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## SUPRANATIONAL SUPERVISION - HOW MUCH AND FOR WHOM?

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## ABSTRACT

### Supranational Supervision - How Much and for Whom?\*

We argue that the extent to which supervision of banks takes place on the supranational level should be guided by two factors: cross-border externalities from bank failures and heterogeneity in bank failure costs. Based on a simple model we show that supranational supervision is more likely to be welfare enhancing when externalities are high and country heterogeneity is low. This suggests that different sets of countries (or regions) should differ in their supranational orientation. We apply the insights of our model to discuss optimal supervisory arrangements for different regions of the world and contrast them with existing arrangements and current policy initiatives.

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# 1 Introduction

The question of how to regulate and supervise banks across countries has taken center stage in the debate on the reform of the banking sector. The failure of internationally active financial institutions, such as Lehman Brothers, and cross-border banks, such as Fortis, Dexia or the Icelandic banks, played a prominent role during the Global Financial Crisis. As a consequence, there is a growing recognition that Memorandums of Understanding and Supervisory Colleges are not sufficient to deal with large and systemically important cross-border financial institutions. In the Eurozone, a banking union with a supranational supervision authority (and possibly also resolution powers) is being proposed, both as a crisis resolution tool and as a necessary condition for making the Eurozone a sustainable currency union (Beck, 2012).

The discussion on the optimal international financial architecture is a complex one and often gets mired in details. In this paper, we argue that this discussion should be guided by a basic trade-off. This trade-off can serve as a general framework for gauging the need and feasibility of different forms of cross-border integration of bank supervision. In particular, based on a simple model, we derive circumstances under which a supranational supervisor is preferable to a national supervisor. Our model naturally also permits us to analyze intermediate forms of cooperation, such as minimum standards across countries. We then apply the insights from the model to the discussion on the optimality of different forms of cross-border cooperation that are currently being considered in the regulatory reform debate.

In the wake of the Global Financial Crisis, several initiatives have aimed at closer international cooperation to regulate banks (for example, principles and standards, peer reviews and progress reports by the Financial Stability Board). One key insight from the crisis, however, has been that such cooperation is most important at the stage of intervention and resolution of failing banks, i.e. at the point where supervisors have to decide if and how to intervene in a failing bank. There have been efforts to force bail-in of creditors to reduce the costs of bank failure to taxpayers. In this context, there are also reforms under discussion to lessen the impact of bank failures on the rest of the financial system and the economy at large. Recovery and resolution plans, also known as living wills, for the largest financial institutions, are an important part of these reforms.

The different initiatives to intensify cooperation among supervisors have seen different

degrees of success. Initial cooperation in the context of the living wills for G-SIFIS (global systemically important financial institutions) has been replaced by increased suspicion, especially between U.S. and European supervisors.<sup>1</sup> On the other hand, in several smaller regions, there has been progress. In the Nordic-Baltic region, a Memorandum of Understanding has been signed that includes ex-ante burden sharing agreements. Moreover, a College of Resolution Authorities has been formed that includes ministries of finance. Supervisors in Africa have taken first steps towards closer cooperation with the establishment of a Committee of African Bank Supervisors. Cooperation in certain sub-regions, as for example in the East Africa Community, has advanced even further. In the Eurozone there have been attempts to move towards a fully-fledged banking union, with a supranational supervisor and resolution authority. However, the attempts have been bogged down in technical discussion and national resistance.

The variety of experiences and approaches that are taken raises the question of what kind of cooperation is optimal for which set of countries. Our paper aims to inform the debate by focusing on the supervisory decision to intervene and resolve failing banks. Specifically, we propose that there are two dimensions that should determine the degree of supervisory integration – cross-border externalities from financial instability and heterogeneity of countries in the costs of failing banks. We model the supervisory decision to intervene in a failing bank under national and supranational supervision regimes and derive conditions under which either of the two results in higher welfare. The analysis shows that higher externalities and lower heterogeneity between countries in failure costs result in a higher likelihood that supranational supervision is welfare improving over national supervision.<sup>2</sup> We also show that there is an intermediate form of cooperation between national supervisors that can reduce (but not eliminate) externalities from national supervision of cross-border banks, while at the same time avoiding most of the inefficiencies related to heterogeneity in failure costs. Based on the analysis, we propose solutions for cross-border regulatory coordination or integration for different countries and regions in the world, and contrast them with current arrangements and policy initiatives.

Our paper is linked to a small – but growing – literature on cross-border bank regulation. Loranth and Morrison (2007) discuss the implications of capital requirements and

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<sup>1</sup>See for instance “NY Fed warns on ‘go it alone’ regulators” (Financial Times, April 22 2013).

<sup>2</sup>The externality-heterogeneity trade-off is essentially an application of the literature on fiscal decentralization (see, for example, Oates, 1972) that argues that the comparative advantage of centralization increases with the size of interjurisdictional externalities but decreases with preference heterogeneity.

deposit insurance for cross-border banks and show that capital requirements set at a level to off-set the safety net subsidy of deposit insurance result in too little risk-taking in the case of multinational banks. Dell’Arricia and Marquez (2006) show that competition between national regulators can lead to lower capital adequacy standards, since national regulators do not take into account the external benefits of higher capital adequacy standards in terms of higher stability in other countries. Acharya (2003) argues that coordinating capital adequacy ratios across countries without coordinating on other dimensions of the regulatory framework, such as resolution policies, can have detrimental effects. Freixas (2003) and Goodhart and Schoenmaker (2009) show that ex-post negotiations on recapitalization of failing cross-border banks can lead to underprovision of the necessary resources and identify an advantage of ex-ante burden sharing agreements in helping overcome coordination problems between regulators. Holthausen and Ronde (2002) consider cooperation between home and host country supervisor on the intervention decision for a multinational bank. Given that national regulators represent national interests, a misalignment of interests leads to suboptimal exchange of information and distorted intervention decisions. Calzolari and Loranth (2011) analyze how the organizational structure of multinational banks can influence regulatory behavior. Specifically, organization of foreign presence through branches leads to higher incentives to intervene as the home country regulator can draw on all assets. At the same time, it can reduce intervention incentives if the regulator is responsible for repaying all deposits, including in foreign branches. Most closely related to this paper, Beck, Todorov and Wagner (2013) show that different dimensions of cross-border banking (deposit collection, investment and ownership) distort regulatory interventions in different directions. Evidence on intervened banks from the recent crisis provides support for their theoretical findings.

There is also a more institutionally oriented literature on legal differences across countries in the treatment of domestic and foreign creditors (e.g. Krimminger, 2007). Osterloo and Schoenmaker (2007) and Schoenmaker (2010) discuss the importance of regulation of cross-border banks within Europe. Allen et al. (2011) discuss policy options for the regulation of cross-border banks in the European Union. Schoenmaker and Siegmann (2013) compare the efficiency of different burden sharing agreements to a supranational supervisor, using data on the largest 30 European banks.

