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ESSAYS ON FINANCIAL INTERMEDIATION IN TRANSITION AND EMERGING COUNTRIES

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«La faculté n’entend donner aucune approbation ou improbation aux opinions émises dans les thèses ; ces opinions doivent être considérées comme propres à leurs auteurs.»

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In memory of my uncle François

SUMMARY

INTRODUCTORY CHAPTER

Over the past two decades, substantial changes have occurred in the banking sector of emerging countries through the liberalization of financial markets, the promotion of foreign competition, the implementation of explicit deposit insurance schemes and the deregulation of interest rates.

In Central and Eastern European countries, the progress from the centrally planned economy toward the market economy went through changes in the banking sector in the mid 1990s. In order to achieve this transformation of the banking sector, several measures have been taken to harmonize the banking legislation, regulation and supervision with the European Union standards. Thus, the relaxation of the regulatory limitations on foreign ownership has led to high entry of foreign banks. It enabled the recapitalization and consolidation of local banks and the privatization of inefficient state banks. Besides, the introduction of explicit deposit insurance was one of the major regulatory transformations in the Central and Eastern European countries banking industry.

Also, in the latter half of the 1990s, Asia and Latin America have undergone important changes in their banking industry. These changes were driven by a broader international financial integration and the need for local banking sectors to recapitalize in the wake of financial crises. These reforms have led, as in transition economies, to an increase of foreign bank entry in these countries, and more generally to the broader industry trends of consolidation, privatization and liberalization during this period.

Thus, although the motivations of these financial sector reforms vary among countries, the banking sectors in emerging markets share some common characteristics. First, emerging banking systems are characterized by a massive presence of foreign banks. Second, banks remain the main source of financing of the economy, implying less developed bond and stock markets as part of the financial system of these countries. Overall, these financial reforms have led the banking systems of emerging countries to quickly move towards modern banking systems.

In this thesis, we examine how some aspects of financial sector reforms, precisely the implementation of explicit deposit insurance and the entry of foreign banks, impact banks' risk-taking behavior in the emerging countries.

The prevention of bank runs, the limitation of the frequency and cost of individual bank failures and the protection of small and unsophisticated depositors are the motivation of the implementation of explicit deposit insurance. Indeed, Diamond and Dybvig (1983) show

that deposit insurance is an optimal policy in a model where bank stability is threatened by self-fulfilling depositor runs. It is for this reason among others, that Central and Eastern European countries implemented explicit deposit insurance schemes in the early 1990s within the framework of the liberalization of their economies and also to comply with the European Union (EU) Directive on Deposit Insurance.

Despite the fact that deposit protection schemes are considered by policymakers as vital in maintaining financial stability, it has been argued that it has an important side-effect. Indeed, with explicit deposit insurance, depositors know their capital is safe; therefore, they no longer have an incentive to monitor banks. Accordingly, riskier banks do not have to pay higher rates to their depositors to compensate them for holding riskier deposits. This encourages banks to engage in more risky activities. This is usually referred to as moral hazard created by deposit insurance. As a result, deposit insurance may lead to banking system fragility. Although deposit insurance schemes may be a source of moral hazard empirical evidence of its impact on banks risk-taking and more generally on the stability of the banking system as a whole provide mixed conclusions (Demirgüc-Kunt and Detriagache (2002); Gropp and Vesala (2004)).

In addition, the deposit insurance scheme is also likely to dampen market discipline. The increasingly sophisticated banking operations, globalization and the growth of global large banks have complicated the role of banking supervisors. For this reason, bank regulators and economists argue that it would be appropriate to associate private investors to bank supervisors in their task of banking supervision. This is referred to as private market regulation or market discipline as it is commonly called.

According to Bliss and Flannery (2002) market discipline involves two key functions: monitoring and influence. Bliss and Flannery (2002) deem that monitoring requires market participants to have the incentives and ability to monitor the actions of the firm and its managers. Bliss and Flannery (2002) add that monitoring is a necessary but not sufficient condition for market discipline. For market discipline to be effective there must be a feedback from the monitors which induces firm managers to adjust their behavior. They call this "influence." Influence can come directly from market participants, called direct discipline, while when it comes from other agents, such as regulators, who use the information provided by market monitoring to take actions that influence managers' decisions; it is called indirect discipline (Bliss (2001)).

Also, Bliss (2004) adds that discipline can take one of two forms. Ex post discipline comes in response to managerial actions. Actions the markets disapprove of may be "punished" in various ways, the most drastic being a withdrawal of funds that may lead to illiquidity and possible insolvency. Properly aligned incentives, including the threat of adverse consequences, may induce managers to undertake actions which are in the first place consistent with the market's interests. This is called ex ante discipline. In the specific context of the banking industry, market discipline (the "influence" function) results in the fact that market forces can raise the cost or restrict the volume of funding for risky banks. This threat could ultimately curb the excessive risk-taking behavior of banks.

There is by now a solid consensus that private investors might have to supplement bank regulators in their supervisory activities. The importance of market discipline became widely recognized insomuch that it forms the third of three pillars of the Basel II accord (Basel Committee on Banking Supervision, 2004).

To be effective, market discipline requires that creditors and depositors have adequate information about the risk profile of banks but also, importantly, that their incentives to take action in response of this information are not distorted. This latter condition explains why deposit insurance is likely to dampen market discipline. Indeed, market discipline is distorted with the introduction of deposit insurance schemes because of the moral hazard argument outlined above: the explicit deposit insurance scheme lowers the incentives of creditors (including depositors) to monitor the investment behavior of their banks.

Besides, the disciplinary role of creditors (bondholders, stockholders, depositors) depends heavily on the existence of well-functioning financial markets where price and quantity movements indicate accurate information on banks' risk profile. Less developed financial systems as in emerging and transition countries may narrow the scope of market discipline. Also, it raises the question of which type of economic agent is most likely to ensure the effectiveness of market discipline in such a context.

Another aspect of financial sector reform in emerging countries is the entry of foreign banks, which led a structural transformation of the banking market of these countries, that is, a considerable presence of foreign banks.

Proponents of foreign banks often argue that foreign banks transfer to local banks the skills and technology that enhance risk management and internal controls, especially a foreign bank presence encourages higher standards in auditing, accounting and disclosure, credit risk underwriting, and supervision (Martinez-Peria and Mody (2004)). Therefore, the presence of foreign banks is expected to improve overall bank soundness of host countries, especially in less developed banking systems as in emerging countries. However, the literature shows that the effect of foreign ownership on banks' risk-taking is unclear (Haber and Musacchio (2005); Levy-Yeyati and Micco (2007)). The question regarding the presence of foreign banks in emerging countries and its implications for domestic banking systems in terms of stability remains open. In this thesis, we focus on the foreign banks' business strategies and their implications on their risk-taking behavior compared to their domestic peers.

Objectives and contents of the thesis

The analysis of the effects of these structural and regulatory transformations of the emerging banking systems on financial stability and economic development is still work in progress. The purpose of this thesis is to investigate how some aspects of financial sector reforms or their consequences, affect financial sector stability in some emerging countries. More precisely, firstly, this thesis examines the effects of deposit insurance on bank risk-taking, given that the evidence of deposit insurance on risk-taking is mixed. Second, this thesis addresses the question of the effectiveness of market discipline in emerging banking markets and the impact of explicit deposit insurance on potential market discipline, specifically the discipline exerted by other banks (peer discipline). Lastly, we examine the impact of foreign banks penetration in emerging countries on their banking stability.

This thesis consists of three essays on deposit insurance, bank risk-taking, market discipline and foreign banks penetration in emerging countries and is organized as follows.

In chapter 1, using data for 245 banks across 10 Central and Eastern European countries, we empirically analyze the implications of the implementation of explicit deposit insurance schemes for bank risk-taking and market discipline. We show that the introduction of explicit deposit insurance in the 90's has led to higher risk-taking incentives. We also show that market discipline exerted by depositors through the interest rate in absence of explicit

deposit insurance is weak and that it disappears in presence of explicit deposit insurance. However, considering the market discipline exerted by depositors through the volume of deposits (deposit growth), we find an evidence of market discipline, more precisely evidence of ex-post discipline, in presence of an explicit deposit insurance scheme. We also show that the adverse effect of explicit deposit insurance on bank risk-taking varies with the cross-country differences in terms of legal and institutional environment.

In chapter 2[1], we empirically examine the disciplining role of interbank deposits. We find that market discipline exerted by banks has been effective in Central and Eastern Europe since the implementation of explicit deposit insurance. However, several factors affect the strength of this discipline. State-owned banks are not disciplined probably because they benefit from implicit insurance. Institutional and legal factors, and resolution strategies adopted by countries during banking crises also impact bank risk and the effectiveness of market discipline. Our results indicate that stronger regulatory discipline reduces risk but also weakens market discipline.

In chapter 3, we analyze the business model of foreign banks in transition and emerging countries and its impact on bank risk-taking. We find that foreign banks rely more on non-interest income activities and non-deposit funding. Also, foreign banks have smaller maturity mismatch between assets and liabilities than domestic banks. This difference in terms of business model is also reflected in different risk levels for foreign banks and domestic banks. Specifically, we find that foreign banks have a higher insolvency risk, while they exhibit a better loan portfolio quality than domestic banks.

[1] This chapter consists in an article co-authored with Isabelle Distinguin and Amine Tarazi and published in Journal of Comparative Economics (2012).

CHAPTER 1

BANK DEPOSIT INSURANCE, MORAL HAZARD AND MARKET DISCIPLINE: EVIDENCE FROM CENTRAL AND EASTERN EUROPE

1.1 Introduction

The prevention of financial and banking crisis requires all countries to have financial safety nets. Thus, deposit insurance system, one component of the safety nets, is widely implemented by policy makers and regulators around the world in their effort to ensure the stability of the banking system and to protect bank depositors from bank failures. Although an explicit[2] deposit insurance scheme is considered as an important device to ensure bank stability, theoretical and empirical studies provide conflicting results on the impact of explicit deposit insurance schemes on bank risk-taking behaviour. Whereas some empirical studies have found that explicit deposit insurance reduces bank riskiness or has no impact on it (Gropp and Vesala (2004), Karels and McClatchey (1999)), other empirical studies have shown that it can create moral hazard, encouraging higher risk-taking by banks (Laeven (2002), Demirgüc-Kunt and Detragiache (2002)).

Also, there is a growing interest among economists as well as regulators in favouring the reliance on market forces and higher involvement of private agents such as uninsured creditors to monitor banks (Flannery (2001), BIS (2003)). Thus, since Basel 2, the Basel Committee on Banking Supervision has designated market discipline the third of the three pillars of the regulatory framework. At the same time, despite the advantages of explicit deposit insurance, critics have pointed out that if depositors are protected by an explicit deposit insurance, they will have less incentives to punish banks for high risk taking. Thus, an important question is whether the presence of explicit deposit insurance is a burden for market discipline?

The question of the impact of explicit deposit insurance on both bank risk-taking and on market discipline is especially important for Central and Eastern European countries where the explicit deposit insurance schemes have been implemented in the early 1990s within the

[2] Explicit or formal deposit insurance is opposed to implicit deposit insurance. Explicit deposit insurance is based on formal regulation through central bank law, banking law, or the constitution. These laws define for example the coverage limits and the funding mode of the deposit insurance, and how bank failures will be resolved. In absence of explicit deposit insurance, the deposit insurance is implicit that is depositors are protected by the bank monitoring and regulatory authority – which does so without specifying guarantees regarding the extent of the protection (Demirgüc-Kunt et al. (2005)). Most countries have henceforth explicit insurance scheme (see Demirgüc-Kunt et al. (2005)) for the year in which an explicit deposit insurance was first enacted in each country).

framework of the liberalization of their economies, to comply with the European Union (EU) Directive on Deposit Insurance and to deal with the banking distress that they suffered at the beginning of their transition process. Indeed, since the implementation of explicit deposit insurance schemes in Central and Eastern European countries no study has analyzed its impact on both banks' risk-taking and market discipline, the exception is Angkinand and Wihlborg (2010) who analyze the effects of explicit deposit insurance in Central and Eastern Europe and Asia using country-level data. Also, most of the studies that analyze the issue of market discipline usually focus on Europe or on the U.S. where financial markets are well developed and where the potential instruments of market discipline are broad, except Martinez-Peria and Schmukler (2001) who investigate the existence of market discipline in the Argentine, Chilean, and Mexican banking industries in the 1980s and 1990s. Moreover, Barth et al. (2004) argue that market discipline is possible only if it is promoted by rigorous accounting and auditing rules and in absence of generous deposit insurance schemes. Testing market discipline in Central and Eastern European countries where the conditions of the effectiveness of market discipline may be doubtful seems important.

Using bank-level and country-level data from 1995 to 2006 from 10 Central and Eastern European countries, the aim of this paper is first, to assess the consequences of explicit deposit insurance on bank riskiness and second, on the disciplinary role of depositors. To analyse the impact of explicit deposit insurance on market discipline, as in Demirgüç – Kunt and Huizinga (2004) or in Martinez Peria and Schmukler (2001), we investigate whether the sensitivity of bank deposits interest rate or banks' growth rate of deposits to banks' risk profile, is impacted by the explicit deposit insurance system. Indeed, the existence of market discipline of depositors assumes that they take action against banks that engage in excessively risky activities. Precisely, depositors must "punish" riskier banks by withdrawing their deposits or by requiring higher rates to compensate them for holding riskier deposits.Third, even if explicit deposit insurance may create incentives for higher risk-taking, we hypothesize that its negative impact on bank risk-taking may be dampened by a strong legal and political environment. Thus, in this chapter, we also test how differences in institutional environment across countries affect the impact of explicit deposit insurance on bank's risk-taking behavior.

The key findings are as follows. First, we find strong evidence that banks take on higher risk in the presence of explicit insurance and hence that explicit deposit insurance has generated moral hazard for banks in Central and Eastern Europe. Second, we find weak

evidence of market discipline through interest rate required by depositors, and only in absence of explicit deposit insurance. The implementation of explicit insurance schemes, however, has enhanced market discipline exerted by depositors through the growth rate of deposits. Finally, we find that the adverse impact of deposit insurance on bank risk-taking is weaker in countries with a good legal and institutional environment.

The remainder of this chapter is organized as follows. Section 1.2 reviews the literature on bank risk-taking, deposit insurance, and market discipline and explains how this work extends the existing literature. Section 1.3 presents our sample, hypotheses, and variables. Section 1.4 analyses the impact of explicit deposit insurance on bank risk-taking. Section 1.5 investigates the impact of explicit deposit insurance on market discipline exerted by depositors. Section 1.6 is dedicated to the influence of legal and institutional environment on the relationship between explicit deposit insurance and bank risk-taking. Section 1.7 concludes.

1.2 Related literature and research focus

Empirical evidence on the impact of explicit deposit insurance on bank risk-taking has produced mixed results. In the case of the US, Wheelock (1992) and Thies and Gerlowski (1989) find a positive and significant relationship between deposit insurance and bank failure during the 1920's. Demirgüc-Kunt and Detriagache (2002) likewise, find that explicit deposit insurance increases the probability of having a banking crisis in weak institutional environment. In addition, they find that the adverse effect of deposit insurance on bank stability is even more severe when the coverage offered to depositors is high and when it is managed by the government rather than by the private sector. Hovakimian, Kane and Laeven (2003) reach a similar conclusion when they argue in their study that risk shifting to the government or subsidization of risk taking is stronger in poor institutional environments. Using estimates of the value of the deposit insurance premium as a proxy for risk taking, Laeven (2002) concludes that the existence of deposit insurance schemes creates moral hazard for banks. However, he also finds that these incentive problems differ in magnitude for banks with different governance structure. By contrast, in the U.S. case, Alston et al. (1994) fail to find a positive relationship between deposit insurance and bank failure rates during the

1920's. Similarly, Karels and McClatchey (1999) find no evidence that the adoption of deposit insurance increased the risk-taking behaviour of credit unions, examining the relationship between deposit insurance and risk-taking behaviour within the U.S. credit union industry. In the European case, Gropp and Vesala (2004) show that explicit deposit insurance in the European banking system has reduced banks' risk taking through a decrease in leverage risk.

This paper also builds on the strand of the literature related to the impact of deposit insurance on market discipline. This literature provides mixed results. Indeed, Mondschean and Opiela (1999) find that the sensitivity of interest rates on time deposits to the risk profile of banks declined after explicit deposit insurance was introduced in Poland. Martinez-Peria and Schmukler (2001) study the interaction between market discipline and deposit insurance focusing on the experiences of Argentina, Chile, and Mexico during the 1980's and 1990's. They find that deposit insurance does not diminish the extent of market discipline. They also find that insured and uninsured depositors identically respond to changes in bank risk, suggesting that none of the deposit insurance schemes is fully credible. Demirgüc-Kunt and Huizinga (2004) investigate the effect of deposit insurance (and its key features) on bank interest rates and market discipline. They find that higher explicit coverage and a funded scheme reduce market discipline, i.e. the risk sensitivity of the deposit interest rate the bank has to pay. However, Angkinand and Wihlborg (2010) argue that explicit deposit insurance may favour market discipline if it credibly excludes some creditors from insurance. They analyze how country specific conditions, the ownership and governance of banks interact with deposit insurance systems to determine the impact of market discipline on banks' risk taking. They focus on country level proxies for risk taking for both the developed and emerging countries. They find a U-shaped relationship between explicit deposit insurance coverage and banks' risk taking and conclude that market discipline depends on the extent of explicit deposit insurance, as well as on the credibility of non-insurance of creditors. They do not infer the optimal coverage of deposit insurance that maximizes market discipline, but consider that this coverage depends on country-specific characteristics of bank governance.

This paper extends earlier works in several directions. First, we explicitly focus on the implications of explicit deposit insurance on both banks' behaviour and market discipline. Indeed, explicit deposit insurance can lead to moral hazard problems by considerably reducing some creditors' risk in the event of bank default, and then, altering their incentives

to monitor banks' management. Consequently, explicit deposit insurance can encourage banks to choose a riskier portfolio and it can also reduce the market discipline, at least the monitoring aspect. However, the introduction of explicit insurance can be beneficial for market discipline in countries where implicit insurance was broad in the absence of explicit insurance. Second, even if several studies consider the implications of explicit deposit insurance on bank risk-taking, and also on market discipline, the closest paper to ours is Demirgüc-Kunt and Detragiache (2002) focusing on country-level analysis while our paper focuses on bank-level analysis. Besides, Demirgüc-Kunt and Detragiache (2002) exclude economies in transition in their analysis. We also use measures of risk-taking that differ from those of Demirguc-Kunt and Detragiache (2002). Third, as we focus on Central and Eastern European countries, we know that the agents likely to exert a discipline are limited. For example, because bond markets are too narrow and illiquid, we cannot focus in our study on the role played by subordinated debt holders which was the main concern of numerous U.S. studies. In our study, we focus on the discipline exerted by depositors by looking at whether depositors require higher interest rate or withdraw their deposits from risky banks. Investigating market discipline is of particular interest in the case of these countries because the conditions of its effectiveness appear less favourable than in other countries. Moreover, because market discipline is expected to be weaker in such a context because of less developed financial markets it is important to determine whether the introduction of explicit deposit insurance has improved or reduced the effectiveness of this discipline. Finally, this paper adds to the literature by further analyzing the impact of legal and institutional environment on the adverse influence of explicit deposit insurance on bank risk-taking.

1.3 Sample, hypotheses and variables

In this section, we first provide information about our sample and the collected data. Then, we present our set of variables and formulate our hypotheses.

1.3.1 Sample

We consider a sample of commercial banks established in 10 Central and Eastern European transition countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania,

Poland, Romania, Slovakia and Slovenia[3]. The sample period is from 1995 to 2006. Accounting data (annual financial statements) for individual banks are obtained from Bankscope Fitch IBCA.

We collected balance sheets and income statements for 340 commercial banks for the countries we consider in this study from Bankscope and we deleted 95 banks with less than 3 consecutive years of time series observations for the following variables: return on assets, return on equity and total assets. Our final sample consists of 245 banks. Indeed, this restriction ensures that we can calculate standard deviations to compute our different dependent variables presented below.

Table 1.1 shows descriptive statistics for some key variables on both the raw sample of 340 banks collected from Bankscope and our sample of banks. We can see that the univariate statistics of these two samples are very similar. With respect to our final sample, we notice that on average, banks receive 76.72% of deposits relatively to total assets. On the asset side, the average value of the net loans to total assets ratio is equal to 45.49%. Considering profitability, the average ROA equals 1.17%. In terms of capitalization, the average equity to total assets ratio amounts to 12.67%.

[3] 24 banks in Bulgaria, 35 in Czech Republic, 9 in Estonia, 34 in Hungary, 27 in Latvia, 11 in Lithuania, 60 in Poland, 24 in Romania, 18 in Slovakia, and 22 in Slovenia.

Table 1.1: Descriptive Statistics on Summary Accounting Information of the raw sample and the 245 banks on the period 1995-2006.

	Full sample of commercial banks collected in Bankscope (340 banks)				Our sample (245 banks)			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Total assets (€ th.)	1584366	3616960	957	3.70e+07	1669020	3677817	957	3.70e+07
ROA (%)	0.838	4.928	-77.181	65.615	1.173	3.866	-33.586	65.615
Equity/ Total assets (%)	13.778	13.467	-99.983	100	12.673	8.612	2.790	58.560
Net loans/ Total assets (%)	45.208	19.894	0	98.013	45.485	19.442	0.036	98.013
Deposits/ Total assets (%)	76.240	16.156	0	145.778	76.724	14.403	0.216	98.511
Net interest margin (%)	5.151	4.656	-35.836	73.013	5.163	4.057	-31.579	35.153
Off balance sheet/ Total assets (%)	42.079	315.434	-7.241	9144.619	30.354	85.173	-7.241	1072.907

1.3.2 Hypotheses

We aim to test the consequences of the introduction of explicit deposit insurance on banks' risk-taking considering both its direct effect on banks' risk and its indirect effect *via* the effectiveness of market discipline.

The benefits of deposit insurance are the protection of small depositors, the maintenance of public confidence in the banking system and the minimization of the broader economic consequences that can accompany bank failures (Diamond and Dybvig (1983)). Unfortunately, deposit insurance can generate moral hazard and can encourage banks to take excessive risk (see Merton (1977)). Indeed, the put-option feature of deposit insurance and the limited liability of bank shareholders, give to the shareholders incentives to take excessive risks, especially when banks have a low level of equity (Rochet (1992). By absorbing part of the losses when a bank fails, deposit insurance is equivalent to a subsidy for bank risk-taking. Cross-country studies show that explicit deposit insurance may encourage banks to take excessive risk (Wheelock (1992), Demirgüc-Kunt and Detriagache (2002), Hovakimian et al. (2003)).

The above theoretical and empirical arguments lead us to make the following hypothesis:

Hypothesis 1: The existence of explicit deposit insurance creates moral hazard which leads banks to take more risk than without explicit deposit insurance.

The first objective of explicit deposit insurance is to protect banks' customers and maintain confidence in the banking system. However, by reducing the potential losses for some creditors in case of bank failure, it lowers their incentives to monitor bank risk-taking (see e.g. Flannery 1998, Gropp et al. 2006). Indeed, market discipline involves two key functions: monitoring and influence. "Monitoring" requires market participants to have the incentives and ability to monitor the actions of banks, while "influence" corresponds to the response from the monitors, which "in fine" induces banks to adjust their behavior (Bliss and Flannery (2002)). The existence of explicit deposit insurance reduces the incentives of depositors to monitor the activities of their banks, and inevitably to engage the influence process of the market discipline, since they are protected. More precisely, because of explicit deposit insurance, depositors have no reason to "punish" riskier banks by withdrawing their funds or by requiring higher rates on their deposits.

Based on these theoretical arguments, we make the following assumption:

Hypothesis 2: The existence of explicit deposit insurance undermines the discipline exerted by depositors.

However, even if deposit insurance may make depositors less likely to enforce market discipline on banks and can provide banks incentives to take excessive risk, this adverse impact of explicit deposit insurance on bank soundness may be curbed by regulatory restrictions or legal and institutional environment. Indeed, since the seminal work of La Porta et al. (1997, 1998), it has long been suggested that law and institutional environment are important determinants of financial development, and specifically, better institutions seem to lead to better outcomes for financial system. For example in countries with better quality and enforcement of law, managers might have reduced incentives to engage in fraud and strategic default at the expense of depositors. Thus, Barth et al. (2004), for example, find that greater adherence to the rule of law and greater political openness mitigate the negative association of moral hazard and bank fragility. We can deduce from the foregoing, this third hypothesis:

Hypothesis 3: The adverse impact of explicit deposit insurance on bank risk-taking is smaller in countries with strong institutional environment.

1.3.3 Presentation of variables

In this section we describe our bank risk-taking proxies and the different independent variables introduced in our estimations. Descriptive statistics regarding these variables are given in Table 1.2.

1.3.3.1 Bank risk measures

First, we consider the *Z-SCORE* as a measure of individual bank default risk. The *Z-SCORE* is defined as:

$$ZSCORE = (ROA + EQTA) / SDROA$$

where *ROA* is the 3-year rolling window average return on assets defined as the ratio of net income to average total assets, *EQTA* represents the average ratio of equity to total assets and *SDROA* stands for the 3-year rolling window standard deviation of the return on assets. All the ratios are in percentages. The *Z-SCORE* has been widely used in the literature as a measure of bank default risk (Hannan and Hanweck (1988), Boyd et al. (1993) and De Nicolo (2000) Houston et al. (2010)). A lower *Z-SCORE* value indicates a higher probability of bank failure.

Second, as measures of banks' assets risk, we use the 3-year rolling window standard deviation of the return on assets (*SDROA*) and the 3-year rolling window of the standard deviation of the return on equity (*SDROE*). A higher standard deviation indicates higher risk taking.

