Does Financial Integration Require Common Policy?
The Lender-of-Last Resort, Supervision and Foreign Owned Banks

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Abstract:
We develop a simple model that looks at the incentives of private banks to behave prudentially and undertake costly efforts to lower the probability of bankruptcy or having to be bailed out by a lender of last resort. Government regulators can force banks to increase efforts beyond the privately optimal level. We contrast the national case under autarky with the case of an integrated banking market with bank cross-holdings. Because regulators demand (and banks will exert) a greater overall effort to monitor their foreign activities, financial integration might lead to more rather than less prudential behavior. We use the framework to investigate the impact of regulatory coordination on bank efforts and discuss incentives for bank's to organize their foreign holdings in the form or branches or subsidiaries. We show that the absence of a common lender of last resort might reduce the probability of a financial crisis.

JEL Codes:
Keywords: Bank regulation, lender of last resort, European financial markets.

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1. Introduction

The relation between financial integration and financial fragility is subject to two opposing forces. The ongoing process of consolidation in the European banking sector—one of the more visible signs of financial integration—should make banks (or other financial institutions) more resilient to crises because only profitable banks will survive more competition and concentration.[1] At the same time, banks will become more connected with each other and across borders and this could imply that financial crises will tend to extend beyond the realm of national banking systems, affecting other national banking sectors as well. As a result, increasing cross-border involvement could make the European banking system as a whole more vulnerable to crises. Therefore, it is argued, the process of integration will also require that European regulators and supervisors to consider more cooperation and coordination concerning the level of regulation and the requirements they place on their national system (see, among others, Padoa-Schioppa 2004). A more integrated banking system with un-coordinated multiple regulators, it is feared, could lead to a race to the bottom or a free-rider problem among national regulators (e.g., Sanio 2005).

This raises the question if a full centralization of regulation is necessary and who, in the event of a European financial crises, should have the responsibility to act as a Lender-of-Last-Resort (LOLR). Opinions vary widely from those who argue that there should be no lender of last resort (because it would only create moral hazard problems), to those who argue that a national bailout might simply be insufficient in a European context.

In this paper we focus on one largely neglected aspect in the debate about the regulatory coordination and the importance of a LOLR in the European context. We argue that an increase in the degree of integration of European banking system might be helpful in the sense that it increases banks' awareness of the positive international externalities of their individual (national) efforts in prudential banking and risk reduction. More specifically, we show that banks might undertake more efforts to make themselves less vulnerable to crises in the presence of cross-border holdings. The reason is simply that cross-border holdings provide partial internalization of the positive repercussions of their own efforts on the systemic stability of the European banking system. Therefore, a more integrated banking system could see an increase in efforts undertaken by private banks and not, as some fear, lower efforts.

[1] We will use the term banks in an encompassing sense, meaning any kind of financial institution subject to financial sector regulation and possibly eligible for Lender-of-Last-Resort support. Similarly, we will sometimes use the terms regulators and/or supervisors to describe government action with regard to banking regulation and oversight.

The same effect might also be at work with regard to national regulators, possibly preventing a "race to the bottom", in which national regulation is competitively reduced to support "domestic champions". For the same reason as private banks, regulators as well might increase their prudential regulations. Since national regulators do not take into account the effects of their action on foreign financial systems, however, the level of regulation will not necessarily be adequate from a European perspective. Full cooperation instead would allow to internalize the positive external effects of individual actions and to take into account the costs of regulation to other governments.

One consequence of the above is that, despite financial integration, the case for a European LOLR is less clear than sometimes argued. Indeed, we show that the absence of a LOLR can induce regulators to demand and private banks to provide more efforts and regulation to avoid financial crises. The creation of a European banking regulator in turn would arguably imply that part of this creative ambiguity is lost and therefore reduce prudential regulation. Hence, the creation of a European lender of last resort might reduce prudential efforts by private banks and national regulators. The creation of a common regulator might additionally reduce prudential regulation because a common regulator would be less ambiguous about the actions of a common lender of last resort.

The paper is structured as follows. In the next section, we discuss some of the main arguments in the literature to put our paper into perspective. Given the great number of contributions, including several surveys, this section is selective rather than complete. In section 3 we provide a brief discussion about the current status of regulation in Europe, while section 4 presents our model. We begin with the national case and the interaction between national banking sectors and regulators in the presence of a national lender of last resort. The next section moves to the case of integrated national banking systems, the possibility of an EMU wide lender of last resort, and a common regulator. The last section points to the limits of our analysis and presents our policy conclusions.

2. The Literature

With the increasing and ongoing integration of the European banking market, a lively discussion has begun on the need of a European regulator. The importance of this discussion has been reinforced by the creation of the European Monetary Union and the prospects of its enlargement. Does an integrated banking market need a common framework of supervision and regulation? And if so, how should this look? Should it be accompanied by a common

lender of last resort? Arguments vary widely, and we will briefly present the main arguments pro and con before we look at the current status of cooperation in Europe.[2]

The basis for regulation of the banking industry is the interest to protect consumers and the systemic risks in the banking market. Because of informational asymmetries, consumers are not in a position to assess the safety and soundness of financial institutions which therefore requires official intervention and regulation (Dewatripont and Tirole 1995). Moreover, banks are seen as being particularly prone to systemic risk and vulnerable to contagion, for instance, in the form of fast-spreading bank-runs leading to sector-wide illiquidity and (if unchecked) bankruptcy. Thus, individual crisis-prevention entails sizable positive externalities, while much of the associated effort takes the form of private costs. As a consequence, supervision and regulation is needed to ensure prudential banking and sufficient risk reduction efforts at the bank level (De Bandt and Hartmann 2000). Besides regulation and monitoring a safety net is provided by the so called LOLR, in the short-run often assumed to be the central bank, which should intervene in case of a systemic crisis and lend to those banks which are temporarily illiquid. It should not intervene if banks are insolvent, reflecting Bagehot's rule.[3]

Arguments in favor of more cooperation between national regulators and supervisory authorities when banks are internationally connected builds on the notion that in its absence there will be too little regulation and that authorities invest too little in the prevention of crisis relative to the social optimum realized by a social planer with an European perspective (see Holthausen and Ronde 2005, Majaha-Jartby and Olafsson 2005).[4] Because of ongoing integration of European financial markets, interdependencies have increased and hence the potential for systemic risk affecting the European markets as a whole. The failure of a national bank might not only put other banks in the respective county at risk but banks in other countries as well.[5] A purely national supervisory structure may lack capability and incentive to assess and address these cross-border risks appropriately and, thus, provide insufficient supervision.

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[2] A convergence in regulation and supervision might lead to a stronger integration of the markets, so that there could be a positive feedback between integration of markets and regulation.

[3] The LOLR is discussed in Goodhart and Huang (1999) and Giannini (1999), among many others.

[4] Eggert and Schindler (2004) argue that this need not lead to a suboptimal level of regulation. A globalized banking market leads to more competition and reduces excessive risk taking by banks. Hence, the optimal amount of regulation falls.

[5] This argument is based on an international version of the standard bank-run model created by Diamond and Dybvig (1983). See Allan and Gale (2000).