The remainder of the paper is structured as follows. The next section discusses the key trade-off faced by supranational supervision, based on externalities and country heterogene-

ity. Section 3 offers a formal model and derives the levels of externalities and heterogeneity for which supranational supervision is preferable to national supervision. Section 4 applies the insights of the theoretical model to a broader discussion on the optimality of different forms of cross-border cooperation in bank regulation and supervision. Section 5 concludes.

## **2 The trade-off arising from cross-border bank supervision**

Since the onset of the Global Financial Crisis, there has been an increasing realization that the regulatory perimeter of banks has to match their geographic footprint. Many analysts and observers, however, also agree that a one-size-fits-all approach to supranational regulation is neither desirable nor realistic, as benefits and costs from moving from national to supranational regulatory frameworks differ greatly across different regions.

We argue that there are two factors that determine whether the regulatory architecture should become supranational.

### **2.1 Cross-border externalities**

The *raison d'être* for financial regulation is externalities from bank failure. After all, in the absence of such externalities, bank governance can be left in the hands of shareholders and other stakeholders – as is the case for non-financial corporations. Externalities from bank failures partly materialize at the domestic level, for example, by causing a credit crunch in the domestic economy. Such externalities do not create a rationale for international regulation since a domestic supervisor will be best equipped to deal with them. However, the failure of banks in a country also causes substantial externalities for other countries – and increasingly so, due to the fact that the financial systems of countries have become more interconnected in recent decades, along several dimensions.

First, externalities arise from cross-border activities of specific financial institutions. For example, the failure of a bank that has foreign assets will incur costs abroad, among others by leading to lower credit availability to foreign firms. Such costs will not be taken into account by a domestic supervisor, leading to inefficient decisions. A point in case is Iceland (which from the perspective of the Icelandic supervisor had substantial foreign assets and deposits) where it can be argued that supervisors had insufficient incentives

to control bank risk. Beck, Todorov and Wagner (2013) show that banks' cross-border activities distorted supervisory incentives during the crisis of 2007-2009. The implications for international regulation are straightforward: in order to avoid these distortions, the perimeter of the supervisor should match that of banks. Or, put differently, the benefits from moving to supranational supervision are higher for regions with significant cross-border banking activities.

This first source of externalities is a problem for developing and developed countries alike. As documented by Claessens and van Horen (2013), there are close ownership links in banking across the world, which have been increasing over the past two decades. These links have led countries to sign (legally non-binding) Memorandums of Understanding between supervisory authorities and the establishment of Colleges of Supervisors. The resolution experience with several multinational banks over recent years has made clear that such arrangements might not be enough.

Second, in a financially integrated world, there are plenty of other channels through which a shock arising from failure of one bank can spill over to other countries. This includes fire-sale externalities and common asset exposures, informational contagion among investors, direct interbank exposures or counterparty risk. For such externalities and contagion effects to materialize, no direct cross-border links have to exist between two banking systems. It is more likely to find such externalities and sources of contagion in more developed financial systems where banks focus increasingly on non-interest sources of income and market-based funding and investment strategies (Demirguc-Kunt and Huizinga, 2010).

Third, specific externalities arise within a monetary union because a country cannot simply devalue its currency to regain competitiveness following a shock and hence may need to tap – in some form or other – the resources of other countries. The costs from asymmetric shocks are thus much higher in monetary unions. Further, relying on a common lender of last resort might result in a tragedy of commons problem, as it is in the interest of every member government with fragile banks to “share the burden” with the other members. It is important to note that this externality applies on the systemic level, rather than just for individual institutions. The Spanish *cajas* did not have any specific cross-border exposures but their failure is at the core of the Spanish crisis, with repercussions for the whole Eurozone. Similarly, Cypriot banks have not had particularly close links with the rest of the Eurozone (though links with other European countries, especially Russia, have been close) but their failure has imposed stress on the Eurozone as a whole.



Fourth, externalities also arise from regulatory arbitrage. Banks have incentives to move to jurisdictions with lighter regulation – such jurisdictions benefit from an “inflow” of banking business but this will cause negative externalities for other countries if and when lighter regulation leads to bank failure. Related to this, a cross-border financial institution operating in different jurisdictions might be subject to a “regulatory run”, leading to an inefficient resolution process. Again the externalities are higher among financially more integrated countries since the hurdles to moving business across borders are lower.

Not all cross-border externalities are of equal importance. A crucial distinction arises between externalities related to specific financial institutions and systemic externalities. It is mainly the systemic externalities that deserve regulation and supervision. For example, the failure of international banks in a country may not affect other countries much if the banks in these countries are in good financial health at the same time. This suggests that the extent to which cross-border externalities are systemic is much higher in financially and economically integrated areas because in those areas the likelihood that banks will face stress simultaneously is greater.

## **2.2 Heterogeneity in resolution across countries**

If all countries were identical ex-ante, it would be easy to agree on the right structure for international regulation and implementation would be straightforward. However, countries differ in practice along various dimensions, which increases the cost of closer cooperation and convergence.

First, countries differ in their legal and regulatory systems. This makes it hard to specify a common set of rules and standards, forcing adaptation of general principles to local circumstances. For example, while some countries are moving towards an universality approach where international insolvency is treated as a single case, many countries adopt a territorial approach where each country looks out for its own creditors before contributing assets to pay creditors in other countries. These differences do not only lead to higher costs of bank failure in the case of internationally exposed banks, but also to a higher difference in such costs.<sup>3</sup>

A second source of heterogeneity arises from preferences. Countries may differ for example in how they view the role of the government in the economy (one consequence being differences in state ownership), focus on fiscal independence or with respect to their risk

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<sup>3</sup>See Claessens, Herring and Schoemaker (2010) for a more detailed discussion.

tolerance. For example, a basic trade-off in banking (and finance more generally) is between risk and return; e.g., lightly regulated institutions may perform better under normal conditions but may be more prone to fragility, while heavy-handed regulation reduces the risk but may also depress banks' profitability and their contribution to economic growth. Differences in risk tolerance can also lead to differences in the costs of bank failure.

Third, heterogeneity can result from informational asymmetries. Such asymmetries arise with respect to the health of another country's banking system but also regarding the most suitable approach to resolving problems under local conditions. Informational asymmetries tend to be compounded in the presence of cultural differences or a lack of geographical proximity. A somewhat different case is that of asymmetric interests and resources between home and host country supervisors, such as in the case of market-dominating subsidiaries that form only a small part of the overall banking group. While the subsidiary is considered systemically important for the host country, it is not for the overall banking group and for the home country supervisor.

There are thus multiple sources of heterogeneity that decrease both the optimality and the desirability of supranational supervision. The next section models heterogeneity as arising from differences in the costs that bank failure imposes on countries.

