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## EU Framework for Safeguarding Financial Stability: Towards an Analytical Benchmark for Assessing its Effectiveness

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## IMF Working Paper

Monetary and Capital Markets Department

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#### Abstract

**This Working Paper should not be reported as representing the views of the IMF.**

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European finance is becoming increasingly cross-border, while the European architecture for safeguarding financial stability – including decision-making processes for providing financial-stability public goods – have remained decentralized with some explicit mechanisms for coordination across countries. Policy makers are aware of the limitations of the existing institutional setting, but opinions on how to proceed, including on burden sharing, are lining up along national and regional political lines with less attention paid to European needs. This paper applies the ‘economics of alliances’ to examine these European policy challenges. The paper establishes benchmarks for assessing the ability of Europe’s existing institutional architecture to efficiently allocate resources to safeguard the EU financial system against systemic threats to stability, such as the insolvency of a pan European bank.

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## I. INTRODUCTION

The European Union (EU) is considering reforms of its architecture for safeguarding financial stability, including the management and resolution of cross-border European financial crises.<sup>2</sup> Much of the discussion has considered whether, and how, the costs of cross-border banking problems should be shared. Although this is a concern, European financial-stability challenges are considerably broader and could involve the (re)creation of Europe's architecture to capture the potential benefits of coordinating decisions that allocate resources for providing European—as opposed to national—financial-stability public goods.<sup>3</sup>

The timeliness of these challenges can not be overstated. In sharp contrast to the nation-oriented architectures for safeguarding stability and the decentralized decision-making processes for allocating resources, cross-border European finance is continuing to grow rapidly and to become more complex and opaque. Moreover, a European financial system is fast becoming a reality—with extensive pan-European markets and the emergence of regional and European institutions. Driving the debate in Europe is a growing recognition by policy makers and politicians that, along with substantial benefits, the emergence of a European financial system will most likely be accompanied by a greater propensity for market turbulence, cross-border contagion, and regional and European systemic risk.

These challenges are seen as requiring a framework that balances the need for economically efficient, least-cost resolutions of cross-border financial problems, should they occur, against the desire to prevent or at least minimize the moral hazard that accompanies financial safety nets. Opinions on how to proceed, particularly on fiscal-cost burden sharing of cross border bank resolution, are lining up along national and regional political lines with less attention paid to safeguarding European financial stability.

Unfortunately, there is a dearth of literature that provides much analytical guidance on these important European issues and, in particular, for assessing the existing architecture's ability to safeguard European financial stability. An important exception is the approach developed in Freixas (2003), which suggests that information asymmetries and country differences in prudential capabilities—such as what presently exists in Europe—will most likely lead to suboptimal decision making and outcomes that can be improved upon through cooperative decision making and centralized information.

This paper applies an alternative approach. It examines model-based benchmarks for assessing the ability of Europe's existing institutional architecture—including its decision-making processes—to efficiently allocate resources to safeguard the EU financial system against systemic threats to stability—such as the insolvency of a pan European bank. The approach is that of the 'economics of alliances,' developed by Olson (1965) to analyze the nature of

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<sup>2</sup> See EU (2007).

<sup>3</sup> In this paper, the term 'EU safety net' refers to this architecture unless otherwise noted. It encompasses prudential supervision, LOLR, deposit insurance and reorganization and resolution.

decision making by a group of countries (NATO) desiring to create a common (military) deterrence against an outside (nuclear) threat. This approach is applicable to settings where collective and cooperative decision making in the production of public goods could lead to welfare improving outcomes relative to decentralized decision making. Differently from NATO, the EU was not created as a “defensive alliance,” but both international alliances share two characteristics relevant for our analysis: a large number of member countries and the need for providing multiple public goods. This paper applies this approach to the provision of European financial stability as a transnational public good within the EU (without dwelling on the mathematics of the approach).

The resulting analysis highlights the need to tackle the possible architectural reforms considered in EU (2007) and previously discussed in various strands of the academic *qua* policy literature.<sup>4</sup> This paper takes the existing European framework as given (in a simplified way) and asks whether it is capable of producing optimal outcomes. In this sense, the paper takes a more ‘positive’ approach when compared to the relatively ‘normative’ literature cited.

The paper is organized as follows. Section II briefly outlines the current policy debate, which seems to be driven by the increasing recognition that there are potential externalities (both positive and negative) that could be associated with rapidly growing EU cross-border financial activities. This section also describes the existing EU framework for safeguarding financial stability, and, as an example, the incentives—or lack thereof—for cooperation in resolving a cross-border banking problem. Section III briefly characterizes in heuristic terms the EU decision-making problem so that it is more amenable to modeling—as one of optimal economic policy design. Section IV then draws implications for this decision making problem from two simple models developed and applied in different contexts from ‘the economics of alliances’ literature. A final section concludes the paper and makes suggestions for future research.

Several general conclusion and implications follow from the models that are relevant for the ongoing debate. First, neither the existing EU framework nor proposals for burden sharing of fiscal costs seem to satisfy the conditions for optimal decision-making and policy design implicit in how a group of countries would behave optimally when they share the benefits of a public good like EU financial stability. Second, a decision-making process that does not fully internalize negative externalities, by providing a sub-optimal amount of the financial-stability public goods, may be associated with a larger fiscal burden to share in resolving financial difficulties. Third, greater coordination of resource-allocating decisions for producing the public good and/or greater internalization of decisions are complementary paths to move closer to what would meet the optimality requirements of rational decision making in the existing theory. Finally, the models also bring into focus the ambiguity of the optimality of an ‘ex ante’ burden sharing of costs based on GDP shares.

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<sup>4</sup> For a selective sample of papers discussing possible reforms to the European architecture see Prati and Schinasi (1999); Goodhart (2000); Holthausen and Ronde (2005); Nieto and Wall (2006); Schinasi and Teixeira (2006); Eisenbeis and Kaufman (2007); and Mayes, Nieto and Wall (2007).

