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PRELIMINARY

FINANCIAL STABILITY AND POLICY COOPERATION

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Abstract: Within the context of the Global Crisis, this paper examines the ongoing policy challenges in establishing a European framework for financial regulation and supervision. We do so taking into account the evidence provided during the crisis of pervasive spillover effects and cross-country interdependence. The paper applies the language and analyses of game-theoretic models as tools to think rigorously about the cross-country aspects of European financial integration over time. Specifically, the paper applies the economic theory of alliances of Olson and Zechauser (1966) and the private provision of public goods of Bergstrom, Blume and Varian (1986). We contrast the Nash equilibrium outcome with the Coase equilibrium that obtains under zero transaction costs. We follow Coase in taking the zero transaction costs benchmark as a starting point to discuss what factors favor cooperation in specific circumstances. We offer some reflections on the on-going process of institutional change in financial regulation and supervision in Europe.

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I. INTRODUCTION AND MOTIVATION.

The Global Crisis became acute in the late summer of 2008. By the autumn, the combination of sharply falling economic activity and trade around the globe, along with severely impaired and dysfunctioning financial markets and institutions, brought to mind images and fears reminiscent of the Great Depression of the 1930s. The threat of a debt-deflation spiral loomed large.

A main difference between the Great Depression and the Global Crisis was in the policy responses. These included: first, an aggressive easing of monetary policies through interest rates and other policy tools, including the provision of emergency liquidity assistance; second, financial policies aimed at avoiding systemic financial collapse, including the provision of government capital injections and guarantees; third, expansionary budgetary policies; and, fourth, policies aimed at facilitating structural adjustments and long run stability and sustainability.

The Global Crisis affected almost all countries in an unprecedented synchronous way. Interdependence and spillover effects were widespread and costly. This was particularly so in the autumn of 2008 and in financial markets. More recently, the Global Crisis has had a significant impact on government debt markets, raising (again) issues of contagion and spillover effects.

Because of these unique features, the global crisis provides an opportunity to examine and reflect upon the practice and effectiveness of continental and global international policy coordination and cooperation in the financial stability space. In fact, in this space, the policy response to the crisis included a fifth and most important element: an intensification of European coordination and a new more inclusive form of global cooperation.

Indeed, during the crisis, although most actions were taken at the national level, there was an unprecedented willingness, on the part of sovereign nations to engage in joint action and to

pursue a multilateral approach (e.g. on trade and on financial regulation and supervision) so as to avoid turning back on international integration and globalization. This represents a turning point for international governance, both politically and psychologically. In November 2008, at the peak of the crisis, the Heads of State of the Group of Twenty (G-20) met for the first time to discuss a cooperative policy approach aimed at restoring global financial and economic stability. The meeting was followed up on April 2, 2009 with the G-20 summit in London and, again, on September 25-26, 2009, in Pittsburgh.

Over time, the European Union has achieved a degree of international integration that is unmatched at the global level. This is so in many dimensions (cultural, social, political, economic and financial), but the progress in European integration can be symbolized in two projects: the single European market and the single currency (the euro).

The single market and the single currency have required (and will continue to require) a degree of institutional maturity unmatched at international level. Interdependence and spillover effects were extremely strong and visible during the crisis in the European Union in general, and in the euro area, in particular. In this context, it is not surprising that on October 12, 2009, euro area countries met for the first time at the level of Heads of State and Government. The meeting, which took place under French Presidency, aimed at drawing "a joint action plan for the Euro Area Member States and the European Central Bank in response to the current financial crisis."[1]

All of the above is relatively unique and suggests that the Global Crisis 2007 provides an opportunity to reflect upon the process of international policy coordination and cooperation and the conditions that might be necessary or lead to better outcomes. The reflection necessarily includes examining institutions, modalities and effectiveness.

Accordingly, the purpose of this paper is to examine the conduct of policies, by national authorities, in an environment of pervasive interdependence and spillover effects. Olson (1965) has argued that the model of decentralized provision of public goods could be successfully applied in an international context. The first example was the seminal contribution of Olson and Zeckhauser (1966) that started the economic theory of (military) alliances. They characterize deterrence as a pure public good among the members of the alliance. The framework can be adapted to be applied to a wide variety of transnational issues including climate change, energy security, international trade, financial stability and tax competition.

