

**CROSS-BORDER COORDINATION
OF PRUDENTIAL SUPERVISION
AND DEPOSIT GUARANTEES**

2011

Daniel C. Hardy and María J. Nieto

**Documentos de Trabajo
N.º 1126**

BANCO DE ESPAÑA
Eurosistema



**CROSS-BORDER COORDINATION OF PRUDENTIAL SUPERVISION
AND DEPOSIT GUARANTEES**

CROSS-BORDER COORDINATION OF PRUDENTIAL SUPERVISION AND DEPOSIT GUARANTEES (*)

Daniel C. Hardy

INTERNATIONAL MONETARY FUND

María J. Nieto

BANCO DE ESPAÑA

(*) The authors gratefully acknowledge comments received from Martin Cihak, Jerry Dwyer, Bob Eisenbeis, David Parker, Alexander Tieman, Larry Wall, and two anonymous referees. The views expressed in this paper are those of the authors and do not necessarily represent those of the Banco de España or those of the IMF or IMF policy.

The Working Paper Series seeks to disseminate original research in economics and finance. All papers have been anonymously refereed. By publishing these papers, the Banco de España aims to contribute to economic analysis and, in particular, to knowledge of the Spanish economy and its international environment.

The opinions and analyses in the Working Paper Series are the responsibility of the authors and, therefore, do not necessarily coincide with those of the Banco de España or the Eurosystem.

The Banco de España disseminates its main reports and most of its publications via the INTERNET at the following website: <http://www.bde.es>.

Reproduction for educational and non-commercial purposes is permitted provided that the source is acknowledged.

© BANCO DE ESPAÑA, Madrid, 2011

ISSN: 0213-2710 (print)

ISSN: 1579-8666 (on line)

Depósito legal: M. 40538-2011

Unidad de Publicaciones, Banco de España

Abstract

We study the optimal joint design of prudential supervision and deposit guarantee regulations in a multi-country, integrated banking market, where policy-makers have preferences regarding profitability and stability of the banking sector. Non-coordinated policies will tend to yield too little supervision and too much deposit insurance. The paper concludes with recommendations on policy priorities in this area.

Keywords: Deposit guarantees, bank supervision, cross-border coordination, EU.

JEL Classification: F36, F59, G28.

Resumen

Hasta que tuvieron lugar los acontecimientos de otoño de 2008 tras la quiebra de Lehman Brothers, la atención de los responsables de política económica y, en buena parte el debate académico, en el ámbito de la estabilidad financiera se había centrado en la coordinación entre supervisión prudencial y prestamista de última instancia a nivel nacional. Se había dejado a un lado la coordinación entre los esquemas de seguro de depósito y la supervisión prudencial entre reguladores nacionales y su impacto en la estabilidad financiera en mercados financieros muy integrados. Este trabajo trata de cubrir esta laguna estudiando el diseño óptimo de la supervisión prudencial y el seguro de depósito en un mercado financiero integrado de carácter multinacional en el que los responsables nacionales de política económica tienen preferencias distintas sobre los objetivos de rentabilidad y estabilidad de sus respectivos sistemas bancarios. En este trabajo demostramos que, bajo ciertas hipótesis, existe una relación entre los niveles óptimos de supervisión prudencial y seguro de depósito que dependen de los “spill overs” de ambas regulaciones entre países cuando sus responsables muestran distintos niveles de cooperación. Así, políticas no coordinadas resultan en demasiada poca supervisión y demasiado elevado seguro de depósito.

Este trabajo supone una aportación al marco teórico del diseño del marco institucional de estabilidad financiera en mercados financieros altamente integrados como la Unión Europea y sugiere un enfoque integrado de la regulación prudencial y del seguro de depósito.

Palabras claves: Garantía de depósitos; supervisión prudencial; coordinación transfronteriza; Unión Europea.

Códigos JEL: F36, F59, G28.

1 Introduction

The recent global financial crisis has demonstrated powerfully the interconnectedness of financial markets, and the difficulties of cross-border coordination of prudential supervision and safety-net arrangements. The failure of several large cross-border banks led to confusion and open rivalry, and the resolution of these banks is likely to be protracted. In response, one of the immediate actions recommended by the G20 leaders is that “national and regional authorities should work together to enhance regulatory cooperation between jurisdictions on a regional and international level.” As surveyed by Goodhart (2008), for example, a wide range of financial regulations, supervisory practice, and safety-net arrangements, including deposit insurance, have to be reexamined in the context of globally linked financial markets and international spill-overs of policy actions.

Banks’ cross-border activities pose particular challenges: banking sector integration is on-going—as witnessed by several major cross-border mergers, and the operation of global wholesale financial markets. Yet, supervisory systems and safety-nets are still nationally based, and effective coordination mechanisms are still being developed. Policy-makers are considering how to achieve the best combination of mechanisms to reduce the probability of banking crises and deal effectively with the incidents that may occur, while also promoting the integration and efficiency of the financial system.

Thus far, the policy debate (and the literature) on financial sector stability framework have focused mainly on the coordination of prudential supervision and lender of last resort facilities (for example, Kahn and Santos, 2002).¹ Relatively little attention has been paid until recently to deposit guarantees schemes and how they affect financial stability in countries with interconnected financial systems.² Quite neglected has been the issue of how deposit guarantee schemes interact with prudential supervision in determining the risks of a crisis and its costs, especially in a cross-border context.³

This paper attempts to bridge this gap by exploring the optimal coordinated design of both deposit guarantees and prudential supervision. We show that, under certain assumptions, a relation exists between optimal level of prudential supervision and deposit guarantees. We show also how the optimal levels of each type of regulation depends on the possible spill-overs in a multi-country setting in which country policy-makers cooperate to various degrees. The paper thus contributes to the theoretical underpinnings of the design of the financial sector stability framework and, more specifically, to an integrated approach to prudential and deposit guarantee regulation.

To this end, we adapt the model of Dell’Ariccia and Marquez (2001), where each policy-maker aims to maximize expected welfare, which depends on both the profitability and

1. The stability framework encompasses prudential regulation, lender of last resort, deposit guarantees, and reorganization and winding up. We will use the term “deposit insurance” and “deposit guarantee” interchangeably. For concision, we will also use the terms “regulation” and “supervision” to encompass both activities.

2. The renewed attention being paid to deposit insurance was marked by the issuance of the “Core Principles for Effective Deposit Insurance Systems,” which was released jointly by the Basel Committee on Banking Supervision and the International Association of Deposit Insurers in June 2009.

3. Some countries have risk-based premia on deposit guarantees, which implies a recognition of how deposit guarantees may affect, and be affected by, the probability of a bank getting into difficulties. However, premia have typically been based only on the riskiness of individual banks and volume of deposits, without regard to the effectiveness of prudential supervision, not to mention the potential cross-border externalities.

the stability of the banking system which it oversees. However, there is a trade-off between the two objectives. Furthermore, there are externalities across countries (for example, the stability of the financial system in one country contributes to that in another) and therefore an incentive to cooperate. The multi-country setting of the model represents decentralized decision-making (see for example Nieto and Peñalosa, 2004 for the EU case). In our paper, each policy-maker has two instruments, namely, the stringency of prudential regulation and supervision on the one hand, and the extent of deposit guarantee provision on the other. Prudential supervision is effective in making the financial system more stable, but it is costly. Anticipated deposit guarantees (or another de facto or de jure guarantee for claimants on a bank) increase the probability of a banking crisis by generating moral hazard, but, if a banking crisis occurs, the costs are reduced by the availability of guarantees because they limit the incentives for bank runs and reduce other social costs, such as the disruption of depositors' payments. In this framework, we can define the optimal design of prudential supervision and deposit guarantee regulations in a multi-country integrated banking market, where policy-makers have either similar or asymmetric preferences.

Section two of the paper reviews related academic literature. Our analysis is particularly relevant to the case of the EU, where policy makers are currently engaged in the reform of the financial stability framework and financial markets are especially well-integrated. Hence, the third section reviews this framework and current reform plans. We present our basic model for prudential supervision and deposit guarantees in section four. In this section, we explore the different solutions both in the case of isolated countries as well as in the case of countries that have integrated their financial systems where regulators' actions (or lack of action) on prudential supervision and deposit guarantees may spill over into across borders. More specifically, we explore the possibility that country policy-makers take into consideration the spill-overs and cooperate in setting the level of supervisory effort either by itself or jointly with the coordination of deposit guarantee coverage. Several extensions are presented in the following section, before conclusions are drawn.