## II. EXISTING FRAMEWORK FOR SAFEGUARDING FINANCIAL STABILITY AND THE ONGOING EU DEBATE

The EU's institutional architecture for financial crisis management and resolution reflects three principles: *decentralization*, *segmentation*, and *cooperation* (Lastra (2003); Schinasi and Teixeira (2006); Garcia and Nieto (2007)).

First, it is based on *decentralization*, with the performance of financial stability functions relevant for crisis management based, in large part, on the exercise of national responsibilities by prudential supervisors, central banks, treasuries and deposit insurance schemes. It also largely follows the legal structure of financial groups, and accountability resides primarily at the national level.<sup>5</sup> The European Central Bank (ECB) and the national central banks (NCBs) of the European System of Central Banks (ESCBs)<sup>6</sup> have financial-stability-related responsibilities, notably in the field of oversight of payment systems and contribution to national policies on financial stability and supervision. The performance of the lender-of-last-resort function is likewise a national responsibility. This is also the case in the euro area, where the provision of emergency liquidity assistance (ELA) is the responsibility and liability of national central banks. This is a unique feature of the Eurosystem in which national central banks have the responsibility of providing ELA without having monetary-policy (as opposed to monetary-operations) responsibilities. However, information flows within the Eurosystem are such that the potential liquidity impact of ELA operations can be managed in the context of the single monetary policy (ECB, 2000).

Second, financial stability functions are *segmented* across sectors. Prudential supervision is exercised by single (cross-sectoral) supervisory authorities and national central banks and, in some cases, is shared between the central bank and the supervisor. The prudential framework followed by supervisors is largely harmonized by EU legislation, but the EU Directives that minimally harmonize the financial playing field across the EU have fallen short of creating a common regulatory and supervisory framework as yet. This results in a disparity in the degree of convergence and quality of financial supervision (Čihák and Podpiera, 2007). Supervision of banking groups and financial conglomerates is conducted separately by each of the supervisors that licensed each entity of the group. Coordination between supervisors is achieved by “consolidating” and “coordinator” supervisors that have limited powers to override decisions by individual authorities. In the euro area, banking supervision and ELA are under the responsibility and liability of the national authorities. Lastly, although some elements of deposit

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<sup>5</sup> There are exceptions. First, the home country supervisor of a bank parent will exercise supervisory authority over a subsidiary bank incorporated in another country through its supervision of the consolidated banking group and the home country supervisor may be the sole prudential supervisor if the host country supervisor of the subsidiary delegates its responsibility. Second, the host country deposit insurer of a branch may supplement the coverage provided by the insurer of the home country to bring it up to the host country's level.

<sup>6</sup> The European System of Central Banks (ESCB) is comprised of the ECB and the NCBs of all EU Member States whether they have adopted the euro or not. By contrast, the Eurosystem comprises the European Central Bank (ECB) and the national central banks (NCBs) of those EU countries that have adopted the euro.

guarantee schemes and banks' reorganization and resolution are harmonized, they have broadly developed in different ways in each Member State.

Third, a number of *cooperation* structures are in place for bridging the potential information gaps of coverage between national responsibilities in safeguarding financial stability. These structures range from legal provisions (e.g., consolidated supervision) to common fora and memoranda of understanding (MoU). There are two MoUs currently in place on financial crisis management of cross border banks in the EU, one between central banks and supervisors and the other additionally involving treasuries.<sup>7 8</sup> The limitations of MoUs in achieving their goals are analyzed by Nieto (2007).

Against this background, achieving a balance between member sovereignty and financial stability in the EU is becoming increasingly difficult as the European financial system integrates as described in Garcia and Nieto (2007). Integration has been slower in banking, and particularly in retail banking, than in the market place (wholesale markets), where integration is far advanced, and in other sectors of the financial system. In banking, integration is occurring, although it has mainly taken place until very recently within regional areas in the EU.<sup>9</sup>

Section A below examines the present debate among policy makers on the need to reform the existing institutional framework, and Section B discusses existing incentives (or lack thereof) to cooperate—using as an example the incentives among banking safety net regulators.

### A. Policy Debate

EU national authorities are becoming increasingly aware of the limitations of the existing institutional framework, for example for resolving EU cross-banking problems. Some of the limitations were acknowledged openly for the first time in 2004 at the highest level by the Council of Economic and Financial Affairs (ECOFIN) comprised of the ministers responsible for EU economic affairs and finance.<sup>10</sup> At their 9 September, 2006 Informal ECOFIN meeting,

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<sup>7</sup> The MoUs consist of sets of principles and procedures that deal specifically with the identification of the authorities responsible for crisis management (central banks, prudential supervisors and ministries of finance) and the required flows of information between all authorities and the practical conditions for sharing information at the cross-border level. In addition to these MoU, EU banking supervisors and central banks also adopted in 2001 the MoU on cooperation between payment systems overseers and banking supervisors, which sets out arrangements for co-operation and information in relation to large-value payment systems. Press release available at <http://www.ecb.int/press/pr/date/2001/html/pr010402.en.html>.

<sup>8</sup> Press releases available, respectively, at [http://www.ecb.int/press/pr/date/2003/html/pr030310\\_3.en.html](http://www.ecb.int/press/pr/date/2003/html/pr030310_3.en.html) and [http://www.eu2005.lu/en/actualites/documents\\_travail/2005/05/14ecofin\\_mou/index.html](http://www.eu2005.lu/en/actualites/documents_travail/2005/05/14ecofin_mou/index.html). There are also (generally bilateral) MoUs among prudential supervisors.

<sup>9</sup> See Hernando, Nieto and Wall (2007) for an analysis of the determinants of cross border bank acquisitions in the EU and comparison with the US.

<sup>10</sup> Council of the European Union 9799/04. ECOFIN 186 EF 25, 26 May, 2004. In the Draft Council conclusions of the Financial Services Committee's report on financial integration, the report of the ECOFIN "... stresses the need for Supervisors, Central Banks and Finance Ministers to work together to ensure that appropriate plans and mechanisms are in place to respond to any developing financial crisis which threatens the stability of the financial

(continued...)