The expected consequence is that the advent of EMU will eventually lead to pressures for some centralized supervisory authority, either within the ECB or independent of it (Eichengreen and Ghironi 2001). The extension of EMU to the east will only increase this tendency. Given that the new members tend to have the weakest banking systems in the union, spillovers could be feared for older members.[6]

The expected effects of enlargement non-withstanding, there is already evidence that interdependencies between European banks have increased over the last 15 years.[7] In particular, there are indications of a higher correlation between measures of bank performance during times of duress, such as the 1987 crash and the Nordic banking crises in the early 1990s. This has certainly been supported by the completion of the internal banking market in the response to the second banking directive 1993, and it can therefore be expected that more mergers and acquisitions between European banks will further increase the correlation between banks' profits (Prati and Schinasi 1999).

Another topic highlighted in the literature is whether a more centralized regulation and supervision—if necessary—should be part of the common central bank or remain independent of it (see Kahn and Santos 2002).

The arguments for centralization are basically twofold. First, the information of the supervisory authority can be useful for the conduct of monetary policy. Second, the central bank must act as a LOLR in case of crisis and needs the information of the supervisory authority in this case (Eichengreen and Ghironi 2001). In order to fulfill its lender of last resort function, the central bank needs timely and adequate information on the liquidity and solvency of private banks. Also, the fact that central banks are independent may enhance their abilities to enforce actions, more than a body under the direction of governments might be able to in certain cases. Padoa-Schioppa (2004, pp. 3-4), speaking for the European Central Bank (ECB) at the time, seems to lean toward this view when he suggests that the existing

[6] However, the effect of EU enlargement might be less clear than sometimes thought. The new economies, including their financial sectors, are relatively small, which limits the potential danger they pose for EMU. Moreover, many of these banking systems have received large capital inflows from western banks, reducing their vulnerability. On the other hand, these foreign banks are exposed to risks stemming from fast credit growth at (still) high interest rates (Hilbers et al. 2005)—which, after all, is part of their motivation to being there. In addition, foreign banks might be able to avoid complying with national regulatory action, for instance by re-allocating loans to their parent institution or off-shore affiliates.

[7] Evidence on increasing financial integration suggests that bond and equity markets may converge faster than loan credit markets. See, among others, Schüler (2005), Barros et al. (2005), Baele et al. (2004), and Adam et al. (2002). Nicolò and Tiemann (2005) stress that economic integration need not imply a decrease in risk exposure as it limits benefits from diversification.

coordination framework for national regulators and supervisors under the so-called Lamfalussy process, while not without merits, would need to be "exploited to the maximum" to be able to face the challenges of financial market integration ahead—otherwise "more radical solutions" would need to be envisaged.

Arguments against centralization are also twofold. First, the responsibilities of the supervisory function, if linked in any way to the ECB, could conflict with the conduct of monetary policy (i.e. the central bank's policy could become more expansive to save banks and thus create more inflation). The expectations about a possible intervention of the central bank might itself create inflationary expectations and thus make the conduct of monetary policy more difficult. Second, exchange of necessary information can in principle also be ensured without housing both responsibilities under one roof. For instance, Sanio (2005, pp. 6-7), speaking as the head of Germany's Federal Financial Supervisory Authority, finds the existing efforts to harmonize the rule book for supervision and enhance cooperation among national supervisors well on track in this regard, suggesting that regulators are "well prepared to handle crisis situations" and "calls for central European supervisory authority...[are] not worth debating at this stage." On the other hand, the LOLR action is usually required very fast, and exchanging information between separate authorities might simply take too long (Eichengreen and Ghironi 2001).

3. The Status Quo in the European Union

As of now, the EU has not made steps into the direction of a full centralization of regulation and supervision of national banking systems.[8] The Economic and Financial Committee (EFC) of the EU merely proposed in a report, endorsed by Ecofin, that arrangements already in place for securities regulation (the Lamfalussy process already mentioned) should be extended to other financial sectors as well, including the banking sector.[9] Its main principles are the home rule and mutual recognition. Extending to the banking sector, each bank that has a domestic license (a "single passport") can do business in the whole EU under the supervision of the authority that issued the license provided that its foreign activity takes the form of branch-

[8] The status quo is described, among others, in Schüler (2005), Gulde and Wolf (2005), and Prati and Schinasi (1999).

[9] This might be due to the fact that harmonization and cooperation in supervision has evolved gradually. It is likely that a newly created system would look differently (Gulde and Wolf 2005). Hence, the question is whether such a system should be evolutionary or revolutionary (Gulde and Wolf 2004).

banking. Foreign subsidiaries are, however, supervised and regulated by the foreign authorities.[10] Member states recognize and accept national decisions.

With the Lamfalussy principle EU member states seem to have accepted the continued coexistence of a multitude of different models of supervision in the union. For instance, a majority of the old EU member states have, with recent changes, now combined their financial markets supervision in a single agency, while as many as three separate branch-authorities governing, for instance, banking and insurance markets, operate in Greece, Portugal, or Spain. Traditionally, bank supervision often lay with the central bank which has not changed through the creation of a common central bank. To some extent, the extension of the Lamfalussy principle might simply be a pragmatic recognition of the continued existence of a diverse set of national supervisory systems.

The cooperation among banking supervisors in the EU is part of a broader and international system of cooperation among central banks and regulators.[11] There are different levels of multilateral and bilateral levels of cooperation. First, there is the Basel Committee on Banking Supervision, aiming to set international standards and to coordinate the work of regulators. It does not possess any formal authority, but formulates guidelines and recommends best standards. Most significant here are the so called Basel II standards that concern minimum capital requirements, rules of disclosure, and assessment processes.

There also exist Memoranda of Understanding (MoU) between European supervisors at the bilateral level. These agreements between national authorities provide a framework for regular exchange of information and define procedures and reciprocal commitments. Nearly all member states have signed such memoranda with each other. In addition, there are MoU between the ECB and national central banks and national banking supervisors on a multilateral basis, for instance among Nordic countries.[12] Finally, in addition to the Committee of European Banking Supervisors (CEBS) operating under the Lamfalussy umbrella, there are several other committees to promote international (and European) cooperation between supervisory authorities, such as a Groupe de Contact (GdC), the Banking Advisory Committee (BAC), the Basel Committee on Banking Supervision, or the Banking Supervisory Committee (BSC) (see, e.g., Schüler 2005).

[10] See Padoa-Schioppa (2004) for a discussion. According to him, measured along total assets, branches and subsidiaries are about equally important for EU-wide banking activity.

[11] For an international perspective, see Kapstein (2005).

[12] A (non-public) MoU on cooperation between the central banks, Ministries of Finance, and EU Supervisors on crises solution with the main focus on banking supervision came into effect 1 July 2005. See ECB (2005), Sanio (2005).