Table 1.2: Definition of the dependent and independent variables and descriptive statistics on our sample

Variable name	Description	Mean	Standard Deviation	Min	Max	Sources
SDROA	The 3-year rolling window standard deviation of the ROA (return on assets).	1.144	2.109	0.009	21.187	Bankscope
SDROE	The 3-year rolling window standard deviation of the ROE (return on equity).	10.592	18.876	0.058	193.726	Bankscope
ZSCORE	Z-SCORE=(ROA+EQTA)/SDROA, where ROA is the 3-year rolling window average return on average assets, EQTA is the 3-year rolling window average ratio of total equity to total assets; SDROA is the 3-year rolling window standard deviation of the ROA.	41.729	78.424	-0.116	1408.728	Bankscope
INTEREST	Ratio of interest expense on total liabilities minus total non-bearing debt (%)	6.138	5.748	0	81.635	Bankscope
GWTH_DEP	Deposit Growth is the growth rate of a bank's customer and short term funding, after dividing by the GDP deflator	16.708	33.080	-81.5089	132.893	Bankscope
LTA	Natural logarithm of total assets.	13.018	1.654	6.864	17.427	Bankscope
NONII	Ratio of non-interest income to total operating income (%)	41.032	17.714	0	99.269	Bankscope
GDPG	Rate of real GDP growth (%)	4.307	3.040	-9.030	12.233	Bankscope
RESOL	Crisis resolution adopted strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks	0.277	0.447	0	1	Tang et al. (2000) Dinger and Von Hagen (2009)
FOREIGN	Equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise	0.560	0.496	0	1	Bankscope

Table 1.2- *Continues*

Variable name	**Description**	**Mean**	**Standard Deviation**	**Min**	**Max**	**Sources**
RULEOFLAW	Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	0.492	0.403	-0.359	1.224	Kaufmann, Kraay, and Mastruzzi(2010)
VOICE	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	0.875	0.253	0.240	1.323	Kaufmann, Kraay, and Mastruzzi(2010)
GOVEFFECT	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	0.529	0.409	-0.623	1.173	Kaufmann, Kraay, and Mastruzzi(2010)
REGQUAL	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	0.765	0.345	-0.122	1.383	Kaufmann, Kraay, and Mastruzzi(2010)
CORRUP	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	0.279	0.418	-0.823	1.314	Kaufmann, Kraay, and Mastruzzi(2010)
DEPINS	Deposit insurance scheme dummy variable that takes the value of one if there is an explicit deposit insurance scheme on the considered period and 0 otherwise	0.942	0.234	0	1	World Bank Database, Barth et al. (2004)
DIPOW	Deposit insurer power determined by adding 1 if the answer is yes and zero otherwise for each of the following questions: (1) Does deposit insurance authority make the decision to intervene a bank? (2) Can deposit insurance agency take legal action against bank directors/officials? (3)Has the deposit insurance agency ever taken any legal action against bank directors/officials? The dummy variable DIPOW takes the value of one if the deposit insurer power is high that is if the number of "yes" answers is 2 or 3, and 0 otherwise.	0.237	0.425	0	1	World Bank Database, Barth et al. (2004)

1.3.3.2 Control Variables

In our empirical analysis, we also control for a number of control variables at the bank-level as well as country-level used in previous literature as determinant of the riskiness of individual banks. These variables capture individual bank characteristics and reflect macroeconomic factors, the institutional environment and the regulatory and supervisory process at the country level.

Bank characteristics

As a control variable at the bank-level, we include the natural logarithm of total assets (*LTA*) to control for bank size. Larger banks can have a greater ability to diversify their risk and thus should have more stable earnings which reduce their insolvency risk. However, in the presence of a too-big-to-fail (TBTF) policy, larger banks might have incentives to take higher risk (Galloway et al. (1997), and Beck and Laeven (2006)). We also include as control variable the bank capitalization defined as the ratio of equity to total assets (*EQTA*). We control for banks' business model, measured by the share of non-interest income in total operating income (*NONII*). Differences in ownership can also affect bank risk. Specifically, we consider the influence of foreign ownership. We construct a dummy variable (*FOREIGN*), that takes the value of 1 if shareholders located in a foreign country own together at least 50 percent of the bank, and zero otherwise. Proponents of foreign banks argue that foreign banks may not be willing to take high levels of risk, for at least two reasons: firstly, because of their charter value at risk, and secondly because they are supervised twice: that is by the host and the home regulatory authority (see, e.g., Demsetz, et al. (1996) and Mian (2006)). Charter value at risk means that, if a foreign bank takes too much risk in a developing country and has a fear of bank failure, it would reap large negative consequences, through reputation, on its operations worldwide (see, e.g. Mian (2006)). From this point of view, foreign banks should be less risky.

Country characteristics

At the country-level, we first control for the presence of explicit deposit insurance, defined as a dummy variable (*DEPINS*) that takes the value one if the country for the given year has an explicit deposit insurance scheme, and zero otherwise. The date of introduction of explicit deposit insurance for each country is reported in Table 1.3[4]. We also control for the the power of the deposit insurer that captures different features of the deposit insurance schemes implemented in the countries, and indicates the extent of the powers and the degree of protection of the deposit insurance fund. Thus, we include an index reflecting the power of the deposit insurance authority (*DIPOW*), with higher values indicating more power, as in Pasiouras et al. (2006)[5].

Table 1.3: Date of introduction of an explicit deposit insurance scheme by country

Country	Year
Bulgaria	1996
Czech Republic	1994
Estonia	1998
Hungary	1993
Latvia	1998
Lithuania	1996
Poland	1995
Romania	1996
Slovakia	1996
Slovenia	2001

Source: Demirgüc-Kunt et al. (2005)

[4] The coverage limits of deposits insurance for the sample countries, as of 2003 and the percentage of total banking sector deposits under protection in each country are presented in appendix in Table A1.

[5] See Table 1.2 for more details on the construction of this index.

This dummy variable takes the value one if the power of the deposit insurance authority is high and zero otherwise.[6] We expect that a more powerful insurer is more likely to tackle moral hazard issues and that banks engage in lower risk-taking in a country with a stronger deposit insurance authority. We consider other country-level variables that might affect bank risk. We control for business cycle fluctuations and the overall economic conditions, measured by annual growth rate of the real Gross Domestic Product (*GDPG*). We include a dummy variable (*RESOL*) that accounts for differences across countries in terms of resolution strategies adopted when the country has experienced banking crises or severe banking distress. Indeed, according to Tang et al. (2000) and Dinger and Von Hagen (2009), the crisis resolution strategies pursued by the countries of our sample fall into two broad categories: (i) extensive restructuring and recapitalization of banks which corresponds to Bulgaria, Czech Republic, Hungary, Lithuania, Poland, and Slovakia which were reluctant to let incumbent banks fail and (ii) a combination of bank liquidation and restructuring for Estonia, Latvia, Romania, and Slovenia. The dummy variable *RESOL* takes the value of one for banks from countries that have proceeded to a combination of bank liquidation and restructuring, and zero otherwise. Claessens and Laeven (2003) show that different approaches in terms of resolution of banking crises have led to very different outcomes in terms of economic growth after the crisis. We assume that these specificities could affect bank risk-taking incentives and that such incentives should be lower in countries that have experienced actual liquidations.

Finally, it has long been suggested that risk-taking incentives of banks managers might depend on the quality of the institutional environment of the country. We therefore control for a series of political and institutional variables**.** These indexes of institutional environment are retrieved from the World Governance Indicators (WGI) of Kaufmann et al. (2010). The Worldwide Governance Indicators (WGI) are a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. These data are gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations,

[6] Deposit insurer power is determined by adding 1 if the answer is yes and zero otherwise for each of the following questions: (1) Does the deposit insurance authority make the decision to intervene in a bank? (2) Can the deposit insurance agency take legal action against bank directors/officials? (3) Has the deposit insurance agency ever taken any legal action against bank directors/officials? The dummy variable *DIPOW* takes the value of one if the deposit insurer power is high that is if the number of "yes" answers is 2 or 3, and 0 otherwise.

and private sector firms. The WGI are composite governance indicators based on 30 underlying data sources. These variables are:

- Voice and Accountability (*VOICE*) reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

- Government Effectiveness (*GOVEFFECT*) reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

- Regulatory Quality (*REGQUAL*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

- Rule of Law (*RULEOFLAW*) reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

- Control of Corruption (*CORRUP*) reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

These indexes of governance range from -2.5 (weak) to 2.5 (strong) governance performance.

1.4 Deposit insurance and bank risk-taking

To assess the impact of explicit deposit insurance on bank risk-taking, we estimate the following panel regression:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 DEPINS_{j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + \varepsilon_{i,j,t} \qquad (1.1)$$

with $RISK_{i,j,t}$ is the bank risk-taking proxy of bank *i* in country *j* in year *t* (either *SDROA*, *SDROE* or *Z-SCORE*); $DEPINS_{j,t}$ is a dummy variable equal to one if in country *j* in year there is an explicit deposit insurance scheme, and zero otherwise ; X_{ijt} is a vector of bank-level control variables; $Z_{j,t}$ is a vector of factors at the country level such as macroeconomic and institutional environment factors that are expected to affect bank's risk-taking at time t. α_k and β_h' are vectors of parameters to be estimated, η_i is the individual fixed effects, τ_t time fixed effects, and ε_{ijt} is the error term.

The set of bank-level control variables includes bank size, the banks' capitalization measured by the equity to assets ratio, the proxy of bank business model, a dummy variable equal to one if bank *i* in country *j* in year *t* is foreign-owned and zero otherwise. The set of country-level control variables includes GDP growth rate, the resolution strategy variable (*RESOL*), the index reflecting the power of the deposit insurance authority (*DIPOW*) and the Rule of Law (*RULEOFLAW*).[7] The detailed definitions of these variables can be found in Section 1.3.3 and in Table 1.2.

The descriptive statistics of our variables indicate highly skewed and heavy tails distribution of variables suggesting the presence of outliers. In order to detect outliers, we run OLS regressions and calculate the Cook's values[8]. Then, we drop any observation if its Cook's value is greater than 4/n, where n is the number of observations in the regression[9]. Finally, we estimate the panel model with OLS using bank and time fixed effects. Standard errors are computed using White's heteroskedasticity-consistent standard errors. We use this method of standard error computation throughout this chapter.

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[7] Rule of Law (*RULEOFLAW*) is taken as our primary institutional environment measure. Indeed, as can be seen from the correlation matrix (Table B1 in Appendix B), the institutional environment factors are highly correlated with each other. Therefore, we do not include them together in the specifications.

[8] Cook's value (D) for the i^{th} observation is a measure of the distance between the coefficient estimates when observation i is included and when it is not, and it is defined as $D_i = \frac{e_{si}^2 (s_{pi}/s_{ri})^2}{k}$; where e_{si} refers to standardised residuals, s_{ri} to standard errors of the residuals and s_{pi} to the standard errors of the prediction. k represents the number of independent variables plus the intercept term. High values of Cook's distance imply that i^{th} observation has significant influence on estimation results, therefore, can be deemed to be an outlier. For more details see Cook and Weisberg (1982).

Furthermore, in our sample several banks have experienced mergers or acquisitions during the period 1995-2006. It seems inappropriate to consider such banks as an unique entity as the balance sheets of these banks have been totally modified by these events. Instead of removing these banks from our sample, we split them into two different entities[10]: we consider the bank after the merger or acquisition as a bank different from the one before the event. This applies to 19 banks in our sample.

Hypothesis 1 states that the existence of explicit deposit insurance creates moral hazard. Under this hypothesis, we expect a significant and positive coefficient (α_1) of the deposit insurance dummy variable, when the risk measures are the standard deviation of the ROA or the standard deviation of the ROE, and a negative coefficient when we use the *Z-SCORE* as the dependent variable.

The results are given in Table 1.4. For each of the reported specifications, we find that the presence of an explicit deposit insurance scheme translates into higher levels of bank risk taking, consistent with our first hypothesis. Indeed, after the implementation of explicit deposit insurance, the results show that the standard deviation of ROE (*SDROE*) is increased by 12.71 and the standard deviation of the return on assets (*SDROA*) by around 1.11. However we do not find a significant relationship between the presence of explicit deposit insurance system and bank's insolvency measure, *Z-SCORE*. Indeed, as shown by Table 1.4, the dummy variable taking into account the presence of explicit deposit insurance (*DEPINS*) is not significant when the dependent variable is *Z-SCORE* and it is significant with a positive coefficient when the risk measure is the standard deviation of the return on assets (*SDROA*) or the standard deviation of the return on equity (*SDROE*). Thus, explicit deposit insurance appears to increase moral hazard: the riskiness of the bank is higher in the presence of explicit deposit insurance.

As far as control variables computed at the bank level are concerned, we find that bank size measured by the natural logarithm of total assets (*LTA*), has a negative and significant effect on the standard deviation of the return on asset (*SDROA*). These results indicate that larger banks are less risky, although this result is only significant for the standard deviation of

[9] See Hamilton (2006) for more details.
[10] This is done only if the merger or acquisition takes place after 1997 and before 2005 in order to be able to compute our dependent variables which are based on standard deviations. If it is not the case, we do not split the bank into two entities but we delete the observations before the event if it takes place before 1998 or the observations after the event if it takes place after 2004.

the return on asset (*SDROA*). The coefficient of the capitalization variable (*EQTA*) is negative and statistically significant when we use the standard deviation of the return on equity (*SDROE*) as risk-taking proxy, suggesting that banks with higher equity ratio take less risk. The banks' business model, measured by the share of non-interest income in total operating income (*NONII*), is positively and significantly related to bank default risk (*Z-SCORE*), suggesting that banks that engage more in non-interest activities are more stable, probably because they benefit from better diversification.

Turning to our control variables at country-level, the coefficient of GDP growth is negative and significant in the specification with the standard deviation of the return on equity (*SDROE*) as dependent variable, suggesting that banks engage in less risky activities in times of economic growth. The rule of law index (*RULEOFLAW*) is significant for all the dependent variables, with a coefficient presenting the expected sign, indicating that higher quality of law enforcement is associated with lower bank riskiness and lower bank risk default. Unexpectedly, foreign banks are more risky than domestic banks since the coefficients on the foreign dummy variable are positive and significant with both the standard deviation of the return on equity (*SDROE*) and the standard deviation of the return on assets (*SDROA*). The power of the deposit insurer (*DIPOW*) is significantly linked with the standard deviation of the ROE (*SDROE*) and the insolvency risk (*Z-SCORE).* These results suggest that banks in countries with higher power of the deposit insurance authority take less risk but have a higher default risk. .

Table 1.4: Impact of explicit deposit insurance on bank risk-taking and bank insolvency risk

VARIABLES	SDROE	SDROA	Z-SCORE
DEPINS	12.710***	1.108***	8.028
	(3.640)	(3.050)	(0.963)
EQTA	-0.292***	-0.010	0.347
	(-3.566)	(-0.748)	(0.896)
LTA	-1.457	-0.385***	1.287
	(-1.521)	(-3.105)	(0.311)
NONII	-0.042	-0.003	0.208**
	(-1.266)	(-1.053)	(1.989)
GDPG	-0.306*	-0.0262	0.906
	(-1.727)	(-1.478)	(1.196)
FOREIGN	4.224*	0.721***	-9.950
	(1.654)	(3.915)	(-1.575)
RESOL	3.388	1.990***	-20.340*
	(1.187)	(4.289)	(-1.815)
RULEOFLAW	-21.000***	-1.285***	33.360**
	(-4.936)	(-3.223)	(2.459)
DIPOW	-8.391**	-0.618	-37.150***
	(-2.081)	(-1.542)	(-2.664)
CONSTANT	24.710	5.306***	-0.753
	(1.581)	(3.445)	(-0.011)
OBSERVATIONS	980	995	1,022
R-SQUARED	0.623	0.587	0.444

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; DEPINS= Deposit insurance scheme dummy variable that takes the value of one if there is an explicit deposit insurance scheme on the considered period and 0 otherwise; *EQTA* = equity to assets ratio; LTA= Natural logarithm of total assets; NONII=Ratio of non-interest income to total operating income (%); FOREIGN=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; GDPG= growth rate of real GDP; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; RULEOFLAW= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

We test the robustness of these results by investigating whether some specific institutional variables affect bank risk-taking. Specifically, we replace the rule of law variable (*RULEOFLAW*) by the other institutional variables[11]. The definitions of these variables are presented in Section 1.3.3. As these variables capture different aspects of the institutional environment and, higher level of these variables indicates better institutional environment, we expect a negative relationship between these variables and risk-taking proxies measured by the standard deviation of the return on equity (*SDROE*) and the standard deviation of the ROA (*SDROA*) and a negative relationship with the bank insolvency risk (*Z-SCORE*). The results related to these specifications are presented in Appendix C. The results are consistent with the previous finding as regard the impact of explicit deposit insurance on bank risk and are consistent with our expectations, that is, a better institutional environment reduces bank risk-taking.

To summarize, the results indicate that there is a positive and significant relationship between the implementation of explicit deposit insurance system in Central and Eastern European countries and bank risk-taking as measured by either the standard deviation of the return on equity (*SDROE*) or the standard deviation of the return on assets (*SDROA*).

However, and in principle, depositors can discipline banks that engage in excessive risk-taking by requiring higher interest rates or by withdrawing their deposits to avoid losing their wealth in case of bank failure. However, the presence of an explicit deposit insurance scheme reduces de facto the potential loss of the creditors and can lower incentives of creditors to monitor bank risk taking. In this context, the deposit insurance would reduce the market discipline. We investigate the impact of explicit deposit insurance system on the disciplinary role of depositors in the next section.

[11] Results (not reported here) do not vary when we develop dummy variables from the institutional variables. Indeed, we construct for each institutional variable a dummy variable that takes 1 for positive value of each variable, and 0 otherwise. The value 1 indicates strong governance performance and 0 a weak governance performance for the dummy variables. Note that the initial values of these indexes of governance range from -2.5 (weak) to 2.5 (strong) governance performance.

1.5 Deposit insurance and market discipline

Do depositors "punish" riskier banks by withdrawing their deposits or by requiring higher rates to compensate them for riskier deposits? In this section we investigate whether the existence of an explicit deposit insurance affects the relationship between the cost of bank's funding or the growth of deposits attracted by the bank and its risk profile.

We make these investigations by estimating the following panel model:

$$Y_{i,j,t} = \alpha_0 + \alpha_1 DEPINS_{i,j} + \alpha_2 RISK_{i,j,t} + \alpha_3 (DEPINS_{i,j} \times RISK_{i,j,t}) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{i,j} + \eta_i + \tau_t + \varepsilon_{i,j,t} \quad (1.2)$$

where $Y_{i,j,t}$ is either the implicit interest rate paid by bank i in country j in year t, expressed as the ratio of interest expense to interest-bearing debt or the percentage growth in real deposits. The other variables are as defined in Eq.1.1 in Section 1.4.

A positive (negative) and significant coefficient α_2 of the risk-taking variable (the standard deviation of the return on equity (*SDROE*) or the standard deviation of the return on assets (*SDROA*)), when the dependent variable is the ratio of interest expense to interest-bearing debt (when the dependent variable is the percentage growth in real deposits) may be interpreted as an evidence of market discipline in the absence of an explicit deposit insurance scheme.

A negative (positive) and significant coefficient α_2 of the insolvency risk (the Z-SCORE), when the dependent variable is the ratio of interest expense to interest-bearing debt (when the dependent variable is the percentage growth in real deposits) may be interpreted as an evidence of market discipline in the absence of an explicit deposit insurance scheme.

$\alpha_2 + \alpha_3$ is the impact of risk-taking on the ratio of interest expense to interest-bearing debt or the percentage growth in real deposits in the presence of explicit deposit insurance. It allows us to know whether an explicit deposit insurance scheme undermines or enhances market discipline. The results of the regressions are presented in Table 1.5.[12]

[12] We also apply the two-stage procedure estimation to avoid the bias arising from the correlation between risk-taking and the errors term when we use the observed values of risk-taking, as in a first stage procedure in Section1.4, the risk is defined as a function of the deposit insurance dummy variable and specific country-level and bank-level variables. Applying the two-stage procedure does not change our conclusions.

Table 1.5: Impact of explicit deposit insurance on market discipline

Model specification: $Y_{i,j,t} = \alpha_0 + \alpha_1 DEPINS_{i,j,t} + \alpha_2 (DEPINS_{j,t} * RISK) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$

VARIABLES	INTEREST	INTEREST	INTEREST	GWTH_CUSTDEP	GWTH_CUSTDEP	GWTH_CUSTDEP
DEPINS	4.945***	4.127***	3.532***	-51.25***	-49.14***	-43.95***
	(6.689)	(6.485)	(7.505)	(-4.617)	(-4.458)	(-5.060)
EQTA	0.0316*	0.0379**	0.0298	-1.503***	-1.401***	-1.415***
	(1.689)	(2.006)	(1.542)	(-6.415)	(-5.997)	(-6.098)
LTA	0.384	0.363	0.293	7.679**	8.502***	10.24***
	(1.296)	(1.203)	(0.966)	(2.446)	(2.648)	(3.305)
NONII	0.0183**	0.0183**	0.0191**	0.0781	0.0710	0.0663
	(2.496)	(2.422)	(2.500)	(1.105)	(1.007)	(0.937)
GDPG	-0.170***	-0.171***	-0.155***	0.354	0.395	0.158
	(-3.456)	(-3.471)	(-3.113)	(0.750)	(0.832)	(0.334)
FOREIGN	-0.602	-0.466	-0.575	5.723	6.553*	7.572**
	(-1.400)	(-1.123)	(-1.263)	(1.495)	(1.712)	(2.010)
RESOL	-1.920**	-2.876***	-0.0910	20.83*	-20.96**	-14.34
	(-2.270)	(-2.715)	(-0.0669)	(1.752)	(-2.084)	(-1.455)
RULEOFLAW	2.127***	1.953**	2.767***	10.38	10.93	15.24*
	(2.752)	(2.495)	(3.572)	(1.213)	(1.279)	(1.806)
DIPOW	-2.373***	-1.830**	-1.479**	47.35***	45.57***	46.07***
	(-3.157)	(-2.419)	(-1.995)	(4.163)	(3.961)	(4.393)
SDROE	0.0774**			-1.247*		
	(2.066)			(-1.872)		
SDROE*DEPINS	-0.0940**			1.091		
	(-2.495)			(1.639)		
SDROA		-0.0433			-8.732	
		(-0.376)			(-1.565)	
SDROA*DEPINS		-0.149			7.748	
		(-1.287)			(1.389)	
ZSCORE			-0.00246			0.0685
			(-0.372)			(0.867)
ZSCORE*DEPINS			0.00199			-0.0432
			(0.298)			(-0.542)
CONSTANT	-6.847	-2.945	-2.611	-14.40	-47.99	-65.64
	(-1.424)	(-0.699)	(-0.589)	(-0.292)	(-1.081)	(-1.342)
$\alpha_1 + \alpha_2$	-0,0166***	-0,1923***	-0,00047	-0,156**	-0,984**	0,0253**
Risk level to reject : $\alpha_1 + \alpha_2 = 0$	0.00142	5.41e-05	0.533	0.0129	0.0282	0.0177
OBSERVATIONS	977	1,003	973	937	940	928
R-SQUARED	0.837	0.841	0.839	0.653	0.645	0.662

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *INTEREST*= Ratio of interest expense on total liabilities minus total non-bearing debt; *GWTH_DEP*= Deposit Growth is the growth rate of a bank's customer and short term funding, after dividing by the GDP deflator; *DEPINS*= Deposit insurance scheme dummy variable that takes the value of one if there is an explicit deposit insurance scheme on the considered period and 0 otherwise; *LTA*= Natural logarithm of total assets; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *NONII*=Ratio of non-interest income to total operating income (%); *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Bank and time fixed effects are included in all regressions but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

As can be seen from Table 1.5, bank risk as measured by the standard deviation of the return on equity (*SDROE*) is positively and significantly related to the ratio of interest expense to interest-bearing debt, and negatively and significantly related to the percentage growth in real deposits. These results suggest an evidence of market discipline in absence of explicit deposit insurance. However, this does not hold when we consider the standard deviation of the return on assets (*SDROA*) as bank risk proxy variable, as it is not significantly associated neither with the ratio of interest expense to interest-bearing debt nor with the percentage growth in real deposits.

Also, the default risk (*Z-SCORE*) is not significantly related neither with the ratio of interest expense to interest-bearing debt nor with the percentage growth in real deposits, suggesting no evidence of market discipline in absence of explicit deposit insurance when we consider the default risk (*Z-SCORE*) as the risk proxy.

To summarize, we find a weak evidence of market discipline exerted by depositors in absence of explicit deposit insurance scheme.

Turning to the interaction terms and first, analyzing the possible market discipline through the deposits growth (the percentage growth in real deposits as dependent variable), the sum of the coefficient of the interaction term (the risk factor and the deposit insurance dummy) and the coefficient of the risk measure (*SDROA* or *SDROE*), is negative and significant (see test at the bottom of Table 1.5). Moreover, the sum of the coefficient of the interaction term (the insolvency risk and the deposit insurance dummy) and the coefficient of the insolvency risk (*Z-SCORE*) is positive and significant. These results indicate an evidence of market discipline exerted by depositors through the volume of deposits (deposit growth) in presence of explicit deposit insurance scheme. Indeed, the depositors withdraw their deposits from risky banks in response to banks' high risk-taking. This action refers to what Bliss (2004) calls the ex-post discipline and does not necessarily mean that the managers of banks curb their risky behavior.

Second, considering the market discipline through the interest rate (the interest rate as dependent variable), we find that the sum of the coefficient of the interaction term (the risk factor and the deposit insurance dummy) and the coefficient of the risk measure (*SDROA* or *SDROE*) is negative and significant (see test at the bottom of Table 1.5). This result suggests

an absence of market discipline in presence of explicit deposit insurance, as depositors do not demand higher interest to riskier banks.

With respect to the default risk (*Z-SCORE*), the results show that the sum of the coefficient on the z-score and the coefficient of the interaction term (obtained with the Z-*SCORE* and the deposit insurance dummy variable) is not significant. This suggests an absence of market discipline in the presence of deposit insurance scheme.

Overall, in absence of explicit deposit insurance, we find a weak evidence of market discipline exerted by depositors through the interest rates and this discipline is no longer effective in presence of explicit deposit insurance. However, market discipline exerted by depositors through deposit growth is effective after the implementation of explicit deposit insurance scheme.

Next, we consider some additional extensions that go beyond our main results by investigating the impact of legal and institutional environment on the effect of explicit deposit insurance on bank risk-taking.

1.6 Institutional environment and the impact of explicit deposit insurance on bank's risk-taking behavior

The results above indicate that the existence of explicit deposit insurance creates moral hazard which leads banks to take more risk than without explicit deposit insurance. In this section, beyond the established influence of deposit insurance on bank risk-taking, we analyze whether differences in institutional environment across countries may affect the impact of explicit deposit insurance on bank risk-taking. These institutional variables are the same as those presented in Section 1.3.3 and used as additional control variables in the extension of Eq.1.1 above. Specifically, we estimate a set of panel regressions of the following form:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 DEPINS_{j,t} + \alpha_2 INST_{j,t} + \alpha_3 DEPINS_{j,t} * INST_{j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + \varepsilon_{i,j,t} \quad (1.3)$$

where $INST_{j,t}$ is a particular institutional environment variable (rule of law, government effectiveness, voice and accountability, control of corruption or quality of regulation). The other variables are as defined in Eq.1 in Section 4.