2 Related Literature

The incentives for prudential regulators to cooperate and the optimal design of regulation in a multi-country framework have drawn the attention of academics in recent years. This interest was initially motivated by the trend towards greater financial market integration, especially in Europe, by the recent global financial crisis has intensified awareness of the perilous interconnections among financial institutions and markets.

Dell’Ariccia and Marquez (2001) studied competition among prudential regulators in a multi-country setting.⁴ These authors studied how competition among regulators affects regulatory standards and which factors favor the emergence of “regulatory unions” among countries. The authors present a model where national regulators concerned with stability and profitability of their country’s banking system set their regulatory policies non-cooperatively, and establish conditions under which a centralized international regulator is more likely to emerge. The main conclusion is that in a setting of many countries with heterogeneous preferences, a centralized regulator will be preferred if such a regulator were to choose regulatory standards higher than those of the country with the highest individual standards. This will be the case when the negative impact of increased regulation for a regulator’s own country is not too large (i.e., the impact on banks’ profits of increasing prudential regulation does not overwhelm the benefits of greater stability).

Holthausen and Rønde (2005) analyze the information exchange between prudential supervisors in the EU, and show that, as long as the interests of the supervisors do not perfectly coincide, the host country supervisor does not reveal all the information that it possess. As a result, it is not possible to implement the first-best bank closure rule. The authors also show that the better aligned are the interests of the supervisors, the more detailed information can be exchanged and the higher is the welfare resulting from the closure decision. In this context, they propose a goal conflict resolution mechanism that relies on supranational supervision. The supranational supervisor has fewer possibilities for exploiting the information that it receives to its ‘own’ advantage than does the home country supervisor that is better informed than the hosts. This alleviates the incentive problems in the information exchange. The authors conclude that, even if there is no political consensus for creating a centralized supervisor in the EU, the centralized supervisor may still lead to better prudential supervision.

The incentives of supervisors to cooperate in a multi-country setting have been studied also by Freixas (2003), who shows that information asymmetries and country differences in prudential capabilities—such as what presently exists in Europe—will most likely lead to suboptimal decisions and outcomes that can be improved upon through cooperative decision making and centralized information. In a multi-country setting, the cost of a cross-border banking crisis would increase both because it requires ex post cooperation that may lead to inefficient rescues, and because it diminishes the incentives to collect accurate information ex ante. As a result, the optimal supervisory policy in a multi-country-setting has to be stricter. This finding is in line with those of Dell’Ariccia and Marquez (2001). Buch and DeLong (2008) use cross-border bank mergers as a natural experiment to test changes in risk and the impact of supervision: an acquirer entering a country with strong supervision appears to shift risk back to its home country. The results suggest that bank supervisors can reduce

4. Dell’Ariccia and Marquez (2006) provide more micro-foundations for their model.

total banking risk in their countries by being strong, and therefore there is an added incentive to cooperate when there are few barriers to cross-border mergers.

Kane (2002) argues that incumbent politicians and regulators do not necessarily respond to regulatory arbitrage by improving their regulatory systems. They may attempt, either instead or as well, to form cross-country regulatory cartels and to curtail industry criticism during their watch by offering their constituencies hard-to-observe supervisory and regulatory subsidies (e.g. more lenient solvency requirements). The speed and extent to which regulatory competition may lead to better regulation on average varies with the accountability design and political system within which the regulatory culture is embedded. In Kane's view, this conclusion affirms the need to focus on regulatory incentives, and to recognize differences in regulatory culture as a largely exogenous constraint on the problem of finding optimal ways to internalize deposit-guarantee externalities across countries.

Deposit guarantees are generally seen as presenting a trade-off between the benefits that it yields in times of banking crisis and the moral hazard it engenders in normal times (see for example Garcia, 2000, or Barth, Caprio, and Levine, 2006). Once suspicions arise about the quality of a bank's assets, a deposit run may occur; even if the bank is in fact solvent the run may also spread to other banks which are viewed as vulnerable to contagion. If a bank actually fails, the cost to society is magnified by the disruption to the availability of liquidity. The non-availability and possible loss of deposits consequent to a bank failure may be especially harmful to poorer and financially less sophisticated section of the population, who hold fewer alternative assets. These negative effects are diminished by the availability of deposit guarantees. Yet, the safety provided by deposit guarantees reduces the incentive for depositors to evaluate the soundness of the institutions where they place their money; deposit financing flows to banks independent of their riskiness. Furthermore, bank managers and owners have more incentive to undertake risky lending, since some of the downside risk is assumed by the deposit guarantees scheme. If the costs of a deposit guarantee scheme are partly met with taxpayers' money, the scheme should reduce banks' net funding costs, leading them to expand lending more than they would have otherwise.

The design of deposit guarantees and its effects on financial stability has been the subject of empirical research. Demirgüç-Kunt and Detragiache (2002) and Barth, Caprio, and Levine (2006) conclude that "more generous deposit insurance is associated with a higher probability of suffering a systemic banking crisis." Demirgüç-Kunt and Huizinga (2004) find that deposit guarantees lowers deposit interests rates but also weakens market discipline. Laeven (2004), and Demirgüç-Kunt, Kane and Laeven (2006) find that deposit guarantee coverage is significantly higher in countries where poorly capitalized banks dominate the market and in countries where depositors are poorly educated. The latter's results suggest also that deposit guarantees subsidizes banks that are prepared to exploit weaknesses in supervisory risk control to extract value from taxpayers and safer banks. Thus, political economy considerations are important in the determination of deposit guarantees and prudential supervision. These considerations may gain in importance and complexity in a cross-country setting.

Although the literature on deposit guarantee schemes concentrates more on single-country settings, notable exemptions are Eisenbeis and Kaufman (2006 and 2008), who propose principles to ensure the efficient resolution of EU cross-border banks, and Eisenbeis (2006), who associates the likely incident of systemic risk and the negative externalities with the bank resolution procedures (including deposit guarantee arrangements). Recently,

Krimminger (2008) has reviewed issues relating to deposit insurance in the management of cross-border banking crises. Mayes, Nieto and Wall (2008) advocate a prompt corrective action regime as a mechanism of coordination aimed at minimizing the private and public costs of deposit insurance. Goodhart and Schoenmaker (2006) focus on the issues associated with recapitalizing a distressed bank that operates in two or more countries, many aspects of which have parallels to the issues likely to arise when a cross-border bank is forced into resolution and compensation is to be paid by deposit insurance.

3 Current Regulation of Supervision and Deposit Guarantees in the EU

In the context of a decentralized decision-making framework, EU policy makers have traditionally relied mainly on the setting of regulatory standards to achieve the integration of the financial markets of member states.⁵ Regulatory harmonization in the EU has by and large set a lower bound on safety and soundness. For example, the EU directive on deposit guarantees gives member states latitude in regard to financing (*ex ante versus ex post* funding), establishing the coverage level above a minimum, and administering the schemes publicly or privately (Eisenbeis and Kaufman 2007, Garcia and Nieto, 2007, and Hoelscher, Taylor and Klueh, 2006).

Banking Directives have established three broad types of principles: home country control; mutual recognition of supervisory authorities; and minimum requirements for authorizing banks as well as capital requirements and deposit guarantees. More specifically, the EU directives on solvency⁶ and depositor protection⁷ were designed mainly with the aim of discouraging credit institutions within the EU from using different features of solvency requirements and depositor protection to compete unduly with each other or to circumvent regulations. When these directives were issued, EU financial markets were not as integrated as they are now, so policy makers did not focus on provisions directly aimed at safeguarding systemic financial stability.

Yet, the lack of full harmonization hinders coordination among regulators and other concerned agencies, and poses an additional challenge for information sharing. Moreover, it creates the potential for negative externalities, especially in the case of a bank failure.⁸ There may also be neglected positive spill-overs from certain policies, such as those that promote greater stability or efficiency for the system as a whole. These positive spill-overs may be neglected by national decision makers (coordination failure), who therefore do not pursue them as vigorously as would be justified by their contribution to overall welfare.