The application of the Lamfalussy approach to banking is a fairly recent development (the final decision at the EU level dates May 2004), the outcome of the underlying political process being less than certain. A joint proposal by finance ministers Brown and Eichel (of Great Britain and Germany), suggesting the creation of a modern and effective supervisory body at the EU level but leaving financial responsibility with national governments, was opposed by national central banks and stalled. It led, however, to the proposal by the EFC, accepted by Ecofin, eventually approved (with amendments) by the European Parliament, whose main feature it is to extend the Lamfalussy model to other financial sectors and thus to preserve the existing inter-institutional arrangements. This proposal also maintains the role for national central banks and thus finds their support.[13]

The focus of the new structure is primarily the regulatory process. It is aimed to speed up EU legislation to make it more responsive to new market developments. It also aims at making national legislation more compatible with each other, to lead to a convergence of supervisory practices, and to ensure a more consistent implementation of EU directives. The proposal finally aims at speeding up information sharing processes among national regulators in response to the increased interdependencies of banks across countries. The convergence of supervisory activities should also help to deal with multinational banks.[14]

Even within the new framework the ECB does not have an explicit mandate to act as a lender of last resort, nor is it explicitly (other than, were applicable, through its national member banks) involved in banking supervision. Art. 105(5) of the treaty remains rather ambiguous in stating that "the ESCB shall contribute to the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system". In particular, there is no explanation who the competent authorities might be. Moreover, according to Freixas et al. (2003), financial crises within EMU constrained to national boundaries—to the extent that they (still) exist—may be handled by national authorities, including through limited collateralized credit extended by the respective *national* central bank. On the other hand, there can be little doubt that the ECB will (need to be) involved in any major liquidity crises within the EMU area, in

[13] The two so called Brouwer reports, commissioned by EFC confirm that the current system based on national competencies is appropriate but that there is also a need for more cross-border and cross-sectoral cooperation between national authorities. Bini-Smaghi and Gros (2000) criticize that convergence of regulation does not automatically imply equal application of rules and thus common treatment of national banks.

[14] One problem with this approach may be that it was designed to foster the market integration process in the securities industry (compare Schüler 2005). Issues like the LOLR and the involvement of national central banks are therefore not addressed in this approach.

particular if it exceeds national boundaries and approaches systemic levels. This view, probably shared by most observers, seems also to underlie the July 2005 MoU between European banking supervisors, central banks, and finance ministries. The document (albeit not published) explicitly involves the ECB and its member banks in a process of crises-preventing information exchanges and, presumably, advance planning (ECB 2005).

While the lack of an explicit function of the ECB as a lender of last resort has led to criticism (Prati and Schinasi 1999, Vives 2001), the ECB itself has stressed the positive role of constructive ambiguity, and that private alternatives (such as deposit insurances schemes) and the presence of fiscal authorities might assume the role of bailing out particular banks in case of crisis. It is doubtful, however, that these alternatives would be sufficient and fast enough (Vives 2001).

It might be concluded as well, however, that the ECB has already a role as an implicit lender of last resort. National central banks could rely on so called Emergency Liquidity Assistance (ELA), comprising also assistance by national central banks given to banks in stress. The question, hence, is to what extent the existence of the lender of last resort should be made public or left partly in the dark to exploit constructive ambiguity. As our model will show, a case for the existence and strategic exploitation of such ambiguity can be made.

4. The Model

In our theoretical analysis, we develop a simple model that focuses on the relation between three national players. There is a private banking sector in each country with n symmetric private banks that compete against each other. A not completely competitive private banking sector would be characterized by fewer banks. Hence, n is also our measure of competition in the national banking sector. We do not assume that national banks cooperate. National mergers and acquisitions would only lead to a fall in n and we would treat merged banks as single national banks. Given the symmetry of national banks, we will speak of a representative national bank.

The second actor is the central bank whose sole objective is to avoid that the private banking sector fails. In case of large negative shocks which risk the failure of the banking system the central bank will intervene and act as a lender-of-last resort to the banking system. This action is however accompanied by some costs for the central bank. For instance, that the central bank is forced to increase the monetary base which will subsequently lead to inflation. We assume that the central bank's objective is to minimize the risk of having to bail out private banks because of these costs.

The third player, the government, reflects the interests of private banks and the central bank. It aims at keeping the private banking sector from failing and avoid that systemic crises develop. It also is affected if the central bank has to intervene. This might imply that the central bank's profits fall and the government obtains less revenue, or it might be that the government suffers from an increase in inflation in the wake of a bailout of the private sector.

We assume that the central bank is responsible for bailing out private banks should systematic crises arise. The government is assumed to be responsible for the regulation of the banking sector and it can force private banks to undertake "efforts" to reduce the probability they end up in a situation in which the central bank will have to bail out banks. While both, central bank and government, have responsibilities for the stability of the banking system, there is no direct relation between the central bank and the government. This assumption is inspired by the fact that central banks in EU member countries have been made independent in preparation of EMU.[15]

The government will create rules that require private banks to invest in the build up of reserves, to lend prudently, to get rid of bad loans and to ensure a sensible loan risk assessment. All of these activities are costly for the private banks which are therefore reluctant to undertake these measures. The government as well is aware of these costs and will not push regulation too far. This can be either because the banking sector is successful in lobbying the government or because more regulation implies a more prudent lending policy of private banks which in turn might have negative short-run effects on business activity in general and growth and employment.

The relative weights that private banks and governments put on these costs might differ, however, which creates a conflict of interest between the private banks and the government. In general, the amount of regulation imposed by the government will be higher than what private banks would provide themselves because the government is less averse to regulation and because it takes the central bank's considerations into account.

Several issues are not analyzed in this model although they have received some attention. First, we do not model supervision of private banks. Our model only looks at the amount of regulation and the actions of the lender of last resort, i.e. the case of crisis management. We do not deal with issues of the enforcement of regulation. In our model, regulation can be enforced without problems.

[15] We assume that the regulation of the banking sector is not exclusively in the hand of the central bank. See Prati and Schinasi (1999), Gulde and Wolf (2005) or Schüler (2005) for a description of actual separation of powers between central banks and governments in Europe.

Another aspect that we do not look at is the question of a private insurance for banks in case of crises or intervention by the government (such as the fiscal authority) to bail out banks, and thus exclude deposit insurance schemes from our analysis. In our setup the only authority that can support banks in danger of failing is the central bank as a lender-of-last resort. We justify this assumption with arguments that deposit insurance schemes are unlikely to be sufficient to save a banking system because they are to small, take too long to be paid out and, in an EU wide setting, involve too lengthy discussions about who has to pay how much, and hence delay the resolution of a banking crisis (Prati and Schinasi 1999).

Also, we do not explicitly distinguish between the forms in which banks' cooperation (or merger and acquisitions) take place. There is some literature explicitly distinguishing between branches and subsidiaries (Repullo 2000, Holthausen and Ronde 2005) pointing out that branches are regulated in the home country (by virtue of the single banking pass (Padao-Schioppa 2004)) while subsidiaries are regulated in the host country. We will ask, however, under what circumstances banks prefer opening branches or subsidiaries if the are active in other countries.

Finally, we do not look at "intermediate" forms of cooperation between governments. We only compare the two cases of non-cooperation in regulation and full cooperation, in terms of the level of regulation that is set. Simple information sharing is not looked at (see Holthausen and Ronde 2005). Again, this leaves out some forms of cooperation that might be important such as the MoU that should create better information sharing. We assume that governments are perfectly informed about regulation in other countries.

4.1. The Single Economy

We proceed by first showing the case of the single economy and the equilibrium determined by the private banks' efforts undertaken to reduce vulnerability to shocks and the government's amount of regulation. In the next step, we will see how this equilibrium is changed through integration among private banks in a European setting. To simplify, we only consider two countries, indexed by i=1,2, which represent the process of financial market integration between two older member states or between the old member states and new member states.