### **3 A model of optimal allocation of supervisory power**

In this section we use a simple model to analyze the circumstances under which supervision should be delegated to the supranational level and when it should remain national. The trade-off will be determined by two factors: cross-border externalities arising from cross-border exposure of domestic banks and country heterogeneity arising from differences in the cost of bank failures. In our analysis we will focus on the supervisory task of intervening and closing a troubled bank.

There are two countries,  $A$  and  $B$ , each inhabited by a representative bank. Both countries are of the same size – an assumption which we will relax later. There are three periods, 0, 1 and 2 and there is no discounting. In period 0, each bank raises one unit of funds from depositors and invests it into a project. The deposit interest rate is to be taken as zero.<sup>4</sup> The return on the project is random. More specifically, the project succeeds with probability  $\lambda$  and yields a return of  $R > 1$  at date 2, while with probability  $1 - \lambda$ ,

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<sup>4</sup>This may be the consequence of deposit insurance with a risk-insensitive premium.

the project fails and yields a zero return in period 2. The ex-ante probability of success is uniformly distributed on  $[0, 1]$ .

Both banks have a cross-border exposure of  $\beta$  ( $0 \leq \beta \leq 1$ ), meaning that a share  $\beta$  of each project is carried out in the other country. Note that while cross-border externalities arise here from cross-border investments, they could alternatively also arise in the presence of indirect foreign depositors or foreign bank ownership (Beck, Todorov and Wagner, 2013). Besides direct cross-border exposures,  $\beta$  can also be thought of as resulting from other, indirect, cross-border externalities, such as those due to common asset exposures and contagion effects. While we assume here cross-border activities that are symmetric (the source of heterogeneity in our analysis comes from differences in bank failure costs), this need not be the case. For instance, due to regulatory arbitrage a country may attract a lot of banks even though the banks' activities are outside the country. In this case a particularly high  $\beta$  would arise for the country. We will return to the issue of asymmetric externalities in Section 3.5.

At date 1, each bank's project probability of success,  $\lambda_i$  ( $i \in \{A, B\}$ ) becomes known. Based on this information, a supervisor can decide whether to intervene in a bank or to allow it to continue. If the supervisor decides to intervene in a bank, she can recover the initial investment of one. This intervention can be interpreted in different ways: it could be a liquidation or a purchase and assumption operation involving another bank. If the supervisor decides not to intervene and allows a bank to continue to period 2, with probability  $\lambda_i$ , the project will be successful and the bank will be able to repay its debt and pay out the surplus to equity. With probability  $1 - \lambda_i$ , the bank will fail. Bank failure causes external costs  $c_i$ . These costs include losses for borrowers losing access to their financing, cost of disruption for savers and creditors of the banks and costs external to the bank's stakeholders, such as contagion and spill-over effects for the rest of the financial system and the real economy.

These cost of bank failure may vary across banks or countries and without loss of generality we assume  $c_A \leq c_B$ . Heterogenous failure costs may, for example, arise because the cost of bank failure is expected to be significantly higher in more bank-based economies where there is greater reliance by enterprises, households and governments on bank financing. Countries may also differ in their marginal cost of public funds (needed to stabilize the economy after bank failure) – more indebted countries may find it difficult to cope with

bank failures (Demirguc-Kunt and Huizinga, 2013).<sup>5</sup> There might also be differences in terms of risk-return trade-offs where country A is more willing to accept the costs of bank failure. Failure costs may also depend on bank types, with smaller more regional banks imposing fewer costs on the national economy than large, too-big-to-fail banks.

### 3.1 Efficient supervision

We first consider the benchmark of efficient intervention decisions. Efficiency requires the supervisor to maximize world welfare, consisting of the returns to domestic debt, and equity minus external costs in both countries. For bank  $i$ , the efficient intervention threshold is given by  $\lambda_i$  which equates the expected returns from continuation with the return from immediate liquidation. We have

$$\lambda_i R - (1 - \lambda_i)c_i = 1. \quad (1)$$

Solving for  $\lambda$  gives

$$\lambda_i^* = \frac{1 + c_i}{R + c_i}. \quad (2)$$

Efficiency thus dictates intervention when  $\lambda < \lambda_i^*$  and continuation when  $\lambda \geq \lambda_i^*$ . Note that  $\lambda_i^*$ , given the assumption of uniform shocks, is also the likelihood of intervention. Equation (2) thus shows that (efficient) intervention becomes more likely when the failure costs,  $c_i$ , increase (since  $\lambda_i^{*'}(c_i) > 0$ ). The implication is that regulators should thus be stricter in countries with higher failure costs. Note also that cross-border activities do not affect the efficient intervention point, as they are internalized in the efficient solution.

### 3.2 Decentralized supervision

We now consider outcomes when each bank is supervised domestically. National supervisors will only care about domestic payoffs. This may modify the intervention threshold and drive a wedge between the socially efficient and the domestic intervention point.

The intervention point for bank  $i$  can be derived as follows. If the domestic regulator intervenes at the intermediate date, the bank will be liquidated, in which case domestic payoffs are 1 and identical to world payoffs. Where there is no intervention, the bank

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<sup>5</sup>For a discussion on the external costs that bank failure can impose on the financial system and the real economy, see Beck (2011). In principle, intervention at date 1 may also incur some costs, however, we would think that such costs are of lower order than those arising from bank failure at date 2.

succeeds with probability  $\lambda$ . In this case depositors obtain  $d$ , while equity obtains  $R - d$ , which again is the same as before. With probability  $1 - \lambda$  the bank fails. In this case both equity and debt holders do not obtain any return and the country in addition suffers the domestic share of the bank failure cost,  $(1 - \beta)c_i$ . Total expected domestic payoff is hence  $\lambda R - (1 - \lambda)(1 - \beta)c_i$ . It follows that the domestic supervisor is indifferent to intervention when

$$\lambda_i^D R - (1 - \lambda)(1 - \beta)c_i = 1. \quad (3)$$

Rearranging for  $\lambda_i^D$  we obtain the intervention threshold

$$\lambda_i^D = \frac{1 + (1 - \beta)c_i}{R + (1 - \beta)c_i}. \quad (4)$$

For  $\beta > 0$  the intervention threshold differs from that derived in the previous section and is hence inefficient from the perspective of world welfare. The reason is that a domestic supervisor does not internalize the cost of bank failure accruing abroad. In fact, we can see from equation (4) that the domestic supervisor is more lenient compared to the efficient solution (for  $\beta > 0$  we have that  $\lambda_i^D < \lambda_i^*$ ).<sup>6</sup>

**Proposition 1** *Domestic and efficient interventions generally do not coincide. In particular, whenever there are cross-border activities ( $\beta > 0$ ), there are ranges for  $\lambda$  where a domestic regulator lets the bank continue even though this is inefficient (the domestic regulator is too lenient).*

**Proof.** *Follows directly from comparing equations (2) and (4), observing that  $\lambda_i^D = \lambda_i^*$  for  $\beta = 0$  and  $\lambda_i^{D'}(\beta) < 0$  and  $\lambda_i^{*'}(\beta) = 0$ . ■*

### 3.3 Supranational supervision

We next consider the case of a supranational supervisor. Compared to a domestic supervisor, the supranational supervisor has the potential to improve welfare because he takes into account the cost of bank failure in both countries. The disadvantage of supranational supervision is that the supranational supervisor is assumed to follow a uniform policy across countries, that is, he cannot set a different intervention threshold in country  $A$  than in country  $B$ . Thus, his intervention decision cannot reflect country-specific bank failure costs.