In the paper, we will use the model of private provision of public goods of Bergstrom, Blume and Varian (1986) and the joint products variant of Cornes and Sandler (1984). We will apply the framework to the case of financial stability, following Schinasi (2007) and Nieto and Schinasi (2007). In both cases, the benchmark is provided by non-cooperative Nash equilibrium. A number of propositions are standard. For example, for the pure public goods case, Olson and Zeckhauser (1966) show that the public good is underprovided and that a large, wealthy nation, bears a disproportionate share of the burden. These propositions are

[1] Available from the French EU Presidency 2008 website at http://www.eu2008.fr/PFUE/site/PFUE/lang/en/reunion_des_chefs_d_etat_et_de_gouvernement_de_la_zone_euro_21541.html

qualified for the case of joint products. We will also discuss critically the possible emergence of cooperation. A starting benchmark is the case of costless bargaining, considered by Coase (1960).[2] The various elements above provide a framework that can be used to evaluate institutions, rules and practices of international policy co-operation. The specific examples we will consider pertain to financial stability.

The remainder of the paper is organized as follows. Section II presents the standard model of private provision of public goods and joint product goods. It offers financial stability as a case of a collective good or, alternatively, a joint product. It will describe and characterize the challenges of international co-operation and discuss circumstances favoring the emergence of effective cooperation. Section III examines and assesses the European achievements in the area of prudential supervision and regulation. Section IV concludes and offers some reflections about global governance in this area.

[2] The general question of social cooperation, in the presence of pervasive externalities, that characterize common resources, has been investigated by 2009 Nobel Prize winner Elinor Ostron (1990).

II. EU FINANCIAL-STABILITY CHALLENGES VIEWED THROUGH THE PRISM OF GAME-THEORETIC LOGIC. [3]

A. The Relevance of 'Economic Theory of Alliances'

Given the difficulties involved, it is understandable that there is not much formal economic analysis examining collective action problems within a European context – for example, the financial-stability challenges faced by the EU. The 'economics of alliances' 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 provision. Within this framework, the implications of a variety of decision- and policy-making processes can be modeled and analyzed.

It is an advantage of the 'economics of alliances' that one can analyze and then compare the characteristics of outcomes consistent with non-cooperative decision-making Nash equilibrium). Non-cooperative equilibrium assumes players that act on their own "without any collaboration or communication with any of the others".[4] However, as we will show, the framework may also be used to discuss the possibility and the constraints on cooperation.

We aim at applying the "Economic Theory of Alliances" to European financial stability. The main idea is to think about financial stability as a good that is valued by all members of the European Union (or of the euro area). Therefore, financial stability may be regarded as a public good (or as joint product) and the theory applies.

B. Conceptual introduction and some intuition.

The EU framework for preserving financial stability can be likened to one in which each nation independently decides to devote part of its economic resources to provide for 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 over-arching entity devotes resources to safeguard the stability of the European financial system as a whole. The result follows from the amalgamation of these integrated national financial systems.[5] Clearly the simplified description above is only a starting point as the EU framework is based on "close coordination of national policies". We postpone discussion of these important aspects for later.

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[3] This section draws on the analysis in Berrigan, Gaspar, and Pearson (2009), Nieto and Schinasi (2007), and Schinasi (2007). The authors gratefully acknowledge the earlier contributions of their respective co-authors and their permission to draw on the work in the respective papers.

[4] John Nash, 1950, Ph.D. Dissertation, page 1.

[5] In this simplified scheme, the "quality" (of the public good) is considered constant and the "quantity" varies across countries.

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).

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 16 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 collectively.

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.

C. More Formal Analysis

The logic of a simple model of 'pure' public goods, with reference to the EU framework to preserve financial stability, can be briefly summarized as follows. Each member of a group of countries (the EU) chooses an allocation of resources to produce a 'pure' 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 Nash *equilibrium*. The Nash solution is equilibrium in the sense that no country has the incentive to alter its allocation of resources subject to the observed decisions of all others. Each country decides by setting (national) marginal benefit equal to marginal cost, thereby ignoring the effect of the decision on others.

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 n-country model can be written as:[6]

$$\max_{\{y^i, q^i\}} \left\{ U^i\left(y^i,\ q^i,\ \sum_{j \neq i}^{n} q^j\right) \text{ subject to } I^i = y^i + p\, q^i \right\} \text{ for all i, j = 1, 2. . n, } i \neq j,$$

[1]

where y^i denotes the consumption of private good by individual i and q^i the contribution of individual i to the provision of the public good, p denotes the relative price (or cost) of the public good (using the private good as numeraire).[7] Most conceptual issues can be clarified by using the simple two agent case. For such a case a simple graphical representation is available. For such a case it is possible to use the budget constraint to eliminate the private good from the utility function, it is possible to write utility as a function of q^1 and q^2.

Figure 1 represents the indifference-curve maps for both agents and the respective Nash reaction functions. If both goods are normal, it is possible to show that Nash reaction curves will be downward sloping with the reaction function of individual 1 steeper than that of individual 2. These assumptions ensure the existence and uniqueness of the Nash equilibrium (see Bergstrom, Blume and Varian, 1984) again as shown in Figure 1 below.