Private Banks

The utility function of a representative private bank is given as

$$EU_i^B = E\pi_i - \nu(e_i) \tag{1}$$

where E denotes the expectations operator, π are the bank's profits and e are the bank's efforts undertaken to make the bank less vulnerable and to increase the bank's profits. This can be more careful lending policies, a better control of lenders' behavior, or other measures that involve efforts.

The bank's effort, *e*, has a twofold effect on expected profits.[16] The first effect is based on the assumption that the effort generates a positive *return* for the bank, perhaps because a more careful balancing of the loan portfolio or an improved risk matching of assets and liabilities. Formally, this can be captured by multiplying expected profits, $E\pi$, by a return factor increasing in *e*, so that $E\pi_i(1+e_i) = [p_i\overline{\pi} + (1-p_i)\underline{\pi}](1+e_i)$, where $\overline{\pi}$ are high profits realized in the "good" situation and $\underline{\pi}$ are negative profits realized under the "bad" outcome, such that $\underline{\pi} < 0 < \overline{\pi}$. We assume that the bank will have to close and go out of business if $\underline{\pi}$ is realized unless it is bailed out.[17]

The second influence of efforts works indirectly on the probability of a negative outcome, for instance, because of greater vigilance in monitoring risks. This can be expressed by a probability function of the general form $p_i = p_i(e_i, \theta_i)$; $p_{\theta_i}, p_{e_i} > 0$, where 1-θ is an exogenous measure of the level of systemic risk. θ_i is the objectively given chance in economy i of a "good" development such as rate of growth or external developments. Even if θ_i is low, the bank can improve its individual chance through reinforced efforts. In what follows, we will use the specification $p_i = e_i + \theta_i$ with $0 \le e_i + \theta_i \le 1$.

Finally, the effort spend by the bank will have costs. Assuming a quadratic form $\nu(e_i) = \gamma e_i^2$, where $\gamma > 0$ measures the bank's aversion to efforts, we can summarize its expected utility as $EU_i^B = [p_i\overline{\pi} + (1-p_i)\underline{\pi}](1+e_i) - \gamma e_i^2$.

There is the possibility that the bank is bailed out by the central bank in its capacity as the lender of last resort (LoLR). The size of the bailout will be such that the bank does not go

[16] Cordella and Levy-Yeyati (2004) make similar assumptions with regard to government reform efforts in crisis prevention. Since we argue here that the bank's efforts are of the same nature as the efforts the government will demand from banks through regulators, there is a similarity in perspective. Freixas et al. (2003) make a related point when they distinguish between banks' efforts in screening credit projects in the selection phase (which might shape expected profits) and monitoring thereafter (which might influence the probability of default).

[17] Since this is a one period model we cannot distinguish between solvency and illiquidity of the bank and Bagehot's rule cannot be applied.

bankrupt, that is, we assume that the bailout B is sufficient to keep the bank in operation. There will be costs to the bank in terms of lost reputation or the manager being fired of size L_B however in case a bailout becomes necessary. In case of the bank's closure these costs are L_C. We assume that all these variables are identical across all countries and therefore do not index them.

However, the individual bank can not be sure that it will be bailed out by the central bank because a single bank's potential failure need not put the whole banking system at risk for the central bank to spring into action. There is a only a probability τ that the central bank will bail out an individual bank. The expected payout to the bank's managers, in the case of $\underline{\pi}$, is hence given as $\tau(\underline{\pi} + B - L_B) + (1-\tau)(\underline{\pi} + 0 - L_C)$. This expression simplifies to $\underline{\pi} + \tau B - L$ where we have defined $L = \tau L_B + (1-\tau)L_C$ as the expected costs to the bank and its manager under the bad outcome.

We assume that the bank's probability of being bailed out, while exogenous to the bank, is a negative function of the number of banks operating in the economy. Under symmetry, if there are many banks in the economy, a single bank's failure is less likely to cause a crisis of the entire banking system. If there are only few banks, however, a bank's default is more likely to cause a run on the banking system, rendering it unstable along the logic of Diamond and Dybvig (1983). In this case, the central bank will have to intervene in order to save the system. Assuming that each bank is a Nash-player with respect to other banks and the regulating authority, a reasonable presumption is that for each single bank the probability of being bailed out is simply $\tau = 1/n$. The private bank's expected payout in case of a negative shock is then $\underline{\pi} + \frac{1}{n}B - L$, which is likely to be negative because of the influence of L. In order to save notation, we define $\bar{x} = \bar{\pi}$ and $\underline{x}^B = \underline{\pi} + \frac{1}{n}B - L$ with $\bar{x} - \underline{x}^B > 0$. Because $\underline{x}$ is a function of the subjective probability of being bailed out, we index it for the private bank. Combining these assumptions in (1), we can calculate the optimal effort for the representative bank as

$$e_1^B = \frac{1}{2}\frac{\theta_i \bar{x} + (1-\theta_i)\underline{x}^B}{\gamma - (\bar{x} - \underline{x}^B)} \tag{2}$$

The efforts undertaken by the private bank are increasing in θ_i and $\bar{x} - \underline{x}^B$ but falling in γ. The more "effective" are efforts, the higher the incentive to provide effort. Hence, efforts are increasing in the difference between expected profits in the good state of the world and the bad state of the world, $\bar{x} - \underline{x}^B$. Since $\bar{x} - \underline{x} = \bar{\pi} - \underline{\pi} + L - \tau B$, efforts increase in the manager's personal cost of a bailout L and fall in the probability of being bailed out τ. Since this probability is a negative function of the number of banks, competition is good for the stability of the banking system.[18]

Because all banks are assumed to be symmetric, the level of efforts undertaken by one bank is also the average level of efforts and the level of effort undertaken by "the banking system". Our assumption of symmetry means that we have a „representative" bank whose behavior reflects the behavior of the entire banking system.

The Central Bank

We turn next to the objective function of the central bank. The central bank, in this simplified setup, has the only objective of avoiding a collapse of the banking system. If the central bank's intervention is followed by inflation, for instance, this would conflict with the standard central bank utility function that is assumed to put much emphasis on avoiding inflation. In case of the European Central Bank this is defined as its overarching aim.

Assuming that the central bank has no further direct costs from bailing out the banking system, its expected utility is simply given as

$$EU_i^{CB} = -(1 - p_i)B \tag{3}$$

Therefore, the central bank would clearly benefit as well if private banks would undertake efforts to reduce the probability of a banking crisis .

The Government

We assume that the government is on the one hand concerned with the stability of the national banking system but also acknowledges that more efforts by private banks make their profit situation less comfortable. If banks, for instance, lobby the government, the government itself might be opposed to too much regulation of private banks as they are financially hurt by too

[18] More precisely $\partial e / \partial \underline{x} > 0$ if $(1 - \theta_i)\gamma + (2\theta_i - 1)\bar{x} > 0$ .Since $\underline{x}$ is increasing in τ and falling in L, a negative $\underline{x}$ implies that efforts rise in L and fall in τ for θ_i large enough.

stringent regulation requiring too much effort of the banks. The government will hence take the efforts of the banking system as a whole into account as $\omega(e_i) = \phi e_i^2$.