EU finance ministers and central bank governors launched an initiative to explore ways to further develop financial stability arrangements in the EU on the basis of the experiences of a crisis simulation exercise. Within this initiative, the starting point is that an effective crisis management framework must evolve, as markets already have done, from a purely national concern to include an explicit cross-border component. The initiative also endeavors to further develop general principles (i.e. minimum cost resolution) and procedures (i.e. assessment methodologies; bankruptcy procedures) for resolving a cross border financial crisis including the policy issue of *ex ante* burden sharing agreements on the fiscal cost of banking crisis (see EU (2007) for the way forward on this initiative). Some policymakers see *ex ante* burden sharing as a cornerstone of a reformed financial stability framework; they see it as a requirement for fully internalizing spillovers of domestic policy actions. Others consider *ex-ante* cost burden-sharing as premature, in part because cost allocation may ultimately be influenced by other more fundamental reforms of the EU framework; others see it as entailing moral hazard, including forestalling reforms of the existing framework EU framework (see IMF (2007)).

Although many in the EU understand burden sharing as facilitating cooperative cross-country solutions (that is, all countries working toward the objective of EU financial stability), the EU debate has focused on *ex ante* sharing of fiscal costs of cross border bank resolution. One rationale given for this focus is that in the event of a failure of a large cross-border European bank, home country supervisors, deposit insurance agencies, resolution authorities and tax payers would be prepared to meet the financial costs of bank restructuring (i.e. recapitalizing a bank in its entirety).<sup>11</sup>

## **B. Are There Incentives to Cooperate in Safeguarding EU Financial Stability?**

The strong national orientation of the EU safety net suggests that in the midst of a crisis, there would be a strong tendency for national authorities to put their own national interests first. As described above, from the perspective of resolving cross-border problems, the present network of nationally oriented financial safety nets provides few incentives for minimizing losses to taxpayers and provides incentives for delayed nationally oriented solutions that are likely to substantially increase taxpayer losses.<sup>12</sup> For example, the interdependence of prudential supervision of banks operating across borders creates a principal-agent relationship between the society (voters and taxpayers) of one country as principal and the various supervisors of the rest

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*system. It also [...] stresses the importance of promoting financial stability and market integrity, through both legislative and practical initiatives [...]."*

<sup>11</sup> Goodhart and Schoenmaker (2006) aver that an 'ex ante' burden sharing scheme would be incentive compatible: fiscal authorities, as principal, will require the optimal level of effort from the supervisor, as agent. Mayes, Nieto and Wall (2007) question whether this would be optimal, doubt that one government agency acting as principal could require another government agency acting as agent to perform optimally, especially in a situation where neither the optimal effort nor the actual effort by the agent are fully observable to the principal and further argue that the more any such agreement is enshrined in hard law, the more plausible the commitment is likely to be by raising the cost of reneging and/or increasing the benefit of honoring the commitment.

<sup>12</sup> For further discussion see Mayes, Nieto and Wall (2007).

of the banking group as the agents.<sup>13</sup> Moreover, the usual principal/agent problems are made substantially worse because some of the principals may have no direct authority over the agent, as when a supervisory authority in one country may expose the taxpayers in another country to losses. The problem is that the agent's incentives will be to follow the goals of the principal that has some direct authority over the agent. That is, when conflicts arise among the principals, the supervisor (agent) is likely to follow the perceived interests of their own country's government and voters (principal).

As an example of existing incentives, consider Table 1, which summarize the incentives to cooperate among national Treasuries in sharing the fiscal cost of a banking crisis depending on the systemic importance of banks both in the host and home country. In the present institutional framework, the incentives to cooperate would be greater in the case of a parent and a subsidiary that are systematically important in their respective banking markets particularly if the subsidiary is key to the survival of the entire group. Moreover, if contagion could be an issue for the EU, the affected Member States, particularly if they are large, could have the political leverage to propose the financing of the banking losses via EU public or private funds. By contrast, there are no incentives to cooperate when the parent and the subsidiary banks are non systemic both in the home and host countries. In turn, in the case of a bank headquartered in the EU and a branch in another EU country, which are both systemic in the home and host countries from the point of view of the "externalities" that the business activities may cause in their respective countries, it will be more difficult to agree on using the EU funds than in the case of subsidiaries, since the responsibilities for supervision, deposit insurance and resolution fall into the home country.

**Table 1: Incentives to cooperate and likely outcomes in sharing costs of resolution**

<b>HOME</b>	<b>HOST</b>	
	<i>Systemic</i>	<i>Non-Systemic</i>
<i>Systemic</i>	<ul style="list-style-type: none"> <li>- Contagion important and incentives to cooperate</li> <li>- If contagion is an issue at the EU level, then burden sharing might consider using EU private or public funds.</li> </ul>	<ul style="list-style-type: none"> <li>- Home authorities better placed to know financial situation of bank. Host has less of an incentive to cooperate with home authorities.</li> <li>- Reputational issues to be considered when settling burden sharing conflicts .</li> </ul>
<i>Non-Systemic</i>	<ul style="list-style-type: none"> <li>- No incentives to cooperate but home authorities better placed to know financial situation of banking group</li> <li>- Burden sharing conflicts. Most likely, burden on host country.</li> </ul>	<ul style="list-style-type: none"> <li>- Minimum conflict</li> </ul>

The problem with supervising banking groups as collections of separate legal banking charters is that the legal approach does not often reflect how these organizations function in practice. It

<sup>13</sup>For simplicity, it is assumed that supervisors act as perfect agents on behalf of their national tax payers. This view is challenged by E. Kane and others.

is unrealistic to expect subsidiaries can be cut off from their parent in the event of difficulties and to be asked to function on their own, with or without statutory management <sup>14</sup>

There are also legal impediments in the EC Treaty to the sharing of cost in resolving an EU banking crisis. Three articles of the Treaty indirectly are applicable to the financing of insolvent bank bailouts—Articles 101, 102 and 103. Article 101 prohibits the provision of central bank liquidity to institutions that are potentially insolvent. One interpretation of this article is that if a bank were declared insolvent, then all assets (including collateral) would be frozen and creditors would have the first priority in being made whole.