The financial crisis has shifted the debate dramatically. Starting in early October 2008, EU member countries effectively raced on another to extend deposit and other bank guarantees. Countries strove to ensure that deposits and other financing remained available to their banks. Subsequently the EU countries began to act in a more coordinated fashion, including on deposit guarantees.⁹ The longer term consequences of these dramatic events and the political economy effects had yet to play out at the time of writing.

5. There are also non-prudential elements, such as limitations on government subsidies and other measures that protect domestic institutions.

6. Directive 2006/48/EC of the European Parliament and of the Council of 14 June 2006 relating to the taking up and pursuit of the business of credit institutions (recast), Official Journal of the European Communities 30 June 2006, L 177 (the so-called Capital Requirement Directive). The Capital Requirement Directive is being revised at the time of writing, in part to strengthen provisions on cross-border risks and their supervision.

7. Directive 94/19/EC of the European Parliament and of the Council of 30 May, 1994 on deposit-guarantee schemes. Official Journal of the European Communities 31 May, 1994, L135/5, amended by Directive 2009/14/EC of the European Parliament and the Council of 11 March, 2009.

8. See discussion in Decressin, Faruqee and Fonteyne (2007).

9. The 2894th Council of the European Union agreed an increase of the minimum coverage up to €50,000 among the measures adopted in order to offer immediate responses to the financial turmoil (Luxembourg, 7 October, 2008). Some countries had long had deposit guarantees above this level, and by early October other had introduced additional measures including, in some cases, full guarantees of a wide range of bank liabilities. In 2009, the Directive on Deposit Guarantees was amended to cover deposits up to €50,000 by June 2009 and €100,000 by 2010.

4 A Model of Supervisory and Deposit Guarantees Coordination

In this section, we model in a simple way the optimal level of prudential supervision and deposit guarantees in the case of policy makers that only consider the policy impact in their own country, and the case of policy makers that have similar preferences and consider the impact of their policies in a multi-country setting. We adapt the model of Dell’Ariccia and Marquez (2001) to allow for competition and cooperation in the provision of deposit guarantees. Each country’s policy makers are concerned to promote the profitability of the financial sector and economic activity generally, but they also want to reduce the probability of having a financial crisis and its severity should one occur. To this end they use prudential regulation and supervision, and also deposit guarantees; each has its own costs and benefits, and thus an optimal amount to be supplied.

More prudential regulation and supervision (S) in a country reduces the probability of a financial crisis occurring and its severity (ρ). Note that regulation and supervision is taken in a broad sense to include, for example, transparency and governance rules, and also action by supervisors to enforce regulations such as requiring banks to take early remedial action once excessively risky behavior is detected. However, supervision is costly; the regulatory burden will impinge on financial sector profits or economic activity generally (Γ).¹⁰ Supervision is costly and creates a burden that has to be borne by someone in the economy. One may think of the burden as being borne by financial institutions, whose profits are reduced, but this is not necessary—costs may be borne ultimately by depositors and borrowers.

Deposit guarantees (D) give rise to a different sort of trade-off: having more generous guarantees is good when a country is faced with a crisis; there is less contagion among financial institutions, and depositors and others suffer lower costs from a disruption in the availability of liquidity.¹¹ Even if deposit guarantees were in the first instance purely redistributive, spreading the burden of a bank failure would be beneficial if marginal utility of wealth is declining. However, deposit guarantees also give rise to moral hazard because the protection against down-side risk reduces depositors’ incentive to monitor and control the behavior of bank managers; effectively, risk taking is subsidized, so more risks are taken. Because both the intensity of prudential supervision and the level of deposit guarantees affect the probability of a banking crisis, policies in these two areas interact.

It is convenient to describe the model in terms of deposit guarantees, but the same effects may be achieved by other mechanisms that effectively give banks’ creditors prompt access to their funds with little or no loss of principal. In particular, the prospect of an ad hoc bail-out if a bank fails can induce moral hazard on the part of banks and those

10. To some extent good regulation and supervision may reduce the riskiness of banks and therefore lower their funding costs, which should raise the overall profits for the banking sector or the consumer surplus of the users of bank services. Also, better supervision can enhance overall efficiency by discouraging financing of excessively risky projects. However, stricter regulation is likely to yield positive benefits only up to some point, and a net marginal cost thereafter. Furthermore, regulators may be “captured” by the banking industry or individual banks who bear all the costs but receive only part of the benefits, because some benefits accrue to users of bank services. For these regulators, marginal costs outweigh marginal benefits at a lower level of supervision than for a non-captured regulator. The equilibrium will necessarily be a region where, in the view of the decision-maker, supervision generates marginal costs.

11. The availability of funds to depositors helps ensure that they are able to meet payment obligations, and funds can circulate to other banks, so that they do not become liquidity-constrained in their lending. Where a guarantee is met through “purchase and assumption,” another bank takes over deposits and a collection of loans and other assets from the failed bank. The second bank thereby provides continuity of financing for the assumed loans, thus reducing disruption to borrowers.

who invest in them, but a bail-out may be optimal ex post once a failure has occurred by minimizing liquidity and credit losses. In the context of this paper, deposit guarantees should be understood in the broad sense. For now, the variable D is taken to measure the credibly committed and expected amount of assistance; a country may have to deploy “commitment technology” to ensure that support for claimants on a failed bank is limited to the predetermined deposit guarantees.

Deposit guarantees are (initially) assumed to have no other costs, such as deadweight loss from levying premiums or taxes. Also, from a welfare perspective it does not matter in this model whether banks or taxpayers bear the costs of payouts should there be a bank failure. It is further assumed that information between supervisor and deposit guarantee agency is perfectly symmetric, which, in practice, assumes that the later is either in the supervisory authority (as for example in Ireland, the Netherlands and Spain) or that they are closely related.

4.1 Isolated country case

To fix ideas it is useful to start with the case of a single country. The reduced-form and normalized equation of the welfare function to be maximized is

$$W = \alpha\Pi(S) - (1 - \alpha)p(S, D)(1 - \beta D), \quad \Pi_1, p_1 < 0, p_2 > 0, \quad \alpha \in [0, 1]. \quad (1)$$

The parameters α and β capture the weights attached to various elements that enter the objective function. A policy maker that attaches much importance to bank profitability and economic activity, as opposed to the probability of a financial crisis, will have a high α . A government that attaches much importance to dampening the effects of a crisis through the provision of guarantees will have a high β .

The optimal level of supervision (S^*) and deposit guarantees (D^*) are implicit in the first order conditions:

$$\alpha\Pi_1 - (1 - \alpha)p_1(1 - \beta D^*) = 0 \quad (2)$$

$$-(1 - \alpha)(p_2(1 - \beta D^*) - \beta p) = 0. \quad (3)$$

A subscript denotes a partial derivative with respect to the respective argument. The second order conditions are assumed to be fulfilled. A sufficient condition, which we will assume throughout, is that the second cross-derivative p_{12} is small relative to first derivatives and own-second derivatives.¹² Intuitively, the marginal effects of supervision and deposit insurance on the probability of crisis should not depend importantly on one another.

One can differentiate equations (2) and (3) with respect to α and β and manipulate the equations to establish the sensitivity of the policy choices to the values of the parameters. Assuming that the second order conditions hold, it can readily be shown that the model conforms with certain intuitions: policy makers that give more weight to bank profits rather than stability (a higher α) would provide less supervision. If more weight is attached to reducing the effects of a crisis, more deposit guarantees are provided. As for the parameter β , one can implicitly differentiate equations (2) and (3), and rearrange to obtain

¹² Another sufficient condition is that p_{12} be positive.

$$\begin{pmatrix} dS^* \\ dD^* \end{pmatrix} = \frac{-1}{W_{SS}W_{DD} - W_{SD}^2} \begin{pmatrix} W_{DD} & -W_{SD} \\ -W_{SD} & W_{SS} \end{pmatrix} \begin{pmatrix} (1-\alpha)p_1D^* \\ (1-\alpha)(p_2D^* + p) \end{pmatrix} d\beta \quad (4)$$

The double-subscripted terms in W refer to the second derivatives. By the second-order conditions, the Jacobian of second derivatives evaluated at the optimal values S^* and D^* is negative definite. Hence, $W_{SS}, W_{DD} < 0$; $W_{SD} < 0$ if as assumed p_{12} is small or positive and $W_{SS}W_{DD} - W_{SD}^2 > 0$. Therefore, given the signs of p_1 and p_2 , one can easily establish that $dS^*/d\beta < 0$ and $dD^*/d\beta > 0$. Intuitively, if deposit insurance is more effective in mitigating the effects of a banking crisis, there is more incentive to provide insurance and less incentive to engage in costly supervision. Effective deposit insurance and supervision are in that sense substitutes.