In addition, however, the government is also concerned with the implications of a bail out for the central bank. Depending on how much the government is affected by the costs to the central bank of a bail out, this may play a more or less important role for the government. We denote the relative influence of this aspect with δ.

The government's objective function is therefore

$$EU_i^G = E\pi_i - \omega(e_i) + \delta EU_i^{CB} \tag{4}$$

There is one more crucial difference between the government's view of private banks' profits and their own view. Not only will the government view the costs of effort differently whenever $\phi \neq \gamma$, but for the government it is clear that the central bank will intervene to save the banking system should the need arise. While each individual bank considers only its own situation, the government considers all banks and thus realizes that the central bank will intervene to save some banks. Moreover, since all banks are symmetric this means that if one bank is in trouble the entire system is, which will prompt the central bank to bailout the system. Thus, for the government the probability of central bank intervention τ takes a value of one, so that the bad case payout considered by the government (and entering the expected bank profit term in (4), $E\pi_i$) is $\underline{x}^G = \underline{\pi} + B - L$ (rather than $\underline{x}^B = \underline{\pi} + \frac{1}{n}B - L$).

The optimal level of efforts undertaken by the banking system from the point of view of the government is then given as

$$e_i^G = \frac{1}{2}\frac{\theta_i \bar{x} + (1-\theta_i)\underline{x}^G + \delta B}{\phi - (\bar{x} - \underline{x}^G)}, \tag{5}$$

Since the government is the regulatory authority, we assume that it can impose its desired level of efforts on the private banks. Determining e_i^G as our measure of "regulation" of the banking sector, the level of effort provided in the banking system is hence $e_i^* = \max\{e_i^G, e_i^B\}$.

The level of effort that the government will impose on the economy is larger than the private system's if $\delta > 0$, $\phi < \gamma$, and n is not too large (see Appendix 1.) This is because

under these assumptions the government has a stronger interest to avoid bailouts, it is less averse against banks' efforts, and banks' incentives to provide efforts are not too strong. Therefore, we can reasonably assume $e_i^* = e_i^G$.

4.2. An Integrated Banking System

With financial integration, the well-being of domestic banks will not only depend on their own profits but—through various channels—on the profits of banks abroad. We consider three different cases reflecting possible integration scenarios in the European banking industry.

A first scenario is that financial integration takes the form of domestic banks acquiring shares in a foreign bank, which implies that domestic banks will be sharing foreign profits. Under the so-called home rule, the domestic bank would continue to be regulated by the domestic regulator and the foreign bank would be regulated by the foreign regulator. To distinguish this case from the branch-scenario (see below), we shall assume that the foreign bank, even when becoming a full subsidiary of the domestic bank, will continue to be managed independently from the domestic bank. Secondly, we look at the case of cross-holdings where domestic banks hold shares abroad and foreign banks hold shares of domestic banks. In this case, too, domestic and foreign banks are supervised by their respective national regulators. Finally, we consider a scenario in which domestic banks run a foreign bank as a branch and provide themselves the efforts that are necessary to run the bank.

In all of these cases, regulation will be carried out by national supervisors. The representative domestic and (where applicable) foreign bank decides in each case about the effort that it will put into reducing risks and increasing expected profits, and national regulators will determine national regulation. The case of centralized regulation by a EU-wide regulator will be considered in section 4.4.

Domestic Bank with Shares in Foreign Banks

For this case, we assume that a domestic bank (i.e., because of its representative nature, the domestic banking system as a whole) acquires a share λ $(0 < \lambda < 1)$ in a foreign banking system. The domestic bank is labeled 1, the foreign bank is labeled 2. We consider only country 1. As already noted , we assume that the connection between banks remains loose and that both foreign and domestic banks continue to decide on their efforts individually.
The domestic bank's utility is

$$E\pi_1 - v(e_1) = [p_1\overline{\pi} + (1-p_1)\underline{\pi} + \lambda E\pi_2](1+e_1) - \gamma e_1^2,$$

where $E\pi_2 = (p_2\overline{\pi} + (1-p_2)\underline{\pi})(1+e_2)$. In line with the previous section, we have $p_2 = \theta_2 + e_2$, but we allow for differing exogenous risk levels, that is $\theta_1 \gtreqless \theta_2$. For simplicity, let $\theta_1 \neq \theta_2$ be the only difference between the two banks at home and abroad, so that the expected gain and losses (as well as the LoLR support) in both countries are equal. In other words, some countries are more likely to be hit by bad shocks than others but all else is symmetric.

Note that the bank's foreign holdings are treated similar to their domestic assets. Domestically banks can increase their profits by exerting costly efforts, for instance, through more closely monitoring their domestic credit projects. The basic idea here is that more of the same effort will also be helpful to increase revenue flows from abroad—for instance, by monitoring foreign bank managers and their credit projects or ensuring that a larger part of foreign profits is distributed and not diverted to other uses, thereby increasing expected profits for a given level of foreign efforts.[19]

Another crucial feature of the expected utility function is that the domestic bank shares the foreign bank's profits but not its efforts. This reflects the assumed continued independence of the foreign banks—domestic managers do not take into account the efforts paid by foreign managers. They do, however, take into account the positive repercussions of the (given) level of expected foreign profits (linked to a given level of the foreign managers' efforts, e_2) on their own profits. Obviously, if the domestic bank's share λ in foreign profits is positive and if $E\pi_2 > 0$, there is now an additional benefit from a marginal increase in domestic effort.

The bank's optimal efforts will thus be given as

$$e_1^B = \frac{1}{2}\frac{\theta_1\overline{x} + (1-\theta_1)\underline{x}^B + \lambda(1+e_2)\left(\theta_2\overline{x} + (1-\theta_2)\underline{x}^B + e_2\left(\overline{x} - \underline{x}^B\right)\right)}{\gamma - \left(\overline{x} - \underline{x}^B\right)} \qquad (6)$$

The higher the domestic bank's share in the foreign bank, the larger is the positive feedback effect it reigns from increasing its own efforts. Ceteris paribus, compared to the autarky case discussed in the previous section, this leads to higher domestic efforts and higher

[19] A key assumption here is obviously that the type of effort spent to monitor foreign activities is similar to—in effect, identical with—monitoring domestic activity. While this will not apply for *any* type of foreign asset held by the bank, it seems a plausible assumption for an extension of the bank's core business activity to foreign markets.

expected profits. As a consequence, the overall effort level will increase with financial integration. Moreover, ceteris paribus, more efforts by the foreign bank will induce the domestic bank to provide more efforts itself because it increases the payoff from more efforts.