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<sup>6</sup>Beck, Todorov and Wagner (2013) show that the presence of foreign deposits equally makes a national regulator more lenient. In contrast, foreign ownership of the bank makes the domestic regulator stricter.

The regulator sets his policy  $\lambda^S$  at  $t = 0$ , maximizing expected (utilitarian) welfare in the world economy. This welfare consists of the expected world payoffs from the activities of both banks:

$$W(\lambda^S) = \int_0^{\lambda^S} d\lambda + \int_{\lambda^S}^1 (\lambda R - (1 - \lambda)c_A)d\lambda + \int_0^{\lambda^S} d\lambda + \int_{\lambda^S}^1 (\lambda R - (1 - \lambda)c_B)d\lambda. \quad (5)$$

In equation (5), the first expression is expected welfare arising when the  $\lambda$  of bank  $A$  is below the intervention threshold  $\lambda^S$  (and the regulator intervenes) and the second question is expected welfare when the health of bank  $A$  is above the threshold, in which case the regulator does not intervene. The third and fourth expressions are the respective terms arising for bank  $B$ .

The first-order condition for the supranational regulator is given by:

$$2 - (\lambda^S R - (1 - \lambda^S)c_A) - (\lambda^S R - (1 - \lambda^S)c_B) = 0. \quad (6)$$

We hence obtain for the intervention threshold of the supranational regulator:

$$\lambda^S = \frac{1 + \frac{c_A + c_B}{2}}{R + \frac{c_A + c_B}{2}}. \quad (7)$$

Two points are worthy of note. First, and as expected, the supranational regulator's decision does not depend on cross-border exposures. Second, it depends on the average failure costs in both countries,  $\frac{c_A + c_B}{2}$ , rather than the cost specific to the bank in question. This introduces an inefficiency ex-post (equation (2) tells us that optimal intervention should depend on the country-specific costs).

**Proposition 2** *Supranational and efficient interventions generally do not coincide. In particular, whenever there is country heterogeneity ( $c_A < c_B$ ), there are ranges for  $\lambda$  where a supranational regulator is too strict in a country with the low failure costs but too lenient in a country with high failure costs.*

**Proof.** *Follows directly from comparing equations (2) and (7). ■*

### 3.4 When is supranational supervision efficient?

We are now in a position to analyze whether supervision should take place at the domestic or the supranational level. For this we examine whether supranational supervision leads to higher world welfare. Given that expected world welfare under domestic regulation is

$$W(\lambda_A^D, \lambda_B^D) = \int_0^{\lambda_A^D} d\lambda + \int_{\lambda_A^D}^1 (\lambda R - (1 - \lambda)c_A)d\lambda + \int_0^{\lambda_B^D} d\lambda + \int_{\lambda_B^D}^1 (\lambda R - (1 - \lambda)c_B)d\lambda, \quad (8)$$

the welfare impact of supranational supervision can be written as:

$$\Delta W = W(\lambda^S) - W(\lambda_A^D, \lambda_B^D) = \int_{\lambda_A^D}^{\lambda^S} (1 - \lambda R + (1 - \lambda)c_A) d\lambda - \int_{\lambda^S}^{\lambda_B^D} (1 - \lambda R + (1 - \lambda)c_B) d\lambda \quad (9)$$

We denote with  $\Delta c := c_B - c_A$  the difference in costs across countries.

**Proposition 3** *The benefits from supranational supervision i) increase in cross-border externalities  $\beta$  and ii) decrease in country heterogeneity  $\Delta c (= c_B - c_A)$ . In addition, there is a function  $\widehat{\Delta c}(\beta)$  with  $\frac{d\widehat{\Delta c}}{d\beta} > 0$  such that for  $\Delta c < \widehat{\Delta c}(\beta)$  supranational supervision is optimal, while for  $\Delta c > \widehat{\Delta c}(\beta)$  domestic supervision is optimal.*

**Proof.** Using (4) and (7) to substitute  $\lambda_A^D$ ,  $\lambda_B^D$  and  $\lambda^S$  in (9), we obtain  $\Delta W$  as a function of  $\beta$  and  $\Delta c$ :  $\Delta W = \Delta W(\beta, \Delta c)$ . From this we can derive that  $\frac{\partial \Delta W}{\partial \beta} > 0$  and  $\frac{\partial \Delta W}{\partial \Delta c} > 0$ . Thus,  $\beta$  increases the benefits from supranational supervision, while  $\Delta c$  decreases it. Since in addition we have that  $\Delta W(0, 0) = 0$ , there exists hence a function  $\widehat{\Delta c}(\beta)$  (with  $\frac{d\widehat{\Delta c}}{d\beta} > 0$ ) for which  $\Delta W(\beta, \widehat{\Delta c}(\beta)) = 0$ . For this function we then have that  $\Delta W(\beta, \Delta c) < 0$  if  $\Delta c > \widehat{\Delta c}(\beta)$  and  $\Delta W(\beta, \Delta c) > 0$  if  $\Delta c < \widehat{\Delta c}(\beta)$ . ■

How can we interpret this finding in the context of the discussion in section 2? High externalities in the form of large global banks being active across several countries or in the form of banks across countries being exposed to the same capital markets increase the likelihood that supranational supervision is welfare improving. Similarly, high externalities stemming from being part of a currency union increases the optimality of supranational supervision. On the other hand, a high difference in failure costs reduces this likelihood as it increases the range of  $\lambda$  where the supranational supervisor takes an inefficient decision from the viewpoint of either country. As discussed above, such differences can arise from different financial structures, fiscal policy stances but also political preferences.