4.2 Two symmetric countries with spill-overs

Suppose now that there are two countries, i and j , whose banks and regulators have similar preferences in terms of efficiency and stability of their banking systems. Their financial systems are interlinked, such that a higher probability of crisis in one country will increase the probability of crisis in the other (for now, that is assumed to be the only linkage). The linkage could go through various channels: The two countries may be subject to common shocks, or be perceived to be subject to common shocks, so that confidence in one is undermined by bank failures in the other; banks in i and j may have interbank dealings with each other, so that the failure of a bank in i , for example, has a direct effect on the solvency and liquidity of banks in j ; a bank in difficulties in i may call in loans to corporations that also borrow from country j banks, which consequently suffer a deterioration in portfolio quality; and some banks in one country may be subsidiaries of banks in the other and thus affected by strain on their parents.

The interlinkage creates positive and negative externalities in policy-making: better supervision in one country reduces the probability that it suffers a crisis, and therefore also the probability that the banks in the other country will be adversely affected; the probability of a crisis in the other country is reduced. In addition, a higher level of deposit guarantees in one country generates more moral hazard and thus a higher probability of a crisis, which increases the probability of crisis in the other country. The function $\rho(\cdot)$ describing the probability of crisis becomes, for country i ,

$$p^i(S^i, D^i, \gamma S^j, \chi D^j) \quad p_1^i, p_3^i < 0, p_2^i, p_4^i > 0, \quad (5)$$

and similarly for country j with the superscripts reversed. The parameters γ and χ capture the degree of spill-over from country j to country i and vice versa; $\gamma, \chi \in [0, 1]$.¹³ The parameters γ and χ could vary across countries, as could α and β . For now though attention focuses on the symmetric case: the spill-over parameters are the same across countries, and regulators have similar preferences in terms of banks' profitability and financial stability, so

$$\alpha_i = \alpha_j = \alpha \quad \text{and} \quad \beta_i = \beta_j = \beta.$$

¹³ Dell'Ariccia and Marquez allow for the possibility that the level of supervision in one country affects bank profitability in the other. Specifically, they assume that supervision is a cost burden that reduces a banking sector's competitiveness, and therefore higher supervision in one country raises bank profitability in the other. This assumption is not essential here but is discussed below.

Given this symmetry in preferences, countries' policy makers will always behave in similar ways. Hence, in this case, if cooperation is worthwhile, it will always involve harmonization.

These spill-overs give rise to the possibility that uncoordinated action will be sub-optimal. In general, countries acting individually will provide less supervision than they would in the cooperative solution because they do not take into account the benefit for others. Furthermore, typically countries will compensate for the relatively low level of supervision by providing more deposit guarantees. Because the probability of crisis in country i is raised by the risk of crisis in country j , i will want to ensure that, should it be hit by a crisis, the effects are cushioned by generous deposit guarantees. This cushioning is offset by the negative externality of deposit guarantees on the ex ante probability of crisis; the net effect will in general be to reduce on expected welfare from what it could be with full cooperation.

In the case of two symmetric countries with the possibility of spill-overs, there are three main possibilities: (i) each country continues to act in their individual national interest; or (ii) some policies are coordinated but others are not; or (iii) all policies are determined on a fully cooperative basis, taking both countries' welfare into account. Under the second possibility (ii), attention will focus on the case where supervision is coordinated but each country determines its own level of deposit guarantees. This dichotomy corresponds roughly to the current situation in Europe where, at least in some areas of prudential regulation (e.g., bank capital adequacy), the common standards are worked out in detail and practice is relatively harmonized, while deposit guarantees are subject to only modest minimum standards, mainly on coverage, which are exceeded in many countries.

To formalize these intuitions, let the reduced form welfare function for country i be

$$W^i = \alpha \Pi^i(S^i) - (1 - \alpha) p^i(S^i, D^i, \gamma S^j, \chi D^j) (1 - \beta D^i). \quad (6)$$

The parameters γ and χ capture the importance of the policy actions of country j for country i ; higher values for these parameters imply that the actions of country j have larger spill-over effects on country i , and, as will be shown, variations in these parameters will affect optimal policy and the gains from cooperation. The welfare function of country j is analogous. Welfare for the two countries together is taken to be the weighted sum of the two countries' welfare. Thus:

$$\begin{aligned} W &= \mu W^i + (1 - \mu) W^j \\ &= \mu \left[\alpha \Pi^i(S^i) - (1 - \alpha) p^i(S^i, D^i, \gamma S^j, \chi D^j) (1 - \beta D^i) \right] + \\ &\quad (1 - \mu) \left[\alpha \Pi^j(S^j) - (1 - \alpha) p^j(S^j, D^j, \gamma S^i, \chi D^i) (1 - \beta D^j) \right] \end{aligned} \quad (7)$$

where μ is the relative weight attached to country i , $\mu \in [0, 1]$. This is the continuous and twice differentiable welfare function that is maximized with respect to all arguments in the fully cooperative case, and with respect to S^i and S^j only in the case of cooperation in supervision alone.

It is convenient to define the following terms:

$$A_S^i \equiv \alpha \Pi_1^i - (1 - \alpha) p_1^i (1 - \beta D^i) \quad (8)$$

$$A_D^i \equiv -(1 - \alpha) (p_2^i (1 - \beta D^i) - \beta p^i) \quad (9)$$

$$B_S^i \equiv -(1 - \alpha) \gamma p_3^j (1 - \beta D^j) \quad (10)$$

$$B_D^i \equiv -(1 - \alpha) \chi p_4^j (1 - \beta D^j), \quad (11)$$

and analogous terms for country j with the superscripts reversed. The terms A_S^i and A_D^i capture the marginal welfare for country i of an increase in its own supervisory efforts or deposit guarantee coverage, respectively. The terms B_S^i and B_D^i capture the spill-over effects on country j of these marginal changes in country i 's policies; ignoring these spill-overs would represent a coordination failure. From the sign of p_3 it can be seen that B_S^i is always positive, and from the sign and p_4 it can be seen that B_D^i is always negative.

The first order conditions S^i and D^i for in the various cases are as follows:¹⁴

(i) Non cooperative, where each country determines its supervisory and deposit guarantee policy separately to maximize its respective version of equation (6) in pursuit of individual national interests:

$$A_S^i = 0 \quad (12)$$

$$A_D^i = 0 \quad (13)$$

(ii) Supervisory cooperation, where each country determines its deposit guarantee policy separately to maximize its respective version of equation (6), but supervision levels in the two countries are chosen to maximize joint welfare (7):

$$\mu A_S^i + (1 - \mu) B_S^i = 0 \quad (14)$$

$$A_D^i = 0 \quad (15)$$

(iii) Fully cooperative, where all four policy variables are chosen to maximize joint welfare (7):

$$\mu A_S^i + (1 - \mu) B_S^i = 0 \quad (16)$$

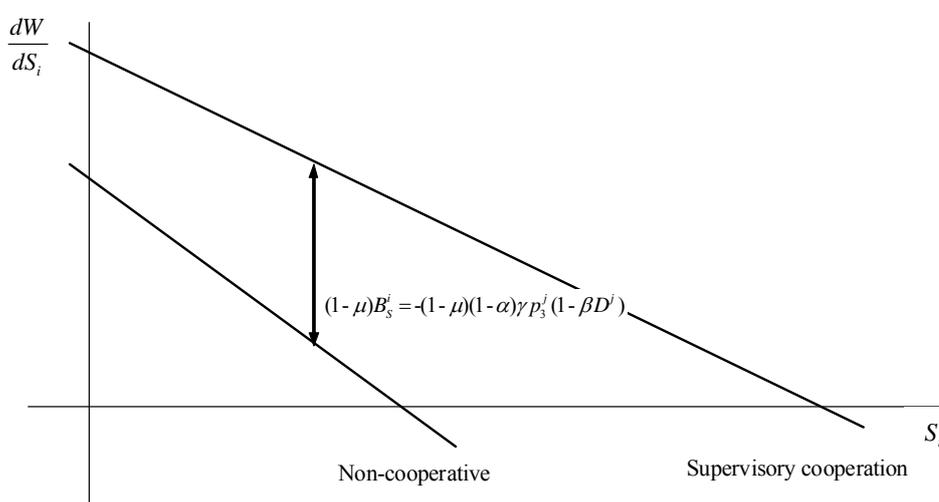
$$\mu A_D^i + (1 - \mu) B_D^i = 0 \quad (17)$$

¹⁴ First order conditions for optimal S^i and D^i are analogous, with the superscripts reversed. Moreover, since policy makers in countries i and j are symmetric, at the optimum $S^i = S^j$ and $D^i = D^j$.