For the government, we have the same effect. Optimal regulation from their national perspective requires an effort of

$$e_1^G = \frac{1}{2}\frac{\theta_1\bar{x} + (1-\theta_1)\underline{x}^G + \lambda(1+e_2)\left(\theta_2\bar{x} + (1-\theta_2)\underline{x}^B + e_2\left(\bar{x} - \underline{x}^B\right)\right) + \delta B_1}{\phi - \left(\bar{x} - \underline{x}^G\right)}, \tag{7}$$

and, as before, regulation is binding in the sense that the government's demanded efforts are higher than what the banks provide themselves. Because $\delta > 0$ and $\gamma > \phi$, the relation between $e_1^B < e_1^G$ is not changed.[20]

Like domestic banks, the government takes into account that the domestic banks' profits are related to the profits of the foreign bank. Because the government realizes as well that, all else being equal, more foreign efforts make the provision of more efforts more worthwhile, it also increases its demands from the domestic banking system. Intuitively, this would correspond to a regulator who demands that banks, if they invest in foreign banks, also invest in better surveillance of those banks. Hence, in the sense of protecting investors and deposits in domestic banks, the regulators requires those banks to carefully monitor what happens with the bank's investments. Thus, contrary to what is often claimed, financial market integration might not lead to less regulation or a "race to the bottom".. Like domestic private banks themselves, domestic regulators have an interest that more efforts are provided by banks that hold international investments in other banks.

Cross Holdings between Banking Systems

In the case of cross-holdings, bank 1 shares the profits of bank 2, and bank 2 shares the profits of bank 1. This probably best describes financial integration among equals—within the EU, say—where banks from already well developed banking systems acquire shares in each other. In contrast, the case of one-sided foreign holdings discussed above might characterize a form of involvement of old EU member banks in the new EU member banking markets, with, for instance, a Finnish bank acquiring a share in a bank operating in the Baltics.

[20] Notice that the efforts of bank 2 will be given like in the domestic case in (2). This is because bank 2 has no interest in bank 1. A mutual interest is considered in the next subsection.

The objective function of banks in country 1 is, as before, given as $E\pi_1 - v(e_1) = [p_1\overline{\pi} + (1-p_1)\underline{\pi} + \lambda E\pi_2](1+e_1) - \gamma e_1^2$, but in this case we also have $E\pi_2 = [p_2\overline{\pi} + (1-p_2)\underline{\pi} + \lambda E\pi_1](1+e_2)$. Hence, the banks in country 1 realize that their own efforts also have a positive impact on the profits on the banks in country 2, which in turn feeds back into their own profits. Because foreign banks benefit from domestic efforts, providing these efforts now creates a positive "second round" effect.

Accordingly, banks in country 1 provide efforts of

$$e_1^B = \frac{1}{2}\frac{(1+\lambda^2(1+e_2))[\theta_1\overline{x} + (1-\theta_1)\underline{x}^B] + \lambda\tilde{\pi}_2}{\gamma - (\overline{x} - \underline{x}^B)(1+\lambda^2(1+e_2))} \tag{8}$$

where $\tilde{\pi}_2 = (1+e_2)(\theta_2\overline{x} + (1-\theta_2)\underline{x}^B + e_2(\overline{x} - \underline{x}^B))$. Because of the positive second round effect, banks internalize some of the positive externalities of their own activities, which, in turn, will motivate foreign banks to increase their effort as well. Whereas in the first case, foreign banks had no incentive to increase their efforts and only bank 1 did so, we now have that both will increase their efforts. The additionally boost in the efforts of the representative bank in country 1 is visible in the factor $\lambda^2(1+e_2)$.

The government's regulation is given as

$$e_1^G = \frac{1}{2}\frac{(1+\lambda^2(1+e_2))[\theta_1\overline{x} + (1-\theta_1)\underline{x}^G] + \lambda\tilde{\pi}_2 + \delta B_1}{\phi - (\overline{x} - \underline{x}^G)(1+\lambda^2(1+e_2))} \tag{9}$$

The government as well realizes the positive feedback of regulation in the case of cross-holdings and will accordingly increase its demand on the national banking system. Again, it is not the case that integration lowers banks' efforts or government regulation.

Multinational Banks

Finally, we consider the case of a multinational bank. This could take to forms. First, the bank might acquire a foreign bank and take control of that bank. Examples would include a take-over of, say, a German by an Italian bank or banks from old EU member states taking over banks in the new member states as a subsidiary. The other case would be a domestic bank opening branches abroad. The two cases differ under current EU law because subsidiaries are under the regulation of a foreign regulator, whereas branches are regulated by the domestic

regulator. The organizational choice of the bank—a case of supervisory arbitrage, as it is sometime called—is considered in the next subsection. The bank's optimization with regard to prudential effort, however, is independent of the supervisory structure and will be discussed next.

What re the effort levels at home and abroad that a bank would provide unconstrained by regulators? In the multinational bank scenario—be it in the form of branches or subsidiaries—the domestic bank now has a more profound interest in foreign banks. It shares not only the foreign profits but also the effort undertaken (and the implied cost occurring) abroad. This reflects the fact that the domestic bank is now fully responsible for the behavior and stability of the foreign bank. Assuming that it can set domestic and foreign effort levels seperately, its optimal choice will reflect national markets' characteristics, that is, differences between θ_1 and θ_2.

Expected utility in the multinational bank case is

$$E\pi_1 + E\pi_2 - v(e_1, e_2) = [p_1\overline{\pi} + (1-p_1)\underline{\pi}](1+e_1) + \lambda[p_2\overline{\pi} + (1-p_2)\underline{\pi}](1+e_2) - \gamma(e_1^2 + \lambda e_2^2),$$

where e_1 and e_2, mark the bank's efforts in the two countries. Their optimal level will be

$$e_1^B = \frac{1}{2}\frac{\theta_1\overline{x} + (1-\theta_1)\underline{x}^B + \lambda\tilde{\pi}_2(e_2^B)}{\gamma - (\overline{x} - \underline{x}^B)} \text{ and } e_2^B = \frac{1}{2}\frac{\theta_2\overline{x} + (1-\theta_2)\underline{x}^B}{\gamma - (\overline{x} - \underline{x}^B)}. \quad (10)$$

Comparing the levels of efforts provided by the banks in the different cases, we see that we end up with the same situation if the domestic banks had only acquired a *non*-controlling share in the foreign bank. Because we have assumed identical utility parameters (in particular γ) are the same, the outcome does not depend on where the efforts are provided or decided. Comparing e_2^B in (10) with (2), we see that they are similar as are e_1^B in (10) and (6). Therefore, (6) and (10) yield the same results for the banks in country 1. The multinational's efforts in country 2 are the same as if a bank in country 2 would set the level of efforts independently.[21]

[21] Efforts in the banking system in country 2 would be higher if controlled by the multinational bank than by an independent bank in country if the multinational bank's aversion to efforts are lower than the independent bank's ($\gamma_1 < \gamma_2$) which we have excluded by assumption. In general, there can of course be a difference between efforts levels provided by the domestic and the foreign banking system.

Note that the governments will continue to determine regulation independently and that—mirroring the behavior of private banks— the level of effort required by regulators will be the same as described in case where banks only have shares in foreign banks. This is because under the home rule principle governments set their regulatory levels only with respect to their national markets.

Branches or Subsidiaries?

In the case of multinational banks that hold controlling interests in foreign banks, the question arises whether banks should open branches in foreign countries and compete with foreign banks or rather try to acquire them. In our simple model, the two strategies only differ in the regulatory authority to which the banks have to refer. As already mentioned, branches are regulated by the home authority (by virtue of the "single banking pass") while subsidiaries are subject to the host country's regulation.