Another interpretation of this article is that central banks would be unable to finance the issuance of bonds by national treasuries for resolving the insolvent bank. In order to avoid a perception of monetary financing, national treasuries would need to provide state guarantees in a transparent manner.

The prohibition of "bailouts" of governments contained in Article 103 also places limitation on the resolution of insolvent banks by means of the European Community assuming the commitments of bodies governed by public law such as deposit insurers or bank resolution agencies. However, these institutions can have privileged access to financial institutions' liquidity based on prudential considerations according to Article 102. Prudential considerations are those designed to promote the soundness of financial institutions so as to strengthen the stability of the financial system.<sup>15</sup> Article 102 opens the possibility of a liquidity facility fully financed by private banks that eventually would have the right to purchase the insolvent bank (or parts of it). Banks participating in this borrowing facility with a stake in the insolvent bank would have the incentive to minimize losses. The role of central bankers and prudential supervisors would be to reduce the information asymmetries providing information on the financial condition of the insolvent bank.

The next section of the paper characterizes, in a simplified way, Europe's financial-stability challenge as one in which European countries make decentralized decisions about how much of the shared public good (European financial stability) to provide. The section distinguishes between 'pure' public goods that are provided to all Europeans and 'exclusive' public goods provided primarily to national citizens. The models developed in Section 4 based on this characterization of the challenge then go on to make more transparent some of the implications of decentralized decision making and what it means within the context of the current debate within Europe.

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<sup>14</sup> On this point see Mayes (2006).

<sup>15</sup> Council Regulation (EC) No 3604/93 of 13 December 1993 specifying definitions for the application of the prohibition of privileged access referred to in Article 104a of the Treaty.

### III. MODELING EUROPE'S FINANCIAL-STABILITY CHALLENGE OF PROVIDING A PAN-EUROPEAN PUBLIC GOOD

It has become increasingly recognized that for the purposes of financial-system policy making, financial stability should be viewed as a public good.<sup>16 17</sup> The operational significance of this is that achieving and safeguarding financial stability requires both collective decision-making and action, at times involving private stakeholders, at times public stakeholders (including politicians and policy makers), and at times combinations of both. The crisis-management discussion in Europe has focused recently on fiscal burden sharing, in part because large and systemically important European financial institutions with significant cross-border operations/exposures are emerging. However, this paper takes it as given that the challenge is broader and, as recognized by the ECOFIN, is that of safeguarding EU financial stability. This entails both the prevention of threats to EU financial stability and the effective management and resolution of EU financial problems at minimum fiscal costs.

Safeguarding financial stability is challenging within one legal jurisdiction, because it requires significant resources and collective action. The challenges are greater within a multi-country and decentralized decision-making framework such as the EU's. The added difficulty is that the public-good benefits of EU financial stability arise through the efforts and resources (expenditures) of individual countries whose primary objective is national financial stability and not European. Only recently have cooperation mechanisms been established to promote and to foster close cooperation and information sharing, both on an ongoing basis and within the context of any crisis situation that might arise. These mechanisms are positive initial steps to take account of the potential externalities that may exist across countries and within pan-European markets. Negative externalities could be associated with cross-border financial problems either involving turbulence across European markets or systemically important European financial institutions with extensive cross-border operations and financial exposures. Thus, the ongoing discussions in Europe to cooperate more closely and to share information can be seen as first steps in an EU iterative process to internalize some of the potential negative externalities associated with the integration of national financial systems.

Looking ahead to the next section in which benchmark models are discussed, existing EU arrangements can be characterized in a simplified, yet relevant way. Accordingly, the EU framework for resolving cross-border banking problems can be likened to one in which each nation independently decides to devote part of its economic resources to produce public goods that safeguard the stability of its national financial system—through market surveillance, and regulation and supervision of financial institutions, including bank resolution policies. At the same time, no single or collective entity devotes resources to safeguard the stability of the

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<sup>16</sup> Chapter 5 in Schinasi (2006) defines financial stability and provides reasons for seeing it as a public good.

<sup>17</sup> Financial stability can be considered a pure public good in the same way the provision of national defense is considered as one, because it provides non-excludable and non-rival benefits. Benefits are non-excludable if the provider/producer of the good cannot exclude others from the benefits without incurring significant costs. The benefits are non-rival if consumption by one agent does not reduce benefits to others. The provision of EU financial stability would have these characteristics for all member countries and their citizens.

European financial system—or the amalgamation of these integrated national financial systems.<sup>18</sup>

Within this simplified setting, and taking account of some of the differences between countries within Europe, three types of countries can be distinguished. First, consider a large country in Europe whose economic and financial activities comprise a relatively large share of European activities. In providing for national financial stability (or not providing for it) the large country may be providing both ‘exclusive’ public goods, whose benefits are received by nationals, and ‘pure’ public goods, whose benefits are received by a large majority, if not all, European countries. For such countries, the provision and maintenance of financial stability can be seen as providing joint products: the ‘exclusive’ or national benefits of stability to its own citizens (which collectively amounts to a public good) as well as the positive externalities of stability conveyed through market integration and cross-border financial institutions to citizens of other nations whose financial systems are closely integrated: the public good from the European perspective. The widespread benefits of ‘pure’ public goods can arise, for example, because of the important role of the large country’s markets, financial institutions, or market infrastructures in the integrated EU market place.

Second, there are (small) countries in the EU whose financial activities are either small relative to EU activity or primarily domestic. In these countries, the resources devoted to safeguarding national financial stability can be seen as providing primarily ‘exclusive’ benefits to their nationals.

Third, and by contrast, there are countries in Europe whose size and, therefore, whose resources devoted to preserve financial stability, are small relative to the potential negative externalities that might be conveyed to the EU markets (e.g. by the failure of a large cross-border bank whose parent is licensed in the jurisdiction of this small country). All of these distinctions can be analyzed in the approaches developed in Section 4—although this paper does not fully analyze them.