Intuitively, the conditions under supervisory cooperation take into account the positive spill-over of supervision from country to the other (B_S^i) but the marginal cost per unit of supervision does not shift.¹⁵ Hence, more supervision is optimally chosen. Given more supervision, more deposit guarantees yield lower marginal benefit, so less is chosen.

The difference in marginal value of supervision between the non-cooperative and the supervisory cooperation cases can be illustrated by the Figure 1 below: The net marginal welfare of supervision in country i is decreasing, but at any given level of S and D it must be higher when the benefit to the other country is taken into account.¹⁶ Therefore, the level of supervision that solves the optimality conditions for supervisory cooperation must be higher than the optimum under non-cooperation. Once the level of supervision is higher, optimal deposit insurance is lower; as explained above, at the margin supervision and deposit insurance are substitutes.

**Figure 1. Net marginal welfare from supervision
(non-cooperation and cooperation only on supervision)**



More formally, start from the non-cooperative values of S and D , that is, those that satisfy conditions (12) and (13) of the non-cooperative solution.¹⁷ These values would satisfy also condition (15)—which captures the lack of cooperation in deposit guarantees and is thus identical in form to (13)—but condition (14), which captures cooperation in supervision, is not met: $A_S^i = 0$, yet B_S^i is always positive. By the second order conditions for a maximum, one needs a higher value of S to solve (14). Then, using the implicit function theorem on (15) and the assumption that p_{12} is small or positive, it is easy to show that meeting that condition with a higher value of S requires a lower value of D .¹⁸ Higher S and lower D are consistent with meeting condition (14).

¹⁵ This would not be the case if cooperation was in itself costly, perhaps because of the supervisory resources that would have to be devoted to it.

¹⁶ The additional marginal benefit need not be constant, so the curves are not necessarily parallel.

¹⁷ Since the countries are symmetric, a parallel argument applies to supervision and deposit guarantees in each country, and we can neglect country superscripts.

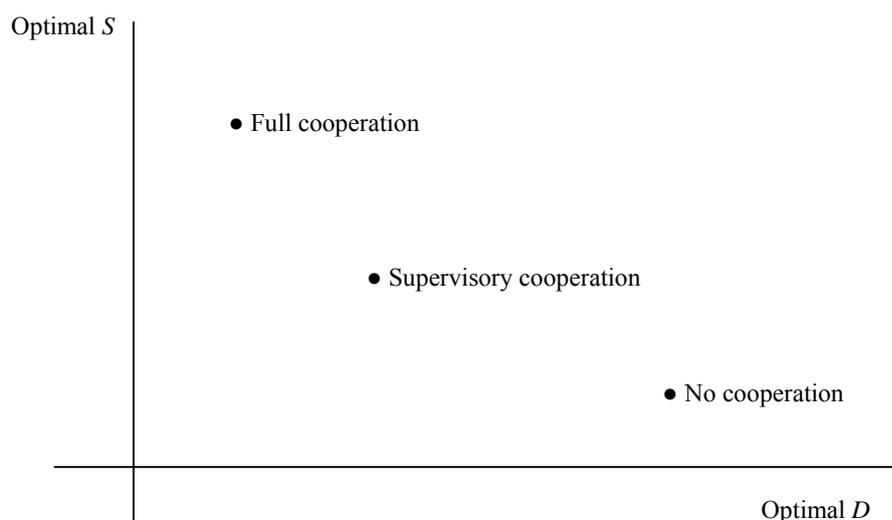
¹⁸ Under the assumption that second cross-derivates are relatively small, the derivatives of A_S^i and B_S^i with respect to D are both necessarily positive.

The conditions under full cooperation take into account both the positive spill-over of supervision (B_S^i) and the negative spill-over of deposit guarantees (B_D^i). Hence, under full cooperation there should be more supervision and even less deposit guarantees than in the other two cases.

A comparison can be made between the values of S and D that solve conditions (14) and (15) for cooperation only on supervision, and those that solve (16) and (17) for full cooperation that is analogous to the comparison made above related to conditions (12) and (13) and conditions (14) and (15). B_S^i and B_D^i are always positive and negative, respectively, A_S^i is decreasing in S , and A_D^i is increasing in D , so the only way to satisfy the fully cooperative conditions is with still more supervision and less deposit guarantees than under supervisory cooperation only.

The three cases can thus be arranged from high supervisory effort, relatively low deposit guarantees under full cooperation, to low supervisory effort and high deposit guarantees under no cooperation; cooperation only on supervision results in an intermediary case (Figure 2).

Figure 2. Optimal supervision and deposit guarantees (two symmetric countries with spill-overs)



It is notable that countries have incentives to renege on commitments to cooperate; an enforcement mechanism is needed to realize gains from cooperation. Each country acting in a self-interested fashion would prefer the other to act cooperatively, while it spares itself the added costs. For example, if country i chooses S^i and D^i according to the full cooperation conditions (16) and (17) and thus provides more supervision and less deposit insurance than it would otherwise, it reduces the probability of a crisis in country j as well. Country j therefore has an incentive to “free ride” by providing less of costly supervision unless cooperation is enforced.

Certain policy conclusions follow, at least for symmetric countries where policy makers have similar preferences in terms of profitability and safety and soundness under the assumption of symmetry and costless information and coordination:

- Full coordination of prudential supervision and deposit guarantees would result in the highest level of safety and soundness and involve the lowest provision of deposit guarantees.
- Cooperation in prudential supervision without deposit guarantees is better than no cooperation, but is sub-optimal compared to cooperation in both policy areas;
- Absent cooperation, countries tend to provide too little prudential supervision because they do not take account of the benefit to others. To compensate, countries provide more generous deposit guarantees than would be first best; and
- Agreement to cap deposit guarantees could be beneficial. Especially in the absence of full cooperation in prudential supervision—but also if only deposit guarantees is determined on a national level—each country may tend to provide excessively generous deposit guarantees, which protects its own depositors but has an adverse effect on financial stability everywhere. Capping deposit guarantees will induce countries to tighten supervision and thus move closer to the cooperative optimum.

5 Extensions

So far a number of simplifying assumptions have been made to bring out the main points. Here we relax some of these assumptions to consider the possibilities that policy makers do not share the same preferences or where countries differ in other regards; that deposit insurance is costly in itself; that the direct costs of supervision spill over across borders or that coordination generates its own costs; that policy-makers cannot always commit themselves to limit deposit guarantees; and that the supervisor and the deposit guarantee agency have divergent interests or information. Most qualitative results survive, and some considerations strengthen the argument for cooperation.

5.1 *Asymmetric countries*

Banks and financial regulators may have different preferences and face different economic relationships. Countries could be asymmetric in terms of the importance they attach to the two elements of the welfare function; their relative weight in a common welfare function (α and β); the marginal effects of S and D in the bank profit and crisis probability functions due to different institutional arrangements; and the magnitude and sign of spill-overs (χ and γ) due to the importance of their cross border activity.

The model has some plausible implications. A country that is strongly influenced by the condition of banks in the other country and thus by the other country's stability policies (χ and γ are large) will gain much from coordination. This effect can be seen by examination of equations (10) and (11), which define the marginal spill-over of supervisory and deposit guarantee policies, respectively. These expressions are larger in absolute magnitude, the larger are χ and γ . Hence, the change in the other country's behavior will be larger when cooperation is introduced, and the benefit for the "host" country will be larger.

The gain from cooperation will be especially large when the country receives a relatively high weight (μ) in the collective objective function that represents the decision making. In the European context, the financial systems of smaller countries are often dominated by subsidiaries of banking groups from larger countries, yet European institutions usually place importance on consensus, such that small countries have importance in decision-making that is disproportionate to their economic size. Hence, for these small countries would be rational to enhance supervisory cooperation.