To better understand the bank's organizational decision, let there hence be two different values of regulation in country 1, e_1^* and country 2 e_2^*, reflecting the national authorities optimal levels of regulation as given in (7). With a branch structure (indexed b), bank 1 has expected utility of $EU_1^B|_b = E[\pi_1(e_1) + \lambda\pi_2(e_1)] - \gamma(1+\lambda)e_1^2$ whereas with a subsidiaries structure (indexed s) it has expected utility $EU_1^B|_s = E[\pi_1(e_1) + \lambda\pi_2(e_2)] - \gamma e_1^2 - \lambda\gamma e_2^2$.

It follows that the banks prefer the branch structure over the subsidiaries structure if $EU_1^B|_b > EU_1^B|_s$ which is equal to

$$(1+e_1^*)\left[\theta_2\overline{x} + (1-\theta_2)\underline{x}^B + (\overline{x} - \underline{x}^B)\right](e_2^* - e_1^*) + (e_2^{*2} - e_1^{*2})\left((\overline{x} - \underline{x}^B)(1+e_1^*)\right) < \gamma(e_2^{*2} - e_1^{*2}) \qquad (11)$$

The condition shows that if country 2 is demanding a higher prudential effort than country 1 and if the bank is sufficiently averse to regulation (i.e., finds it sufficiently costly), it will prefer the branch structure in order to avoid the higher regulatory burden abroad. On the other hand, since regulation improves crisis resilience and expected profits, the bank will subject itself to this regulation if its aversion to efforts is low. That is, the bank will cast its foreign activity in the organizational form that minimizes the difference between the optimal efforts it would undertake form its own point of view and the (higher) levels of effort that are enforced by regulators at home or abroad.

Welfare Considerations

Directly comparing the efforts undertaken by private national banks in their own interest shows efforts increase if banks share in the profits of other banks. Our assumption that the value of investment in other banks (and the share of profits that is obtained from these investments) is increasing in own efforts induces banks to extend their efforts to the supervision of these foreign investments. The increase in efforts is even magnified if there are cross-holdings among national banking systems. In this case banks realize that their own efforts increase the profits of the other banks which in turn is good for their own profits. Therefore, internationally active banks will not necessarily reduce their prudential efforts.

However, although banks benefit from providing more efforts, these efforts in general will be too low from a social planner's perspective. Especially large banks can expect to be bailed out in case of a financial crises and this expectation reduces their efforts. National regulators, taking into account the costs of such bail outs will therefore require more efforts from banks. With internationally active banks, regulators will additionally increase the level of regulation because they realize that the financial health of national banks depends to some extent on how prudent banks handle their international investments. Financial integration thus need neither lead to a race to the bottom in regulation. Regulators demand more efforts from private banks than these are willing to provide themselves because banks do not internalize the costs of a potential bailout and hence provide too little efforts to avoid such a situation.

Nevertheless, national regulators as well do not take into account how national efforts impact crisis probability in other countries since they are only interested in possible feedback effects of their regulations on national financial stability. From a European point of view, national regulation need not be adequate because it does not take spillovers into account. For instance, in the case of a national bank holding a share in the foreign bank, the regulator in country 2 does not take into account that more efforts in this country would induce banks in country 1 to provide more efforts. Hence, regulation in country 2 is too low from a European perspective. Since regulation in country 1 is increasing in e_2^G it is too low as well from a European perspective. The same logic applies to the case of cross-holdings. Here as well, national regulators react positively to effort levels provided by foreign banks but take not into account that their regulatory levels have an influence on foreign regulators as well. National regulation in general is therefore different from what a European regulator would demand who takes such spillovers into account. We therefore consider next the case of a common lender of last resort and the case of a European wide regulator of banking activities.

4.3. The Lender-of-Last Resort

With the process of monetary integration in Europe, the situation has additionally changed for private banks and governments. The move towards a common central bank has implications for national banking systems and governments. A common central bank foremost implies that the national lenders-of-last resort disappears. National central banks can no longer bail out national banking systems in case of negative shocks independently because they are part of the European System of Central Banks.[22]

Assume that the common central bank, the ECB, is concerned with the stability of the entire EU wide banking system. More specifically, we assume that it is concerned with a weighted average of national banking systems of member states. That is, the ECB's utility function is a weighted sum of the national banking systems, depending on the national probabilities to be hit by a large negative shock (a function of national efforts) and the bailouts that would be necessary to save the national banking systems in the EU

$$EU^{ECB} = \frac{1}{2}EU_1^{CB} + \frac{1}{2}EU_2^{CB} \tag{12}$$

The ECB, like before the national central banks, aims to minimize the probability that the whole EU-wide banking system is faced with collapse. It will intervene, however, only if the whole banking system is hit by a crisis large enough to make the whole banking system collapse. If only one national banking system is hit, the ECB might as well decide not to intervene in order to avoid that other banks revise their subjective probability of being bailed out and reduce their own efforts (the often mentioned moral hazard effect of a lender of last resort). It also benefits from creating ambiguity because the national governments might themselves increase their regulatory demands on the national banking systems.

For any single national bank, the probability of being bailed out by the common central bank falls by a factor proportional to the number of countries that are members of the monetary union. It is accordingly given as $\tau = \frac{1}{2n}$ (instead of $\tau = \frac{1}{n}$), and efforts of each of the single national banks will accordingly increase because in all cases that we have discussed, e_1^B was an increasing function of $1/\tau$. The efforts of private banks will hence increase with a common central bank.

[22] This might not literally be the case as the discussion above has indicated. But powers of national central banks are significantly reduced and, what is important, national governments can no longer be sure of the intervention of the central bank.

It is evident that individual efforts are increasing in the number of member countries. Hence, a larger monetary union leads to more efforts by private banks because the larger is the monetary union the lower is the probability that the ECB will intervene to save a single national bank. The process of monetary integration leads therefore to more efforts by national banks. Financial integration without a single central bank does not have this effect, because only a single central bank creates more ambiguity and hence induces more efforts from private banks.

Moreover, for the national governments as well the likelihood that the ECB intervenes to save their national banking systems is now smaller than unity (as has been the case with a national central bank where we assumed that the subjective probability of τ for the government was 1). For the government, too, this probability is now a declining function of the number of member states in the EMU. From the government's perspective the probability falls to $\tau = 1/2$.[23] However, the national government is also affected by the ECB's costs of a bailout by a correspondingly smaller factor, so that a decrease in the probability of a bailout should increase regulation whereas the governments concern for the interest of the central bank would fall. Appendix 2 shows under what circumstance the regulation by a national government will increase in a monetary union.

This logic can directly be extended to the case of *no* lender of last resort. In this case, governments and private banks have no chance to be bailed out if a negative shock to the banking system in a country occurs. This would correspond to the current situation where a clear lender of last resort responsibility has not been assigned to the ECB.[24]

From the private banks it follows that the absence of a lender of last resort will unambiguously increase the efforts undertaken by the bank itself. The banks compensate for the loss of the LoLR by decreasing the probability that they end up in such a situation. This is the often discussed case for creative ambiguity that is created by the absence of an institution that can bail out private banks.

Governments are in a similar position, because their regulation is also decreasing in the expected bailout by the central bank if the case discussed above is fulfilled. If also for the government the probability that a central bank intervenes falls to zero , there will be more

[23] With m member countries the subjective probability of a national regulator would have $\tau = 1/m$. Thus, national regulators would increase their regulatory demands with the number of member countries.