The coefficient on the explicit deposit insurance dummy variable (DEPINS), i.e. α_1 indicates the impact of explicit deposit insurance on bank risk-taking. As shown by the results above, we expect a risk-shifting incentive created by the explicit deposit insurance scheme, that is, a positive estimate of α_1 when the risk-taking proxy is measured by the standard deviation of the return on equity (*SDROE*) and the standard deviation of the return on assets (*SDROA*) and a negative coefficient of the deposit insurance dummy variable when the risk proxy is the default risk (*Z-SCORE*). The coefficient of $INST_{j,t}$ (α_2) indicates the impact of the institutional variable on bank risk-taking. The coefficient of the interaction terms of the deposit insurance dummy variable (*DEPINS*) with the institutional variable (*INST*), i.e. α_3, indicates how the impact of the explicit deposit insurance scheme on bank risk-taking varies with the quality of institutional and legal environment in which the bank operates. In particular, when the dependent variable is the standard deviation of the return on equity (*SDROE*) or the standard deviation of the return on assets (*SDROA*), negative estimates of the α_3 coefficient suggest that higher quality of institutional and legal environment counteracts the moral hazard created by the explicit deposit insurance. The empirical results are presented in Table 1.6.

As can be seen from Table 1.6, the coefficient of the deposit insurance dummy variable is positive and significant in almost all the specifications when the risk-taking proxy is the standard deviation of the return on equity (*SDROE*) or the standard deviation of the return on assets (*SDROA*). It is consistent with our previous findings and suggests a risk-shifting incentive created by the explicit deposit insurance scheme.

As far as the institutional and legal environment variables are concerned, we find negative and significant coefficients on the rule of law (*RULEOFLAW*) and on the corruption level (*CORRUP*) variables, consistent with the previous results, and suggesting that in a better institutional and legal environment, banks take less risk.

Table 1.6: Impact of the institutional environment variables on the effect of explicit deposit insurance on risk-taking.

VARIABLES	SDROE	SDROE	SDROE	SDROE	SDROE	SDROA	SDROA	SDROA	SDROA	SDROA	ZSCORE	ZSCORE	ZSCORE	ZSCORE	ZSCORE
DEPINS	14.600***	12.400	14.240**	10.300*	13.360***	1.209***	0.923	1.350**	0.785	1.210***	5.586	29.680	-7.489	19.530	9.955
	(3.049)	(1.172)	(2.430)	(1.700)	(3.729)	(2.609)	(0.928)	(2.299)	(1.338)	(3.337)	(0.416)	(0.582)	(-0.593)	(0.762)	(1.195)
EQTA	-0.289***	-0.361***	-0.336***	-0.378***	-0.337***	-0.00995	-0.0144	-0.0127	-0.0151	-0.0127	0.343	0.469	0.352	0.483	0.428
	(-3.522)	(-4.201)	(-3.784)	(-4.349)	(-4.065)	(-0.734)	(-1.036)	(-0.901)	(-1.087)	(-0.939)	(0.884)	(1.214)	(0.921)	(1.262)	(1.105)
LTA	-1.427	-2.369**	-1.606	-2.567**	-1.405	-0.384***	-0.441***	-0.400***	-0.456***	-0.371***	1.235	3.070	0.309	3.062	1.917
	(-1.490)	(-2.372)	(-1.594)	(-2.569)	(-1.471)	(-3.102)	(-3.414)	(-3.105)	(-3.504)	(-3.076)	(0.299)	(0.757)	(0.076)	(0.766)	(0.469)
NONII	-0.043	-0.045	-0.039	-0.041	-0.044	-0.003	-0.003	-0.003	-0.003	-0.003	0.209**	0.204*	0.202*	0.204*	0.208*
	(-1.281)	(-1.259)	(-1.139)	(-1.153)	(-1.297)	(-1.064)	(-1.065)	(-0.946)	(-0.922)	(-1.180)	(1.983)	(1.916)	(1.955)	(1.913)	(1.952)
GDPG	-0.305*	-0.421**	0.0383	-0.429**	-0.154	-0.0262	-0.0337*	-0.0102	-0.0344*	-0.0160	0.905	1.137	-0.207	1.127	0.873
	(-1.724)	(-2.313)	(0.159)	(-2.348)	(-0.809)	(-1.474)	(-1.896)	(-0.476)	(-1.913)	(-0.909)	(1.195)	(1.485)	(-0.236)	(1.476)	(1.094)
FOREIGN	4.254*	3.835	4.325	3.681	4.689*	0.722***	0.690***	0.725***	0.668***	0.760***	-9.994	-8.348	-11.860*	-8.686	-9.496
	(1.665)	(1.516)	(1.629)	(1.505)	(1.808)	(3.922)	(3.748)	(3.960)	(3.724)	(4.142)	(-1.574)	(-1.341)	(-1.801)	(-1.404)	(-1.508)
RESOL	17.930**	-2.594	-2.166	-2.792	-2.037	2.758***	2.495***	2.236***	2.428***	1.785***	-24.510	-30.840***	-28.140*	-30.310***	-19.320
	(2.260)	(-0.962)	(-0.830)	(-0.971)	(-0.793)	(3.725)	(4.316)	(5.273)	(4.823)	(4.032)	(-1.528)	(-2.818)	(-1.732)	(-2.784)	(-1.299)
DIPOW	-2.321	1.703	0.896	-0.424	3.944	-0.309	-0.078	0.339	-0.102	0.112	-45.520	-46.610**	-67.80***	-51.310***	-50.54***
	(-0.384)	(0.438)	(0.179)	(-0.120)	(0.988)	(-0.440)	(-0.180)	(0.513)	(-0.276)	(0.274)	(-1.264)	(-2.325)	(-3.023)	(-3.609)	(-2.802)
RULEOFLAW	-14.060*					-0.928					23.940				
	(-1.830)					(-1.104)					(0.561)				
RULEOFLAW_DEPINS	-7.174					-0.369					9.755				
	(-0.898)					(-0.451)					(0.230)				
VOICE		-7.686					-0.720					22.480			
		(-0.748)					(-0.686)					(0.368)			
VOICE_DEPINS		-4.838					-0.084					-18.450			
		(-0.440)					(-0.079)					(-0.301)			
GOVEFFECT			-8.807					0.272					-2.502		
			(-0.686)					(0.190)					(-0.062)		
GOVEFFECT_DEPINS			-5.805					-1.060					44.730		
			(-0.478)					(-0.777)					(1.243)		
REGQUAL				-3.632					-0.298					11.44	
				(-0.790)					(-0.648)					(0.429)	
REGQUAL_DEPINS				-2.267					0.0820					-5.062	
				(-0.455)					(0.164)					(-0.183)	
CORRUP					-9.019***					-0.720**					14.230
					(-3.040)					(-2.495)					(0.840)
CORRUP_DEPINS					-9.584**					-0.646*					4.650
					(-2.549)					(-1.914)					(0.276)
CONSTANT	22.410	43.550**	23.440	43.600***	18.820	4.423**	6.297***	5.042***	6.380***	5.195***	2.416	-45.970	30.230	-39.240	-5.798
	(1.409)	(2.501)	(1.334)	(2.706)	(1.178)	(2.515)	(3.217)	(2.934)	(3.887)	(3.501)	(0.036)	(-0.570)	(0.453)	(-0.600)	(-0.087)
OBSERVATIONS	980	980	980	980	980	995	995	995	995	995	1,022	1,022	1,022	1,022	1,022
R-SQUARED	0.624	0.603	0.610	0.602	0.627	0.587	0.579	0.581	0.578	0.594	0.444	0.439	0.446	0.439	0.441

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *DEPINS*= Deposit insurance scheme dummy variable that takes the value of one if there is an explicit deposit insurance scheme on the considered period and 0 otherwise; *LTA*= Natural logarithm of total assets; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *NONII*=Ratio of non-interest income to total operating income (%); *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *VOICE*= Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media; *GOVEFFECT*= Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *REGQUAL*= Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; *CORRUP*= Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Bank and time fixed effects are included in all regressions but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Turning to the coefficients of the interaction terms of the deposit insurance dummy variable with the different institutional and legal environment variables, they are almost all with the expected sign (negative when the risk proxy is the standard deviation the standard deviation of the ROE (*SDROE*) or the standard deviation of the ROA (*SDROA*) and positive with the default risk (*ZSCORE*)) but only significant when the institutional and legal environment variable is the control of corruption (*CORRUP*). Note that the interaction term of the deposit insurance dummy variable with the control of corruption (*CORRUP*) variable is significantly associated only with the standard deviation the standard deviation of the ROE (*SDROE*) and the standard deviation of the ROA (*SDROA*). These results suggest that the moral hazard effect of explicit deposit insurance is mitigated in countries with an effective control of corruption.

Overall, these results indicate that the extent of risk-shifting incentive of explicit deposit insurance depends on the bank's institutional environment. Indeed, a good legal and institutional environment counteracts the moral hazard generated by an explicit deposit insurance scheme. These results are consistent with Kane (2000), Demirgüc-Kunt and Detriagache (2002) and Gonzalez (2005) who find that the risk-shifting incentives of deposit insurance are higher in countries with weak institutional environment and weak enforceability of private contracts.

1.7 Conclusion

In this paper, we employ a data set of 245 commercial banks from 10 transitions countries for the period of 1995-2006, and analyze the impact of explicit deposit insurance implementation on the bank's behavior in terms of risk-taking. The results show that explicit deposit insurance has generated moral hazard for banks in Central and Eastern Europe as there is evidence of higher risk-taking in presence of explicit insurance.

We also investigate the impact of explicit deposit insurance on the disciplinary role of depositors. We find a weak evidence of market discipline exerted by depositors through the interest rate in absence of explicit deposit insurance and no evidence in presence of explicit deposit insurance. However, we find that the market discipline exerted by depositors through the deposit growth in banks is effective in presence of explicit deposit insurance scheme.

We also examine how differences in institutional environment countries affect the impact of explicit deposit insurance on bank risk-taking behavior. We find that the adverse influence of explicit deposit insurance on bank risk-taking is lesser in countries with strong legal and institutional environment as measured by the control of corruption (*CORRUP*) that reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

APPENDIX

Appendix A

Table A1: Coverage limits and percentage of deposit value covered in each country

Country	Coverage limits as of 2003[13] in US$[14]	Percentage of deposit value covered
Bulgaria	9686	71
Czech Republic	31575	86,2
Estonia	8058	NA
Hungary	14429	86,8
Latvia	5545	18,7
Lithuania	16293	44
Poland	28418	NA
Romania	3842	43
Slovakia	25260	47
Slovenia	26931	NA

Source: Demirgüc-Kunt et al. (2005).

[13] 2000 is the reference date of data on coverage limits for Latvia and Lithuania.

[14] Note that following the 2008 autumn financial crisis, the Directive2009/14/EC of 11 March 2009 amends Directive 94/19/EC on deposit guarantee schemes as regards the coverage level. It requires coverage to be increased from a minimum of € 20 000 to at least € 50 000 by June 2010 and to a uniform level of € 100 000 by the end of 2010. In all the Member States, on the basis of a coverage of € 100 000, 95% of eligible accounts will be fully covered, 7% more than before the crisis.

Appendix B

Table B1: Correlations between Independent Variables.

		1	2	3	4	5	6	7	8	9	10	11	12	13
DEPINS	1	1												
LTA	2	0,157	1											
EQTA	3	0,019	-0,517	1										
NONII	4	-0,117	-0,065	-0,066	1									
GDPG	5	0,012	0,100	-0,114	-0,146	1								
FOREIGN	6	0,289	0,285	-0,084	-0,137	0,016	1							
DIPOW	7	0,172	0,162	-0,132	-0,055	-0,125	0,160	1						
RESOL	8	-0,433	-0,203	0,086	0,054	0,132	-0,180	-0,227	1					
RULEOFLAW	9	-0,225	0,327	-0,277	-0,056	0,095	-0,023	0,303	-0,126	1				
VOICE	10	-0,200	0,297	-0,257	-0,054	0,120	0,012	0,375	-0,237	0,927	1			
GOVEFFECT	11	-0,063	0,375	-0,317	-0,068	0,249	0,071	0,474	-0,283	0,892	0,881	1		
REGQUAL	12	-0,154	0,276	-0,286	-0,017	0,292	0,033	0,303	-0,172	0,748	0,774	0,835	1	
CORRUP	13	-0,202	0,313	-0,234	-0,101	0,197	-0,031	0,322	-0,140	0,880	0,852	0,814	0,605	1

DEPINS= Deposit insurance scheme dummy variable that takes the value of one if there is an explicit deposit insurance scheme on the considered period and 0 otherwise; *LTA*= Natural logarithm of total assets; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *NONII*=Ratio of non-interest income to total operating income (%); *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *VOICE*= Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media; *GOVEFFECT*= Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *REGQUAL*= Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; *CORRUP*= Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Appendix C

Table C1: Impact of explicit deposit insurance on bank risk-taking using additional controls.

VARIABLES	SDROE	SDROE	SDROE	SDROE	SDROE	SDROA	SDROA	SDROA	SDROA	SDROA	ZSCORE	ZSCORE	ZSCORE	ZSCORE	ZSCORE
DEPINS	12.71***	8.371**	12.92***	8.256**	12.65***	1.108***	0.852**	1.099***	0.860**	1.152***	8.028	14.48*	2.055	15.05*	10.18
	(3.640)	(2.542)	(3.501)	(2.447)	(3.673)	(3.050)	(2.420)	(2.952)	(2.405)	(3.238)	(0.963)	(1.747)	(0.222)	(1.795)	(1.214)
RULEOFLAW	-21.00***					-1.285***					33.36**				
	(-4.936)					(-3.223)					(2.459)				
VOICE		-12.14**					-0.798*					5.517			
		(-2.442)					(-1.771)					(0.297)			
GOVEFFECT			-14.67***					-0.799**					42.61**		
			(-3.099)					(-2.098)					(2.532)		
REGQUAL				-5.576*					-0.228					7.116	
				(-1.685)					(-0.765)					(0.562)	
CORRUP					-16.51***					-1.225***					17.87*
					(-4.951)					(-4.334)					(1.821)
CONSTANT	24.71	47.48***	25.08	45.53***	21.89	5.306***	6.646***	5.344***	6.313***	5.356***	-0.753	-30.98	17.62	-32.63	-7.285
	(1.581)	(3.028)	(1.527)	(2.890)	(1.390)	(3.445)	(4.156)	(3.282)	(4.036)	(3.599)	(-0.0114)	(-0.489)	(0.270)	(-0.513)	(-0.110)
OBSERVATIONS	980	980	980	980	980	995	995	995	995	995	1,022	1,022	1,022	1,022	1,022
R-SQUARED	0.623	0.603	0.610	0.602	0.624	0.587	0.579	0.581	0.577	0.593	0.444	0.439	0.446	0.439	0.441

The regressions contain the same control variables as those in Tables 1.4. We add and report only the coefficients on institutional environment variables and the dummy variable *DEPINS* that takes the value of one if there is an explicit deposit insurance scheme on the considered period and 0 otherwise. *SDROA* = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *GOVEFFECT*= Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *REGQUAL*= Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; *CORRUP*= Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Bank and time fixed effects are included in all regressions but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

CHAPTER 2

INTERBANK DEPOSITS AND MARKET DISCIPLINE: EVIDENCE FROM CENTRAL AND EASTERN EUROPE[15]

[15] This chapter consists in an article co-authored with Isabelle Distinguin and Amine Tarazi and published in Journal of Comparative Economics (2012).

2.1 Introduction

Economists and bank regulators have shown a growing interest in favoring the reliance on market forces and higher involvement of private agents such as uninsured creditors to monitor banks (Flannery (2001), BIS (2003)). Concomitantly, the Basel Committee on Banking Supervision has designated market discipline the third of the three pillars of the regulatory framework. Market forces are assumed to reinforce bank capital regulation and supervision to ensure the safety of the banking system. However, for market discipline to be effective, several conditions must be fulfilled: market agents must feel at risk and must have sufficient information about the actual riskiness of banks (Hamalainen et al. (2005), Nier and Baumann (2006)). Thus, explicit deposit insurance with a coverage limit might serve as a signal that eliminates the unlimited coverage of the de facto implicit deposit insurance system.[16] However, even in presence of explicit insurance other factors are likely to affect the incentives of uninsured creditors to monitor banks. Some banks can still benefit from implicit government insurance. For example, state-owned banks might be considered by uninsured creditors as implicitly insured which should remove their incentives to monitor them (Borisova and Megginson (2012)). Similarly, some country specificities might affect the effectiveness of market discipline. Angkinand and Wihlborg (2010) show for example that market discipline depends on the extent of explicit deposit insurance, as well as on the credibility of non-insurance of creditors. Banks face a combination of regulatory discipline and market discipline. Market discipline implies that the cost and availability of debt depend on bank risk. Regulatory discipline is based on risk-weighted capital requirements, insurance premiums and examination frequency and intensity (Billet et al. (1998)). Thus, the incentives of uninsured creditors to monitor banks might also depend on the strength of regulatory discipline: stronger regulatory discipline might weaken market discipline.

[16] Explicit or formal deposit insurance is different than implicit deposit insurance. Explicit deposit insurance is based on formal regulation through central bank law, banking law, or the constitution. These laws define for example the coverage limits and the funding mode of the deposit insurance system, and how bank failures will be resolved. In absence of explicit deposit insurance, the deposit insurance is implicit that is depositors are protected by the bank monitoring and regulatory authority which does so without specifying guarantees regarding the extent of the protection (Demirgüc-Kunt et al. (2005)). Most countries have henceforth explicit insurance schemes.

The aim of this paper is to assess the effectiveness of market discipline and the factors affecting its strength in the Central and Eastern European context. While most of the previous studies focus on Europe or on the U.S. where financial markets are well developed and where the potential instruments of market discipline are broad, we consider Central and Eastern European countries where the conditions of the effectiveness of market discipline may be doubtful and where the potential instruments of market discipline are almost inexistent.[17] In fact, it is well-known that market discipline is likely to contribute to financial stability, but evidence from cross-country studies show that market discipline is possible only if it is promoted by rigorous accounting and auditing rules and in absence of generous deposit insurance schemes (Barth et al. (2004)). In other words, low-income countries would lack the prerequisites for market discipline and regulators would have to rely only on capital adequacy rules and bank supervision, the two first Basel II pillars.

Besides, Central and Eastern European countries have implemented explicit deposit insurance in the 1990's. Indeed, within the framework of the liberalization of their banking market, starting in the early 1990's, they have implemented explicit deposit insurance systems to comply with the European Union (EU) Directive on Deposit Insurance and to deal with the banking distress that they suffered at the beginning of their transition process. The existence of an implicit insurance beforehand, that covered most creditors (large and small), had presumably undermined market discipline. The implementation of explicit deposit insurance should have created the conditions for effective market discipline.

In this paper, using bank-level and country-level data under explicit deposit insurance from 1995 to 2006 for 10 countries, we examine the effectiveness of market discipline by focusing on deposits and more specifically interbank deposits which are explicitly uninsured. We question whether banks that are more reliant on interbank deposits take less risk. We also investigate how some aspects of regulatory discipline and some bank specificities affect the effectiveness of market discipline by influencing the incentives of uninsured creditors to monitor banks. Specifically, we investigate the following empirical questions. First, we test

[17] Indeed, there are only few listed banks which limits the use of indicators based on equity markets. Similarly, subordinated debt which is an instrument frequently used in the literature on market discipline (Sironi (2003), Morgan and Stiroh (2001)) cannot be used for these countries because of illiquidity issues: very few banks issue subordinated debt and only for small amounts.

the effectiveness of market discipline on government controlled banks assuming that these banks are less prone to market discipline. Indeed, state-owned banks might benefit from an implicit insurance from the government. Second, we examine whether higher deposit insurer power weakens the impact of interbank deposit on bank risk-taking. We assume that the disciplinary role of interbank deposits weakens as regulatory discipline is stronger. Third, we analyze the impact of the previous banking crises resolution strategies on the effectiveness of market discipline. We assume that the effectiveness of market discipline is higher in countries that have pursued liquidation strategies rather than recapitalizations.

The key findings are as follows. First, we find that under explicit deposit insurance (which has been implemented in the 1990's), interbank deposits do play a disciplining role in Central and Eastern Europe. However, we also find that several factors affect the effectiveness of market forces. Interbank deposits do not moderate the risk behavior of state-owned banks presumably because of an implicit and unlimited insurance perceived for such banks by market participants. The effectiveness of market discipline is also affected by the regulatory environment and notably the resolution strategies adopted by each country during banking crises and the power of the deposit insurer. Our results indicate that when regulatory discipline is strong, market discipline is undermined.

The remainder of this paper is organized as follows. Section 2.2 reviews the literature and explains how this work extends the existing literature. Section 2.3 presents our sample, variables and method. The empirical results are presented in section 2.4. Section 2.5 is dedicated to robustness checks. Section 2.6 concludes.

2.2 Related literature and research focus

Many empirical studies have addressed the issue of the existence and the effectiveness of market discipline. Several types of agents can discipline banks. Some papers focus on the discipline exerted by depositors. For example, Martinez-Peria and Schmukler (2001) show, using a sample of banks from Argentina, Chile and Mexico, that depositors withdraw their deposits from bad banks or require higher interest rates on their deposits, suggesting the presence of market discipline, even among small-insured depositors. Boot and Greenbaum

(1993) establish theoretically that, when banks raise funds, the cost of funds is related to the bank's risk profile. Banks face lower costs when they invest in safe assets than when they invest in risky assets. A broad literature focuses on subordinated debt holders showing that the spreads on subordinated debt reflect bank riskiness (Flannery and Sorescu (1996), Jagtiani et al. (1999)). Other papers show that indicators based on equity prices can reflect bank riskiness (Curry et al. (2008), Gropp et al. (2006)). The conditions of effectiveness of market discipline are also studied by some authors showing notably that, for market discipline to be effective, market agents must feel at risk and must have sufficient information about bank riskiness (Hamalainen et al. (2005), Nier and Baumann (2006)).

Our paper is more specifically related to a strand of the literature on market discipline focusing on interbank deposits. Indeed, making banks themselves the monitors of others banks, assuming that similar institutions might be expected to better identify a peer's risk, has been often encouraged in the literature. Under such an approach interbank deposits form the ideal tool to ensure the effectiveness of market discipline. Such deposits are not covered by explicit deposit insurance schemes. Besides, banks are likely to be informed investors on the interbank market. As the lending bank may be directly affected by a sudden change in the health and soundness of the borrowing bank, interbank deposits should be sensitive to the risk taken by the borrowing bank. Rochet and Tirole (1996) indicate that as banks are particularly good at identifying the risks of other banks and have incentives to monitor other banks in an interbank borrowing relationship; the extent of interbank exposures may contribute to restrain bank excessive risk taking and reduce the risk of bank failures. Thus, interbank deposits can generate market discipline and perform a complementary task to bank regulation and supervision by public authorities.

However, the empirical literature on the ability of banks to identify the risk of other banks is scarce. One of the first papers using interbank deposits as factors of market discipline is that of Furfine (2001), which analyzes the pricing of interbank lending agreements. The author investigates the risk pricing on the fed-funds market and finds that borrowing banks with higher profitability, higher capital ratios, and fewer problem loans pay lower interest rates than others when they borrow overnight. King (2008) also finds, using data on the U.S. interbank market between 1986 and 2005, that the rate a bank pays for interbank loans

depends to some extent on its riskiness, particularly its credit risk, and the reliance on these funds tends to decrease as their cost rises.

Other papers suggest that interbank deposits can be considered as a market discipline factor that contributes to limit bank risk-taking. Nier and Baumann (2006) test whether factors associated with the strength of market discipline, specifically the proportion of deposits received from other banks, lead banks to choose higher capital buffers for a given level of asset risk. Considering individual listed banks from 32 different countries over the years 1993 to 2000, they find that banks holding a higher proportion of interbank deposits have greater incentives to limit their insolvency risk by choosing a larger capital buffer. Dinger and Von Hagen (2009) also show, considering a sample of banks from Central and Eastern Europe (CEE), that interbank borrowing is associated with lower risk taking of borrowing banks. Cocco et al. (2009) examine the importance of relationships, measured by the intensity of pair-wise lending activity, in the process of liquidity provision on the interbank market. Using data on the Portuguese interbank market between January 1997 and August 2001, they find that relationships are an important determinant of banks' ability to access interbank market liquidity. Banks with a larger imbalance in their reserve deposits are more likely to borrow funds from banks with which they have a relationship, and to pay a lower interest rate on these loans. Besides, they find that small banks and banks with a higher proportion of non-performing loans tend to rely more on relationships when borrowing funds on the interbank market.

This paper extends earlier works in several directions. First, while most of the existing literature focuses on developed countries, we consider Central and Eastern European countries which have less developed banking industries and financial markets. These countries have introduced explicit deposit insurance systems relatively later than other countries, in the 1990's. Investigating market discipline is of particular interest in the case of these countries because the conditions of its effectiveness appear less favorable than in other countries. Moreover, because market discipline is expected to be weaker in such a context because of less developed financial markets it is important to determine what factors could improve its strength and reliability. Second, we focus on the discipline within the interbank market by looking at interbank deposits. Because stock markets and bond markets are relatively narrow and less liquid than in western countries, we do not deal with the role played

by subordinated debt holders which has been the main concern of numerous U.S. studies. We consider that banks are likely to be informed investors and therefore risk-sensitive lenders because their (interbank) deposits are not insured. Third, we explicitly focus on the effectiveness of market discipline in the presence of explicit deposit insurance schemes. Indeed, the introduction of explicit insurance is beneficial for market discipline in countries where implicit insurance was broad in the absence of explicit insurance. Explicit deposit insurance is expected to create the conditions for the effectiveness of market discipline by credibly excluding some creditors from the perspective of a bail out in the event of bank default and interbank deposits are explicitly excluded from the deposit insurance scheme. Fourth, we investigate how some aspects of banking supervision and bank specificities might affect market discipline. For example, state-owned banks might benefit from an implicit insurance from the government. In this case, market discipline could be weaker for such banks. Thus, we take into account several features likely to impact the effectiveness of market discipline: the power of the deposit insurer, the existence of an implicit insurance through state guarantee and the resolution strategies adopted in each country during the banking crises they experienced to assess the credibility of imposing losses to uninsured creditors in case of bank failures.

2.3 Sample, variables and method

Before presenting our set of variables and the method, we provide information about our sample of banks and the collected data.