Equations (10) and (11) also indicate that the marginal benefit of action by the other country will be small for a country whose policy makers give a high value to the preference parameter α , that is, a country which places much weight on bank profitability. That country's welfare is not very sensitive to the reduced probability of a banking crisis that the other country's cooperative actions could achieve. Also, the higher is the value of β (that is, a country whose policy makers place much weight on financial stability), the smaller is the magnitude of the marginal benefit of supervision by the other country: a high β indicates that deposit guarantees is relatively effective in cushioning the effects of a bank failure. Hence, a diminution of the risk of failure induced by stronger supervision abroad does not contribute much to welfare.

The asymmetric case makes it interesting to consider the possibility of an additional type of equilibrium, namely, one in which both supervision and deposit guarantee levels are

not only determined cooperatively, but must also be fully harmonized across diverse countries. Then, as in Dell’Ariccia and Marquez (2001), if countries differ sufficiently, a cooperative solution with harmonization may not be worthwhile. This harmonization solution improves on the un-coordinated, non-cooperative solution in that spill-overs are taken into account, but at the cost of imposing policies that are optimal for no one country. Various loci can be defined, along which countries are indifferent to cooperating or not. For example, if one country is very concerned about the profitability of its banking system and another attaches a great deal more weight to stability, they may find it impossible to find a cooperative solution with harmonization.

Despite the possible costs of full harmonization, some cooperation (in the form of minimum or maximum standards) is in general worthwhile for each country: starting from the non-cooperative equilibrium, a little cooperation small movement in a policy variable in the direction of cooperation incurs zero net marginal cost to the originating country, but yields a positive marginal benefit for the other country in terms of positive spill-overs. Suppose for example that country i attaches more importance to banks’ profitability than country j , so that $\alpha^i > \alpha^j$. In this case, country i tends to have weaker supervision and more generous deposit guarantees than country j . Consider the non-cooperative equilibrium, where countries determine policy settings according to equations (12) and (13). From this starting point, a marginal increase in supervision by country i (dS^i) and a marginal decrease in deposit guarantees ($-dD$) leave i ’s welfare unchanged, since i has maximized its welfare with respect to these variables (the first order conditions imply that the welfare function is locally flat). However, using equation (6) applied to country j , these marginal adjustments change j ’s welfare by

$$-(1 - \alpha^j) (\gamma p_3^j dS^i - \chi p_4^j dD^i), \quad (18)$$

where $\gamma p_3^j dS^i$ represents the spill-overs of weaker supervision of country i into j and $\chi p_4^j dD^i$ represents the spill-overs of higher deposit guarantee coverage in i into country j . The marginal adjustment is certainly positive given the assumptions that $p_3 < 0$ and $p_4 > 0$. Hence, it should always be possible to agree on a minimum prudential standard of supervision that is at least slightly binding on the weakest supervisor, and a maximum level of deposit guarantees that is at least slightly binding on the most generous deposit guarantee scheme.

5.2 Additional costs of deposit insurance

Deposit guarantees could generate additional costs, either for banks or for society more widely. The guarantee premiums are often viewed as a tax, which reduce banks’ profits.¹⁹ If the costs are passed along to banks’ clients, or if the deposit guarantee payouts are substantially funded from tax revenues, deadweight loss is likely to be generated elsewhere in the economy.

To model this possibility, an extra term is added to the function Π for bank profits or general economic activity to capture the extra expected cost of deposit guarantee premiums, which in actuarial terms equals the probability of a payout multiplied by its level.²⁰ Thus, for an isolated country, the welfare function becomes

$$W = \alpha \Pi(S, pD) - (1 - \alpha) p(S, D)(1 - \beta D), \quad \Pi_1, \Pi_2, p_1 < 0, p_2 > 0, \quad \alpha \in [0, 1]. \quad (19)$$

¹⁹. However, even if banks notionally bear much of the explicit cost of the deposit guarantee scheme, the guarantee could reduce their funding costs, in which case the net costs to banks would be reduced.

²⁰. At the level of abstraction of this model, there is no distinction between costs to banks and costs to the economy as a whole.

The new first order conditions for a maximum are

$$\alpha\Pi_1 + \alpha\Pi_2 p_1 D^* - (1-\alpha)p_1(1-\beta D^*) = 0, \text{ and} \quad (20)$$

$$\Pi_2(p_2 D^* + p) - (1-\alpha)(p_2(1-\beta D^*) - \beta p) = 0. \quad (21)$$

In equation (20), the term involving Π_2 is positive, so the optimal level of supervision is higher; more supervision not only reduces the probability of a crisis, but also reduces the costly premiums that have to be paid for deposit insurance. In equation (21), the term involving Π_2 is negative, so the optimal level of deposit insurance is less than it would be without consideration of this extra cost factor.

The outcome with cross-border spill-overs is analogous; there tends to be more supervision and less deposit insurance because good supervision reduces costly premiums in both countries. Country i 's welfare function becomes

$$W^i = \alpha\Pi^i(S^i, p^i(S^i, D^i, \gamma S^j, \chi D^j)D^i) - (1-\alpha)p^i(S^i, D^i, \gamma S^j, \chi D^j)(1-\beta D^i), \quad (22)$$

and similarly for country j . In the full cooperation case, for example, the first order conditions for S_i and D^i become

$$\mu(A_s^i + \Pi_2^i p_1^i D^i) + (1-\mu)(B_s^i + \Pi_2^j \gamma p_3^j D^j) = 0 \quad (23)$$

$$\mu(A_D^i + \Pi_2^i(p_2^i D^i + p^i)) + (1-\mu)(B_D^i + \Pi_2^j \chi p_4^j D^j) = 0. \quad (24)$$

These equations contain the same extra terms involving Π_2^i as found in equations (20) and (21). Moreover, they contain extra terms involving Π_2^j that capture the extra spill-overs: in equation (23), the term $\Pi_2^j \gamma p_3^j D^j$ is certainly positive (reflecting how supervision in country i reduces the probability of crisis and thus deposit insurance costs in j), so the optimal level of supervision is higher. In equation (24), the term $\Pi_2^j \chi p_4^j D^j$ is certainly negative, so less deposit insurance should be provided by i when account is taken of the extra costs for j . It is easy to see that, if only supervision is coordinated, taking into account extra deposit insurance costs still increases the incentives for supervision.

5.3 Cross-border supervisory costs

Supervision in one country (say, i) could be costly to banks in the other country (say, j) if they operate in i and are subject to its supervision.²¹ Introducing a term S^j into the function Π^i with a negative partial derivative would not greatly alter the analysis, although cooperation might then entail less supervision if the negative spill over onto profits were strong enough. However, it could also be the case that supervision in i has a positive effect on profits of country j banks by raising the costs of their competitors from i (as assumed by Dell'Ariccia and Marquez), in which case the incentives to under-supervise and provide more deposit guarantees are enhanced in country j .

21. Costs could include, for example, those of additional reporting requirements or higher supervision fees.

5.4 Coordination costs

Costs to cooperation and coordination could be made explicit. Because the model has no informational or organizational costs, full coordination is always optimal and can be no worse than decentralized decision making (so long as harmonization is not imposed on highly asymmetric countries). It could however be that supervisors and deposit insurers know their own local banks best, and therefore uncoordinated decision making results in greater informational efficiency that partly offsets the welfare cost of neglecting externalities. Some limit on cooperation would then be optimal. Note, however, that this argument applies to situations in which one country supervises or provides deposit guarantees for (branches and subsidiaries of) banks from another country.²² It does not apply to situations in which the spill-overs are channeled directly through the banks, for example because of interbank lending or contagion affecting investor confidence in different countries. In such situations, national agencies would deal just with their own banks, so informational asymmetries should not matter.

5.5 Inability to limit deposit guarantees ex ante

Many countries increased deposit insurance coverage during the recent financial crisis, and in some cases extensive guarantees were announced even after it became apparent that one or more financial institution was in severe difficulties. It seems that, at least in extreme situations, countries cannot credibly and irrevocably pre-commit to a level and breadth of coverage of their guarantees of deposit and other bank liabilities.