[24] We ignore opinions that argue that the ECB de facto has this function nevertheless (see discussion above). The model interprets the treaty very literally.

regulation and hence a more resilient national banking system. Creative ambiguity will work to make governments put more effort into avoiding bank failures.

Interpreting our model more broadly, increased efforts on the side of the government need not only mean more and better regulation for private banks, but it can mean that governments create other agencies that can deal with bank problems, create insurance agencies or take precaution in their ministries of finance to be able to deal with banking crises.

4.4. Coordination of Regulators

So far, we have assumed that the regulators in the two regions set their regulations independently. But apart from creating a common lender of last resort, regulating authorities might go beyond the current degree of cooperation and information sharing as reflected in the Lamfalussy-model and centralize regulation as well. Arguably, if financial markets in the EU continue to integrate and if banks interdependencies increases further, national governments might decide that the time has come for a common regulator.

In this case it is reasonable to expect that this common regulator would apply the same level of regulation to all member countries and thus follow as “one size fits all” strategy. This would also imply that it would no longer matter for private banks whether they operate subsidiaries or branches because they would be subject to the same level of regulation independent of where they are located and what type of banking business they operate.

We thus consider the case that there is also one common regulator, paired with one lender of last resort. We assume that this regulator looks at a weighted average of the objective function of the two independent regulators when determining a common level of regulation. That is

$$EU^{CR} = \frac{1}{2}\left(E\pi_1 - \omega(e) + \delta B_1\right) + \frac{1}{2}\left(E\pi_2 - \omega(e) + \delta B_2\right) \tag{13}$$

His policy follows as

$$e^{CR} = \frac{1}{4}\frac{\left[\theta_1\bar{x} + (1-\theta_1)\underline{x}^G\right] + \left[\theta_2\bar{x} + (1-\theta_2)\underline{x}^G\right] + 2\delta B}{\phi - \left(\bar{x} - \underline{x}^G\right)} \tag{14}$$

where $B_1 = B_2 = B$ because the potential bailout for the two banking system is the same since $\overline{x} - \underline{x}^G$ is equal in both countries.

In contrast to national regulators, the common regulator will naturally adopt an EU-wide perspective. In particular, this implies he would realize that the ECB intervenes if national banking systems are in trouble. While every national regulator assigns a probability of $\tau = 1/2$ to the central bank's intervention, the common regulator assigns $\tau = 1$ to this possibility.

There are two opposing effects responsible for this result. On the one hand, the common regulator is aware the lender of last resort will intervene if the European banking system is in danger of failure. Therefore, the creative ambiguity created by the common LoLR is lost and regulatory efforts fall. On the other hand, the common regulator will probably take the costs arising for the central bank more into account than a single government would. This should raise his precautionary regulation to avoid that the central bank has to intervene. But as we have shown in appendix 2 the former effect is likely to dominate the latter and hence a common regulator will be less demanding on banks than a national regulator in the presence of a common lender of last resort.

5. Conclusion

The paper has developed a simple model of financial integration between national banking systems in which banks can reduce the probability of financial and banking crises through providing more prudential efforts in selecting and monitoring their business activities. These efforts in addition increase their expected profits in "good" and "bad" situations. Assuming that banks' efforts also increase the expected profits from financial integration with foreign banks, we show that international integration increases national banking system's prudential efforts. It does thus not necessarily imply, as is often feared, financial globalization makes national financial systems more crisis prone. Because national regulators realize the positive effects of regulation in an international environment as well, we also show that "a race to the bottom" between regulators need neither follow from financial integration.

Nevertheless, national regulators will not internalize the external effects of their activities on other member states in a European context, thus leading in general to a suboptimal level of regulation from a European perspective. While this would justify a centralization of regulation at the European level, a European regulator is problematic from another perspective.

This is because the prudential efforts of private banks and the level of regulation set national authorities are decreasing functions of the subjective probability that the central bank would intervene as a lender of last resort in case of a crisis. European monetary integration and the creation of the ECB have lowered the probability that a central banks would intervene to save individual banks or single national banking systems. The creation of a common regulator at the European level, however, could imply that the positive effect of this creative ambiguity vis-à-vis national regulators is lost. A common regulator will probably be less ambiguous about an eventual intervention of a common lender of last resort and regulatory requirements from national financial systems might therefore be lower with a common regulator.

It follows that members of EMU might not be better off with a common LoLR because by abolishing national central banks and not explicitly creating a European lender of last resort, individual national and private efforts to avoid financial crises are reinforced. Creating a common lender of last resort and centralizing banking supervision and regulation at the European level could therefore be less desirable than often assumed. Not only would constructive ambiguity be lost, but prudential regulation might fall as well. The argument that international financial integration leads to a fall in regulation and a race to the bottom if no common regulator is created, on the other hand, is less severe than is often argued.

Appendix 1: The condition for $e_i^G > e_i^B$

The condition for $e_i^G > e_i^B$ is $\left(\theta\bar{x} + (1-\theta)\underline{x}^G + \delta B\right)\left(\gamma - \left(\bar{x} - \underline{x}^B\right)\right) > \left(\phi - \left(\bar{x} - \underline{x}^G\right)\right)\left(\theta\bar{x} + (1-\theta)\underline{x}^B\right)$ or $\theta\bar{x}\left[\left(\gamma - \left(\bar{x} - \underline{x}^B\right)\right) - \left(\phi - \left(\bar{x} - \underline{x}^G\right)\right)\right] + \left[(1-\theta)\underline{x}^G + \delta B\right]\left(\gamma - \left(\bar{x} - \underline{x}^B\right)\right) - \left[(1-\theta)\underline{x}^B\right]\left(\phi - \left(\bar{x} - \underline{x}^G\right)\right) > 0$

It is clear that $\underline{x}^G > \underline{x}^B$ because the expected bailout is larger for the government. Moreover, $\left[\left(\gamma - \left(\bar{x} - \underline{x}^B\right)\right) - \left(\phi - \left(\bar{x} - \underline{x}^G\right)\right)\right] = \gamma - \phi - B\left(1 - \frac{1}{n}\right) > 0$ if n is not too large and if γ is sufficiently larger than ϕ. In this case, the bank will not provide more effort by itself than the government would like to see. (The first term is then clearly positive and so is the second because of the influence of δB.)

Appendix 2: Comparison of regulation with a national and a common central bank

The condition for $e_i^G\big|_{CB} > e_i^G\big|_{ECB}$, where CB refers to the national central bank and ECB to the common central bank by using (5) is, $\left[(1 - \theta_i + \delta B)(\phi - \bar{x}) - \theta_i\bar{x}\right]\left(\underline{x}^G\big|_{CB} - \underline{x}^G\big|_{ECB}\right) > 0$. Because $\left(\underline{x}^G\big|_{CB} - \underline{x}^G\big|_{ECB}\right) = B/2$, regulation in the monetary union will increase if $(1 + \theta_i)\bar{x} > \phi$. If the government's aversion to regulation ϕ is rather small, this condition is likely to be fulfilled.

This general logic can be extended to international banks as well and applies hence to all cases that we have discussed.

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