2.3.1 Sample

Our sample consists of commercial banks established in 10 Central and Eastern European transition countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.[18] Accounting data (annual financial statements) for

[18] 26 banks in Bulgaria, 27 in Czech Republic, 6 in Estonia, 24 in Hungary, 21 in Latvia, 9 in Lithuania, 40 in Poland, 18 in Romania, 19 in Slovakia, and 17 in Slovenia.

individual banks are obtained from Bankscope Fitch IBCA. The sample period is from 1995 to 2006. However, since our focus is on the disciplinary role of interbank deposits and because a necessary condition for market discipline to be effective is that creditors are credibly excluded from any guarantee, we restrict our analysis to the period covering the presence of an explicit deposit insurance scheme. Our argument is that the disciplinary effect of interbank deposits will be effective only when such liabilities are explicitly excluded from any formal guarantee i.e. after the introduction of explicit deposit insurance. Thus, the actual starting date for each country in our sample is the date of introduction of explicit deposit insurance.[19]

Bankscope reported for the period under study balance sheets and income statements for 324 commercial banks for the countries we consider in this study. We delete 117 banks with less than 4 consecutive years of time series observations. This restriction allows us to compute our dependent variables using 4-year rolling windows. Our final sample consists of 207 banks. Table 2.1 shows some descriptive statistics for the raw sample of 324 banks and the final sample of banks we use. The univariate statistics of these two samples are very similar. Besides, on average as of 2006, the final sample of banks constitutes over 89.23% of the total commercial banks' assets of the different sample countries (the lowest is 65.35% for Poland and the highest is 98.55% for Bulgaria).[20] By considering some key accounting ratios on our final sample, we notice that deposits account for a large share of total liabilities. On average, banks receive 76.16% of deposits relatively to total assets. On the asset side, the average value of the net loans to total assets ratio is equal to 44.59%. Considering profitability, the average ROA equals 0.98%. In terms of capitalization, the average equity to total assets ratio amounts to 13.18%.

[19] This date is 1993 for Hungary, 1994 for the Czech Republic, 1995 for Poland, 1996 for Bulgaria, Lithuania, Romania, and Slovakia, 1998 for Estonia and Latvia, and 2001 for Slovenia.

[20] For the other countries the percentages are as follows (in 2006): 90.24% for Czech Republic, 98.06 for Estonia, 80.59% for Hungary, 98.12% for Latvia, 98.82% for Lithuania, 80.69% for Romania, 88.86% for Slovakia and 93.06% for Slovenia.

Table 2.1: Descriptive Statistics on Summary Accounting Information.

	Full sample of commercial banks available in Bankscope (324 banks)				Our sample (207 banks)			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Total assets (€ th.)	1,724,172	3,846,473	957	3.70E+07	1,797,062	3,988,865	957	3.70E+07
ROA (%)	0.85	4.64	-46.25	65.61	0.98	4.23	-44.12	65,61
Equity/ Total assets (%)	13.80	13.52	-99.98	98.45	13.18	9.91	2.79	68.20
Deposits/ Total assets (%)	75.94	16.26	0	100	76.16	16.14	0	98.51
Net loans/ Total assets (%)	45.47	19.97	0	98.01	44.59	19.58	0	97.24
Net interest margin (%)	5.09	4.59	-35.84	73.01	4.97	3.95	-31.58	35.15
Off balance sheet/ Total assets (%)	16.96	19.32	0	100	17.09	19.48	0	99.72

NB: descriptive statistics are computed on the 1995-2006 period with the restriction that there is an explicit deposit insurance scheme in the considered country.

2.3.2 Presentation of variables

We present our dependent variables reflecting bank risk and the different independent variables introduced in our estimations. Descriptive statistics regarding these variables are given in Table 2.2.

Table 2.2: Definition of the dependent and independent variables and descriptive statistics on our sample.

Variables name	Description	Mean	Std. Dev.	Min	Max	Sources
Dependent variables						
SDROA	The 3-year rolling window standard deviation of the ROA (return on assets).	1.570	3.190	0.009	39.630	Bankscope and author's calculations
SDROE	The 3-year rolling window standard deviation of the ROE (return on equity).	9.960	18.340	0.060	427.640	Bankscope and author's calculations
Z-SCORE	Z-SCORE=(ROA+EQTA)/SDROA, where ROA is the 3-year rolling window average return on average assets, EQTA is the 3-year rolling window average ratio of total equity to total assets; SDROA is the 3-year rolling window standard deviation of the ROA.	39.940	78.380	-0.220	1408.730	Bankscope and author's calculations
Bank level variables						
MKD	Ratio of deposits due to banks to total deposits (%).	28.570	26.470	0	100	Bankscope and author's calculations
EQTA	Ratio of equity to total assets (%).	13.180	9.910	2.790	68.200	Bankscope and author's calculations
LTA	Natural logarithm of total assets.	13.060	1.670	6.860	17.430	Bankscope and author's calculations
STATE	Dummy variable that takes the value of one for state owned bank that is if the share of state ownership in bank total ownership is higher than 50 percent, and zero otherwise.	0.080	0.280	0	1	Bankscope and author's calculations
NII	Ratio of net interest income to total operating income (%).	58.440	20.910	-106.500	99.990	Bankscope and author's calculations
SAVING	Saving bank dummy. This dummy variable takes the value of one if the bank is a state saving bank on the year considered, and zero otherwise.	0.020	0.140	0	1	Bankscope and author's calculations

Table 2.2- *Continues*

Variables name	Description	Mean	Std. Dev.	Min	Max	Sources
Country level variables						
GDPG	Real GDP growth rate (%).	4.200	3.160	-9.400	11.930	World Development Indicators
RESOL	Crisis resolution adopted strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks	0.240	0.430	0	1	Tang et al. (2000) Dinger and Von Hagen (2009)
LAW	Assessment of law and order tradition in the country. This variable takes value between 1 and 10, higher values suggesting a higher quality of law enforcement	7.650	1.170	5.600	8.700	Pistor, Raiser and Gelfer (2000)
DIPOW	Deposit insurer power determined by adding 1 if the answer is yes and zero otherwise for each of the following questions: (1) Does deposit insurance authority make the decision to intervene a bank? (2) Can deposit insurance agency take legal action against bank directors/officials? (3)Has the deposit insurance agency ever taken any legal action against bank directors/officials? The dummy variable *DIPOW* takes the value of one if the deposit insurer power is high that is if the number of "yes" answers is 2 or 3, and 0 otherwise.	0.270	0.440	0	1	World Bank Database, Barth et al. (2003) and author's calculations

2.3.2.1 Bank risk measures

We consider several variables reflecting bank risk which are all computed on the basis of 3-year rolling windows but also 4-year rolling windows for robustness considerations. We take the *Z-SCORE* as a measure of individual bank default risk. The *Z-SCORE* is defined as:

$$ZSCORE = (ROA + EQTA) / SDROA$$

where *ROA* is the 3-year rolling window average return on assets defined as the ratio of net income to average total assets, *EQTA* represents the average ratio of equity to total assets and *SDROA* stands for the 3-year rolling window standard deviation of the return on assets. All the ratios are in percentages. The *Z-SCORE* has been widely used in the literature as a measure of bank default risk (see Roy (1952), Hannan and Hanweck (1988), Boyd et al. (1993) and De Nicolo (2000)). A lower *Z-SCORE* value indicates a higher probability of bank failure.

As measures of banks' assets risk, we use the 3-year rolling window standard deviation of the return on assets (*SDROA*) and the 3-year rolling window of the standard deviation of the return on equity (*SDROE*). A higher standard deviation indicates higher risk taking.

2.3.2.2 Market discipline factor

To examine empirically the hypothesis that market discipline is effective in providing incentives for banks to limit their risk, we need an indicator of market discipline. We follow Nier and Baumann (2006) and consider a measure of market discipline based on uninsured liabilities. This variable is the share of deposits received from other banks in total deposits (*MKD*). By nature, interbank deposits are not covered by explicit deposit insurance schemes, and this is the case in all the countries of our sample. Besides, banks are likely to be informed investors in the interbank market. A lending bank may be subject to the same risk as the borrowing bank. Consequently, interbank deposits are likely to be sensitive to the risk the borrowing bank is taking. The share of subordinated debt in total liabilities is an alternative variable used in several studies, including that of Gropp et al. (2006) and Sironi (2003), showing that subordinated debt spreads reflect the risk profile of the bank. Thus, subordinated debt holders are apparently able to correctly assess bank risk. However, note that, in our sample, there are at least 50 percent of banks which did not issue subordinated debt, and

among banks which issued subordinated debt during the period under study, most of them provide information only for one or two years on our sample period. For this reason, we solely focus on interbank deposits. Table 2.2 shows that the average value of the ratio of banks deposits to total deposits is equal to 28.57% with a great deal of heterogeneity across banks as shown by the standard deviation (26.47) and by the extreme values of this ratio (the lowest value is equal to 0% and the highest to 100%).

2.3.2.3 Control Variables

In our empirical analysis, we include a set a control variables known to affect the riskiness of individual banks. These variables capture individual bank characteristics and reflect macroeconomic factors, the institutional environment and the regulatory and supervisory process at the country level.

Bank characteristics

We consider several control variables at the bank level. We include the natural logarithm of total assets (*LTA*) as a proxy of bank size. The nature of the relationship with bank risk is ambiguous. Indeed, larger banks are assumed to have a greater ability to diversify their risk and thus should have more stable earnings reducing their insolvency risk. However, in the presence of a too-big-to-fail (TBTF) policy, larger banks might have incentives to take higher risk, as indicated by Galloway et al. (1997), and Beck and Laeven (2006). We also control for bank capitalization defined as the ratio of equity to total assets (*EQTA*).[21] We also control for banks' business model. We make use of the ratio of net interest income to net

[21] Table A1 in Appendix A presents the correlation matrix of the independent variables used in this study. The correlation coefficients are low except for bank size as measured by the natural logarithm of total assets (*LTA*) and the ratio of equity to total assets (*EQTA*). To see if the correlation between these variables affects our results, we have separately introduced total assets (*LTA*) and the ratio of equity to total assets (*EQTA*) as independent variables. We have also estimated another equation where we have orthogonalized *LTA* with the ratio of equity to total assets (*EQTA*). These specifications lead to results qualitatively similar to those obtained by simultaneously introducing *LTA* and *EQTA*. Thus, the results presented in the paper are those obtained without orthogonalizing these two variables.

operating income, *NII*, to proxy bank business model.[22] This variable is also a proxy of bank product diversification used in many studies (Stiroh (2004), Lepetit et al. (2008a, 2008b)), a lower value indicating stronger expansion towards nontraditional intermediation activities. In the case of U.S. banks, Stiroh (2004) finds that greater reliance on noninterest income, particularly trading revenue, is associated with higher risk and lower risk-adjusted profits. Lepetit et al. (2008a) find that a heavier engagement in commission and fee activities implies higher risk for western European banks. Thus, we expect that, ceteris paribus, banks with a higher ratio of net interest income to net operating income will be less risky. Differences in ownership can also affect bank risk. Specifically, we consider the influence of state ownership. We construct a dummy variable (*STATE*), that takes the value of 1 if the share of state ownership in bank total ownership is higher than 50 percent, and zero otherwise. Several studies have found that state ownership leads to inefficiency and poor performance. For example Barth et al. (2004) and Berger et al. (2005) find that state-owned banks have higher ratios of non-performing loans to total loans. This can be explained by the fact that the managers of such banks are often under pressure to serve particular political interests.

We also control for the existence of state saving banks. These banks were the only or the most important suppliers on the interbank market. Besides, they benefited from full state deposit guarantee. To control for these specificities, we identify these state saving banks[23] and construct a dummy variable (*SAVING*) that takes the value of 1 if the bank is a state saving bank.[24]

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[22] As a robustness check, we use the ratio of net loans to total assets as an alternative proxy for the bank business model. The results do not qualitatively change and are available on request.

[23] The state saving banks indentified in our sample are: DSK Bank Plc (Bulgaria), Ceska Sporitelna a.s (Czech Republic), Eesti Hoiupank - IAS-Estonian Savings Bank – IAS (Estonia), OTP Bank Plc (Hungary), Latvijas Kraj Banka-Latvian Savings Bank (Latvia), Swedbank AB (Lithuania), Powszechna Kasa Oszczednosci Bank Polski SA - PKO BP SA and Bank Polska Kasa Opieki SA-Bank Pekao SA (Poland), Casa de Economii si Consemnatiuni-Romanian Savings Bank (Romania), Slovenska sporitel'na as-Slovak Savings Bank (Slovakia).

[24] We check the status of these banks each year. The dummy variable $SAVING_{it}$ takes the value of one for bank *i* on year *t* only if bank *i* is a state saving bank on year *t*. As a robustness check, we consider another definition for the state saving bank dummy variable. We assign the value one during the entire period for the identified state saving banks. As such, we consider that former state saving banks could still be different from other banks notably in terms of risk taking. Considering this alternative definition leads to similar conclusions. We also check that introducing both *SAVING* and *STATE* in our regressions is acceptable regarding colinearity issues. The correlation coefficient between these two variables is equal to 0.289 (Appendix A). Running our regressions without *STATE* or without *SAVING* does not impact our conclusions. The results are available on request.

Country characteristics

We also consider country-level variables that might affect bank risk.[25] We take into account the annual growth rate of the real Gross Domestic Product (*GDPG*) to control for business cycle fluctuations and the overall economic conditions. Demirgüc-Kunt and Detragiache (2000) suggest that risk-taking incentives of banks managers might depend on the quality of law enforcement. We therefore control for the quality of law enforcement using the summary measure of law and order (*LAW*) that we borrow from Pistor et al. (2000). A higher index reflects a higher quality of law enforcement and reduces incentives to engage in fraud and strategic default at the expense of creditors. We also control for the design of the deposit insurance regime as in Pasiouras et al. (2006). We construct a dummy variable reflecting the power of the deposit insurance authority (*DIPOW*). This dummy variable takes the value 1 if the power of the deposit insurance authority is high and 0 otherwise.[26] We expect that a more powerful insurer is more likely to tackle moral hazard issues and that banks engage in lower risk taking in a country with a stronger deposit insurance authority. Finally, to account for differences across countries in terms of resolution strategies adopted when the country has experienced banking crises or severe banking distress, we include a dummy variable (*RESOL*). Indeed, according to Tang et al. (2000) and Dinger and Von Hagen (2009), the crisis resolution strategies pursued by the countries of our sample fall into two broad categories: (i) extensive restructuring and recapitalization of banks which corresponds to Bulgaria, Czech Republic, Hungary, Lithuania, Poland, and Slovakia which were reluctant to let incumbent banks fail and (ii) a combination of bank liquidation and restructuring for Estonia, Latvia, Romania, and Slovenia. The dummy variable *RESOL* takes the value of one for banks from countries that have proceeded to a combination of bank liquidation and restructuring, and zero otherwise. Claessens and Laeven (2003) show that different approaches in terms of resolution of banking crises have led to very different

[25] Alternatively, we have considered country characteristics through the introduction of country dummies. Our conclusions remain unchanged (see robustness checks in section 5). However, as it is not possible to introduce both country dummies and country-level indexes because of colinearity issues, we only consider country level indexes.

[26] Deposit insurer power is determined by adding 1 if the answer is yes and zero otherwise for each of the following questions: (1) Does the deposit insurance authority make the decision to intervene in a bank? (2) Can the deposit insurance agency take legal action against bank directors/officials? (3) Has the deposit insurance agency ever taken any legal action against bank directors/officials? The dummy variable *DIPOW* takes the value of one if the deposit insurer power is high that is if the number of "yes" answers is 2 or 3, and 0 otherwise.

outcomes in terms of economic growth after the crisis. We assume that these specificities could affect bank risk-taking incentives and that such incentives should be lower in countries that have experienced actual liquidations. [27]

2.3.3 Method

To examine the impact of interbank deposits on bank risk, we estimate the following panel data model:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t} \qquad (2.1)$$

with $RISK_{i,j,t}$ a proxy for bank *i* risk taking in country *j* at time *t*; $MKD_{i,j,t}$ a variable reflecting market discipline, $X_{i,j,t}$ a collection of variables that capture bank i characteristics at time t in country j; $Z_{j,t}$ a vector of factors at the country level such as macroeconomic and institutional environment factors that are expected to affect bank risk at time t. α_k and β'_h are vectors of parameters and η_i and τ_t the individual and time fixed effects.[28]

A necessary condition for market discipline to be effective is that some creditors are credibly excluded from any guarantee. Before the introduction of explicit deposit insurance implicit guarantees were broad. The introduction of explicit deposit insurance by credibly excluding some creditors from the guarantee is expected to favor the effectiveness of market discipline. Thus, we consider the disciplinary effect of interbank deposits when they are explicitly excluded from the guarantee that is after the introduction of explicit deposit insurance. For countries where explicit deposit insurance was introduced before 1996 (Czech Republic, Hungary, and Poland), the estimation is computed on the entire sample period (1995-2006). If explicit deposit insurance was introduced after 1995 (Bulgaria, Lithuania,

[27] Note that the summary measure of law and order (LAW), the deposit insurer power (*DIPOW*) and the banking crisis resolution strategies (*RESOL*) are not time-varying variables.

[28] The regressions include individual and time fixed effects as the Fisher test rejects the null hypothesis of homogeneity in both individual and time dimensions.

Romania, Slovakia, Estonia, Latvia, and Slovenia), the estimation period begins with the introduction of explicit deposit insurance.[29]

In our sample several banks have experienced mergers or acquisitions during the 1995-2006 period. It seems inappropriate to calculate mean values or standard deviations to compute our dependent variables for such banks as their balance sheets have been totally modified by these events. Instead of removing these banks from our sample, we split them into two different entities[30]: we consider the bank after the merger or acquisition as a bank different from the one before the event. This applies to 19 banks in our sample.

The descriptive statistics of our variables indicate highly skewed and heavy tails distribution of variables suggesting the presence of outliers. Thus, we follow John et al. (2008) and conduct residual diagnostic analyses and exclude outliers.[31] In the regression with the standard deviation of ROA (*SDROA*) as a proxy of risk taking, 67 observations are excluded. In the regression with the standard deviation of ROE (*SDROE*) as a proxy of risk taking, 45 observations are excluded and 33 observations in the regression with the Z-*SCORE* as a proxy of default risk.

Finally, equation (2.1) is estimated on the sample excluding outliers with standard errors robust to heteroskedasticity.[32]

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[29] See footnote 20.

[30] This is done only if the merger or acquisition takes place after 1995 and before 2005 in order to be able to compute our dependent variables which are based on standard deviations. If it is not the case, we do not split the bank into two entities but we delete the observations before the event if it takes place before 1996 or the observations after the event if it takes place after 2004.

[31] In order to detect outliers, we run OLS regressions and calculate the Cook's values. Cook's value (D) for the i^{th} observation is a measure of the distance between the coefficient estimates when observation *i* is included and when it is not, and it is defined as $D_i = \frac{e_{si}^2 (s_{pi/} s_{ri})^2}{k}$; where e_{si} refers to standardised residuals, s_{ri} to standard errors of the residuals and s_{pi} to the standard errors of the prediction. k represents the number of independent variables plus the intercept term. High values of Cook's distance imply that i^{th} observation has significant influence on estimation results, therefore, can be deemed to be an outlier. For more details see Cook and Weisberg (1982). Then, we drop any observation if its Cook's value is greater than 4/n, where n is the number of observations in the regression (see Hamilton (2006) for more details).

[32] Alternatively, we have kept outliers and run outliers robust estimation, by following Covitz and *Downing* (*2007*), Laeven and Levine (2009) and Houston et al. (2010) and using the natural logarithm of the bank risk measures (*Z-SCORE*), the standard deviation of the return on assets (*SDROA*) and the standard deviation of the return on equity (*SDROE*)) to limit the impact of outliers. This method leads to similar conclusions.

2.4 Empirical results

2.4.1 Effectiveness of interbank deposits as a market discipline factor

The results of the impact of interbank deposits on bank risk-taking are presented in Table 2.3.[33] For each of the reported specifications, we find that the market discipline variable (*MKD*) is significant. A higher proportion of interbank deposits translates into lower levels of bank risk taking and a lower probability of failure. This effect is not only statistically significant but also economically noteworthy. Indeed, considering the specification where the risk-taking proxy is the standard deviation of *ROE* (*SDROE*), a one standard deviation increase in interbank deposits (*MKD*) decreases the risk-taking proxy by 20.88% of its mean (from 7.99 to 6.32).[34] The concomitant drop in the standard deviation of ROA (*SDROA*) amounts to 17.71% of its mean (from 1.05 to 0.87). The economic impact of interbank deposit on the insolvency risk proxy (*Z-SCORE*) is also important. Indeed, a one standard deviation increase in interbank deposit is associated with an increase in the *Z-SCORE* of 10.33% of its mean (from 33.11 to 36.53).

[33] All our regressions are run under explicit deposit insurance as mentioned in 3.1 and 3.3. It ensures that interbank deposits are explicitly excluded from guarantee. Indeed, before the introduction of explicit deposit insurance, implicit guarantees were broad which should deter market discipline. We have tested the influence of the introduction of explicit deposit insurance on market discipline by running our regressions on the whole period (1995-2006) for all countries and controlling for the existence of explicit deposit insurance. The results that are presented in Appendix B confirm that market discipline is only effective in the presence of explicit deposit insurance.

[34] Note that the mean values of our risk-taking and insolvency risk proxies are slightly different from the values reported in Table 2 (descriptive statistics) because of the use of unbalanced panel data and outliers' diagnostic method in our regressions.

Table 2.3: Effectiveness of interbank deposits as market discipline factor.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.068***	-0.008**	0.141*
	(-2.799)	(-2.182)	(1.712)
EQTA	-0.456***	-0.023*	0.693**
	(-5.484)	(-1.687)	(2.561)
LTA	-4.396***	-0.689***	5.236*
	(-3.803)	(-4.715)	(1.741)
STATE	-5.849***	-0.140	10.68
	(-2.804)	(-0.335)	(1.315)
NII	0.010	-0.011**	-0.087
	(0.336)	(-2.515)	(-1.099)
SAVING	-1.119	-0.986***	5.194
	(-0.439)	(-3.374)	(0.289)
GDPG	-0.508***	-0.166***	1.469***
	(-2.827)	(-4.168)	(2.703)
RESOL	-6.540**	-1.028***	50.880***
	(-2.008)	(-4.030)	(6.814)
LAW	-2.919***	-0.373***	51.600***
	(-2.608)	(-4.302)	(21.810)
DIPOW	-8.399**	-0.376*	-13.520
	(-2.533)	(-1.867)	(-1.122)
CONSTANT	111.700***	15.580***	-405.100***
	(7.643)	(6.991)	(-8.881)
OBSERVATIONS	1060	1083	1080
R-SQUARED	0.534	0.563	0.470

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio; *EQTA* = equity to assets ratio; *NII* = ratio of net interest income to total operating income; *LTA* = logarithm of total assets; *GDPG* = growth rate of real GDP; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *LAW* = rule of law. This variable takes value between 1 and 10, higher values suggesting a higher quality of law enforcement; *STATE* = state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 50 percent of total share, and zero otherwise; *SAVING* = state saving bank dummy variable. This dummy variable takes the value of one if the bank is a state saving bank on the year considered, and zero otherwise. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Finally, the regressions results indicate that market discipline is effective and leads to a reduction in banks' riskiness and an improvement of their solvency.

As far as control variables computed at the bank level are concerned, we find that bank size measured by the natural logarithm of total assets (*LTA*), has a positive and significant effect on *Z-SCORE*, and a negative and significant effect on the standard deviation of return on assets (*SDROA*) and on the standard deviation of return on equity (*SDROE*). These results indicate that larger banks take less risk and are less vulnerable (lower default probability). The ratio of equity to total assets (*EQTA*) has also a significant effect on bank risk-taking measures. Indeed, as expected, we find a positive and significant relationship with the *Z-SCORE* and a negative and significant relationship with the standard deviation of the ROE (*SDROE*) and the standard deviation of the ROA (*SDROA*), which suggests that better capitalized banks are less vulnerable and take less risk. The dummy variable *STATE* is negatively and significantly related to the standard deviation of the ROE (*SDROE*). Unexpectedly, state owned banks appear to take less risk than other banks possibly because most banks that are not owned by the state are foreign institutions. As noted by Mian (2006), foreign banks may actually have a preference for higher risk locally as they can more easily diversify themselves internationally.[35] Similarly, state saving banks appear less risky as the dummy variable controlling for these banks (*SAVING*) has a significant and negative effect on the standard deviation of ROA (*SDROA*). As expected, the business model proxy, i.e. the ratio of net interest income to total operating income (*NII*) has a negative coefficient in the regression with the standard deviation of ROA (*SDROA*) as the dependent variable, indicating that banks with a higher ratio of net interest income to total operating income are less risky.

Considering the control variables at the country level, several appear significant. The annual growth rate of the real Gross Domestic Product (*GDPG*) and the law index (*LAW*) are significant, whatever the dependent variable, with the expected sign indicating that higher quality of law enforcement and higher annual growth rate of the GDP are associated with lower risk-taking and lower default probability. The resolution strategy variable *RESOL* also

[35] A closer look at the descriptive statistics of state-owned banks and those of privately owned banks shows that the dispersion of returns of state-owned banks is lower than that of private banks, but also that state-owned banks exhibit a lower profitability measured by the return on equity. Thus, lower risk taking by state-owned banks may be explained by the fact that these banks engage in activities with lower returns.

affects both the insolvency risk of the bank as measured by the *Z-SCORE* and its asset risk as measured by the standard deviation of the ROE (*SDROE*) or ROA (*SDROA*). We find that banks' insolvency risk and asset risk are lower in countries that have experienced actual liquidations. The power of the deposit insurer (*DIPOW*) also plays an important role as it is significantly linked with both the standard deviation of the *ROE* (*SDROE*) and the standard deviation of the ROA (*SDROA*). Banks in countries with higher power of the deposit insurance authority take less risk.

By comparing the impact of our dummy variables reflecting institutional and bank specific factors, we find that in countries that have experienced actual liquidations the standard deviation of ROE (*SDROE*) is reduced by 6.540 whereas a high power of the deposit insurer allows a larger decrease of the standard deviation of ROE (8.399). State ownership allows a slightly lower decrease in bank risk taking, as measured by the standard deviation of ROE, by 5.849. Considering the standard deviation of ROA (*SDROA*) as the dependent variable, only the power of the deposit insurer (*DIPOW*) and the resolution strategy (*RESOL*) affect bank risk with a larger impact for the resolution strategy: in countries that have experienced actual liquidations the standard deviation of ROA (*SDROA*) is reduced by 1.028 and only by 0.376 when the power of the deposit insurer is high. Thus, the resolution strategy (*RESOL*) and the power of the deposit insurer (*DIPOW*) are the factors that have the most important impact on bank risk. Considering banks' insolvency risk (*Z-SCORE),* among the dummy variables, only the resolution strategy has a significant impact.