If there is no pre-commitment at all, then the only policy variable is the level of supervisory effort. Let the ex post optimal deposit insurance be designated by \hat{D} , which is presumed to be higher than what would be chosen ex ante. For an isolated country, the optimal level of supervision is given by equation (2) evaluated at $D = \hat{D}$. Under our assumptions, the authorities will then choose less supervisory effort than when the level of deposit insurance is chosen ex ante because crises are less costly than they would be otherwise; at the margin it is less worthwhile to bear the costs of supervision. More formally, one can use the implicit function theorem on (2) to derive that $\partial S^*/\partial \hat{D} = (1-\alpha)(p_{12}(1-\beta\hat{D}) - \beta p_1)/W_{SS}$, evaluated at $D = \hat{D}$. The denominator is negative by the second order conditions, and $p_1 < 0$. Hence $\partial S^*/\partial \hat{D} < 0$ if $p_{12} > \beta p_1 / (1-\beta\hat{D})$ – a negative number; higher deposit insurance is associated with less supervisory effort.

Likewise, an inability to commit to a level of deposit guarantees limits the scope for cooperation to supervision. But coordinating supervisory effort is still worthwhile: supervision in one country still contributes to the financial stability of the other; the optimal condition is given by (14) evaluated at $D^i = D^j = \hat{D}$. For the same reasons as in the isolated country case, the level of supervision will typically be higher in both countries than it would be if deposit insurance coverage is limited in advance.

5.6 Divergent objectives

The objective function of supervisors may diverge from that of the providers of deposit guarantees. For example, the supervisor and/or the deposit guarantee provider may have bureaucratic incentives to expand their mandates or avoid what may be seen as embarrassing failures. Alternately, one or the other may be more prone to capture by industry

²² In the EU, a host country may provide deposit guarantees to branches of foreign banks only as “topping-up” of the home country coverage.

interest groups, fiscal interests, or political groups, in which case it will be important to determine who bears the cost of deposit guarantees.²³ The divergence may be especially wide when the supervisory agency and the deposit guarantee agency are separate institutions, answerable to different constituents. In some countries of Europe, for example, deposit guarantees are provided on a mutual basis by groups of banks, while supervision is a responsibility of central government.

However, the qualitative results presented here should be robust to such complications. For example, suppose that the deposit guarantees provider is especially concerned about the expected cost of deposit guarantee payouts. This concern might be captured by including an additional term in the deposit guarantees provider's objective function, which might become

$$W^{iD} = \alpha \Pi^i(S^i) - (1 - \alpha) p^i(S^i, D^i, \gamma S^j, \chi D^j) (1 - \beta D^i) - \nu p^i D^i, \quad \nu \in [0, 1],$$

where the superscript D indicates that the objective function applies to the deposit guarantee scheme, ν is a parameter, and $p^i D^i$ is the expected deposit guarantee payout. It is easy to show that less generous deposit guarantees are provided than the supervisor would like. Yet, the tendency for cooperation to lead to increased supervision and decreased generosity of deposit guarantees would remain, and indeed the deposit guarantees provider would welcome the move.

23. Hardy (2006) applies the concept of regulatory capture to banking supervision.

6 Conclusions

The need to improve deposit guarantees is becoming more widely recognized, at a time when it seems that even very large financial institutions risk suddenly running into liquidity and eventually solvency difficulties. However, current approaches to deposit guarantees are diverse, and there is incomplete consensus about what an ideal scheme would look like. Furthermore, policy makers have paid little or no attention to the interrelation between the level of deposit guarantees and optimal supervisory effort.

This paper attempts to contribute to the theoretical underpinnings of concerted reforms in these areas that are under way following the global financial crisis, and in particular when the EU is politically committed to reform its financial sector stability framework. Specifically, we examine the optimal level of prudential supervision and deposit guarantee regulation in a multi-country integrated banking market, where policy-makers have either similar or asymmetric preferences regarding profitability and stability of the banking sector.

Policy conclusions of our paper include the following:

- For an individual country, the optimal tightness of level of prudential regulations, supervision and enforcement is linked to the deposit insurance scheme. Effective supervision is costly but also reduces the need for deposit insurance, which may generate moral hazard. Correspondingly, if a country's deposit insurance scheme is not very effective in mitigating the costs of banking failures when they occur, then the country should strive for good supervision, even at some extra costs to banks and overall economic performance during normal times.
- In a multi-country setting, the first best approach would involve the simultaneous strengthening of prudential supervision and limiting depositor protection. However, each country has an incentive to "free ride" on the strengthened supervision of others, so an enforcement mechanism such as mutual evaluations is needed.
- Strengthening coordinated prudential regulation and supervision is valuable even if deposit guarantee schemes are not well coordinated. Stronger supervision (which can be taken to include enforcement action that requires imperiled banks to take remedial action long before they are insolvent) will reduce the need for deposit guarantees, and help induce countries to limit protection to depositors and other bank creditors.
- Consideration should be given to establishing not only a minimum level of deposit guarantee coverage, but also, if possible, a maximum level. Countries may have difficulty in abiding by this upper limit at times of systemic distress, but the cooperation described here would still be useful when dealing with isolated bank failures, and cooperation in supervision is valuable even if countries cannot commit to limiting deposit guarantees.
- Additional considerations may strengthen or weaken the case for cooperation. Asymmetric countries can still benefit from some cooperation. Accounting for deadweight losses associated with funding deposit guarantees makes cooperation in supervision more valuable.

The analysis and conclusions are of general application but are especially relevant to the EU and associated countries. First, at least some aspects of the EU banking market are already well-integrated; even cross-border linkages in retail banking are becoming more important, especially in the new member states. Potential spill-over effects are large. Second, the EU has mechanisms to negotiate and enforce coordination of prudential regulations and supervision, and deposit insurance schemes. However, these mechanisms have to take into account the mandates and powers of numerous national supervisory authorities and deposit insurance agencies, not to mention central banks and finance ministries. Finally, the EU and its member states are currently engaged in reforming the frameworks for both prudential supervision and deposit insurance to address the deficiencies revealed by the recent crisis.