Figure 1: Externalities vs. Heterogeneity: The case of Supranational Supervision

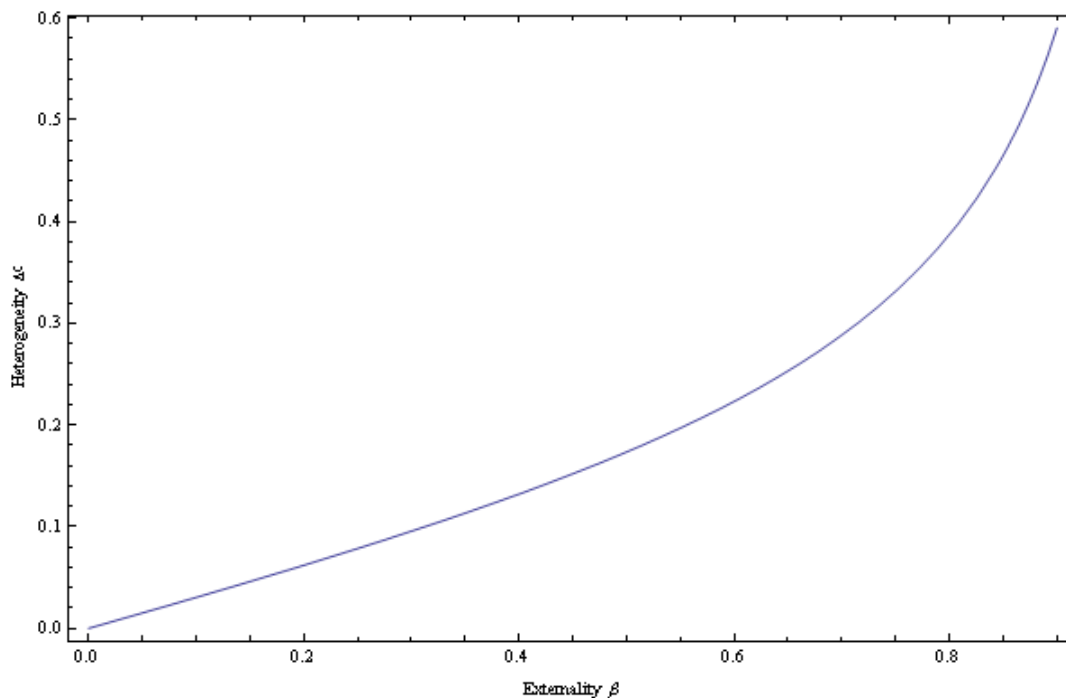


Figure 1 illustrates the trade-off between externalities and heterogeneity. This figure depicts  $\widehat{\Delta c}(\beta)$  assuming a (gross) return in the case of success of  $R = 1.1$  and failure costs of  $c = 0.3$  (note that this restricts  $\Delta c$  to be less or equal to 0.6). The area above  $\widehat{\Delta c}(\beta)$  gives the region where domestic supervision is optimal, while the area below this critical line indicates efficiency of supranational supervision. We can see that the critical line passes the origin of the coordinate system – which is to be expected since for  $\beta = 0$  and  $\Delta c = 0$  there are neither benefits nor cost to supranational supervision. We can also see that the critical line is upward sloping, that is, higher externalities have to be offset by higher heterogeneity in order to preserve the neutrality of both types of supervision. In addition, the figure also shows that when the externalities are only modest ( $\beta < 0.5$ ) the relationship between  $\beta$  and  $\Delta c$  is fairly linear. However, when the externalities are high (in particular, for  $\beta > 0.7$ ), the costs needed to offset them become very high. This suggests that for sets of countries that display a high degree of externalities, supranational supervision is desirable no matter how heterogenous the countries are.



### 3.5 The political economy of supranational supervision

In our baseline model, countries individually agree to supranational supervision precisely when supranational supervision is also preferable for world welfare.<sup>7</sup> In practice, however, there are many situations where the incentives to adopt supranational supervision are asymmetric. Then a country may not agree to a delegation of supervision even if this is optimal from the perspective of world welfare. In the following we discuss several instances where this is the case.

First, we have assumed that countries are of equal size and hence the supranational supervisor bases his decision simply on the average of the failure costs of the countries. However, we can also envision countries being of different size. Suppose that the size of the bank of country  $A$  is  $w_A$  and the size of the bank of country  $B$  is  $w_B$ . It is then easy to see that the intervention threshold of the supranational entity becomes

$$\lambda^S = \frac{1 + \frac{w_A \cdot c_A + w_B \cdot c_B}{w_A + w_B}}{R + \frac{w_A \cdot c_A + w_B \cdot c_B}{w_A + w_B}}, \quad (10)$$

and is hence driven by the *weighted* average of the failure costs in the two countries. This means that the preferences of the smaller country are taken into account less. As a result, when the failure costs across countries are different ( $c_A < c_B$ ), a reduction in the relative size of a country will reduce its gain from supranational supervision. Hence, smaller countries may not have an incentive to join the supranational reform even if optimal. A similar consideration arises when the decisions of the supranational regulator are not governed by world welfare but by political considerations. Again, the large country is then likely to be given a larger weight, reducing the benefits for smaller countries to join.

Asymmetries may also arise with respect to the externalities. For instance, suppose that country  $A$  is a financial center. Most of the costs of bank failure will then fall outside its borders, while the country itself may be relatively little affected by bank failures in other countries. For such a country there are limited gains from supranational supervision (arising because it allows internalizing of externalities). It may hence object to supranational supervision even if it is of benefit to countries overall.

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<sup>7</sup>This is because the intervention threshold of the supranational regulator depends on the average of the failure costs of both banks (see (7)). The supervisor thus takes each country's cost equally into account; hence the benefits (and costs) of supranational regulation are also equally shared among countries.

### 3.6 An intermediate solution

Domestic and supranational supervision are two extreme solutions on a continuum of possible forms of cooperation on cross-border banking. In the following, we will discuss one possible intermediate solution where countries commit to a *minimum threshold* for intervention.

Suppose that countries agree on a threshold  $\lambda_{\min}^*$ , such that a country has to intervene whenever  $\lambda < \lambda_{\min}^*$ , but is free to decide about intervention when  $\lambda \geq \lambda_{\min}^*$ .<sup>8</sup> Such a minimum threshold helps to internalize externalities that tend to make countries more lenient in their intervention policies. At the same time, by giving countries discretion about interventions, it allows them to cater intervention policies to their own failure costs.