To summarize, our results indicate that market discipline is effective. The importance of interbank deposits in total liabilities has an effect both on bank risk and bank default probability. However, several features might affect the effectiveness of market discipline. Indeed, in presence of explicit deposit insurance the extent of the power of the insurer is expected to play an important role. The importance of state ownership might be also an important factor reflecting the existence of an implicit insurance through state guarantee. Finally, likelihood for uninsured creditors to actually suffer losses in case of bank failures might depend on the resolution strategies adopted in each country during the banking crises they experienced.

2.4.2 Factors affecting the effectiveness of market discipline.

Our main results indicate that interbank deposits play a disciplinary role in presence of an explicit deposit insurance scheme. In this section, we study if differences in bank ownership or differences in banking regulation and supervision across countries may influence the effectiveness of market discipline.

2.4.2.1 Implicit insurance through state ownership

First, we focus on the influence of state ownership on the effectiveness of market discipline. More precisely, we test the potential difference in market discipline effectiveness between state-owned banks and other banks. We hypothesize that state-owned banks may benefit from an implicit insurance from the government. Therefore, market discipline may be weaker for such banks.

To test this hypothesis in all our regressions, we interact the market discipline factor (*MKD*) with the state ownership dummy variable (*STATE*). The results, presented in Table 2.4, are consistent with our hypothesis. Indeed, we find that, for private banks, our market discipline variable (*MKD*) is significant in all the estimations. Based on the specification with the standard deviation of ROE (*SDROE*) as the dependent variable, a one standard deviation increase in interbank deposits (*MKD*) decreases the risk-taking proxy by 23.88% of its mean for private banks. Regarding the standard deviation of ROA *(SDROA)* for private banks, the fall amounts to 24.58% of its mean. The economic impact of interbank deposits on the *Z-SCORE* is also important for private banks, since a one standard deviation increase in interbank deposits is associated with an increase in the *Z-SCORE* of 11.07% of its mean.

However, the results of the test at the bottom of Table 2.4 indicate that the market discipline variable is not significant for state-owned banks. Therefore, market discipline is effective only for private banks and is associated with both a lower insolvency risk as measured by the *Z-SCORE* and lower risk taking measured by the standard deviation of the ROA (*SDROA*) and the standard deviation of the ROE (*SDROE*). This result suggests that, uninsured creditors perceive the existence of an implicit insurance for state-owned banks and do not exert market discipline on them.

Table 2.4: Influence of implicit insurance through state ownership on the effectiveness of market discipline.

Model specification: $RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (STATE * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.077***	-0.010***	0.151*
	(-2.959)	(-2.869)	(1.889)
STATE *MKD	0.117*	0.0301**	-0.126
	(1.933)	(2.032)	(-0.438)
EQTA	-0.461***	-0.024*	0.698***
	(-5.532)	(-1.747)	(2.590)
LTA	-4.451***	-0.698***	5.286*
	(-3.852)	(-4.768)	(1.761)
STATE	-8.512***	-0.882**	13.440
	(-3.731)	(-2.297)	(1.586)
NII	0.010	-0.011**	-0.088
	(0.362)	(-2.511)	(-1.119)
SAVING	-0.608	-0.825***	4.714
	(-0.245)	(-2.962)	(0.262)
GDPG	-0.531***	-0.169***	1.483***
	(-2.944)	(-4.261)	(2.738)
RESOL	-6.020*	-1.194***	49.810***
	(-1.839)	(-4.388)	(6.018)
LAW	-3.051***	-0.345***	50.960***
	(-2.752)	(-3.962)	(18.010)
DIPOW	-9.817***	-0.453**	-13.790
	(-2.787)	(-2.223)	(-1.163)
CONSTANT	114.800***	15.760***	-401.300***
	(7.877)	(7.050)	(-8.434)
$\alpha_1 + \alpha_2$	0.040	0.020	0.025
Risk level to reject : $\alpha_1 + \alpha_2 = 0$	0.470	0.166	0.935
OBSERVATIONS	1060	1083	1080
R-SQUARED	0.536	0.569	0.470

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio; *EQTA* = equity to assets ratio; *NII* = ratio of net interest income to total operating income; *LTA* = logarithm of total assets; *GDPG* = growth rate of real GDP; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *LAW* = rule of law. This variable takes value between 1 and 10, higher values suggesting a higher quality of law enforcement; *STATE* =state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 50 percent of total share, and zero otherwise; *SAVING* = state saving bank dummy variable. This dummy variable takes the value of one if the bank is a state saving bank on the year considered, and zero otherwise. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

2.4.2.2 Deposit insurer power

We now explore how market discipline might be affected by the deposit insurer power. Indeed, both markets and regulators impose a discipline. Markets penalize banks for increasing risk by increasing the costs of their market funding and by limiting the types of claims they can issue. Regulators impose discipline through risk-based capital requirements and insurance premiums, examination frequency and intensity, and cease and desist orders. We assume that the effectiveness of market discipline declines as the regulatory discipline is stronger (Billett et al. (1998)). Indeed, the incentives of market agents to intensively monitor and discipline banks could be weaker when regulators impose a stronger and tighter supervision. As such, regulatory discipline can, to some extent, be considered as a substitute for market discipline. As the deposit insurance scheme is one of the components of regulatory discipline, we conjecture that strong deposit insurer power undermines market discipline. We test this hypothesis by interacting the market discipline factor with the deposit insurer power dummy variable (*DIPOW*). The empirical results are reported in Table 2.5.

Table 2.5 shows, as previously, that stronger deposit insurer power (*DIPOW*) is significantly associated with lower risk taking. Besides, market discipline is effective to reduce bank risk taking measured by the standard deviation of ROE (*SDROE*) or ROA (*SDROA*) when the power of the deposit insurer is low. A one standard deviation increase in interbank deposits (*MKD*) reduces *SDROE* by 22.93% of its mean and *SDROA* by 15.62% of its mean for banks located in countries with low deposit insurer power.

By contrast, the results of the tests at the bottom of Table 2.5 indicate that the market discipline variable is not significant when the power of the deposit insurer is high. This result confirms that strong deposit insurer power undermines market discipline. When the extent of the insurer's attributions is higher, the market appears to have lower incentives to monitor banks.

Table 2.5: Influence of the deposit insurer power on the effectiveness of market discipline.

Model specification: $RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (DIPOW * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.074***	-0.007*	0.083
	(-2.844)	(-1.784)	(1.042)
DIPOW*MKD	0.024	-0.003	0.218
	(0.486)	(-0.396)	(1.085)
EQTA	-0.456***	-0.0233*	0.686**
	(-5.504)	(-1.679)	(2.547)
LTA	-4.429***	-0.685***	4.948*
	(-3.802)	(-4.623)	(1.654)
STATE	-5.858***	-0.135	10.560
	(-2.798)	(-0.326)	(1.325)
NII	0.011	-0.011**	-0.077
	(0.379)	(-2.520)	(-0.986)
SAVING	-0.970	-1.005***	6.418
	(-0.378)	(-3.444)	(0.358)
GDPG	-0.502***	-0.166***	1.487***
	(-2.815)	(-4.157)	(2.743)
RESOL	-6.725**	-1.071***	50.720***
	(-2.064)	(-3.812)	(6.886)
LAW	-2.759**	-0.410***	53.04***
	(-2.373)	(-3.990)	(21.20)
DIPOW	-8.907***	-0.236	-18.39
	(-2.596)	(-0.688)	(-1.418)
CONSTANT	111.100***	15.790***	-410.300***
	(7.654)	(7.085)	(-8.938)
$\alpha_1 + \alpha_2$	-0.050	-0.010	0.301
Risk level to reject : $\alpha_1 + \alpha_2 = 0$	0.278	0.173	0.123
OBSERVATIONS	1060	1083	1080
R-SQUARED	0.535	0.563	0.471

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio; *EQTA* = equity to assets ratio; *NII* = ratio of net interest income to total operating income; *LTA* = logarithm of total assets; *GDPG* = growth rate of real GDP; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *LAW* = rule of law. This variable takes value between 1 and 10, higher values suggesting a higher quality of law enforcement; *STATE* = state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 50 percent of total share, and zero otherwise; *SAVING* = state saving bank dummy variable. This dummy variable takes the value of one if the bank is a state saving bank on the year considered, and zero otherwise. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

2.4.2.3 Banking crisis resolution strategies

All the countries in our sample experienced a systemic banking crisis or at least borderline and small (non-systemic) banking crises, before or at the beginning of our sample period. As noted above, these countries have followed different strategies in managing these crises. We explore whether the effect of market discipline is different for countries which have proceeded to massive recapitalizations and those which have adopted a mix of liquidation and restructuring. We hypothesize that the disciplining effect of interbank deposits will be higher in countries that have pursued liquidation than in those which have followed recapitalization policies. Indeed, creditors might fear losing their wealth in case of bank liquidation if they assume that the same resolution strategy would be adopted in case of crisis.

We examine this hypothesis by interacting the resolution strategy dummy variable (*RESOL*) with the market discipline factor (*MKD*), where *RESOL* equals one for countries which have adopted a mix of liquidation and restructuring to manage banking crises, and zero for those which have adopted recapitalization and restructuring. As shown by Table 2.6, the results indicate that market discipline is less effective in countries that had enforced bank liquidation policies in previous episodes of banking distress. Indeed, the market discipline factor is effective (*MKD*) in all specifications for countries that have adopted recapitalization and restructuring. A one standard deviation increase in interbank deposits (*MKD*) decreases the standard deviation of ROE (*SDROE*) by 18.75% of its mean and the standard deviation of ROA (*SDROA*) by 16.91% of its mean for banks located in countries that have undergone recapitalizations and restructuring in managing banking crises. Regarding the default risk, the *Z-SCORE* is increased by 14.71% of its mean. By contrast, for countries that have adopted a mix of liquidation and restructuring, the sum of the coefficients of the interaction term and the market discipline variable is significant only with the standard deviation of ROE (*SDROE*) as the dependent variable. Thus, market discipline leads to a lower risk taking of banks in countries that have proceeded to liquidations but it does not affect their insolvency risk.

These results are not consistent with the assumption that countries that have pursued liquidation policies should exhibit higher market discipline. However, as discussed in section 4.2.2, stronger regulatory discipline is also expected to undermine market discipline. Indeed, when banks are supervised by a strict regulator that is known to liquidate an institution in the event of insolvency, the fear of punishment might lead banks to take less risk in the first place. This might weaken the incentives of market agents to discipline banks.

Table 2.6: Influence of the banking crisis resolution strategy on the effectiveness of market discipline.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (RESOL * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.061**	-0.007*	0.200**
	(-2.249)	(-1.793)	(2.001)
RESOL*MKD	-0.028	-0.001	-0.241
	(-0.583)	(-0.210)	(-1.433)
EQTA	-0.456***	-0.0234*	0.689**
	(-5.468)	(-1.687)	(2.566)
LTA	-4.406***	-0.690***	5.108*
	(-3.817)	(-4.724)	(1.697)
STATE	-5.847***	-0.140	10.810
	(-2.810)	(-0.335)	(1.332)
NII	0.010	-0.011**	-0.086
	(0.337)	(-2.514)	(-1.088)
SAVING	-1.035	-0.983***	5.762
	(-0.406)	(-3.368)	(0.321)
GDPG	-0.504***	-0.166***	1.490***
	(-2.814)	(-4.164)	(2.738)
RESOL	-6.097*	-0.989***	55.580***
	(-1.889)	(-3.003)	(6.355)
LAW	-2.934***	-0.376***	50.450***
	(-2.616)	(-4.279)	(19.43)
DIPOW	-8.005**	-0.365*	-10.850
	(-2.343)	(-1.728)	(-0.898)
CONSTANT	111.300***	15.570***	-400.700***
	(7.590)	(6.975)	(-8.749)
$\alpha_1 + \alpha_2$	-0.089**	-0.009	-0.041
Risk level to reject : $\alpha_1 + \alpha_2 = 0$	0.039	0.130	0.767
OBSERVATIONS	1060	1083	1080
R-SQUARED	0.535	0.563	0.471

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio; *EQTA*=equity to assets ratio; *NII*= ratio of net interest income to total operating income; *LTA* = logarithm of total assets; *GDPG* = growth rate of real GDP; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *LAW* = rule of law. This variable takes value between 1 and 10, higher values suggesting a higher quality of law enforcement; *STATE* = state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 50 percent of total share, and zero otherwise; *SAVING* = state saving bank dummy variable. This dummy variable takes the value of one if the bank is a state saving bank on the year considered, and zero otherwise. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Thus, our variable *RESOL* might reflect the strength of regulatory discipline rather than the credibility of non bail-out policies. As shown in Table 2.3, banks' insolvency risk (*Z-SCORE*) and asset risk (*SDROE* and *SDROA*) are lower in countries that have experienced actual liquidations. Thus, market discipline may be weaker, given the role played by the discipline introduced by the regulator.

2.5 Robustness checks

To check the robustness of our results, we conduct several sensitivity analyses.

First, we compute our dependent variables on 4-year rolling windows (see appendix C). The results are highly consistent with our previous findings regarding the effectiveness of market discipline and the impact of deposit insurer power, state ownership and resolution strategies.

Second, to control for specificities at the country level, we exclude all country-level indexes used as control variables and replace them by country dummies.[36] Considering these alternative control variables leads to similar results. The results are reported in Tables D1 and D2 in appendix D.

Third, to check the robustness of the deeper investigations on the effectiveness of market discipline, we run the regressions on sub-samples. Firstly, we separate countries that have high deposit insurer power (*DIPOW*=1) from countries with low deposit insurer power (*DIPOW*=0). We still find that market discipline is effective to reduce bank risk when the power of the insurer is low. When the power of the insurer is high, the market discipline

[36]Alternatively, it could be interesting to run single country regressions. However, we do not have enough observations for most of the countries in our sample. As a robustness check, we have analyzed the impact of market discipline on bank risk taking in Hungary (by running regressions on a sample restricted to banks located in Hungary). Indeed, Hungary is the country for which we have the highest number of observations with a stable number of banks on our sample period. Besides, our sample of Hungarian banks represents over 80% of the total Hungarian commercial banks' assets. Running regressions on this single country leads to the same conclusion concerning the impact of market discipline on bank risk taking. We cannot analyze the impact of state ownership on the effectiveness of market discipline as this variable is not introduced in the regressions due to colinearity issues. Besides, as the deposit insurer power (*DIPOW*) and the banking crisis resolution strategies (*RESOL*) are not time-varying variables, it is not possible to measure their impact on market discipline in a within-country study.

variable is significant only with the standard deviation of the ROA (*SDROA*) as the dependent variable and only at the 10% level of significance (see Panel A in appendix E). Secondly, we separate countries that have conducted liquidation and restructuring (*RESOL*=1), from countries that have conducted extensive recapitalizations and restructuring (*RESOL*=0). On the whole, our results remain the same. Market discipline is weaker in countries that have experienced a mix of bank liquidations and restructuring than in countries that have pursued recapitalization and restructuring policies (see Panel B in the appendix E).[37]

Fourth, we consider another threshold to construct the dummy variable *STATE*. Banks are considered state owned if at least 30% of the shares are controlled by the state. We construct the dummy variable *STATE2* with this new definition. Considering this dummy variable leads to similar results (see appendix F).

Fifth, we run the regressions excluding the banks that have experienced mergers or acquisitions during the period 1995-2006. This leads us to eliminate 19 banks. Our main conclusions remain unchanged. (See Tables G1 to G3 in appendix G).

2.6 Conclusion

The purpose of this study is to assess the disciplinary role of interbank deposits as well as the institutional and bank specific factors affecting its effectiveness. Using a sample of 207 banks from 10 countries of Central and Eastern Europe, we find, by controlling for various factors, that interbank deposits do play a disciplinary role in the presence of explicit insurance and refrain banks from excessive risk taking.

Our results also indicate that the market is more lenient with state owned-banks possibly because they are perceived as implicitly insured by the government even in the presence of explicit limited insurance. We also find that the extent of the insurer's power impacts market discipline: market discipline is effective only when deposit insurer power is low suggesting that the presence of a more powerful insurer undermines market discipline by

[37] We do not separately run regressions on a sub-sample restricted to state-owned banks and a sub-sample including private banks only because of an insufficient number of observations for the sub-sample of state-owned banks.

lowering the incentives of market participants to monitor banks. We consistently find that banks take less risk in countries with more powerful deposit insurers. Finally, we also show that when banks are supervised by a regulator that is more likely to liquidate failing institutions rather than to rescue them, they are less risky and market discipline is weaker: stronger regulatory discipline might be undermining market discipline.

APPENDIX

Appendix A

Table A1: Correlations between Independent Variables.

	MKD	EQTA	LTA	STATE	NII	SAVING	GDPG	RESOL	LAW	DIPOW
MKD	1									
EQTA	-0.065	1								
LTA	-0.081	-0.528	1							
STATE	0.009	0.000	0.136	1						
NII	0.047	0.058	0.041	-0.081	1					
SAVING	-0.109	-0.084	0.208	0.289	0.080	1				
GDPG	-0.119	0.010	-0.018	-0.091	0.081	0.032	1			
RESOL	-0.188	0.086	-0.122	-0.036	-0.018	-0.027	0.314	1		
LAW	0.231	-0.205	0.273	-0.030	-0.097	0.029	-0.142	-0.218	1	
DIPOW	0.046	-0.124	0.151	-0.084	0.046	0.008	-0.179	-0.162	0.211	1

MKD = interbank deposits to total deposits ratio; *EQTA* = equity to assets ratio; *NII* = ratio of net interest income to total operating income; *LTA* = logarithm of total assets; *GDPG* = growth rate of real GDP; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *LAW* = rule of law. This variable takes value between 1 and 10, higher values suggesting a higher quality of law enforcement; *STATE* = state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 50 percent of total share, and zero otherwise; *SAVING* = state saving bank dummy variable. This dummy variable takes the value of one if the bank is a state saving bank on the year considered, and zero otherwise.

Appendix B

Table B1: Impact of explicit deposit insurance on market discipline.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 DEPINS + \alpha_2 MKD_{i,j,t} + \alpha_3 (DEPINS * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + \gamma_j + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE
DEPINS	9.489***	1.049***	-14.400*
	(4.410)	(3.671)	(-1.730)
MKD	0.096	-0.010	0.085
	(0.823)	(-0.983)	(0.244)
DEPINS*MKD	-0.158	0.005	0.026
	(-1.361)	(0.430)	(0.0766)
$\alpha_2 + \alpha_3$	-0.062***	-0.006*	0.111
Risk level to reject : $\alpha_2 + \alpha_3 = 0$	0.007	0.096	0.148
OBSERVATIONS	1142	1170	1156
R-SQUARED	0.559	0.570	0.425

The regressions contain the same control variables as those in Table 2.3 except that we control for country specificities by introducing country dummy variables instead of country-level invariant variables. We report only the coefficients on explicit deposit insurance scheme dummy variable, market discipline factor and the interaction term (explicit deposit insurance scheme dummy variable and the market discipline factor). Detailed results are available upon request.

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *DEPINS* = explicit deposit insurance scheme. This dummy variable takes the value of one if there is an explicit deposit insurance scheme on the considered year and 0 otherwise*; MKD* = interbank deposits to total deposits ratio. Bank, time and country fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix C

Table C1: Regressions using dependent variables computed on 4-year rolling windows

Panel A model specification: $RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$

Panel B, C and D model specification: $RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (DUM * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$ with DUM= DIPOW, RESOL, and STATE respectively.

	Panel A:Effectiveness of interbank deposits as market discipline factor			**Panel B**:Influence of the deposit insurer power on the effectiveness of market discipline			**Panel C**:Influence of the banking crisis resolution strategy on the effectiveness of market discipline			**Panel D**:Influence of implicit insurance through state ownership on the effectiveness of market discipline		
VARIABLES	SDROE	SDROA	Z-SCORE	SDROE	SDROA	Z-SCORE	SDROE	SDROA	Z-SCORE	SDROE	SDROA	Z-SCORE
MKD	-0.061**	-0.006*	0.028	-0.069***	-0.007*	0.043	-0.062**	-0.007*	0.087	-0.065***	-0.009**	0.049
	(-2.524)	(-1.823)	(0.590)	(-2.754)	(-1.948)	(0.789)	(-2.219)	(-1.824)	(1.472)	(-2.585)	(-2.561)	(1.012)
DIPOW	-26.760***	-1.514***	55.950***	-27.540***	-3.180***	15.760*	-26.700***	-3.085***	54.160***	-26.820***	-3.054***	56.990***
	(-13.680)	(-2.600)	(14.930)	(-10.950)	(-9.048)	(1.933)	(-13.240)	(-9.812)	(14.300)	(-13.490)	(-10.270)	(14.860)
DIPOW*MKD				0.026	0.002	-0.057						
				(0.499)	(0.303)	(-0.607)						
RESOL	-14.620***	-1.116***	35.310***	-14.550***	-0.860*	23.820***	-14.770***	-0.962*	41.410***	-14.410***	-0.528	34.870***
	(-7.163)	(-4.003)	(6.542)	(-7.181)	(-1.694)	(4.157)	(-6.285)	(-1.810)	(6.960)	(-6.934)	(-1.125)	(6.404)
RESOL*MKD							0.005	0.004	-0.227**			
							(0.102)	(0.630)	(-2.170)			
STATE	-4.940**	-0.175	10.230**	-4.935**	-0.179	10.170**	-4.935**	-0.175	10.300**	-6.269**	-0.790*	16.440***
	(-2.414)	(-0.394)	(2.039)	(-2.405)	(-0.405)	(2.024)	(-2.408)	(-0.392)	(2.049)	(-2.555)	(-1.795)	(2.602)
STATE*MKD										0.064	0.029*	-0.327*
										(1.015)	(1.751)	(-1.852)
$\alpha_1 + \alpha_2$				-0.043	-0.005	-0.013	-0.057	-0.003	-0.140	-0,001	0,02	-0,278
Risk level to reject : $\alpha_1 + \alpha_2 = 0$				0.385	0.462	0.864	0.179	0.625	0.108	0.981	0.216	0.110
OBSERVATIONS	883	940	888	883	940	888	883	940	888	883	940	888
R-SQUARED	0.682	0.781	0.618	0.682	0.781	0.618	0.682	0.781	0.621	0.682	0.783	0.620

The regressions contain the same control variables as those in Tables 2.3. We report only the coefficients on market discipline factor, dummy variable of interest, and the interaction term (dummy variable and the market discipline factor). Detailed results are available upon request. *SDROA* = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio. *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and 0 for country having made extensive restructuring and recapitalization of banks; *STATE* = state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 50 percent of total share, and zero otherwise. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix D

Table D1: Effectiveness of interbank deposits as market discipline factor introducing country dummies as control variables.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + \gamma_j + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.068***	-0.008**	0.141*
	(-2.802)	(-2.182)	(1.719)
OBSERVATIONS	1058	1083	1071
R-SQUARED	0.529	0.555	0.446

The regressions contain the same control variables as those in Table 2.3 except that we control for country specificities by introducing country dummy variables instead of country-level invariant variables. We report only the coefficient on market discipline factor. Detailed results are available upon request.

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio. Country, bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table D2: Influence of implicit insurance through state ownership on the effectiveness of market discipline introducing country dummies as control variables.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (STATE * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + \gamma_j + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.077***	-0.010***	0.151*
	(-2.962)	(-2.869)	(1.897)
STATE*MKD	0.117*	0.0301**	-0.126
	(1.935)	(2.032)	(-0.440)
STATE	-8.512***	-0.882**	13.44
	(-3.735)	(-2.297)	(1.593)
$\alpha_1 + \alpha_2$	0.040	0.020	0.025
Risk level to reject : $\alpha_1 + \alpha_2 = 0$	0.469	0.166	0.935
OBSERVATIONS	1058	1083	1071
R-SQUARED	0.530	0.562	0.446

The regressions contain the same control variables as those in Table 2.3 except that we control for country specificities by introducing country dummy variables instead of country-level invariant variables. We report only the coefficients on market discipline factor and the interaction term (= state owned bank dummy variable and the market discipline factor). Detailed results are available upon request.

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio; *STATE* = state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 50 percent of total share, and zero otherwise. Country, bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix E

Table E1: Regressions on sub-samples

Panel A and B model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$$

Panel A: Influence of the deposit insurer power on the effectiveness of market discipline

	High deposit insurer power			Low deposit insurer power		
VARIABLES	SDROE	SDROA	Z-SCORE	SDROE	SDROA	Z-SCORE
MKD	-0.073	-0.006*	0.230	-0.0427**	-0.00960**	0.0616
	(-1.236)	(-1.661)	(1.065)	(-2.149)	(-2.403)	(0.747)
Observations	350	342	342	696	739	737
R-squared	0.513	0.654	0.442	0.632	0.650	0.468

Panel B: Influence of the banking crisis resolution strategy on the effectiveness of market discipline

	Countries having proceeded to a mix of recapitalizations and liquidations			Countries having proceeded to recapitalizations		
VARIABLES	SDROE	SDROA	Z-SCORE	SDROE	SDROA	Z-SCORE
MKD	-0.094**	-0.004	-0.039	-0.052**	-0.009**	0.191*
	(-2.395)	(-0.799)	(-0.404)	(-2.045)	(-2.072)	(1.818)
OBSERVATIONS	269	275	266	783	802	796
R-SQUARED	0.803	0.827	0.681	0.441	0.592	0.436

The regressions contain the same variables as those in Table 2.3 except the power of deposit insurance authority dummy variable in Panel A and the crises resolution strategies dummy variable in Panel B. Besides, the dummy variable *SAVING* is not included in the regressions on the sub-sample of banks located in countries with low deposit insurer power due to strong correlation between this variable and *STATE* and cannot be introduced on the sub-sample of banks located in countries that have proceeded to a mix of recapitalizations and liquidations (when the dependent variable is *SDROE* or *Z-SCORE*) due to colinearity issues. We report only the coefficients on market discipline factor. Detailed results are available upon request.

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. The power of the deposit insurer is considered high for countries that have a deposit insurance authority power index equals two or more. It is considered low for countries that have a deposit insurance authority power index equals 0 or 1.

Appendix F

Table F1: Regressions using another definition of state-owned banks.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (STATE2 * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.085***	-0.012***	0.157*
	(-3.200)	(-3.488)	(1.943)
STATE2*MKD	0.188***	0.038***	-0.199
	(3.312)	(2.759)	(-0.665)
STATE2	-9.949***	-1.136***	18.170**
	(-4.305)	(-2.868)	(2.161)
$\alpha_1 + \alpha_2$	0.103**	0.026*	-0.042
Risk level to reject : $\alpha_1 + \alpha_2 = 0$	0.047	0.052	0.887
OBSERVATIONS	1060	1083	1080
R-SQUARED	0.539	0.572	0.472

The regressions contain the same control variables as those in Table 2.3. We report only the coefficients on state-owned bank dummy variable, market discipline factor, and the interaction term (state owned bank dummy variable and the market discipline variable). Detailed results are available upon request.