Taking these differences as given, the decision making problem faced by policy makers in the EU can be viewed as one in which an alliance of a large number of countries (27 in the EU or 13 in euro area) independently decide the resources to devote to financial stability in their own economies knowing that there is some unquantifiable threat of financial instability to Europe as a whole (i.e. contagion), for example, relating to cross-border bank problems. They do so in the knowledge, or at least the presumption, that they may both be conveying benefits to non-citizens and receiving benefits from the actions of other European countries. Because each nation knows this, there are incentives for some to free ride on the benefits provided by others (e.g. more prudential supervision) and thereby devote a lower level of resources to financial stability than is optimal nationally.

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<sup>18</sup> In this simplified scheme, the “quality” (of the public good) is considered constant and the “quantity” varies across countries.

This is a dilemma faced by European policy makers that the models developed below make transparent. If each nation makes independent decisions in providing a public-good in the form of financial stability, then there is the possibility that each country will devote an insufficient amount of resources to safeguarding EU financial stability as a whole and, in some countries, perhaps an insufficient level of resources nationally as well. While well-known in welfare economics, this conclusion and its implications have rarely been analyzed within this financial-stability context; and the models developed below carry several other interesting, and in our view important, implications for the current debate in Europe.

#### **IV. APPROACHES FOR EVALUATING CURRENT EU FINANCIAL STABILITY FRAMEWORKS**

In viewing European financial stability as a public good that provides benefits to all EU countries, key questions seem to be: Who should provide the public good?; and how can the benefits be sustained and safeguarded?

As noted, there is not much formal economic analysis examining these issues, which is understandable given the difficulties of doing so. Particularly difficult to formalize is the existing complex, decentralized, and nationally-oriented EU safety net—albeit with some, mainly non-legally binding agreements promoting dialogue, information sharing, and convergence in frameworks. In this regard, the centralization of business operations and risk-management functions of the European large and complex financial institutions have run far ahead of the institutional structures that are responsible for oversight of these very same institutions and the pan-European markets in which they operate.

To our knowledge, the ‘economics of alliances’ approach has not been applied to analyze the challenges now facing financial-stability policy makers in the EU. This approach analyzes the nature of ‘equilibrium’ outcomes that can arise when members of a group of optimizing decision makers share the benefits of a public good (or the costs of its absence) and must decide how to allocate their own scarce resources to contribute to its production. Within this framework, the implications of a variety of decision- and policy-making processes can be modeled and analyzed.

That this can help to sort through some of the difficult financial-stability issues in the EU should be obvious. For example, EU stakeholders that share in the benefits of European financial stability (or who share the costs of its absence) can be viewed as having the option (1) to continue to make decentralized public-good decisions focusing primarily on national objectives or (2) to form coalitions that make joint and mutually advantageous allocations of coalition resources aimed at maximizing coalition public-good benefits. In the context of the models, socially optimal decision making for the EU as a whole would imply the full internalization of potential externalities in the decision-making process (for example, via central data bases of banks’ financial condition; convergence of prudential regulation and supervisory practices; a common budget authority) without necessarily implying a new centralized European institution. The most inclusive coalition would be all European countries; less inclusive would be the EU; even less inclusive would be the euro area countries. Each coalition can have separate yet related objectives. One can also imagine a coalition of large countries or of small countries or

both considering whether it is to their advantage to design a shared prevention and resolution framework of their own that optimizes the utilization of their joint resources.

It is an advantage of the ‘economics of alliances’ that one can analyze and then compare the characteristics of the optimal outcomes consistent with, on the one hand, a decentralized decision making process (for example, *Nash equilibrium*), and on the other hand, more cooperative decision making process, as described in the previous paragraph, which could result in Pareto-efficient equilibrium allocations for the group as a whole.

The remainder of this section examines the implications of two simple models that provide objective ‘benchmarks’ for evaluating aspects of the ongoing debate in the EU, such as the implications of decentralized *versus* centralized decision making and the benefits *versus* costs of ‘ex ante’ burden sharing agreements for resolving threats to financial stability (or what amounts to the same thing in the models, to producing the optimal amount of financial-stability benefits). Subsection A examines the implications of a decentralized decision making in allocating resources to the production of a ‘pure’ public good that conveys benefits to all countries and citizens within a group of countries. Subsection B then goes on to examine the production of a public good that conveys some exclusive public-good benefits to the country that provides it and some pure public-good benefits to all other countries as well. This joint-public-good model encompasses the pure model and results of the two models can be compared.

#### **A. Decentralized Decision-Making in Providing a ‘Pure’ Public Good (such as European-Wide Financial Stability)**

Consistent with the features of the EU safety net as described in section 2, and without getting into the details of mathematical notation, the logic of a simple model can be briefly summarized as follows (see Annex for a more formal representation of this elementary benchmark model).

Each member of a group of countries (the EU) chooses an allocation of resources to produce a public good that conveys benefits to other countries in the group. The benefits can be seen, for example, as the resolution of threats to the stability of the European financial system, such as the insolvency of a pan-European bank. Each country chooses a resource allocation so as to maximize its own welfare subject to two constraints: (1) its income constraint (say, GDP), which requires that the cost of producing both an index of private goods and the public good does not exceed the nation’s income and (2) the presumption that each other country chooses an optimal resource allocation conditional on every other country doing likewise. The second constraint is relevant because all countries contribute to, and share the benefits of, the public good. Each country knows this and makes its decision presuming that all other member countries are also choosing optimal mixes of private and public goods conditional on all other countries behaving similarly. While not an exact indicator, a country’s GDP relative to total GDP of the alliance of countries (Europe) can be seen as proxy for the volume of the country’s financial activities relative to the size of the European financial system. One can think of noteworthy exceptions, but they are ignored here for simplicity but can be explicitly accommodated in more elaborate models. Thus, in what follows size can be taken as providing some indication of the potential for (1) spillovers of negative externalities of financial

difficulties to the wider European financial system and (2) ‘spill-ins’ of benefits of country-specific public goods to other countries in Europe.