Suppose that the minimum threshold is set such that interventions in country  $A$  are always welfare maximizing. From equation (2) we then have

$$\lambda^{\min} = \frac{1 + c_A}{R + c_A}. \quad (11)$$

Intervention decisions will then be efficient whenever they are done in country  $A$ :

$$\lambda_A^I = \lambda^{\min}. \quad (12)$$

Country  $B$  may decide to be even stricter and hence to intervene sometimes also when  $\lambda > \lambda_{\min}^*$ . This is desirable (and also optimal for the country itself) since the country has higher failure costs and hence also a higher optimal intervention threshold. However, whenever  $\beta > 0$ , the country will not be strict enough from a world perspective and supervision may still be subject to some inefficiency. Formally, intervention by country  $B$  will be the minimum of the domestically optimal intervention for the country,  $\lambda_B^D$ , and the minimum threshold:

$$\lambda_B^I = \min[\lambda_B^D, \lambda^{\min}]. \quad (13)$$

How does the intermediate solution compare to the domestic and the supranational approach? Comparing to the domestic solution we have that intervention will always be more efficient in country  $A$  under the intermediate approach (as  $\lambda_A^I$  is fully efficient). For interventions in country  $B$  two situations arise. The first case is when the minimum threshold is not binding. In this case country  $B$  will set the same threshold as in the

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<sup>8</sup>Note that this approach retains symmetry across countries, that is, supranational agreements are not made country-specific by making them contingent on the failure cost of the intervened bank.

domestic solution. Where the threshold is binding, the country will set a higher threshold than in the domestic solution. Interventions will then be more efficient as the threshold partially forces the country to internalize the externalities. Overall, we thus have that intervention is always more efficient in country  $A$  under the intermediate solution, while it is at least as efficient in country  $B$ . The intermediate solution thus dominates decentralized supervision.

The intermediate solution, however, does not necessarily dominate the supranational approach. Interventions are still more efficient in country  $A$ , but they may be more or less efficient in country  $B$ . In fact, a similar trade-off as in Section 3.4 arises. On the one hand, the intermediate solution allows country  $B$  to carry out interventions depending on the country's own cost. On the other hand, it will not fully internalize the externality as the country will determine its own intervention level whenever the threshold is not binding.

**Proposition 4** *The benefits from supranational supervision relative to the intermediate solution i) increase in cross-border externalities  $\beta$  and ii) decrease in country heterogeneity  $\Delta c := c_B - c_A$ . In addition, there is a function  $\widehat{\Delta c}^I(\beta)$  with  $\frac{\widehat{\Delta c}^I}{d\beta} > 0$  such that for  $\Delta c < \widehat{\Delta c}^I$  supranational supervision is optimal, while for  $\Delta c > \widehat{\Delta c}^I(\beta)$  domestic supervision is optimal.*

**Proof.** *Welfare under the intermediate solution is given by*

$$W(\lambda_A^D, \lambda_B^D) = \int_0^{\lambda_{\min}^*} d\lambda + \int_{\lambda_{\min}^*}^1 (\lambda R - (1-\lambda)c_A) d\lambda + \int_0^{\min[\lambda_B^D, \lambda^{\min}]} d\lambda + \int_{\min[\lambda_B^D, \lambda^{\min}]}^1 (\lambda R - (1-\lambda)c_B) d\lambda. \quad (14)$$

*The remaining part of the proof is analogous to Proposition 3. ■*

Figure 2: Externalities vs. Heterogeneity: The case of the Intermediate Solution

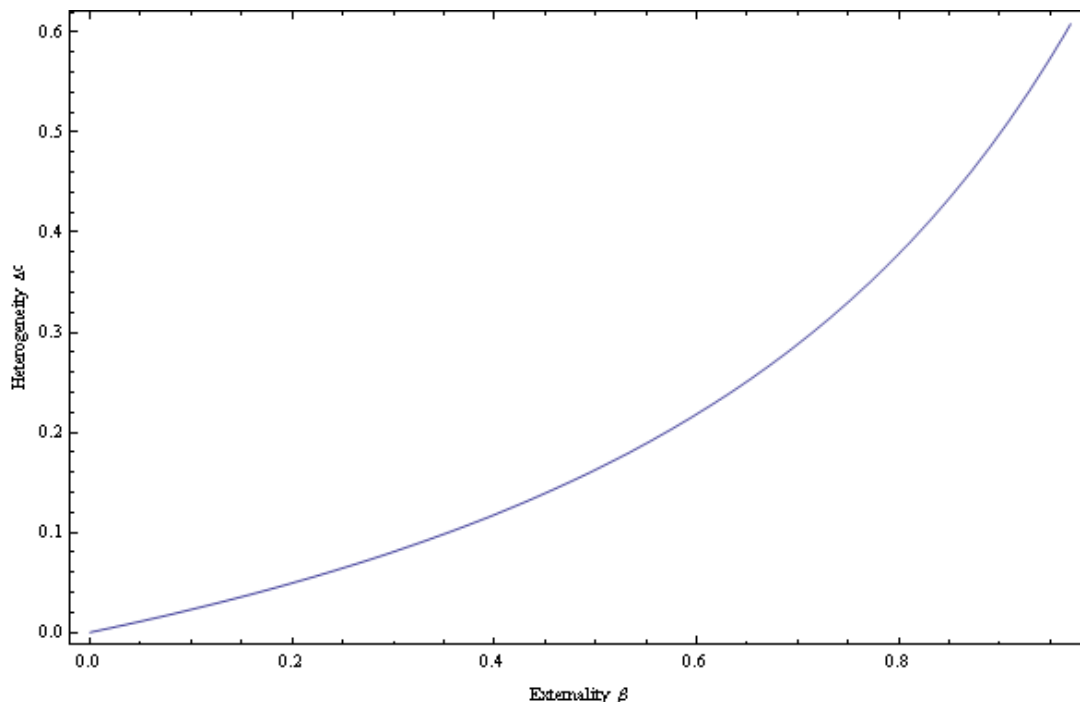


Figure 2 depicts the trade-off for  $R = 1.1$  and failure costs of  $c = 0.3$ . The region where supranational supervision remains optimal is below the critical threshold  $\widehat{\Delta c}^I$ . We can see that  $\widehat{\Delta c}^I(\beta)$  still goes to the origin of the coordinate system – which is of course because whenever there is neither an externality nor a cost difference, intermediate solution and supranational supervision coincide. It can also be seen that the figure shows a positive relationship between  $\beta$  and  $\widehat{\Delta c}^I$ . However, compared to Figure 1 the relationship is now less sensitive to  $\beta$  in regions where externalities are high. It should be pointed out that  $\widehat{\Delta c}^I$  is always below  $\widehat{\Delta c}$  in Figure 1, indicating that there are now fewer situations where supranational supervision is desirable. This is because the alternative (intermediate solution) is more attractive than previously (domestic solution).

## 4 Implications for the debate on supranational supervision

In this section we will apply the analysis of the previous section to the policy discussion on cross-border bank regulation and supervision. The baseline model has discriminated be-

tween two possible solutions (national and supranational supervision). In reality, there is a continuum of solutions, reflecting different degrees of cooperation (such as through minimum intervention thresholds). We can use the insights of our model to discuss these different forms of cooperation. The key challenge for an appropriate approach is to overcome externalities while at the same time being adequate for different degrees of heterogeneity.