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio. *STATE2* = state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 30 percent of total share, and zero otherwise. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix G

Table G1: Effectiveness of interbank deposits as market discipline factor excluding banks that have undergone M&A.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.072***	-0.009**	0.125
	(-2.938)	(-2.398)	(1.532)
OBSERVATIONS	975	1002	990
R-SQUARED	0.485	0.603	0.431

The regressions contain the same control variables as those in Table 2.3. We report only the coefficients on market discipline factor.

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table G2: Influence of the deposit insurer power and the banking crisis resolution strategy on the effectiveness of market discipline excluding banks that have undergone M&A.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (RESOL * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$$

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (DIPOW * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE	SDROE	SDROA	Z-SCORE
MKD	-0.066**	-0.009**	0.193*	-0.082***	-0.007*	0.070
	(-2.434)	(-2.075)	(1.953)	(-3.052)	(-1.895)	(0.888)
RESOL*MKD	-0.022	0.00046	-0.280*			
	(-0.438)	(0.063)	(-1.652)			
DIPOW* MKD				0.036	-0.005	0.210
				(0.727)	(-0.655)	(1.052)
RESOL	-6.862***	-2.875***	117.400***	-11.540***	-2.785***	112.800***
	(-2.702)	(-6.655)	(8.765)	(-4.808)	(-8.153)	(9.034)
DIPOW	-1.901	0.221	69.840***	-8.859**	0.352	63.630***
	(-0.726)	(0.605)	(7.389)	(-1.998)	(0.841)	(6.094)
$\alpha_1 + \alpha_2$	-0.088**	-0.008	-0.087	-0.045	-0.013	0.280
Risk level to reject: $\alpha_1 + \alpha_2 = 0$	0.046	0.172	0.535	0.321	0.106	0.150
OBSERVATIONS	975	1002	990	975	1002	990
R-SQUARED	0.486	0.603	0.433	0.486	0.603	0.432

The regressions contain the same control variables as those in Table 2.3. We report only the coefficients on market discipline factor, crises resolution strategies dummy variable, power of deposit insurance authority dummy variable and the interaction terms (power of deposit insurance authority dummy variable and the market discipline factor or crises resolution strategies dummy variable and the market discipline factor). Detailed results are available upon request.

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio; *DIPOW* = power of deposit insurance authority dummy variable. This dummy variable takes the value of one for countries that have a deposit insurance authority power index equals two or more, and zero otherwise; *RESOL* = crises resolution strategies dummy variable that takes the value of 1 for country having proceeded to a combination of bank liquidation and restructuring, and

0 for country having made extensive restructuring and recapitalization of banks. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table G3: Influence of implicit insurance through state ownership on the effectiveness of market discipline excluding banks that have undergone M&A.

Model specification:

$$RISK_{i,j,t} = \alpha_0 + \alpha_1 MKD_{i,j,t} + \alpha_2 (STATE * MKD) + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_i + \tau_t + u_{i,j,t}$$

VARIABLES	SDROE	SDROA	Z-SCORE
MKD	-0.082***	-0.012***	0.127
	(-3.079)	(-3.090)	(1.622)
STATE* MKD	0.122*	0.034**	-0.035
	(1.844)	(2.168)	(-0.115)
STATE	-9.897***	-1.117**	16.090*
	(-3.452)	(-2.415)	(1.649)
$\alpha_1 + \alpha_2$	0,040	0,022	0,092
Risk level to reject : $\alpha_1 + \alpha_2 = 0$	0.505	0.140	0.769
OBSERVATIONS	975	1,002	990
R-SQUARED	0.487	0.609	0.431

The regressions contain the same control variables as those in Table 2.3. We report only the coefficients on market discipline factor, state owned bank dummy variable and the interaction term (state owned bank dummy variable and the market discipline factor). Detailed results are available upon request.

SDROA = standard deviation of the ROA; *SDROE* = standard deviation of the ROE; *Z-SCORE* = bank insolvency risk; *MKD* = interbank deposits to total deposits ratio; *STATE* = state owned bank dummy variable. This dummy variable takes the value of one for banks in which state ownership represents at least 50 percent of total share, and zero otherwise. Bank and time fixed effects are included but not reported. Robust t-statistics are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

CHAPTER 3

FOREIGN BANKS' ACTIVITY AND FUNDING STRATEGIES AND RISK-TAKING: EVIDENCE FROM EMERGING COUNTRIES

3. 1 Introduction

Over the past two decades, important changes have occurred in the banking sectors of transition and emerging countries. These changes are the outcome of several factors such as the implementation of financial liberalization policies that removed barriers to entry across geographic areas and markets sectors in Latin America and Central Asia and the dissolution of the Soviet Union for Central and Eastern European countries. A major consequence of these financial sector reforms is the sharp increase of foreign bank entry in these countries. Thus, in terms of numbers, the share of foreign banks in Eastern European and Central Asian banking systems has increased from 15 % in 1995 to 47 % in 2009. Similarly, this share increased from 25 % to 39 % in Latin America and the Caribbeans. In 2009, in terms of assets, the share of foreign total assets in the total assets of the banking system was 28% in Eastern Europe and Central Asia and 31% in Latin America and Caribbean countries (Claessens and Van Horen (2012)). In some Central and Eastern European countries, the average market share of foreign-owned banks in terms of assets often exceeds 80%. For example, in 2009, the market share of foreign banks in the Czech Republic, Estonia and Slovakia were 86%, 99% and 88%, respectively.[38]

The significant presence of foreign banks in the banking industry raises a number of important issues among economists. Indeed, several studies have addressed the benefits and disadvantages of foreign bank entry for the host economy in terms of resource allocation, efficiency and financial sector development. Particularly, several studies question the reasons for entry of foreign banks in developing and emerging countries (see Wezel (2004) and Focarelli and Pozzolo (2005)). Some authors compare the profitability of domestic banks and foreign banks or analyze the determinants of foreign bank profits (Martínez Pería and Mody (2004), Demirguc-Kunt et al. (2001)).

Turning to the difference in business model between foreign banks and their domestic peers in emerging countries, existing studies examine the question of whether foreign banks are different from domestic banks in the type of firms they finance and why. Theoretical and

[38] See Claessens and van Horen (2012) for a comprehensive database on bank ownership trend for 137 countries around the world.

empirical studies argue that because of their informational and agency costs due to cultural and geographical differences, foreign banks lend mainly to large domestic firms, or the government rather than lending to soft information-based relational firms such as small firms or firms not backed by large business group (Mian (2006), Detragiache et al. (2008)). In this paper we focus on possible differences in the type of activity and the funding strategies between foreign and domestic banks.

Also, some studies analyze the impact of foreign banks' presence on financial stability, mainly during times of financial stress and find mixed results. Indeed, some studies find a positive impact of foreign banks presence on host country bank system stability when parent banks relieve their foreign subsidiaries during times of financial stress through internal capital markets (Detragiache and Gupta (2006), De Haas and Van Lelyveld (2010), Barba-Navaretti et al. (2010)). Other studies find that foreign banks presence weakens host countries' bank system stability as a distress of parent banks can be transmitted to their foreign subsidiaries with negative consequences for their lending (Acharya and Schnabl (2010)).

Our paper investigates the possible differences of banks' activity mix and funding strategies between foreign and domestic banks and its implications on risk-taking behavior. Specifically, using bank-level and country-level data from 1998 to 2008 for 28 transition and emerging countries, we start by addressing the question of how the share of non-interest income in total operating income, the share of short-term deposit (funding) and the share of non-deposit funding vary with bank ownership. We further examine the impact of different bank's activity mix and funding strategy on bank risk-taking behavior, especially on default risk.

We draw three conclusions from our findings. First, there is a difference in activity mix and funding strategy between foreign banks and domestic banks in emerging countries. Foreign banks rely more on non-interest income in their operating income. Second, on the liability side, foreign banks attract more long term funding than domestic banks, and they rely more on non-deposits funding. Third, due to their activity mix and funding strategy, foreign banks exhibit a higher insolvency risk than that of domestic banks, even if foreign banks have better loan portfolio quality as measured by the ratio of non-performing loans to net total loans.

The remainder of this paper is organized as follows. Section 3.2 reviews the literature and explains how this work extends the existing literature. Section 3.3 presents our sample, variables and summary statistics. Regression analyses and results are presented in section 3.4. Section 3.5 concludes.

3.2. Review of Literature

3.2.1 Do foreign and domestic banks differ in host countries?

Existing studies that analyze the effect of the entry of foreign banks compare the lending portfolios of foreign and domestic banks. Overall, these studies show that foreign banks "cherry pick" borrowers in poor countries, by lending predominantly to multinational corporations, larges domestics firms or the government (Detragiache et al. (2008)). Using a sample of Argentinean banks, Berger et al. (2001) find that large banks and foreign banks were reluctant to lend to small opaque firms. Clarke et al. (2006), meanwhile, investigate whether higher foreign bank participation improves the accessibility of external financing for firms by combining responses from a survey of firms operating in 35 developing and transition economies. They find that all enterprises, including small and medium-sized ones, report facing lower financing obstacles in countries having higher levels of foreign banks presence. Further, Mian (2006) shows that due to greater cultural and geographical distance between a foreign bank's headquarters and local branches, foreign banks further avoid lending to "informationally difficult" firms, using a loan-level dataset for Pakistan. Also, Claessens and van Horen (2012) using a database on bank ownership for 137 countries over the 1995-2009 period, find a negative relationship between private credit and foreign banks presence, but only in countries with relatively distant foreign banks. Using bank-level data for Argentina, Chile, Colombia, and Peru during the mid-1990s, Clarke et al. (2005) find that foreign banks lend a smaller fraction of their funds to SMEs than similar domestic banks. However, comparing large domestic banks' and large foreign banks' lending behavior, they find that large foreign banks appeared to lend more to SMEs than large domestic banks in Chile and Colombia. Detragiache et al. (2008) investigate the impact of foreign bank entry on private credit levels using a sample of 89 low income and lower middle income countries. They find that credit to the private sector is lower in countries marked with higher foreign banks penetration.

Some of these studies that analyze the differences between foreign banks and domestic banks compare the performance of foreign banks and domestic banks. Berger et al. (2005) find that foreign banks exhibit lower cost of financial intermediation and lower profitability, contrary to Micco et al. (2004) who find that foreign-owned banks tend to have higher profitability and lower costs, particularly in developing countries. Moreover, their results do not indicate a significant correlation between bank ownership and performance in industrialized countries. Also, Claessens et al. (2001) investigate how net interest margins, overhead, taxes paid, and profitability differ between foreign and domestic banks. They find that foreign banks have higher profits than domestic banks in developing countries, but the opposite is the case for developed countries.

Turning to the strand of studies that deal with the impact of foreign bank entry on financial stability in the host country, Demirgüç-Kunt et al. (1998), using a broad cross-section of countries find that foreign banks penetration is associated with lower financial fragility. Acharya and Schnabl (2010) find that a distress of parent banks can be transmitted to their foreign subsidiaries with negative consequences for their lending which can result in more banking distress. On the other hand, Detragiache and Gupta (2006), De Haas and Van Lelyveld (2010) and Barba-Navaretti et al. (2010) find a positive impact of foreign banks presence on host country bank system stability when parent banks relieve their foreign subsidiaries during times of financial stress through internal capital markets. Barth et al. (2004), analyzing bank regulation and supervision in 107 countries, find that the degree of foreign ownership could not explain the likelihood of banking crisis but barriers to foreign-bank entry are positively associated with bank fragility. Haber and Musacchio (2005) analyze Mexico's experience and find that with foreign banks entry, bank capitalization improved both loan portfolio quality and operational efficiency in terms of a lower nonperforming loans (NPLs) ratio and a decrease in operational expenses. Their results suggest that the banking system has become more stable and profitable as a result of foreign bank entry. However they find that lending to the private sector declined. Levy-Yeyati and Micco (2007) find that foreign banks are associated with higher risks, measured by the *Z-SCORE*, than domestic banks in a sample of Latin American banks.

3.2.2 Activity and funding strategy and risk

Several studies investigate the impact of combining traditional banking with other financial activities on bank risk-taking. Acharya et al. (2002), using data from Italian banks analyze the tradeoffs between (loan portfolio) focus and diversification. They find that diversification of bank assets is not guaranteed to produce higher performance and/or safer banks.

In the case of U.S. banks, Stiroh (2004) finds that greater reliance on noninterest income, particularly trading revenue, is associated with higher risk and lower risk-adjusted profits. Lepetit et al. (2008) find that a heavier engagement in commission and fee activities implies higher risk for western European banks.

Meanwhile, Baele et al. (2007) examine how a bank's share of non-interest income affects bank risk for a sample of European banks over the 1989-2004 period. They find that bank's non-interest income share is associated with higher systematic risk; measured by the market beta. Idiosyncratic risk, in turn, is found to be associated to the non-interest income share in a non-linear way, with most banks beyond the point where idiosyncratic risk is minimized.

Demirgüç-Kunt and Huizinga (2010) examine the implications of bank activity and short-term funding strategies for bank risk and returns. They find that banks with a high non-interest income share are riskier. On the liability side, they find that banks with a large share of non-deposit wholesale funding in total short-term funding are also riskier.

This paper connects the literature on both business model and its implication on risk-taking, and on foreign bank participation and banking stability by extending earlier works.

First, contrary to most previous research on foreign bank participation and banking stability which investigate whether foreign banks amplify or attenuate the banking problems in host countries, in this paper we examine the intrinsic foreign banks' risk regardless of the economic and banking situation. The closest study to ours as regards the relationship between foreign bank penetration and banking stability is Levy-Yeyati and Micco (2007) which find that foreign banks are associated with higher risks, measured by the *Z-SCORE*, than domestic banks in a sample of Latin American banks. However, there are at least two differences between this study and ours. Contrary to Levy-Yeyati and Micco (2007), we consider a

broader data set including transition economies, Latin American countries, Asian countries and African countries, whereas Levy-Yeyati and Micco (2007) consider only Latin American countries. Besides, contrary to us, they analyze an indirect relationship between foreign banks' penetration and banks stability through the impact of competition on risk-taking.

Second, most of existing studies analyzing the foreign banks' business model examine the question of whether foreign banks are different from domestic banks in the type of firms they finance, specifically difference in their loan portfolios. Besides, the other studies that analyze banking business strategies focus predominantly on banking company size or on categories of banks (commercial banks, cooperative banks, investment banks, etc.). In this paper we focus on possible differences in the type of activity and the funding strategies between foreign and domestic banks.

Third, our paper is also related to Demirgüç-Kunt and Huizinga (2010) regarding the impact of business model on risk-taking. Our paper goes beyond Demirgüç-Kunt and Huizinga (2010) as in their analysis they do not take into account the connection between foreign banks and business model and the impact of foreign ownership on risk-taking.

3.3 Data, variables and summary statistics

To investigate how bank ownership affects bank's activity and funding mix and further how bank's activity and funding mix impacts bank risk-taking, we combine bank-level-data with information on the ownership type, along with other macro-level variables and institutional variables that might affect either banks' business strategies or bank risk-taking behavior. These variables are compiled from various sources. Before presenting our set of variables and the method, we provide information about our sample of banks and the collected data.

3.3.1 Sample

Our sample consists of 863 commercial banks established in 28 countries in Central and Eastern Europe, Latin America, Asia and Africa defined by World Bank as emerging countries.[39] Only commercial banks are selected in the dataset to reduce the possible bias resulting from the different business models among different categories of banks. Income statement and balance sheet information on individual banks are obtained from Bankscope Fitch IBCA. The sample period is from 1998 to 2008. Coverage by Bankscope database is comprehensive in most countries, accounting for over 90% of all the banking assets in each country. In this study the sample is chosen based on the requirement that data are available to compute our risk measures defined below. We keep only banks with at least 3 consecutive years of time series observations for the return on assets (ROA) series, which allows us to compute standard deviations using at least 3-year consecutive observations.

3.3.2 Presentation of variables

We present our dependent variables reflecting bank ownership, the bank's activity mix and funding strategy, bank risk and the different independent variables introduced in our estimations.

3.3.2.1 Identifying bank ownership

A bank is classified as a foreign bank if at least 50% of its capital is owned by non local residents. As Bankscope does not provide ownership history, but only for the most recent year, we use several sources in coding bank ownership. In addition to Bankscope, we also look into individual banks' websites to review their historical evolution or into their

[39] We do not consider all the countries defined by the World Bank as emerging countries due to the unavailability of information on the banks' ownership in these countries. These countries and the number of banks per country are: Brazil=126; Bulgaria=23; China=84; Colombia=29; Czech Rep.=25; Egypt=30; Estonia=6; Hong Kong=41; Hungary=30; India=65; Indonesia=59; Korea Rep. =14; Latvia=23; Lithuania=8; Malaysia=36; Mexico=22; Morocco=8; Peru=19; Philippines=26; Poland=48; Romania=22; Saudi Arabia=10; Singapore=12; Slovakia=17; Slovenia=19; South Africa=27; Thailand=19; Turkey=15.

annual reports. We also explore Central Banks' websites and publications such as Bloomberg BusinessWeek, Asiamoney, Euromoney, the Banker, Funding Universe, ECBS (European Banking Guides and Resources) etc. This allows us to identify a banks' ownership structure year-by-year for the 1998-2008 period. Finally, in this paper, we define our foreign ownership variable, *FOREIGN*, as a dummy variable equals to 1 if, during the considered year, the bank is foreign-owned that is if at least 50% of its capital is owned by non local residents, and 0 otherwise. Table 3.1 reports the number of domestic and foreign banks per country for a few years in our dataset as a guide.

Table 3.1: Distribution of foreign banks and domestic banks per country in our sample.

COUNTRY	1998		2000		2002		2004		2006		2008	
	D	F	D	F	D	F	D	F	D	F	D	F
BRAZIL	102	38	102	37	104	36	105	32	109	37	106	42
BULGARIA	14	9	14	11	11	13	11	14	10	15	11	15
CHINA	79	5	79	6	77	7	75	7	77	6	78	8
COLOMBIA	31	7	31	7	32	7	32	7	32	7	32	7
CZECH REP.	15	15	15	15	14	17	14	17	14	18	14	18
EGYPT	16	12	16	12	16	12	16	12	14	13	14	15
ESTONIA	7	3	5	5	5	5	5	5	5	5	5	5
HONG KONG	16	26	16	27	15	28	15	28	14	29	16	29
HUNGARY	11	22	10	22	9	24	9	23	9	24	9	24
INDIA	65	5	66	5	65	6	65	6	64	6	65	6
INDONESIA	42	18	55	22	52	28	50	30	50	31	48	33
KOREA REP.	11	3	11	3	10	4	10	4	10	4	10	4
LATVIA	16	5	17	7	16	8	15	9	14	10	14	11
LITHUANIA	8	1	6	2	3	6	3	7	3	7	3	7
MALAYSIA	35	11	36	11	36	11	36	11	36	11	36	11
MEXICO	16	8	16	8	15	9	15	9	15	9	15	9
MOROCCO	9	4	9	4	9	4	9	4	9	4	9	4
PERU	15	10	15	10	14	11	14	11	14	11	14	11
PHILIPPINES	30	6	30	6	30	6	30	5	28	6	29	6
POLAND	20	34	18	37	18	37	18	35	18	36	18	37
ROMANIA	8	16	7	15	7	15	5	19	5	18	5	19
SAUDI ARABIA	11	0	11	0	11	0	11	0	11	0	11	0
SINGAPORE	13	5	13	5	13	5	13	5	13	5	13	5
SLOVAKIA	8	10	9	10	6	14	5	15	5	15	5	15
SLOVENIA	18	2	18	2	14	6	13	7	13	7	13	7
SOUTH AFRICA	24	5	25	5	25	5	25	5	24	6	24	6
THAILAND	12	5	13	5	13	5	12	5	13	5	13	5
TURKEY	11	3	11	3	10	4	10	4	9	5	9	5

NB: D=Domestic banks; F=Foreign banks.
Calculations are based on our sample.

3.3.2.2 Measuring activity mix and funding strategy

To test whether foreign banks and domestic banks differ in their business model, we need to identify the proxies that measure a bank's business model. Regarding activity mix we consider the share of non-interest income in total operating income (*NONII*). This variable is usually used to proxy the overall relative importance of a bank's non-interest generating activities (see Demirgüç-Kunt and Huizinga (2010)). A higher value of the share of non-interest income in total operating income indicates stronger expansion towards nontraditional intermediation activities.

Banks use several sources of funding among deposits or other short-term or long-term instruments. In this paper we consider two proxies to identify a bank's funding strategy. First, we use the share of non-deposit funding (*NONDEPOS*) defined as the share of total funding excluding derivatives minus customer deposits to total funding. As mentioned in Demirgüç-Kunt and Huizinga (2010), deposits tend to be instantly demandable, while non-deposits are considered term financing, even if the term may be very short as in the case of overnight inter-bank lending. Second, we look at the strategy of a bank based on the maturity of its debt and thus on more or less reliance on short-term funding. We define short-term funding as bank's customer and short term funding as a share of total interest-bearing debt (*SHORTDEBT*).

3.3.2.3 Measuring risk-taking

We take as a measure of individual bank insolvency risk the *Z-SCORE* defined as the return on asset plus the capital to total assets ratio divided by the standard deviation of assets return. Specifically, $ZSCORE = (ROA + EQTA) / SDROA$.

As previously mentioned, we collect data ranging from 1998 to 2008. The *ROA*, the return on assets defined as the ratio of net income to average total assets and *EQTA*, the ratio of equity to total assets are calculated as follows:

- If a bank maintains its ownership over the entire study period the ROA and the capital-asset ratio are calculated as the mean over 1998-2008, and *SDROA* which is the standard deviation of *ROA* estimated over the time period 1998-2008.

- If there is a change in the ownership of a bank over the period 1998-2008 the *ROA* and capital-asset ratio are calculated as the means over the period over which the bank is foreign-owned and domestic-owned respectively, and *SDROA* is estimated as the standard deviation of *ROA* over the period over which the bank is foreign-owned and domestic-owned respectively.

In all cases, a *Z-SCORE* is calculated only if we have accounting information for at least three years. Also, whenever we use the *Z-SCORE* as the dependent variable, the independent variables are calculated as averages over different periods depending on the evolution of the bank ownership as described above. All the ratios are in percentages. The *Z-SCORE* has been widely used in the literature as a measure of bank default risk (see Roy (1952), Hannan and Hanweck (1988), Demirgüç-Kunt and Huizinga (2010) and Distinguin et al. (2012)). A lower *Z-SCORE* value indicates a higher probability of bank failure.

We also use another method to calculate the *Z-SCORE*. Indeed, instead of using the ROA and capital-asset ratio calculated as the mean over 1998-2008 or over the sub-period corresponding to one ownership type, we use the ROA and capital-asset ratio in 2008, in the case where the bank maintains its ownership over the whole period, and the standard deviation of *ROA* is estimated over the time period 1998-2008. We denote this variable, *ZSCORET* , which is defined as $ZSCORET = (ROA_t + EQTA_t) / SDROA$.

3.3.2.4 Control variables

In our empirical analysis, we include a set of control variables known to explain the business model choice and the riskiness of individual banks. These variables capture individual bank characteristics and reflect macroeconomic factors and the institutional environment at the country level.

Bank characteristics

We consider several control variables at the bank level. First, we include the natural logarithm of total assets (*LTA*) as a proxy of bank size. Second, we control for bank capitalization defined as the ratio of equity to total assets (*EQTA*). Third, the ratio of

personnel and other non-interest expenses to total assets *(OVERHEAD*) is included to control for the bank's cost structure. We expect lower costs of financial intermediation to be associated with greater foreign bank presence (see for example Berger et al. (2005)). Fourth, we control for banks' total assets growth rate, assuming that fast-growing banks have different income and funding strategies as well as risk-taking.

Country characteristics

We also consider country-level variables that might affect bank risk as well as income and funding strategies. We take into account the annual growth rate of the real Gross Domestic Product (*GDPG*) to control for business cycle fluctuations and the overall economic conditions. We also include GDP per capita (*GDPCAP*) to capture the degree of economic development of the country. We also control for inflation (*INFLATION*). Indeed, inflation may impact a bank's decision to move towards nontraditional intermediation activities and can affect bank risk-taking. Macroeconomic control variables are retrieved from the World Development Indicator (WDI) database provided by the World Bank.

Furthermore, we include a series of political and other institutional variables in some of our empirical specifications. These variables are:

- Voice and Accountability (*VOICE*) reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

- Political Stability and Absence of Violence/Terrorism (*STABILITY*) reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

- Government Effectiveness (*GOVEFFECT*) reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

- Regulatory Quality (*REGQUAL*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

- Rule of Law (*RULEOFLAW*) reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

- Control of Corruption (*CORRUP*) reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

These indices of governance ranges from -2.5 (weak) to 2.5 (strong) governance performance and are retrieved from the World Governance Indicators of Kaufmann et al. (2010).

3.3.3 Data Summary and Univariate Results

We present the summary statistics for the dependent and independent variables in Table 3.2. On average, banks derive 32.45 % of their income from noninterest fees. However, this average is 34.89% for foreign banks against 30.73% for domestic banks. On average, banks fund themselves at 24.92% with non-deposit funding. This ratio is 21.60 % for domestic banks and 30.43 % for foreign banks. With regards to the maturity of debt, we can see that, on average, banks attract 92.99% of their funds from short-term funding. This ratio is 93.19 % for domestic banks and 92.52 % for foreign banks. The mean *Z-SCORE* is 21.66 for all banks, 23.25 for the domestic banks and 19.14 for the foreign banks. The ratio of overhead expenses to assets has a sample mean of 3.99%. This ratio for the domestic banks and foreign banks is 4.10% and 3.85%, respectively.

Table 3.3 displays the correlation coefficients for the independent variables. As can be seen from this table, the institutional and political indices are highly correlated with each other; therefore, we include the indices individually in the different specifications.

Table 3.2: Summary statistics for the regression variables.

Panel A: Summary statistics on all the banks in the sample.