Characterized as such, the simultaneous decision-making process faced by each member of the alliance of countries has many of the features of a non-cooperative mathematical game, the solution of which is a *Nash equilibrium*. The Nash solution is an equilibrium in the sense that no country has the incentive to alter its optimal allocation of resources if all other countries maintain theirs. That is, the marginal benefits on other allies are ignored.

Keeping the exercise relatively simple—and consistent with Olson and Zeckhauser (1966)—requires a number of important simplifying assumptions: (i) all countries share the benefits of a single pure public good (as opposed to an imperfect public or club good, with some exclusively private benefits); (ii) preferences of citizens in each country can be represented in a continuous and twice differentiable utility function; (iii) the cost of producing a unit of the common public good is fixed, valued in terms of the ‘numeraire’ private good, and is identical in each country; (iv) all decisions are made simultaneously; and (v) the public good produced by one country is the same as another (perfect substitutability).

The most relevant implications of this optimization exercise can be shown to be as follows:<sup>19</sup>

First, and as is well known in other contexts, the (decentralized, non-cooperative) Nash-equilibrium level of resources devoted to European financial stability would be suboptimal relative to the Pareto-optimal allocation of resources consistent with maximizing EU welfare (rather than each individual countries’ welfare). Even though each country optimally chooses to allocate resources to produce a private/public good output mix (conditional on simultaneous optimal ‘response’ choices by others as well), the resulting European equilibrium will be suboptimal. It is sub-optimal because no country considers the costs and benefits of its resource-allocation decisions in producing the pure public good for other European countries. Consequently, a sub-optimal level of the public good will be provided by a decentralized process compared to a coordinated one in which even only some of the positive externalities (benefits) from collective action can be internalized and distributed to all European countries.

Second, because of the model’s decentralized decision-making process, some countries (smaller ones) may find it optimal to free-ride on the efforts of others (as implied by perfect substitutability in the provision of the public good). This would be reflected in the country distribution of the supply of the public good. More specifically, the optimal allocation of the burden of safeguarding financial stability (for example, the sharing of the costs of resolving a cross-border banking problem) falls disproportionately on the larger (higher income) countries—in the sense that they provide a share of the public good that exceeds their GDP share in the group of countries. That is, in the Nash equilibrium, a large country’s share in providing the group’s total public good will exceed its GDP share in the alliance.

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<sup>19</sup> See Schinasi (2007) for a demonstration of these results.



Third, in the Nash equilibrium, member countries' propensities to provide the public good (that is, their policy reactions to a threat to their financial stability) will depend on four factors: country-specific income, the relative cost of producing financial stability, the aggregate amount of resources devoted to financial stability by *other* member countries, and the commonly perceived threat of financial instability. If all factors were in fact measurable, these derived *policy reaction functions* would be estimable.

Fourth, in the context of the current debate, if a greater matching of benefits received and costs incurred to preserve financial stability are to be achieved, then at least some form of coordination of resource allocation decisions, if not full internalization of the externalities, would be required. The mandate of the ad hoc EU group to consider cross-border implications for EU financial stability can be seen as a move in this direction if some form of coordination results.

Fifth, addition of new member countries (e.g., EU enlargement) would imply additional marginal benefits to the group as a whole (more contributors) without a diminution in the benefits for existing member countries to the extent that public goods are non-excludable and non-rival (as the model assumes) and the threat to financial stability is not increased.

These implications are conditional on the assumptions made, and will change if some of the assumptions of the model are relaxed or altered. For example, if one allows for country differences in the marginal cost of producing the pure public good, optimal decentralized decision making would imply that the more efficient countries would take on a larger share of the EU wide costs, regardless of their size. Thus, by relaxing this assumption, a country with a comparative advantage in providing, for example, efficient and relatively reliable clearing and settlement services for financial transactions, might end up devoting a greater amount of resources to producing this particular good to the benefit of all of Europeans.

## **B. Decentralized Decision-Making in Providing Both 'Exclusive' (Nationally-Oriented Financial Stability) and 'Pure' Public Goods (European-Wide Financial Stability) <sup>20</sup>**

Countries in Europe provide financial-stability public goods whose benefits are also country-specific and conveyed exclusively to economic agents residing within the country. For example, countries in Europe have country-specific deposit insurance schemes that protect domestic depositors in segments of the national banking system that are exclusive retail, domestic financial institutions (such as, for example, the Sparkassen in Germany). By contrast, there are elements of the EU safety net such as prudential regulation or parts of financial infrastructures in European countries – such as large-value payments systems– that require domestic public expenditures and public maintenance but which nevertheless convey public good benefits to nonresidents across the European financial landscape.

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<sup>20</sup> Deviations from the 'pure' public good model of Olson and Zeckhauser (1966) were first examined in Ypersele de Strihou (1967) and later generalized by Sandler and Cauley (1975), Sandler (1977), and Cornes and Sandler (1984). This section applies the analysis in these papers.

Once the possibility of ‘exclusive’ or ‘impure’ public goods are acknowledged and accounted for, the nature of the decision-making process within a country and among a group of countries changes as do the country and potential collective implications. In particular, while the set up of the model is the same as before, the public good conveys two types of benefits: ‘exclusive’ public-good benefits that convey only to the citizens of that specific country, and ‘fully shared’ public-good benefits to all other members of the group of countries (i.e. non contagion or absence of European systemic crisis). A key parameter in this model is the share of ‘exclusive’ benefits to the producing country relative to total benefits to all of Europe.

The implications of this more complicated model can be summarized as follows. First, the simultaneous decisions of countries still results in a Nash equilibrium. Consistent with the ‘pure’ public good model, other countries’ welfare are unaccounted for in each country’s decisions and so the resulting Nash equilibrium is still sub-optimal compared to one in which the decision making process internalizes the externalities. Achieving the Pareto optimal allocation of resources in this decision making process would require that all other countries benefits and costs be considered in each countries’ optimal decisions—a veritable coordinated decision making process.