REFERENCES

- Barth, James R., Gerard Caprio Jr., and Ross Levine (2006), *Rethinking Banking Regulation: till angles govern*, Cambridge University Press, New York.
- Buch, C. M. and Gayle DeLong (2008), "Do Weak Supervisory Systems Encourage Bank Risk-taking?" *Journal of Financial Stability*, Vol.4, No. 1, pp 23-39.
- Kahn, Ch. M., and Santos J. A. C. (2002), "Allocating Lending of Last Resort and Supervision in the Euro Area," in V. Alexander, J. Melitz and G.M. von Furstenberg, (eds.) *Monetary Union: Why, How, and What Follows?*, Oxford University Press, London.
- Decressin, Jörg, Hamod Faruqee, and Wim Fonteyne (2007), *Integrating Europe's financial markets*, International Monetary Fund, Washington D.C.
- Dell'Ariccia, Giovanni, and Robert Marquez (2001), "Competition Among Regulators," International Monetary Fund Working Paper WP/01/73.
- Dell'Ariccia, Giovanni, and Robert Marquez (2006), "Competition Among Regulators and Credit Market Integration," *Journal of Financial Economics* 79, pp. 401-430.
- Demirgüç-Kunt, Asli, and Enrica Detragiache (2002), "Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation," *Journal of Monetary Economics* 49(7), pp. 1373-1406.
- Demirgüç-Kunt, Asli, and Harry Huizinga (2004), "Market Discipline and Deposit Insurance," *Journal of Monetary Economics* 51(2), pp. 375-99.
- Demirgüç-Kunt, Asli, Edward J. Kane, and Luc Laeven (2006), "Determinants of Deposit -Insurance Adoption and Design," World Bank Policy Research Paper No. 3969, Washington D.C.
- Eisenbeis, R. A. (2006), "Home Country versus Cross-Border Negative Externalities in Large Banking Organization Failures and How to Avoid Them," Federal Reserve Bank of Atlanta Working Paper 2006-18, October, reprinted in Evanoff, Douglas D., George G. Kaufman, and John Raymond LaBrosse (eds.) (2007), *International Financial Instability: global banking and national regulation*, World Scientific, New Jersey.
- Eisenbeis, R. A. and George G. Kaufman (2006), "Cross-Border Banking: Challenges for Deposit Insurance and Financial Stability in the European Union," Federal Reserve Bank of Atlanta Working Paper 2006 -15a (revised January, 2007).
- Eisenbeis, R. A. and George G. Kaufman (2008), "Cross-border Banking and Financial Stability in the EU," *Journal of Financial Stability*, Vol.4, No. 3, pp 168-204.
- Freixas, X. (2003), "Crisis Management in Europe," in J.J.M. Kremers, D. Schoenmaker, and P.J. Wierds (eds.), *Financial Supervision in Europe*, Edward Elgar, pp. 102-19.
- Garcia, Gillian G. H. (2000), "Deposit insurance: actual and good practices," IMF Occasional Paper 197, International Monetary Fund, Washington D.C.
- Garcia, Gillian G. H., and María J. Nieto (2007), "Preserving Financial Stability: a dilemma for the European Union," *Contemporary Economic Policy* Vol. 25, No. 3, pp. 444-58.
- Goodhart, C. A. E (2008), "The Regulatory Response to Financial Crisis," *Journal of Financial Stability*, Vol. 4 Issue 4, December, 2008, pp 351-358.
- Goodhart, C. A. E., and Dirk Schoenmaker (2006) "Burden Sharing in Banking Crisis in Europe," LSE Financial Markets Group, Special Paper Series No 163 September.
- Hardy, Daniel C., "Regulatory Capture in Banking," IMF Working Paper WP/06/34, Washington D.C.
- Hoelscher, David S., Michael Taylor, and Ulrich H. Klueh (2006), "The Design and Implementation of Deposit Insurance Systems," IMF Occasional Paper No. 251, Washington D.C.
- Holthausen, Cornelia, and Thomas Ronde (2005), "Cooperation in International Banking Supervision," Center for Economic Policy Research Discussion Paper Series No. 4990.
- International Monetary Fund (2008), "Euro Area Policies—Selected Issues—2008 Article IV Consultation," (<http://www.imf.org/external/pubs/ft/scr/2008/cr08263.pdf>).
- Kane, Edward J. (2002), "What Kind of Multinational Deposit-Insurance Arrangements Might Best Enhance World Welfare?" *Keynote Address: APFA/PACAP/FMA Finance Conference*.
- Krimminger, Michael H. (2008), "The Resolution of Cross-border Banks: issues for deposit insurers and proposals for cooperation," *Journal of Financial Stability* Vol. 4, April, pp. 376-390.
- Laeven, L. (2004), "The Political Economy of Deposit Insurance," *Journal of Financial Services Research* 26(3), pp. 201-24.
- Mayes, D., Nieto, M. J. and Wall, L. (2008), "Multiple Safety Net Regulators and Agency Problems in the EU: is prompt corrective action partly the solution?" *Journal of Financial Stability*, Vol.4, No. 3, pp 223-257.
- Nieto, María J., and Juan Peñalosa (2004), "The European Architecture of Regulation, Supervision and Financial Stability: A Central Bank Perspective," *Journal of International Banking Regulation*, 5(3), 2004, pp. 228-42.

BANCO DE ESPAÑA PUBLICATIONS

WORKING PAPERS¹

- 1032 GABE J. DE BONDT, TUOMAS A. PELTONEN AND DANIEL SANTABÁRBARA: Booms and busts in China's stock market: Estimates based on fundamentals.
- 1033 CARMEN MARTÍNEZ-CARRASCAL AND JULIAN VON LANDESBERGER: Explaining the demand for money by non-financial corporations in the euro area: A macro and a micro view.
- 1034 CARMEN MARTÍNEZ-CARRASCAL: Cash holdings, firm size and access to external finance. Evidence for the euro area.
- 1035 CÉSAR ALONSO-BORREGO: Firm behavior, market deregulation and productivity in Spain.
- 1036 OLYMPIA BOVER: Housing purchases and the dynamics of housing wealth.
- 1037 DAVID DE ANTONIO LIEDO AND ELENA FERNÁNDEZ MUÑOZ: Nowcasting Spanish GDP growth in real time: "One and a half months earlier".
- 1038 FRANCESCA VIANI: International financial flows, real exchange rates and cross-border insurance.
- 1039 FERNANDO BRONER, TATIANA DIDIER, AITOR ERCE AND SERGIO L. SCHMUKLER: Gross capital flows: dynamics and crises.
- 1101 GIACOMO MASIER AND ERNESTO VILLANUEVA: Consumption and initial mortgage conditions: evidence from survey data.
- 1102 PABLO HERNÁNDEZ DE COS AND ENRIQUE MORAL-BENITO: Endogenous fiscal consolidations.
- 1103 CÉSAR CALDERÓN, ENRIQUE MORAL-BENITO AND LUIS SERVÉN: Is infrastructure capital productive? A dynamic heterogeneous approach.
- 1104 MICHAEL DANQUAH, ENRIQUE MORAL-BENITO AND BAZOUMANA OUATTARA: TFP growth and its determinants: nonparametrics and model averaging.
- 1105 JUAN CARLOS BERGANZA AND CARMEN BROTO: Flexible inflation targets, forex interventions and exchange rate volatility in emerging countries.
- 1106 FRANCISCO DE CASTRO, JAVIER J. PÉREZ AND MARTA RODRÍGUEZ VIVES: Fiscal data revisions in Europe.
- 1107 ANGEL GAVILÁN, PABLO HERNÁNDEZ DE COS, JUAN F. JIMENO AND JUAN A. ROJAS: Fiscal policy, structural reforms and external imbalances: a quantitative evaluation for Spain.
- 1108 EVA ORTEGA, MARGARITA RUBIO AND CARLOS THOMAS: House purchase versus rental in Spain.
- 1109 ENRIQUE MORAL-BENITO: Dynamic panels with predetermined regressors: likelihood-based estimation and Bayesian averaging with an application to cross-country growth.
- 1110 NIKOLAI STÄHLER AND CARLOS THOMAS: FIMod – a DSGE model for fiscal policy simulations.
- 1111 ÁLVARO CARTEA AND JOSÉ PENALVA: Where is the value in high frequency trading?
- 1112 FILIPA SÁ AND FRANCESCA VIANI: Shifts in portfolio preferences of international investors: an application to sovereign wealth funds.
- 1113 REBECA ANGUREN MARTÍN: Credit cycles: Evidence based on a non-linear model for developed countries.
- 1114 LAURA HOSPIDO: Estimating non-linear models with multiple fixed effects: A computational note.
- 1115 ENRIQUE MORAL-BENITO AND CRISTIAN BARTOLUCCI: Income and democracy: Revisiting the evidence.
- 1116 AGUSTÍN MARAVALL HERRERO AND DOMINGO PÉREZ CAÑETE: Applying and interpreting model-based seasonal adjustment. The euro-area industrial production series.
- 1117 JULIO CÁCERES-DELPIANO: Is there a cost associated with an increase in family size beyond child investment? Evidence from developing countries.
- 1118 DANIEL PÉREZ, VICENTE SALAS-FUMÁS AND JESÚS SAURINA: Do dynamic provisions reduce income smoothing using loan loss provisions?
- 1119 GALO NUÑO, PEDRO TEDDE AND ALESSIO MORO: Money dynamics with multiple banks of issue: evidence from Spain 1856-1874.
- 1120 RAQUEL CARRASCO, JUAN F. JIMENO AND A. CAROLINA ORTEGA: Accounting for changes in the Spanish wage distribution: the role of employment composition effects.

1. Previously published Working Papers are listed in the Banco de España publications catalogue.

- 1121 FRANCISCO DE CASTRO AND LAURA FERNÁNDEZ-CABALLERO: The effects of fiscal shocks on the exchange rate in Spain.
- 1122 JAMES COSTAIN AND ANTON NAKOV: Precautionary price stickiness.
- 1123 ENRIQUE MORAL-BENITO: Model averaging in economics.
- 1124 GABRIEL JIMÉNEZ, ATIF MIAN, JOSÉ-LUIS PEYDRÓ AND JESÚS SAURINA: Local versus aggregate lending channels: the effects of securitization on corporate credit supply.
- 1125 ANTON NAKOV AND GALO NUÑO: A general equilibrium model of the oil market.
- 1126 DANIEL C. HARDY AND MARÍA J. NIETO: Cross-border coordination of prudential supervision and deposit guarantees.