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
NONII	6030	32.455	19.207	0	99.641
SHORT_TERMDEBT	6452	92.989	13.567	0.038	118.618
NON_DEPOFUND	3443	24.920	20.937	0.339	100
ZSCORE	901	21.657	23.808	0.438	154.612
ZSCORET	901	21.664	23.809	0.438	154.612
NPL	4168	8.406	10.900	0	97.316
OVERHEAD	6423	3.986	4.308	0	75.82729
GROWTH_TA	5323	17.321	29.285	-97.118	140.912
LTA	6461	14.135	1.976	7.525	21.079
EQTA	6461	12.664	11.209	0.004	99.723
FOREIGN	9248	0.385	0.487	0	1
VOICE	9482	0.110	0.774	-1.704	1.224
STABILITY	9482	-0.192	0.853	-2.412	1.327
GOVEFFECT	9482	0.294	0.581	-0.623	2.374
REGQUAL	9482	0.360	0.645	-0.775	2.150
RULEOFLAW	9482	0.081	0.633	-0.946	1.763
CORRUP	9482	0.0491	0.676	-1.140	2.391
GDPG	9482	4.775	3.522	-13.127	14.200
INFLATION	9252	6.271	8.532	-4.023	84.641
GDPCAP	9482	4977.116	6395.967	413.287	34570.240

NONII=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*= Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding (%); Z-SCORE= bank insolvency risk; ZSCORET = bank insolvency risk; *NPL*=Ratio of non-performing loan to net total loans (%); *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars; *VOICE*= Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media; *STABILITY*= Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism; *GOVEFFECT*= Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *REGQUAL*= Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; CORRUP= Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interest.

Panel B: Summary statistics on Domestic banks *versus* foreign banks.

	DOMESTIC BANKS					FOREIGN BANKS				
VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX	OBS	MEAN	STD. DEV.	MIN	MAX
NONII	3438	30.733	19.820	0	99.027	2435	34.886	17.948	0	99.641
SHORT_TERMDEBT	3694	93.189	13.782	0.038	110.400	2592	92.523	13.539	1.259	118.618
NON_DEPOFUND	2050	21.598	19.290	0.339	100	1322	30.434	22.458	0.632	100
ZSCORE	551	23.253	26.690	0.438	154.612	350	19.144	18.130	0.438	154.612
ZSCORET	551	23.262	26.689	0.438	154.612	350	19.148	18.136	0.438	154.612
NPL	2517	8.855	10.481	0	91.032	1552	7.735	11.609	0	97.316
OVERHEAD	3671	4.105	4.471	0.002	42.195	2588	3.848	4.139	0	75.827
GROWTH_TA	3003	16.203	28.430	-88.968	139.434	2185	19.076	30.357	-97.118	140.912
LTA	3699	14.310	2.079	7.525	21.079	2596	13.899	1.782	9.060	20.125
EQTA	3699	12.360	12.061	0.088	99.723	2596	13.161	10.001	0.004	97.486
VOICE	5684	-0.033	0.803	-1.704	1.224	3564	0.352	0.652	-1.704	1.224
STABILITY	5684	-0.361	0.805	-2.412	1.327	3564	0.074	0.852	-2.412	1.327
GOVEFFECT	5684	0.216	0.529	-0.623	2.374	3564	0.416	0.628	-0.623	2.374
REGQUAL	5684	0.224	0.585	-0.775	2.150	3564	0.574	0.665	-0.775	2.150
RULEOFLAW	5684	-0.012	0.587	-0.946	1.763	3564	0.225	0.668	-0.946	1.763
CORRUP	5684	-0.046	0.620	-1.140	2.391	3564	0.194	0.716	-1.140	2.391
GDPG	5684	5.052	3.666	-13.127	14.2	3564	4.323	3.215	-13.127	14.200
INFLATION	5511	6.081	8.411	-4.023	84.641	3507	6.635	8.739	-4.023	84.641
GDPCAP	5684	4061.397	5241.302	413.287	34570.240	3564	6297.841	7470.361	413.287	34570.240

NONII=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*= Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding (%); Z-SCORE= bank insolvency risk; ZSCORET = bank insolvency risk; *NPL*=Ratio of non-performing loan to net total loans (%); *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars; *VOICE*= Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media; *STABILITY*= Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism; *GOVEFFECT*= Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *REGQUAL*= Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; CORRUP= Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interest.

Table 3.3: Correlations between Independent Variables.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
NONII	**1**	1																
SHORT_TERMDEBT	**2**	0.053	1															
NON_DEPOFUND	**3**	-0.010	-0.569	1														
LTA	**4**	0.050	0.0434	-0.147	1													
EQTA	**5**	-0.077	-0.115	0.234	-0.491	1												
OVERHEAD	**6**	-0.021	-0.037	0.161	-0.417	0.376	1											
GROWTH_TA	**7**	-0.045	0.027	0.022	0.071	-0.162	-0.110	1										
FOREIGN1	**8**	0.178	-0.157	0.222	-0.089	0.085	-0.060	-0.009	1									
VOICE	**9**	0.260	-0.193	0.317	-0.218	0.134	0.212	-0.032	0.307	1								
STABILITY	**10**	-0.003	-0.171	0.276	0.119	0.028	-0.045	0.039	0.276	0.393	1							
GOVEFFECT	**11**	0.147	-0.017	0.087	0.240	-0.097	-0.219	0.010	0.199	0.299	0.749	1						
REGQUAL	**12**	0.196	-0.090	0.217	0.116	-0.000	-0.058	-0.011	0.350	0.468	0.832	0.871	1					
RULEOFLAW	**13**	0.259	0.020	0.063	0.260	-0.153	-0.283	0.005	0.213	0.417	0.719	0.887	0.822	1				
CORRUP	**14**	0.170	-0.084	0.203	0.123	0.028	-0.031	-0.031	0.234	0.438	0.770	0.880	0.919	0.824	1			
GDPG	**15**	-0.113	0.189	-0.267	0.231	-0.271	-0.351	0.276	-0.177	-0.452	-0.110	-0.031	-0.202	-0.020	-0.194	1		
INFLATION	**16**	-0.042	-0.094	0.098	-0.206	0.182	0.273	-0.077	0.031	0.131	-0.135	-0.214	-0.128	-0.230	-0.190	-0.334	1	
GDPCAP	**17**	0.108	-0.034	0.094	0.171	0.023	-0.112	-0.039	0.227	0.209	0.606	0.777	0.791	0.733	0.881	-0.112	-0.177	1

NONII=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*= = Ratio of bank's customer and short term funding to total interest-bearing debt (%); NON_*DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding; OVERHEAD= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; FOREIGN=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars; *VOICE*= Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media; *STABILITY*= Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism; *GOVEFFECT*= Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *REGQUAL*= Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; *CORRUP*= Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Table 3.2 shows that foreign and domestic banks have roughly different business models as measured by the share of non-interest income in total operating income, the share of non-deposit funding and the share of short-term funding. It shows also that foreign and domestic banks exhibit different level of risk as measured by the bank insolvency risk (*Z-SCORE*).

This descriptive analysis, however, has a limitation because it does not tell us whether these differences between foreign and domestic banks are statistically significant. To address this limitation, we test for mean differences and report *t*-test for some variables in Table 3.4.

As shown in Table 3.4, foreign banks rely significantly more on nontraditional intermediation activities compared to domestic banks. A look at the maturity structure shows that foreign banks depend significantly less on short-term debt than domestic banks. On the other hand, foreign banks are relying more significantly on non-funding deposits when compared with domestic banks. Finally, foreign banks exhibit significantly higher level of risk as measured by the bank insolvency risk than domestic banks.

Table 3.4: Mean comparison test for some key variables

	NONII	SHORT_TERMDEBT	NON_DEPOFUND	NPL	EQTA	ZSCORE	ZSCORET
FOREIGN=0							
Mean	30.733	93.189	21.600	8.855	12.360	23.253	23.262
observations	3438	3694	2050	2517	3699	551	551
FOREIGN=1							
Mean	34.886	92.523	30.434	7.7348	13.161	19.144	19.147
observations	2435	2592	1322	1552	2596	350	350
T-statistic of the mean test	-8.364***	1.904***	-11.776***	3.101***	-2.871***	2.750***	2.754***

T-statistics test for the null: ''There is not different on the above variables between for foreign-owned banks and domestic banks". ***,** and * indicate significance, respectively, at the 1%, 5% and 10% levels for a bilateral test. Variable definitions: *NONII*=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*= = Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding (%); *Z-SCORE*= bank insolvency risk; *ZSCORET* = bank insolvency risk; *NPL*=Ratio of non-performing loan to net total loans (%); EQTA= equity to assets ratio. *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise.

The statistical framework is consistent with the descriptive statistics presented in Table 3.2, however, there are no serious econometric investigations to confirm that foreign and domestic banks differ in term of activity mix or funding strategy or in terms of risk-taking behavior. The next section deals with the multivariate analysis.

3.4 Regression Analysis

3.4.1 Bank ownership and activity and funding strategy

3.4.1.1. Basic empirical estimation

The theoretical literature provides two explanations as to why foreign banks may be different from domestic banks in their business model. The first explanation is based on distance constraints: greater physical distance between a principal (the controlling shareholder of a foreign bank) and his agent (the loan officer) leads to higher informational and agency costs for foreign banks which can influence the lending behavior of foreign banks, and more generally their business model (Berger et al (2005), Mian (2006)). The second explanation argues that the differences between foreign and domestic banks are due to the fact that the former have higher standards and more prudent preferences when evaluating risk, rather than additional cost due to distance.[40] Based on these theories, this section tests whether foreign banks and domestic banks have a different business model. We address this question by estimating the following panel regression:

$$BUSMODEL_{i,j,t} = \alpha_0 + \alpha_1 FOREIGN_{i,j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_j + \tau_t + \varepsilon_{i,j,t}, \qquad (3.1)$$

where $BUSMODEL_{i,j,t}$ is either the share of non-interest income in total operating income (*NONII*), the share of non-deposit funding in total funding (*NONDEPOS*), or the share of short-term funding (*SHORTDEBT*) in interest-bearing debt, indicating the activity or funding strategy of bank *i* in country *j* in year *t*, $FOREIGN_{i,j,t}$ is a dummy variable equal to one if bank *i* in country *j* in year *t* is foreign-owned, *Xijt* is a vector of bank-level control variables. $Z_{j,t}$ is a vector of factors at the country level such as macroeconomic and institutional environment factors that are expected to affect business model at time t. α_k and β'_h are vectors of parameters to be estimated, η_j is the country fixed effects, τ_t time fixed effects,

[40] See, e.g., Demsetz, et al. (1996) and Mian (2006) for more details on these theories.

and ε_{ijt} is the error term. The set of bank-level control variables includes bank size, bank capitalization, bank's cost efficiency, expressed as the ratio of overhead expenses to assets, and the growth rate of real bank assets. The set of country-level control variables includes GDP per capita, GDP growth rate, and the inflation of the economy. The detailed definitions of these variables can be found in Section 3.3.2 and Appendix A.

In the regressions, the standard errors are clustered at the bank level since repeated observations on a given bank's business model proxy are not necessarily independent. The results of the regressions are presented in Table 3.5.

As can be seen from Table 3.5, for each of the specification, the coefficients of the foreign bank dummy variable, *FOREIGN*, are statistically significant. When non-interest income share is the dependent variable, we see that foreign banks rely more on fee income than domestic banks. Indeed, for foreign banks, the non-interest income share is increased by 1.112 compared to domestic banks. The coefficient of bank capitalization is negative and statistically significant, suggesting that better capitalized banks have lower fee income share. The coefficient of the bank size proxy is positive and statistically significant, suggesting that large banks have higher fee income share. The coefficient of bank's annual asset growth rate is negative and statistically significant suggesting that fast-growing banks have lower shares of fee income. The coefficient of overhead costs variable is positive and statistically significant, suggesting that fee-generating activities are relatively costly. As might be expected, we see that the GDP per capita variable is positively and significantly related to the share of non-interest income, suggesting that in countries with relative higher economic development, banks have higher fee income share.

When the share of short-term funding is the dependent variable, we see that foreign banks rely less on short-term funding than domestic banks. Indeed, the share of short-term funding is reduced by 0.66 for foreign banks compared to domestic banks.

Table 3.5: Bank ownership and activity mix and funding strategy. Panel regression

VARIABLES	NONII	SHORT_TERMDEBT	NON_DEPOFUND
FOREIGN	1.112***	-0.656*	4.278***
	(4.598)	(-2.242)	(7.981)
EQTA	-0.075*	-0.168***	0.169**
	(-1.907)	(-3.654)	(2.651)
LTA	0.288**	-0.823*	-0.607**
	(2.776)	(-2.084)	(-3.037)
GROWTH_TA	-0.021**	0.020*	0.024
	(-2.416)	(1.859)	(1.098)
OVERHEAD	0.550***	0.252*	-0.471***
	(4.813)	(1.967)	(-4.983)
INFLATION	-0.142	0.100	-0.367***
	(-1.442)	(1.504)	(-4.179)
GDPG	0.058	0.078	-0.272**
	(0.449)	(1.096)	(-2.964)
GDPCAP	0.001***	-0.0002*	0.001**
	(3.411)	(-2.134)	(2.408)
CONSTANT	7.850***	98.120***	43.43***
	(4.500)	(13.670)	(15.100)
OBSERVATIONS	4806	5103	2884
R-SQUARED	0.324	0.115	0.292

NONII=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*= Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding *(%)*; *OVERHEAD*= Ratio of overheads to total assets (%); GROWTH_TA= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars. Country and time fixed effects are included in all regressions but not reported. T-statistics are in parentheses and are based on robust standard errors clustered at bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

This result might imply that foreign banks have smaller maturity mismatch between assets and liabilities than domestic banks and thus, are less vulnerable to liquidity risk. The coefficient of bank capitalization is negative and statistically significant, suggesting that better capitalized banks have lower short-term funding. The coefficient of the bank size proxy is negative and statistically significant, suggesting that large banks have lower short-term funding. The coefficient of the GDP per capita variable is negative and statistically

significant, suggesting that in countries with relative higher economic development, banks have lower short-term funding share.

Looking at the specification with the non-deposit funding share as the dependent variable, we see that foreign banks rely more on non-deposit funding than domestic banks. Indeed, compared to domestic banks, the non-deposit funding share is increased by 4.28 for foreign banks. Furthermore, banks with better capitalization have higher non-deposit funding shares. We find that larger banks tend to rely less on non-deposit funding share. The coefficient of overhead costs variable is negative and statistically significant, suggesting that non-deposit funding are relatively cheaper. Examining the coefficients of country-level control variables, we find that inflation is negatively related to non-deposit funding share, and we find that banks rely more on non-funding deposit in more developed countries, as measured by the GDP per capita.

We test the robustness of these results by including individually a series of macro institutional indexes in addition to the macroeconomic variables. The results related to these specifications are presented in Appendix B. In all specifications, the results are highly consistent with the previous findings as regard to the foreign bank dummy variable, bank-level and country-level control variables.

To summarize, the regressions indicate that the ownership matters in bank's funding and activity strategies. Foreign banks rely more on non-interest income activities and non-deposit funding. Also, foreign banks have smaller maturity mismatch between assets and liabilities than domestic banks. Next, we consider some robustness checks of these results.

3.4.1.2. Robustness Checks

To check the robustness of our results, we conduct several sensitivity analyses.

First, we re-estimate the regressions using bank-level cross-sectional regressions. We calculate mean values for all bank-level and country-level variables over the sample period. As explained above, if there is a change in the ownership of a bank over the period 1998-2008, we calculate the mean value on each sub-period when the bank have different

ownership profile. We report the estimates from the cross-sectional regression in Appendix C. Consistent with the previous finding, the results show that foreign banks rely more on non-interest income activities and non-deposit funding. Also, foreign banks have smaller maturity mismatch between assets and liabilities than domestic banks.

Second, in the bank-level cross country regressions more weight is given to country with more banks. To address this concern, we delete Brazil in our regression since it has the highest number of banks in our panel. Excluding this country from our tests does not reverse our conclusions; however we find only difference in terms of the funding strategy between foreign banks and domestic banks. Appendix D reports regression results without Brazil.

Third, the bank-level cross-country analysis can have some limitations. Indeed, even if we control for country difference with the inclusion of macroeconomics variables and country fixed effects, the differences may not have been fully controlled. To address this concern we examine a within country analysis to test the robustness of our results. We choose Brazil for this within-country analysis since Brazil has the highest number of banks in our panel. We report the estimates from within-country regression in Appendix E. Foreign banks and domestic banks do exhibit differences in activity and funding strategies; however we do not find a significant difference in their maturity mismatch between assets and liabilities.

Overall, the results support a difference in activity mix and funding strategy between foreign banks and domestic banks. Next, we investigate the impact of bank ownership on risk-taking.

3.4.2. Bank ownership and risk-taking

3.4.2.1. Direct evidence

In the literature of foreign banking, it is frequently admitted that foreign banks can achieve better economies of scale and risk diversification than domestic banks and have advantage in evaluating risk. However foreign banks have some limitations due to distance constraints.

Moreover, our findings above support a difference in activity mix and funding strategy between foreign banks and domestic banks. Based on the arguments above, we empirically examine the relationship between bank ownership and risk-taking. We examine this relationship by estimating the following cross sectional regression:

$$RISK_{i,j} = \alpha_0 + \alpha_1 FOREIGN_{i,j} + \beta'_1 X_{i,j} + \beta'_2 Z_j + \varepsilon_{i,j} \qquad (3.2)$$

where $RISK_{i,j}$ is the risk-taking proxy (say, *Z-SCORE* or *Z-SCORET*) of bank *i* in country *j* , $FOREIGN_{i,j}$ is an indicator variable equal to one if bank *i* in country *j* is foreign-owned, *Xij* is a vector of bank-level control variables, Z_j is a vector of factors at the country level such as macroeconomic variables that are expected to affect bank risk-taking. α_k and β'_h are vectors of parameters to be estimated, and $\varepsilon_{i,j}$ is the errors term.

The model is estimated with ordinary least squared (OLS) using the heteroskedasticity-robust standard errors clustered at the country level to compute t-values. Table 3.6 displays the estimation results.

As can be seen from Table 3.6, the coefficients of the foreign dummy variable are negative and statistically significant, suggesting that foreign banks exhibit a higher default risk than domestic banks. Indeed, the *Z-SCORE* is reduced by 4.40 for foreign banks compared to domestic banks. The coefficients of bank capitalization are positive and statistically significant, suggesting that better capitalized banks are safer. The coefficients on the bank size proxy variable are negative and statistically significant, suggesting that large banks have a higher insolvency risk, probably because the latter have incentives to take higher risk because of the presence of a too-big-to-fail (TBTF) phenomenon. The coefficients of the overhead costs variable are negative and statistically significant, suggesting that less efficient banks are more risky. We find that inflation is negatively related to bank insolvency risk. The coefficients on GDP per capita variable are positively and statistically significant, suggesting that in countries with relative higher economic development, banks have lower probability of default. Similarly, in times of economic growth, banks are more solvent, as the coefficients on GDP growth are positive and statistically significant.

Table 3.6: Bank ownership and risk-taking.

VARIABLES	ZSCORE	ZSCORET
FOREIGN	-4.403**	-4.404**
	(-2.360)	(-2.359)
EQTA	0.363**	0.363**
	(2.054)	(2.054)
LTA	-0.900*	-0.899*
	(-1.817)	(-1.814)
GROWTH_TA	-0.044	-0.044
	(-0.683)	(-0.684)
OVERHEAD	-1.123***	-1.123***
	(-4.796)	(-4.795)
INFLATION	-0.239*	-0.240*
	(-1.985)	(-1.988)
GDPG	1.658**	1.664**
	(2.183)	(2.186)
GDPCAP	0.0003**	0.0003**
	(2.149)	(2.146)
CONSTANT	28.330***	28.310***
	(3.025)	(3.022)
OBSERVATIONS	879	879
R-SQUARED	0.102	0.102

Z-SCORE= bank insolvency risk; *ZSCORET* = bank insolvency risk; *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars. The models are estimated using OLS. T-statistics are in parentheses and are based on robust standard errors clustered at country-level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

To summarize, the regressions indicate that bank ownership directly impacts bank solvency, specifically foreign banks have higher default risk than domestic banks. Next, we examine whether bank ownership indirectly affects its risk-taking behavior.

3.4.2.2. Indirect evidence

Since we find that foreign banks differ from domestic banks in their activity mix and funding strategy, we investigate whether the activity mix and funding strategies affect default

risk as measured by the *Z-SCORE*. Specifically, as in Demirgüç-Kunt and Huizinga (2010), we regress the risk proxy on the different proxies of bank activity and funding strategies. Thus, we run the following cross sectional regressions:

$$RISK_{i,j} = \alpha_0 + \alpha_1 BUSMODEL_{i,j} + \beta'_1 X_{i,j} + \beta'_2 Z_j + \varepsilon_{i,j} \quad (3.3)$$

where $RISK_{i,j}$ is the risk-taking proxy (say, *Z-SCORE* or *Z-SCORET*) of bank *i* in country *j* , $BUSMODEL_{i,j}$ is either the share of non-interest income in total operating income (*NONII*), the share of non-deposit funding in total funding (*NONDEPOS*), or the share of short-term funding in interest-bearing debt (*SHORTDEBT*), indicating the activity or funding strategy of bank *i* in country *j*, *Xij* is a vector of bank-level control variables, Z_j is a vector of factors at the country level such as macroeconomic variables that are expected to affect bank risk-taking. α_k and β'_h are vectors of parameters to be estimated, and $\varepsilon_{i,j}$ is the errors term.

The model is estimated with ordinary least squared (OLS) using the heteroskedasticity-robust standard errors clustered at the country level to compute t-values. As we consider banks' business model proxies to be endogenous in section 3.4.1, we regress this model using also a two stage procedure. Thus, the first-stage estimation consists in the regression in section 3.4.1(Eq. 3.1) where we regress banks' business model variables (the ratio of non-interest income to total operating income, the share of non-deposit short-term funding and the share non-deposit funding) on various control variables. We calculate the predicted values of the different business model proxies from these regressions, and replace each observed business model proxies by its predicted value in Eq. 3.3 to complete the two-stage procedure.

The empirical results of both specifications are reported in Table 3.7.

The results of both specifications are very similar. We see from Table 3.7 that the coefficient on non-interest income share is negative and statistically significant, indicating that higher non-interest income share translates into lower *Z-SCORE*. Indeed, considering the specifications where we use the observed business model proxies as independent variables, a one standard deviation increase of non-interest income share decreases the *Z-SCORE* by 2.63.

Table 3.7: Activity mix and funding strategy and risk-taking

VARIABLES	ZSCORE	ZSCORE	ZSCORE	ZSCORE	ZSCORE	ZSCORE	ZSCORET	ZSCORET	ZSCORET	ZSCORET	ZSCORET	ZSCORET
EQTA	0.325*	0.390**	0.442**	-0.160	1.059***	0.456*	0.325*	0.390**	0.442**	-0.160	1.060***	0.456*
	(1.989)	(2.178)	(2.129)	(-0.567)	(3.037)	(1.960)	(1.989)	(2.178)	(2.130)	(-0.568)	(3.037)	(1.960)
LTA	-0.850	-0.692	-0.100	-1.740**	1.919*	-0.138	-0.850	-0.691	-0.100	-1.740**	1.920*	-0.138
	(-1.699)	(-1.460)	(-0.157)	(-2.393)	(1.758)	(-0.228)	(-1.696)	(-1.457)	(-0.157)	(-2.390)	(1.759)	(-0.227)
GROWTH_TA	-0.069	-0.062	0.029	-0.136*	-0.092	0.036	-0.069	-0.062	0.029	-0.136*	-0.093	0.036
	(-1.056)	(-0.897)	(0.442)	(-1.719)	(-1.312)	(0.459)	(-1.056)	(-0.898)	(0.440)	(-1.719)	(-1.313)	(0.457)
OVERHEAD	-1.051***	-1.110***	-0.781**	-0.780***	-1.652***	-0.801**	-1.051***	-1.110***	-0.781**	-0.780***	-1.652***	-0.800**
	(-4.829)	(-4.344)	(-2.622)	(-3.170)	(-4.518)	(-2.340)	(-4.830)	(-4.342)	(-2.622)	(-3.169)	(-4.517)	(-2.339)
INFLATION	-0.227	-0.238**	-0.230**	-0.308**	-0.072	-0.235**	-0.227	-0.239**	-0.231**	-0.309**	-0.072	-0.235**
	(-1.659)	(-2.321)	(-2.297)	(-2.132)	(-0.517)	(-2.204)	(-1.661)	(-2.324)	(-2.301)	(-2.135)	(-0.518)	(-2.209)
GDPG	1.778**	1.688**	2.257***	0.381	-1.962	2.111*	1.783**	1.693**	2.263***	0.386	-1.957	2.117*
	(2.456)	(2.134)	(3.516)	(0.333)	(-0.975)	(1.776)	(2.458)	(2.136)	(3.515)	(0.337)	(-0.972)	(1.779)
GDPCAP	0.0003*	0.0002*	0.0005***	0.0004**	-0.0001	0.0005***	0.0003*	0.0003*	0.0005***	0.0004**	-0.0001	0.0005***
	(1.847)	(1.742)	(3.843)	(2.520)	(-0.479)	(3.435)	(1.845)	(1.739)	(3.837)	(2.517)	(-0.481)	(3.430)
NONII	-0.106**						-0.106**					
	(-2.233)						(-2.237)					
SHORT_TERMDEBT		0.134**						0.134**				
		(2.604)						(2.606)				
NON_DEPOFUND			-0.080**						-0.080**			
			(-2.177)						(-2.178)			
NONII_PREDICTED				-1.383**						-1.383**		
				(-2.360)						(-2.360)		
SHORT_TERMDEBT_PREDICTED					3.828**						3.830**	
					(2.360)						(2.359)	
NON_DEPOFUND_PREDICTED						-0.122						-0.122
						(-0.554)						(-0.554)
CONSTANT	29.440***	11.340	8.107	95.640**	-356.600**	10.260	29.430***	11.310	8.094	95.640**	-356.800**	10.240
	(3.098)	(1.343)	(0.843)	(2.677)	(-2.271)	(0.801)	(3.096)	(1.340)	(0.841)	(2.676)	(-2.271)	(0.798)
OBSERVATIONS	869	879	665	869	879	665	869	879	665	869	879	665
R-SQUARED	0.098	0.099	0.150	0.100	0.102	0.145	0.098	0.099	0.150	0.100	0.102	0.145

NONII=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*== Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding (%); *Z-SCORE*= bank insolvency risk; *ZSCORET* = bank insolvency risk*; OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars. The models are estimated using OLS. T-statistics are in parentheses and are based on robust standard errors clustered at country-level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

This result suggests that higher non-interest income share reduces bank solvency. Also, the coefficient on non-deposit funding share is negative and statistically significant, indicating that higher non-deposit funding share translates into lower *Z-SCORE*. Indeed, increasing the non-deposit funding share by one standard deviation will result in a 1.64 decrease in the *Z-SCORE*. This result suggests that higher non-deposit funding share reduces bank solvency. These results confirm the findings in Demirgüç-Kunt and Huizinga (2010). By contrast the coefficient on short-term funding share is positive and statistically significant, indicating that higher short-term funding share translates into higher *Z-SCORE*. Indeed, a one standard deviation increase of short-term funding share is associated with an increase in the *Z-SCORE* of 3.10.