The literature on the economics of alliances suggests that the existence of joint products could in reality provide greater incentives for collective action and coalition forming than the case of the pure goods model. As Sandler and Sargent (1995) demonstrated, a joint-products’ view may result in a coordination game where one of the Nash equilibrium would have all countries contributing to the collective action. If the ‘pure’ public-good benefits are a sufficient share of total benefits, then contributing to the activity may even be a dominant strategy. That is, if coordination allows countries to take advantage of country-specific benefits as well as excludable public benefits, then the payoff pattern may be more conducive to encouraging all countries to make contributions to the ‘fully shared’ public-good. Thus, the mix of joint products and their public-ness can influence how coalitions and alliances are formed.

Second, the greater are the exclusive benefits to a particular country relative to total benefits, the lower will be the extent to which the cost of providing shared benefits will fall disproportionately on larger countries. This is because as exclusive benefits take a greater share of total benefits (and as national financial stability becomes the exclusive benefit), smaller countries may capture fewer shared benefits and devote more of their resources to produce exclusive public goods. In other words, when there are country specific benefits, small countries have a greater incentive to produce the public good (financial stability).

As the exclusive benefits relative share to total benefits approaches one, market solutions and the formation of ‘clubs’ or ‘coalitions’ are capable of yielding solutions that achieve more efficient equilibrium outcomes (for example, consider the special coalitions between the Nordic and the Benelux countries to safeguard financial stability). This occurs because when there are exclusive country-specific benefits, more of the benefits of a public good are received by the country producing it. Accordingly, equilibrium outcomes are associated with a greater association between a country’s benefits received and costs incurred, which is welfare improving for all country members concerned.

Third, as the exclusive benefits relative share to total benefits increases, the benefits of collective action through cooperation and alliances declines. In the limit, when benefits are all exclusive, there are no shared public-good benefits between countries to internalize.

Fourth, countries with a greater likelihood of threats to stability—and of causing EU-wide threats—would contribute more resources to offsetting the resulting externalities.

Fifth, and consistent with an earlier implication, the recognition of joint products should result in decision making that produces a greater match between benefits received and cost burdens carried—which is similar to a benefit principle of taxation.

Sixth, the extent of sub-optimality is not related to the size of the group of countries if there is a large share of ‘exclusive’ public-good benefits.

Finally, once ‘exclusive’ public goods are admitted, and unlike with the production of pure public goods, the relation between a country’s resource allocation to produce the public good and that of other countries can be positive. This has the implication that a higher level of spending on the public good in one country might be associated with a greater level of expenditure in other countries as well. This would reduce the tendency toward free riding, and also raise the level of total benefits received by the group of countries. That is, in the joint-product model, there is greater scope for cooperation to move the group to an equilibrium that is welfare improving relative to the Nash equilibrium.

## V. SUMMARY AND CONCLUSIONS

This paper applies two models of decision making, drawn from the ‘economics of alliances’ literature, to assess the ability of Europe’s existing institutional architecture to effectively (if not optimally) allocate resources for safeguarding EU financial stability. The public goods considered in the paper can be thought of either generally as safeguarding (including prevention and resolution efforts) the EU financial system from systemic financial threats or specifically as resolving a European systemic financial event, such as the liquidity/insolvency of a pan-European bank or a pan-European-market-driven systemic threat to stability. In practice, in the absence of a common fiscal authority in the EU, the EU Treaty limits the possibility of using EU public funds (or ECB monetary financing) to save insolvent banks.

If decentralized decision making can be taken as a rough approximation of how European decisions are made, then the implications of the ‘pure’ public good model are instructive for the ongoing debate in Europe. Two implications are most pertinent.

First, decentralized decision making in the provision of shared financial-stability public goods results in an (Nash) equilibrium that is sub-optimal from a European perspective, even though each country views its decision as optimal and has no incentive to change its decision if other countries maintain theirs. In making decisions that do not account for the public good benefits/costs of other countries, each European country chooses a level of the public good that jointly turns out to be suboptimal for European stability. While this ‘fundamental theorem’ of welfare economics is well known, it serves as a timely reminder that greater coordination and

harmonization, if not full internalization, of decisions and policies in safeguarding EU financial stability could lead to welfare enhancing improvements relative to the existing European decentralized architectures and decision-making processes.

In recent years, there has been a growing recognition of this ‘efficiency’ gap, which has led to tangible efforts to capture some of these potential gains through policy coordination via participation in joint fora. The ongoing iterative process of cooperation and coordination through committees and MoUs can be interpreted within the model as having already moved the EU away from the Nash equilibrium toward an improvement in EU stability closer to the Pareto optimum. In this sense, the framework presented in the paper is descriptive of what is going on in the EU; as such, it is potentially useful for considering what might happen in the period ahead as EU countries consider how best to internalize existing externalities.

Second, the equilibrium established in providing shared public benefits has the characteristic that country size – as a proxy for systemic importance – matters. In this context, the larger countries in Europe will end up footing a disproportionately large share of the overall (and socially sub-optimal) burden of allocating resources to the production of the public good relative to GDP (including the financial resources to bail out banks) and there may not be a close matching across countries of the benefits received and the costs incurred in contributing to the shared public good. Within the context of the models discussed, and consistent with other applications of the ‘economic of alliances,’ the larger countries might have the incentive to form a coalition and move the equilibrium from Nash to one of the many other welfare-improving equilibria—which could shift some of the burden onto smaller countries.

The paper also considered the provision of financial-stability public goods that convey benefits that are partially ‘exclusive’ (country-specific). In this model, each country’s calculus changes and the resulting European equilibrium has different characteristics and implications. The exact nature of the Nash equilibrium and the other socially more optimal ones changes in ways that depend importantly on the extent to which benefits conveyed are ‘exclusive’ relative to total benefits. First, while the Nash equilibrium remains broadly suboptimal, compared to the Nash equilibrium in the ‘pure’ good case, smaller countries will share more in the cost burden to the extent that benefits are ‘exclusive’ (and do not have implications for the financial stability of the EU).

Second, within a decentralized decision making process, there are greater incentives for collective action and coalition forming than in the case of pure public goods. Thus, the mix of joint products and their public-ness can influence how the alliances are formed.