Regions and countries differ markedly regarding the extent to which their banks pose externalities to other banks but also how heterogeneous their economies and banking systems are. This leads to the straightforward but important conclusion that the optimal degree of cross-border regulatory convergence also differs across regions. In particular, applying our trade-off, homogenous regions with strong externalities should implement a large degree of common supervision. On the other end of the spectrum, the gains from supranational supervision are the lowest for heterogeneous regions in which cross-border externalities are limited.

#### **4.1 Solutions in the case of low externalities**

Low externalities do not call for heavy institutional solutions. Nevertheless, the exact arrangements should depend on the heterogeneity of the countries involved. In the case of high heterogeneity, simple solutions, such as Supervisory Colleges and Memorandums of Understanding (MoUs) for information exchange and cooperation between home and host country supervisors suffice. In addition, countries can carry out joint crisis simulation exercises or even develop joint crisis management plans. This is the case for countries that have very low shares of cross-border banks and have limited integration with international financial markets, such as, e.g., India, a country with limited foreign bank participation and still some capital account restrictions. In the context of our model, such cooperation will imply domestic solutions but with potentially lower external costs  $c$ .

Countries that are more homogenous in their legal and regulatory structure (or because they pursue the joint goal of financial integration) and whose bank failure costs are therefore more similar, can go a step further and establish colleges of bank resolution authorities, that include not only supervisors, but also other stakeholders involved in the resolution of banks, including deposit insurers and, critically, Ministry of Finance officials representing tax payers. Such countries can also try to achieve convergence in cross-border regulatory frameworks. An example of a relatively homogenous but not yet financially well integrated

region is the East African community.<sup>9</sup> Such a solution might be similar to the intermediate solution we discussed above.

## 4.2 Solutions in the case of high externalities

High externalities call for institutional and regulatory solutions that go beyond those described above. In most cases, this also means surpassing the arrangements that were in place before the 2007 crisis. We argue that one can broadly distinguish between four different cases, which reflect different degrees of heterogeneity across the countries involved.

A first case arises between financially well integrated regions that are nevertheless relatively heterogeneous, such as the U.S. and Europe or between Continental Europe and the UK. In such a situation, moving supervision completely to the supranational level is too costly and politically infeasible. Our model suggests this would not be welfare improving, both on the aggregate level but also most likely not for individual countries. This suggests that efforts should therefore rather focus on removing the largest externalities and distortions in the regulatory process and achieving a certain degree of convergence. Given the political constraints and legal differences, such arrangements have to be partly on an institution-specific basis (e.g. SIFIs) or joint support structures for specific financial markets, such as standing foreign exchange swap facilities (Allen et al., 2011). The current trend towards resolution and recovery plans (“living wills”) can be exploited in this context. We can also learn here from the experience with Lehman Brothers, where resolution over the weekend was not possible due to, among many other factors, legal differences between UK and US regulatory and corporate governance frameworks. This emphasizes that living wills for cross-border SIFIs should be developed under the joint supervision of all relevant supervisory and resolution authorities. In the context of our model, these efforts would lead to a lowering of the bank failure costs in both countries, while staying with the domestic solution.

A second case arises when externalities among heterogeneous regions are very asymmetric. While externalities between the US and Europe are probably fairly balanced in that European banks suffer from US bank failures similarly as US banks from European

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<sup>9</sup>While most of the East African countries (Burundi, Kenya, Rwanda, Tanzania, and Uganda) have had historically a high share of non-African banks, there has been a recent trend for Kenyan banks to expand across the other four countries, with several banks from these countries also planning to expand across East Africa.

failures, this is not the case among countries that are predominantly either home or host to cross-border banks. For small host countries, where subsidiaries of large multinational banks are market-dominant but constitute only a small part of the overall banking group, there is little chance for an influential voice in the supervisory process, while at the same time, these countries face high external costs from the failure of such banks. In the context of our model, this would imply a small weight in the decision of a supranational supervisor, while at the same time a high  $c$ , so that any supranational decision process would be too lenient. Insisting on stand-alone subsidiaries that can be relatively easily fire-walled in times of crises might therefore be the preferred option for host country regulators, such as in many African and Latin American countries. While this entails a certain efficiency cost as subsidiaries cannot as easily exploit scale economies, this disadvantage might be more than outweighed by the benefits that arise because host countries have better incentives to appropriately supervise these institutions. For the small host country, this might involve lower external costs  $c$ , but possibly also lower externalities  $\beta$  from bank failure, as the stand-alone subsidiary would be treated as a domestic bank.

A third case arises among financially well integrated countries that display somewhat lower heterogeneity. This applies especially for countries with close economic and political links, but that are neither connected through a currency union nor coordinate their macro-economic policies. For such countries, a complete supranational approach may still be too costly an option. However, the optimal level of supranational supervision in this case goes beyond the previous cases as these countries can implement strong ex-ante burden sharing and resolution agreements. The MoU for burden sharing among the Nordic-Baltic countries is an example of such an arrangement. In the context of our model, this could be the intermediate option of ex-ante agreed intervention thresholds. The adoption of such an agreement is also facilitated by the fact that externalities seem relatively evenly distributed and there is no dominating member, so that there are fewer political economy obstacles than in more asymmetric country groupings. Members of the EU that are currently not part of the Eurozone could benefit from similar arrangements.

Finally, there is the case of currency unions, possibly coupled with joint macroeconomic policies. For such regions externalities are very high because of the high degree of interdependence but also because asymmetric shocks are more costly within currency unions as previously discussed. At the same time, such countries will display limited (ex-ante) heterogeneity in the failure costs of banks. Thus, our analysis calls for a high degree of

supranational delegation in this case. Such delegation should result in a joint bank supervision and resolution framework, with a central resolution authority that has both powers and resources to intervene in failing banks. However, our model can also explain the existence of political economy obstacles to such an agreement if heterogeneity in bank failure costs is correlated with country size.<sup>10</sup> Our model can also explain why the adoption of an ex-post banking union will not be politically feasible, as ex-post heterogeneity will always be higher than ex-ante heterogeneity. This underlines the importance of differentiating between the resolution of legacy problems and forward looking institutional solutions in the context of the current Eurozone crisis (Beck, 2012).

### 4.3 The role for international bodies

Our “tailored approach” to international supervision does not deal well with the problem of regulatory arbitrage across jurisdictions, and related to this, the incentives for supervisors to engage in a race-to-the-bottom. In particular, countries that are not strongly integrated with the regulatory system of other countries may develop very different standards and requirements, creating space and incentives for financial institutions to arbitrage across jurisdictions. By doing so, they might impose high external costs on other countries and - in the context of our model - face a low intervention threshold. In addition, these countries may find it optimal to refrain from closer integration with the expressed aim of becoming a “regulation-haven”. The presence of jurisdictions with insufficiently regulated institutions can pose significant negative externalities for other countries.

This is where international bodies such as the Basel Committee come in. These bodies typically limit themselves to issuing minimum standards and regulation but this is essential for containing regulatory arbitrage. For example, Basel-style capital requirements put a floor on how far individual jurisdictions can go in loosening regulation.