Examining the coefficients on control variables, we find the same results as in direct evidence, except for the bank size proxy which is no longer significant. More precisely, the results on Table 3.7 indicate that banks with higher overhead costs have a higher default risk. We find that inflation is negatively related to bank insolvency risk. The coefficients on the GDP per capita variable are positively and statistically significant, suggesting that in countries with relatively higher economic development, banks' default risk is lower. Similarly, when the economy is growing, banks exhibit lower default risk, as the coefficients on GDP growth are positive and statistically significant.

These results provide evidence that higher non-interest income share and non-deposit funding share translate into lower bank stability. By contrast, the results indicate that higher short-term funding share is associated with higher bank stability.

We interpret these findings as indirect evidence that foreign banks are more risky than domestic banks through their business model, as we show above that foreign banks rely more on non-interest income and non-deposit funding. These results are consistent with those found in the direct investigation of the relationship between foreign bank and insolvency risk.

3.4.3 Bank ownership and loan quality

Are foreign banks' loans of better quality? Indeed, because of their higher cost of acquiring information about local firms, foreign banks focus primary on the most profitable

local firms when lending (Dell'Arricia and Marquez (2004), Detragiache et al. (2008)). Thus, foreign banks are assumed to practice cream-skimming lending that leads them to have a better quality loan portfolio than domestic banks. We test this prediction on our sample by regressing banks' portfolio quality measured by the ratio of non-performing loans to net total loans on the foreign dummy variable, *FOREIGN*, and other control variables.

Thus we run the following panel regression:

$$NPL_{i,j,t} = \alpha_0 + \alpha_1 FOREIGN_{i,j,t} + \beta'_1 X_{i,j,t} + \beta'_2 Z_{j,t} + \eta_j + \tau_t + \varepsilon_{i,j,t} \quad (3.4)$$

where $NPL_{i,j,t}$ is the non-performing loan of bank *i* in country *j* in year *t*, expressed as the ratio of non-performing loans to net total loans, $FOREIGN_{i,j,t}$ is a dummy variable equal to one if bank *i* in country *j* in year *t* is foreign-owned, *Xijt* is a vector of bank-level control variables, $Z_{j,t}$ is a vector of factors at the country level such as macroeconomic and institutional environment factors that are expected to affect loan portfolio quality at time t. α_k and β'_h are vectors of parameters to be estimated, η_j is the country fixed effects, τ_t time fixed effects, and *εijt* is the error term. The set of control variables are the same as those in Eq. (1), Section 3.4.1.1.

The empirical results are reported in Table 3.8.

As can be seen from Table 3.8, the coefficient on the foreign dummy variable is negative and statistically significant, suggesting that foreign banks have loan portfolios of better quality than domestic banks, as predicted by the cream-skimming model. Thus, the ratio of non-performing loans to net total loans is reduced by 1.21 for foreign banks. Banks with higher overhead costs have worst loan portfolio quality. Higher economics growth translates into lower non-performing loans level of banks.

Table 3.8: Bank ownership and loan portfolio quality

VARIABLES	NPL
FOREIGN	-1.211***
	(-6.072)
EQTA	0.020
	(0.369)
LTA	-0.195
	(-1.786)
GROWTH_TA	-0.039**
	(-2.844)
OVERHEAD	0.528***
	(4.151)
INFLATION	-0.268**
	(-2.263)
GDPG	-0.427***
	(-6.051)
GDPCAP	-0.0001
	(-1.636)
CONSTANT	12.120***
	(6.275)
OBSERVATIONS	3443
R-SQUARED	0.213

NPL=Ratio of non-performing loan to net total loans (%); *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars. Country and time fixed effects are included in the regression but not reported. T-statistics are in parentheses and are based on robust standard errors clustered at bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

3.5. Conclusion

In this paper, we employ a data set of 863 commercial banks from 28 transition and emerging countries for the 1998-2008 period. We analyze the differences in activity and funding strategies between foreign and domestic banks and look into their risk implications.

We find that foreign banks differ from domestic banks in terms of activity and funding strategies. Specifically, we find that foreign banks rely more on non-interest income activities and non-deposit funding than domestic banks, while the latter fund themselves more with short-term funding.

We also examine the impact of ownership on bank stability. We find that foreign banks exhibit higher default risk than domestic banks; however foreign banks have better loan portfolio quality than domestic banks. We also find that reliance on fee incomes and non-deposit funding leads to lower bank stability. These results taken together, suggest that foreign banks are more risky because of their activity mix and their funding strategy in the host countries.

APPENDIX

Appendix A

Table A1: Variables definition and sources of data.

Variables	Description	Sources
NONII	Ratio of non-interest income to total operating income (%)	Bankscope
SHORT_TERMDEBT	Ratio of bank's customer and short term funding to total interest-bearing debt (%)	Bankscope
NON_DEPOFUND	Total funding excluding derivatives minus customer deposits divided by total funding (%)	Bankscope
Z-SCORE	Z-SCORE= (ROA+EQTA)/SDROA, where ROA return on average assets, EQTA is the ratio of Total equity to total assets; SDROA is the standard deviation of the ROA.	Bankscope
NPL	Ratio of non-performing loan to net total loans (%)	Bankscope
OVERHEAD	Ratio of overheads to total assets (%)	Bankscope
GROWTH_TA	Growth rate of bank assets (%)	Bankscope
LTA	Natural logarithm of total assets	Bankscope
EQTA	Ratio of equity to total assets (%).	Bankscope
FOREIGN	Equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise	Bankscope and miscellaneous
GDP PER CAPITA	GDP per capita in thousands of 2000 constant U.S. dollars	WDI
GDP GROWTH	Rate of real per capita GDP growth	WDI
INFLATION	Consumer Price inflation rate	WDI

Table A1- *Continues*

Variables	Description	Sources
VOICE	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	Kaufmann, Kraay, and Mastruzzi(2010)
STABILITY	Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.	Kaufmann, Kraay and Mastruzzi(2010)
GOVEFFECT	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	Kaufmann, Kraay and Mastruzzi(2010)
REGQUAL	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	Kaufmann, Kraay and Mastruzzi(2010)
RULEOFLAW	Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	Kaufmann, Kraay and Mastruzzi(2010)
CORRUP	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	Kaufmann, Kraay and Mastruzzi(2010)

Appendix B

Table B1: Bank ownership and activity and funding strategies. Panel Regression with additional institutional variables.

VARIABLES	NONII	NONII	NONII	NONII	NONII	NONII
FOREIGN	1.117***	1.114***	1.087***	1.149***	1.190***	1.087***
	(4.654)	(4.674)	(4.448)	(4.709)	(4.967)	(4.676)
EQTA	-0.075*	-0.074*	-0.077*	-0.075*	-0.074*	-0.076*
	(-1.881)	(-1.876)	(-1.963)	(-1.905)	(-1.875)	(-1.913)
LTA	0.291**	0.291**	0.287**	0.287**	0.311**	0.282**
	(2.898)	(2.853)	(2.869)	(2.707)	(3.049)	(2.739)
GROWTH_TA	-0.021**	-0.021**	-0.020**	-0.021**	-0.023**	-0.022**
	(-2.448)	(-2.392)	(-2.420)	(-2.456)	(-2.591)	(-2.394)
OVERHEAD	0.548***	0.546***	0.559***	0.546***	0.549***	0.551***
	(4.800)	(4.788)	(5.060)	(4.839)	(4.770)	(4.831)
INFLATION	-0.147	-0.134	-0.142	-0.151	-0.165	-0.141
	(-1.553)	(-1.375)	(-1.503)	(-1.576)	(-1.830)	(-1.468)
GDPG	0.058	0.084	0.067	0.070	0.130	0.041
	(0.453)	(0.640)	(0.508)	(0.528)	(1.156)	(0.327)
GDPCAP	0.001**	0.001**	0.001	0.001***	0.001***	0.001**
	(2.886)	(2.902)	(1.794)	(3.853)	(3.404)	(3.181)
CORRUP	-1.014					
	(-0.549)					
GOVEFFECT		-3.194				
		(-1.235)				
RULEOFLAW			4.955			
			(1.482)			
REGQUAL				-2.718		
				(-1.527)		
STABILITY					-3.037***	
					(-3.876)	
VOICE						1.745
						(1.499)
CONSTANT	7.595***	7.021***	11.310**	8.161***	6.436***	7.673***
	(3.737)	(3.356)	(3.036)	(4.670)	(3.717)	(4.613)
OBSERVATIONS	4806	4806	4806	4806	4806	4806
R-SQUARED	0.324	0.325	0.325	0.325	0.325	0.325

NONII=Ratio of non-interest income to total operating income; *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars; *VOICE*= Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media; *STABILITY*= Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism; *GOVEFFECT*= Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *REGQUAL*= Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; *CORRUP*= Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Country and time fixed effects are included in all regressions but not reported. T-statistics are in parentheses and are based on robust standard errors clustered at bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B1 *continues*:

VARIABLE	SHORT_TERMDEBT	SHORT_TERMDEBT	SHORT_TERMDEBT	SHORT_TERMDEBT	SHORT_TERMDEBT	SHORT_TERMDEBT	NON_DEPOFUND	NON_DEPOFUND	NON_DEPOFUND	NON_DEPOFUND	NON_DEPOFUND	NON_DEPOFUND
FOREIGN	-0.657*	-0.659*	-0.669**	-0.645*	-0.661*	-0.672**	4.278***	4.256***	4.271***	4.278***	4.316***	4.274***
	(-2.255)	(-2.254)	(-2.265)	(-2.224)	(-2.225)	(-2.295)	(8.035)	(7.868)	(7.853)	(7.993)	(7.844)	(7.628)
EQTA	-0.168***	-0.170***	-0.169***	-0.168***	-0.168***	-0.169***	0.169**	0.170**	0.169**	0.169**	0.169**	0.169**
	(-3.640)	(-3.698)	(-3.659)	(-3.646)	(-3.667)	(-3.655)	(2.648)	(2.680)	(2.650)	(2.652)	(2.654)	(2.674)
LTA	-0.824*	-0.826*	-0.824*	-0.824*	-0.825*	-0.828*	-0.607**	-0.608**	-0.608**	-0.607**	-0.603**	-0.607**
	(-2.071)	(-2.092)	(-2.075)	(-2.088)	(-2.103)	(-2.079)	(-3.073)	(-3.019)	(-3.045)	(-3.031)	(-2.949)	(-3.076)
GROWTH_TA	0.020*	0.020*	0.020*	0.020*	0.020*	0.020*	0.024	0.023	0.024	0.024	0.022	0.024
	(1.879)	(1.841)	(1.905)	(1.879)	(1.854)	(1.837)	(1.115)	(1.071)	(1.129)	(1.102)	(1.009)	(1.072)
OVERHEAD	0.252*	0.257*	0.258*	0.250*	0.252*	0.252*	-0.471***	-0.481***	-0.468***	-0.471***	-0.477***	-0.471***
	(2.009)	(2.043)	(2.027)	(1.963)	(1.965)	(1.971)	(-5.014)	(-5.097)	(-4.882)	(-5.010)	(-4.958)	(-4.984)
INFLATION	0.100	0.091	0.100	0.098	0.101	0.101	-0.367***	-0.322***	-0.360***	-0.366***	-0.359***	-0.367***
	(1.364)	(1.352)	(1.534)	(1.508)	(1.518)	(1.457)	(-4.065)	(-3.854)	(-3.828)	(-4.308)	(-4.186)	(-4.318)
GDPG	0.078	0.053	0.083	0.082	0.073	0.066	-0.273**	-0.225**	-0.270**	-0.272**	-0.211	-0.275**
	(1.084)	(0.699)	(1.234)	(1.146)	(0.996)	(0.835)	(-2.916)	(-2.317)	(-2.906)	(-2.879)	(-1.521)	(-2.689)
GDPCAP	-0.0002*	-0.0004***	-0.0005***	-0.0002	-0.0002*	-0.0003*	0.001**	0.001**	0.001**	0.001**	0.001**	0.00100*
	(-1.872)	(-3.987)	(-5.523)	(-1.709)	(-2.191)	(-2.015)	(2.468)	(2.660)	(2.338)	(2.431)	(2.723)	(2.256)
CORRUP	0.158						0.042					
	(0.099)						(0.021)					
GOVEFFECT		3.294*						-5.089***				
		(2.086)						(-5.148)				
RULEOFLAW			3.037***						1.846			
			(4.295)						(0.522)			
REGQUAL				-0.842						-0.149		
				(-0.743)						(-0.093)		
STABILITY					0.229						-2.422	
					(0.428)						(-1.173)	
VOICE						1.276						0.269
						(1.087)						(0.136)
CONSTANT	98.160***	98.970***	100.200***	98.200***	98.230***	97.980***	43.430***	42.430***	44.330***	43.460***	42.800***	43.340***
	(13.160)	(13.360)	(13.920)	(13.810)	(13.930)	(14.020)	(15.070)	(14.180)	(12.250)	(15.410)	(13.520)	(17.500)
OBS.	5103	5103	5103	5103	5103	5103	2884	2884	2884	2884	2884	2884
R-SQUARED	0.115	0.116	0.116	0.115	0.115	0.115	0.292	0.293	0.292	0.292	0.293	0.292

SHORT_TERMDEBT= SHORT_TERMDEBT = Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding (%); *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars; *VOICE*= Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media; *STABILITY*= Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism; *GOVEFFECT*= Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *REGQUAL*= Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *RULEOFLAW*= Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence; *CORRUP*= Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Country and time fixed effects are included in all regressions but not reported. T-statistics are in parentheses and are based on robust standard errors clustered at bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix C

Table C1: Activity mix, funding strategy and bank ownership: OLS cross-sectional regressions

VARIABLES	NONII	SHORT_TERMDEBT	NON_DEPOFUND
FOREIGN	3.225**	-1.150*	6.087***
	(2.102)	(-1.805)	(4.195)
EQTA	-0.379***	-0.182	0.358***
	(-4.853)	(-1.686)	(3.320)
LTA	-0.617	-0.736*	-0.623
	(-0.940)	(-1.912)	(-0.711)
GROWTH_TA	-0.0644	0.0127	0.153***
	(-1.238)	(0.568)	(3.552)
OVERHEAD	0.244	0.138	-0.353
	(0.454)	(1.085)	(-1.343)
INFLATION	-0.073	-0.044	-0.115
	(-0.271)	(-0.445)	(-0.513)
GDPG	-0.967	0.946	-3.196***
	(-0.773)	(1.607)	(-3.994)
GDPCAP	6.01e-05	0.0001	-4.90e-05
	(0.299)	(1.404)	(-0.176)
CONSTANT	49.200***	100.600***	42.800***
	(3.481)	(10.640)	(2.803)
OBSERVATIONS	887	897	675
R-SQUARED	0.063	0.052	0.197

NONII=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*= *SHORT_TERMDEBT*= SHORT_TERMDEBT = Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding (%); *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); LTA= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars. The models are estimated using OLS. T-statistics are in parentheses and are based on robust standard errors clustered at country-level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix D

Table D1: Activity mix, funding strategy and bank ownership: Panel regression without Brazil.

VARIABLES	NONII	SHORT_TERMDEBT	NON_DEPOFUND
FOREIGN	0.547	-0.026	2.590***
	(1.781)	(-0.0614)	(3.355)
EQTA	-0.096**	-0.269***	0.122
	(-2.652)	(-5.735)	(1.656)
LTA	-0.154	-1.204**	-0.895**
	(-0.619)	(-2.908)	(-3.070)
GROWTH_TA	-0.017**	0.001	0.049***
	(-2.689)	(0.157)	(3.324)
OVERHEAD	0.837***	-0.004	-0.681***
	(8.595)	(-0.048)	(-5.631)
INFLATION	-0.128	0.196***	-0.320**
	(-1.343)	(5.549)	(-2.724)
GDPG	0.031	0.097	-0.468***
	(0.225)	(1.251)	(-4.636)
GDPCAP	0.001***	-0.0004***	0.001**
	(4.029)	(-3.311)	(2.550)
CONSTANT	-5.263	128.4***	0
	(-0.799)	(11.55)	
OBSERVATIONS	4205	4348	2156
R-SQUARED	0.320	0.103	0.310

NONII=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*= *SHORT_TERMDEBT*= SHORT_TERMDEBT = Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding (%); *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; *GDPG*= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars. Country and time fixed effects are included in all regressions but not reported. T-statistics are in parentheses and are based on robust standard errors clustered at bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix E

Table E1 Activity mix, funding strategy and bank ownership: single country regressions using Brazilian case.

VARIABLES	NONII	SHORT_TERMDEBT	NON_DEPOFUND
FOREIGN	3.200***	-2.409	8.174***
	(3.313)	(-1.756)	(4.179)
EQTA	0.064	0.101**	0.234***
	(0.702)	(2.353)	(3.322)
LTA	2.567***	0.637	0.073
	(3.891)	(1.644)	(0.260)
GROWTH_TA	-0.030	0.061***	-0.002
	(-1.554)	(4.403)	(-0.074)
OVERHEAD	0.301	0.534**	-0.265
	(1.558)	(2.816)	(-1.091)
INFLATION	0.067	-0.712***	-0.450***
	(0.347)	(-4.931)	(-7.601)
GDPG	0.123	-0.090	-1.054**
	(0.301)	(-0.250)	(-2.829)
GDPCAP	-0.002	-0.009*	0.012***
	(-1.323)	(-2.125)	(4.093)
CONSTANT	-11.680	111.300***	-8.503
	(-1.087)	(8.953)	(-0.707)
OBSERVATIONS	601	755	728
R-SQUARED	0.077	0.074	0.060

NONII=Ratio of non-interest income to total operating income (%); *SHORT_TERMDEBT*= *SHORT_TERMDEBT*= SHORT_TERMDEBT = Ratio of bank's customer and short term funding to total interest-bearing debt (%); *NON_DEPOFUND*=Total funding excluding derivatives minus customer deposits divided by total funding (%); *OVERHEAD*= Ratio of overheads to total assets (%); *GROWTH_TA*= Growth rate of bank total assets (%); *LTA*= Natural logarithm of total assets; *EQTA*= equity to assets ratio; *FOREIGN*=Foreign bank dummy variable. This dummy equals 1 if the bank is at least 50% owned by foreign interests, and 0 otherwise; GDPG= growth rate of real GDP; *INFLATION*= Consumer price inflation rate; *GDPCAP*= GDP per capita in thousands of 2000 constant U.S. dollars. T-statistics are in parentheses and are based on robust standard errors clustered at bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

CONCLUDING CHAPTER

In recent decades, transition and emerging countries have been the experimentation field of financial sector reforms which led to structural and regulatory transformations of these countries' banking systems. The effects of these deep changes on transition and emerging financial systems are not all yet known.

The goal of this thesis is to examine how some aspects of these financial sector reforms or their consequences, affect financial sector stability in transition and/or in emerging countries.

Thus, in the first chapter of this dissertation, we first address the question of whether the implementation of explicit deposit insurance in transition economies creates moral hazard which leads to excessive risk-taking by banks. Our results show that explicit deposit insurance has generated moral hazard for banks in Central and Eastern Europe as there is evidence of higher risk-taking in presence of explicit insurance.

Second, we investigate the impact of explicit deposit insurance on the disciplinary role of depositors. We find a weak evidence of market discipline exerted by depositors through the interest rate in absence of explicit deposit insurance and no evidence in presence of explicit deposit insurance. However, we find that in presence of an explicit deposit insurance scheme, depositors withdraw their deposits from risky banks, suggesting an effective discipline exerted through a volume effect but not a price effect. Hence, riskier banks do not seem to raise their interest rates to keep their depositors (or to attract new ones) or depositors might not be inclined to earn higher interests. They seem to prefer walking out.

Third, we examine how differences in institutional environment between countries affect the impact of explicit deposit insurance on bank risk-taking behavior. We find that the adverse influence of explicit deposit insurance on bank risk-taking is smaller in countries with strong legal and institutional environment as measured by the control of corruption (*CORRUP*) that reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

These findings suggest that explicit deposit insurance creates moral hazard in the context of transition banking systems. However, the negative effects of deposit insurance on banking stability can be annihilated, or at least reduced, in an environment less favorable to corruption and with a good quality of law enforcement. Also, the disciplinary role of depositors exerted through the interest rate is inexistent in the absence of explicit deposit

insurance as well as in its presence. Depositors can just withdraw their deposits from risky banks.

The purpose of the second chapter is both to investigate the effectiveness of market discipline in the immature environments like in transition markets and the factors affecting its strength. To answer these questions, we investigate through an empirical model the disciplinary role of interbank deposits. We find, after controlling for various factors, that interbank deposits do play a disciplinary role in the presence of explicit insurance and refrain banks from excessive risk taking.

Our results also indicate that the market is more lenient with state owned-banks possibly because they are perceived as implicitly insured by the government even in the presence of explicit limited insurance. We also find that the extent of the insurer's power impacts market discipline: market discipline is effective only when deposit insurer power is low suggesting that the presence of a more powerful insurer undermines market discipline by lowering the incentives of market participants to monitor banks. We consistently find that banks take less risk in countries with more powerful deposit insurers. Finally, we also show that when banks are supervised by a regulator that is more likely to liquidate failing institutions rather than to rescue them, they are less risky and market discipline is weaker: stronger regulatory discipline might be undermining market discipline.

These findings have three main implications. First, banks are effective agents to exercise market discipline. Indeed, this finding is consistent with the work of Rochet and Tirole (1996) that indicates that banks are particularly good at identifying the risks of other banks, and moreover, banks have incentives to monitor other banks in an interbank borrowing relationship. This result is especially important as its shows that market discipline can exist in emerging countries despite the less developed bond and stock markets in these countries.

Second, the existence of explicit deposit insurance by credibly excluding some creditors from the guarantee favours the effectiveness of market discipline. Indeed, if before the introduction of explicit deposit insurance implicit guarantees were broad, the introduction of an explicit insurance leads creditors who are credibly excluded from this guarantee to have greater incentives to monitor banks and to exert a discipline because such creditors feel at risk.

Third, these findings suggest that regulatory discipline undermines market discipline, probably because it encourages free-riding. These findings are consistent with those of Billett et al. (1998).

In the third chapter, our goal is to investigate how the entry of foreign banks, affects financial sector stability in transition and emerging countries.

We start by analyzing the differences in activity and funding strategies of foreign and domestic banks and look into their risk implications. We find that foreign banks differ from domestic banks in terms of activity and funding strategies. Specifically, foreign banks rely more on non-interest income activities and non-deposit funding than domestic banks, while the latter fund themselves more with short-term funding.

Then, we examine the impact of ownership on bank stability measured as bank default risk. We find that foreign banks exhibit higher default risk than domestic banks; however foreign banks have loan portfolios of better quality (less risky) than domestic banks. We also find that reliance on fee income and non-deposit funding leads to lower bank stability. These results taken together, suggest that foreign banks have a higher default risk because of their activity mix and their funding strategy in the host countries.

These findings imply that the higher default risk of foreign banks is due to their business model instead of poor risk management. The better loan quality of foreign banks is consistent with the "cream skimming" theory stating that foreign banks focus primary on the most profitable local firms when lending (Dell'Arricia and Marquez (2004), Detragiache et al. (2008)).The lower default risk of domestic banks might imply that traditional forms of financial intermediation are safer.

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CONTENTS

Résumé

Dans le chapitre 1 de cette thèse, nous analysons empiriquement les répercutions de la mise en place d'un système explicite d'assurance des dépôts sur la prise de risque des banques et sur la discipline de marché dans des pays d'Europe centrale et orientale. Nous montrons que la mise en place d'un système d'assurance des dépôts dans le courant des années 1990 a conduit à une prise de risque élevée des banques. Nous montrons aussi qu'en l'absence d'un système explicite d'assurance des dépôts, la discipline de marché exercée par les déposants à travers les intérêts demandés sur les dépôts est faible et disparait en présence d'un système explicite d'assurance des dépôts. Cependant, en présence d'un système explicite d'assurance des dépôts, les déposants exercent une discipline de marché à travers les dépôts en soustrayant leurs avoirs des banques présentant un profil de risque élevé. On montre aussi que les incitations à la prise de risque générées par l'existence d'un système explicite d'assurance des dépôts varient selon la qualité du cadre institutionnel et juridique dans le pays. Dans le chapitre 2, nous analysons le rôle disciplinant des dépôts interbancaires et nous montrons l'existence d'une discipline de marché exercée par les banques depuis la mise place d'un système explicite d'assurance des dépôts dans les pays d'Europe centrale et orientale. Cependant, plusieurs facteurs comme l'actionnariat des banques ou l'étendue du pouvoir de l'organisme assureur des dépôts affectent l'efficacité de cette discipline de marché. Nos résultats montrent que la discipline exercée par les régulateurs réduit la prise de risque excessive des banques mais affaiblit la discipline de marché. L'étude empirique menée dans le chapitre 3 analyse le type d'activité et de financement des banques étrangères implantées dans les pays émergents et les conséquences en termes de prise de risque. Nous montrons que les activités et le mode de financement des banques étrangères diffèrent de ceux des banques domestiques et que cette différence conduit à des types et des niveaux de risque différents.

Mots clés: Risque, Assurance des dépôts, Discipline de marché, Banques étrangères, Pays émergents.

Abstract

In chapter 1 of this dissertation, we empirically analyze the impact of the implementation of explicit deposit insurance on bank risk-taking and market discipline in Central and Eastern European Countries. We show that the introduction of explicit deposit insurance in the 90's has led to higher risk-taking incentives. Also, in presence of explicit deposit insurance, we find an absence of market discipline exerted by depositors through the interest rate, while considering the market discipline exerted by depositors through the volume of deposits (deposit growth), we find an evidence of market discipline. We also show that the adverse effect of explicit deposit insurance on bank risk-taking varies with the cross-country differences in terms of legal and institutional environment. In chapter 2, we empirically examine the disciplinary role of interbank deposits and we find that this disciplinary role has been effective in Central and Eastern Europe since the implementation of explicit deposit insurance. However, several factors as banks' ownership, and deposit insurance features also impact bank risk and the effectiveness of market discipline. In chapter 3, we analyze the business model of banks in transition and emerging countries and its impact on bank risk-taking. We find a difference of activity and funding strategies between foreign and domestic banks. This difference in terms of business model is also reflected into different risk levels for foreign banks and domestic banks. Specifically, we find that foreign banks have a higher insolvency risk, while they exhibit a better loan portfolio quality than domestic banks.

Key words: Risk-taking, Deposit insurance, Market discipline, Foreign banks, Emerging countries.