Finally, as the share of exclusive benefits to total benefits increases, the gains from collective action through cooperation and alliances naturally declines.

Future research on these challenges could consider model specifications that more closely account for other important features of the European financial system and decision-making process. The models could also be analyzed more specifically to evaluate the actual potential gains from a more coordinated approach in the EU. Another avenue for future development of these benchmark models would be to introduce the concept of contagion and link to it the

degree of integration.<sup>21</sup> A final avenue for research would be to examine the same issues within the context of models of ‘mechanism design.’<sup>22</sup>

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<sup>21</sup> The authors are grateful to Jorg Decressin and Martin Čihák for these and other substantive suggestions.

<sup>22</sup> As discussed in Box 1 in Čihák and Decressin (2007)

## Annex: The Models

### 1. Decentralized decision-making for ‘pure’ public goods.

Preferences of European citizens in country  $i$  ( $= 1, 2, \dots, n = 27$ ) can be represented by the continuous and twice differentiable utility function,

$$U_i = U_i(y^i, Q, T) = U_i(y^i, q^i + Q_{-i}, T), \text{ where,} \quad [1]$$

$y^i$  is a composite private good produced by country  $i$ ,

$Q = q^i + Q_{-i}$  is the aggregate amount of the ‘pure’ (or fully shared) public good,

$q^i$  is country  $i$ ’s production of the pure public good,

$Q_{-i} = \sum_{j \neq i}^n q^j$  is the production of the public good by countries other than  $i$ , and

$T$  is a measure of the commonly perceived threat to the group’s financial stability.

The simple sum  $Q$  of the  $q^i$ ’s embodies the notion of a ‘pure’ public good in which each country’s public good,  $q^i$ , yields fully shared benefits that are identical to those of any other country’s  $q$ . This ‘substitutability’ of public goods implies the possibility of *free riding*.

Each country faces the income constraint [2] in which the value (cost) of a unit of the private good is 1 and the cost of the public good in terms of the numeraire private good is  $p$ :

$$I^i = y^i + p q^i. \quad [2]$$

[1] implies that each country’s welfare depends on the decisions of other countries (as denoted by  $Q$ ). Thus, country decisions have the characteristics of a *Nash* game.

*The Nash problem for each country ( $i = 1, 2, \dots, n=27$ ) can now be formalized as,*

$$\text{Max}_{y^i, q^i} \{U_i(y^i, q^i + Q_{-i}^*, T)\} \text{ subject to } I^i = y^i + p q^i, \text{ where,} \quad [3]$$

$Q_{-i}^* = \sum_{j \neq i}^n q^j$  \* represents the best-response provision of public goods by all countries other

than  $i$ , given  $i$ ’s allocation of resources; this is also country  $i$ ’s *best-response spill-in* of benefits from the provision of public goods by all other countries.

Assuming that all countries individually provide a positive amount of the public good,  $q^i$ , a *Nash equilibrium* consists of country allocations of resources that solves [3] for all countries. The first-order conditions for optimization are satisfied when each country chooses the mix of private and public goods that equates the marginal rate of substitution between private and public goods to the relative marginal costs of producing both, i.e., when for all  $i$ ,

$MRS_{Qy}^i = p$ . By contrast, the Pareto-optimal provision of the public good is derived by maximizing each country's utility [1] subject to: (1) the constancy of other allies' utility levels and (2) the European resource constraint, the simple sum of the country resource constraints, I. The resulting first-order condition for reaching this optimum is that the *sum of the group of countries* MRSs are equal to the relative cost of a unit of the public good, p, or  $\sum_{j=i}^n MRS_{Qy}^j = p$ . Thus, in the Nash equilibrium, countries collectively provide an amount of the pure public good that is below the socially (Pareto) optimal level.

## 2. Generalization to allow for 'exclusive' public goods.

Alternatively, the public good, q, can be seen as conveying two kinds of benefits: an 'exclusive' country-specific benefit,  $x^i$ , and a fully shared benefit,  $z^i$ . Assume each benefit is provided in fixed proportions to the resources allocated to produce q:  $x^i = \alpha q^i$  and  $z^i = \beta q^i$ , with  $\alpha + \beta = 1$ . If  $\alpha = 0$ , then the pure public model results. If  $\alpha = 1$ , then all public good benefits are country specific.

In this general model, country i receives *spill-ins*  $Z_{-i} = \beta Q_{-i}$ ; European wide benefits, which are assumed to be additive among the member countries, amount to  $Z = z^i + Z_{-i} = \beta(q^i + Q_{-i})$ . Each country's utility function can now be represented as,

$$U_i = U_i(y^i, x^i, Z, T) = U_i(y^i, \alpha q^i, \beta(q^i + Q_{-i}), T). \quad [4]$$

In parallel with equation 3, each country's Nash problem can now be characterized as,

$$\text{Max}_{y^i, q^i} \{U_i(y^i, \alpha q^i, \beta(q^i + Q_{-i}^*), T)\} \text{ subject to } I^i = y^i + p q^i. \quad [5]$$

If  $\beta = 1$  ( $\alpha = 0$ ), equation 5 is equivalent to a pure public good model. If  $\alpha = 1$  ( $\beta = 0$ ), then there are no spill-ins associated with public goods provided by other countries.

A *Nash equilibrium* results when each member country  $i$  chooses a mix of public and private goods that satisfies,  $p = \alpha MRS_{xy}^i + \beta MRS_{zy}^i$ . The first right-hand term represents the marginal value (in terms of the numeraire good, y) of the 'exclusive' public good and the second is the marginal value of the 'shared' public good. The sum represents the country's marginal valuation of financial-stability benefits received; country  $i$  allocates resources to produce these benefits up to the point where the marginal costs and benefits are equalized.

Consistent with the results for the pure public good model, achieving the Pareto optimal allocation of resources in this decision making process would require that the *sum of the group of countries* MRSs are equal to the relative cost of a unit of the public good, p. The Nash equilibrium is socially sub-optimal as it was for the pure public good model above.

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