Another issue is that of coordinating across heterogeneous countries with different economic interests and political weights. During the 2007-9 crisis, a consortium of international bodies under the leadership of the EBRD convened regulators and banks from home and host countries in Europe to avoid aggressive capital repatriation and a credit crunch in

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<sup>10</sup>See, for example, the recent discussions on rules setting the extent of bail-in and thus distribution of bank losses within the Eurozone (“Rush to EU banking union hits roadworks and diversions”, Financial Times, June 26 2103).



Central and Eastern Europe, with some success.<sup>11</sup> Similar arrangements might be necessary to prevent regulatory runs across heterogeneous but well integrated countries. In addition, a champion of the interests of small host countries of large cross-border banks in Africa and Latin American might be needed, given the limited influence with home country supervisors in Europe or the US.

## 5 Conclusions

We have argued that there is no universally applicable optimal degree of supervisory integration. We suggest that two factors should be used to judge whether a set of countries should delegate supervision to the supranational level at a given point in time: the degree to which there are externalities of bank failures across countries and the extent of country heterogeneity. Countries that face low externalities and are fairly heterogeneous should only display a modest level of coordination, such as through supervisory colleges and common stress tests. Moving to the other end of the spectrum, financially well-integrated countries that are not particularly heterogeneous should have a strong supranational approach to supervision and resolution. The clearest case for a full supranational solution is within currency unions – where externalities are very high and heterogeneity should be low or can easiest be reduced. Currency unions should use an integrated approach to the design of their regulatory architecture by moving both supervision and resolution to a supranational body.

It is important to note that the optimal supervisory structure is expected to change over time. Countries may converge in their institutional arrangements or overcome political constraints for closer cross-border cooperation, effectively lowering heterogeneity. Long term trends towards more financial integration (even though partly reversed during the ongoing crisis) suggest that cross-border externalities will increase. This makes it likely that supranational supervision will become attractive for an increasingly larger set of countries in the future.

One important dimension we have stressed is that of the political economy of supranational supervisory arrangements. Even if supranational supervision improves aggregate

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<sup>11</sup>In a broader sense, one could argue that International Financial Institutions, such as the EBRD, can thus play an important role by internalizing externalities from cross-border banking under national supervision.

welfare, it might not be adopted if individual countries do not benefit from it. The current discussions in the Eurozone on establishing a banking union are a good example of this.

## References

- [1] Acharya, Viral (2003), Is the International Convergence of Capital Adequacy Regulation Desirable?, *Journal of Finance* 58, 2745–2781.
- [2] Allen, Franklin, Thorsten Beck, Wolf Wagner, Philip Lane, Dirk Schoenmaker, and Elena Carletti (2011), “Cross-Border Banking in Europe: Implications for Financial Stability and Macroeconomic Policies”, CEPR Policy Report.
- [3] Beck, Thorsten (2011), Bank Failure Resolution: A Conceptual Framework, In: Panagiotis Delimatsis and Nils Herger (Eds.): *Financial Regulation at the Crossroads: Implications for Supervision, Institutional Design and Trade*, 53-71.
- [4] Beck, Thorsten (2012), *Banking Union for Europe - Risks and Challenges*, VoxEU E-book.
- [5] Beck, Thorsten, Radomir Todorov and Wolf Wagner (2013), Bank Supervision Going Global? A Cost-Benefit Analysis, *Economic Policy* 28, 285–44.
- [6] Calzolari, Giacomo and Gyongyi Loranth (2011), Regulation of Multinational Banks: A Theoretical Inquiry, *Journal of Financial Intermediation* 20, 178-98.
- [7] Claessens, Stijn, Richard Herring, and Dirk Schoenmaker (2010), A Safer World Financial System: Improving the Resolution of Systemic Institutions, *Geneva Report on the World Economy* 12.
- [8] Claessens, Stijn, and Neeltje van Horen (2012), Foreign Banks: Trends, Impact and Financial Stability, IMF Working Paper WP/12/10.
- [9] Dell’Ariccia, Giovanni and Robert Marquez (2006), Competition Among Regulators and Credit Market Integration, *Journal of Financial Economics* 79, 401-30.
- [10] Demirgüç-Kunt, Asli and Harry Huizinga (2010), Bank Activity and Funding Strategies: The Impact on Risk and Returns, *Journal of Financial Economics*, 98, 626-650.
- [11] Demirgüç-Kunt, Asli and Harry Huizinga (2013), Are Banks Too Big to Fail or Too Big to Save? International Evidence from Equity Prices and CDS Spreads, *Journal of Banking & Finance*, 37, 875-894.

- [12] Freixas, Xavier (2003), Crisis Management in Europe. In *Financial Supervision in Europe*, ed. J. Kremers, D. Schoenmaker, and P. Wierds, 102–19. Cheltenham: Edward Elgar.
- [13] Financial Times (2013a), Rush to EU banking union hits roadworks and diversions, *Financial Times*, June 26 2013.
- [14] Financial Times (2013b), NY FED warns on ‘go it alone’ regulators, *Financial Times*, April 22 2013.
- [15] Goodhart, Charles and Dirk Schoenmaker (2009), Fiscal Burden Sharing in Cross-Border Banking Crises, *International Journal of Central Banking* 5, 141-65.
- [16] Holthausen, Cornelia and Thomas Ronde (2002), Cooperation in International Banking Supervision: A Political Economy Approach, ECB Working Paper 315, European Central Bank.
- [17] Krimminger, Michael (2007), Banking in a Changing World: Issues and Questions in the Resolution of Cross-Border Banks, In: Douglas Evanoff, George Kaufman and John LaBrosse (Eds.): *International Financial Instability. Global Banking and National Regulation*.
- [18] Loranth, Gyongyi and Alan Morrison (2007), Deposit Insurance, Capital Regulations and Financial Contagion in Multinational Banks, *Journal of Business Finance & Accounting* 34, 917-49.
- [19] Oates, Wallace (1972), *Fiscal Federalism*, Harcourt-Brace, New York.
- [20] Osterloo, Sander and Dirk Schoenmaker (2007), Financial Supervision in an Integrating Europe: Measuring Cross-Border Externalities, *International Finance* 8, 1-27.
- [21] Schoenmaker, Dirk (2010), Burden Sharing for Cross-Border Banks, *Revista de Estabilidad Financiera*, 18, Bank of Spain, 31-47.
- [22] Schoenmaker, Dirk (2013), *Governance of International Banking: The Financial Trilemma*, Oxford University Press, forthcoming.
- [23] Schoenmaker, Dirk and Arjen Siegmans (2013), Efficiency Gains of a European Banking Union, Tinbergen Institute Discussion Papers 13-026/IV/DSF51.