{Insert Figure 1 about here}

[6] See part 1 of the Annex for a fuller mathematical description of the model and optimization exercise.
[7] As usual in microeconomics it is assumed that the utility function reflects non-satiation in both goods and convexity of preferences.

The most relevant implications of the model are stated as Propositions C1-to-C5:[8]

- **C1: The Nash equilibrium is inefficient.** 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 not be Pareto optimal. That is so 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.

- **C2: Exploitation of the large by the small**: 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.

- **C3: Reaction functions (demand functions for the public good):** 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.

- **C4: cooperation has the potential to improve on decentralized equilibrium:** as a corollary to C1, in case the players are able to coordinate effectively they have the opportunity to improve on the decentralized equilibrium. In other words they will be able to approach the geometric region labeled Coase in Figure 1. We will comment further on this below (see sub-section 2.D.).

[8] See Schinasi (2007) for a demonstration of these results.

- **C5: enlargement of the alliance is beneficial in the case of pure public goods:** The 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. [9]

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.

D. Coase Equilibria as the More Desirable Outcomes (a first pass)

It is possible to improve on the de-centralized Nash equilibrium through collective action. For example, starting from point N, if, for example, individual 1 would increase his contribution, it would be possible for individual 2 to increase her contribution, so as to ensure that 1 would move along his indifference curve, while benefiting herself. The entire shaded area in Figure 1 includes pairs of contributions, which are Pareto superior to the Nash equilibrium.

In 1960, Ronald Coase stated a tautology with far-reaching implications for the solution to collective action problems. This tautology became known as the Coase Theorem. It provides a logic for examining private solutions to collective action problems. The idea is that in an environment with perfect information and costless bargaining, a mutually beneficial agreement will be reached whenever there is one.[10]

Coase's theorem was developed to apply to bargaining among private-sector agents in an environment characterized by externalities or spillovers. However, Coase's theorem appears to be equally applicable to the co-ordination of economic, social, cultural, and political policies by a group of countries such as those that make up the EU. In principle, it seems rational and reasonable to think that the fundamental intuition from the Coase Theorem can apply in Europe to a very broad range of policy decisions (Gaspar, 2006 formulated this question). In such a case, spillover effects can be internalized through negotiation, which in turn can lead to efficient outcomes. The plausibility of more efficient outcomes increases once

[9] This result follows from the pure public good formulation and the implicit assumption that risk is invariant to the number of countries. If one introduces idiosyncratic risk and the risk of contagion the result would not follow.

[10] Coase (1960) is the original reference. See Bowles (2004, pages 221-232) and Shavell (2004, page 84).

it is acknowledged that the number of players involved is limited and that by meeting regularly – within the context of various EU institutions, Committees, and Working Groups – decision making and outcomes can benefit from ample opportunities to communicate and find mutually advantageous agreements. By definition when opportunities for mutually beneficial agreements have been exhausted a Pareto optimal solution has been reached.

The Coase Theorem predicts an outcome along the PP line in the northeast part of Figure 1, in the portion bounded by the two indifference curves, corresponding to the Nash equilibrium. In the context of EU financial regulation and supervision, the expression "close cooperation among the competent national authorities" may be interpreted as the challenge of managing the transition from a non-cooperative Nash equilibrium to an efficient collective action outcome along the PP line. In many areas, it is reasonable to argue that such a transition has already been successfully completed. As will be discussed further later, although potentially useful for examining EU processes for coordination and cooperation, the Coase Theorem has important limitations. In a nutshell, it assumes costless bargaining. Specifically, the theorem implies the absence of transactions' costs and the existence of perfect and symmetric information. Some examples on how departures from these assumptions affect outcomes will be examined in the remainder of the paper.

As already discussed, it seems that in the European Union conditions are in place to benefit from an application of the Coasian thinking to collective decision making. First, the number of players involved is limited. Second, the game is repeated as the financial stability framework is applied over time. Third, "close cooperation" takes place in the context of a number of committees and working groups where responsible policy-makers and experts identify the relevant issues and work to find acceptable solutions. Fourth, the members of these groups are well aware of the problems identified in the relevant literatures (and more).

In the remaining sub-sections of section 2, the paper discusses extensions and interprets the basic model in order to build a conceptual framework to assess institutional change in the EU financial system to deliver financial stability. The next sub-section introduces the case of impure public goods. In the literature this case is known as the joint products case for reasons that will become clear shortly.

E. A more complicated case: the joint products model.

Countries in Europe provide financial-stability public goods whose benefits are also country-specific and convey 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). More generally, the geographical distribution of banks' customers – with proximity playing a very important role – implies that some aspects of financial stability will accrue in accordance with well-defined territorial patterns.

By contrast, there are elements of the EU financial 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 that nevertheless convey public good benefits across a large part, and some cases the whole, of the European financial landscape.

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 benefits. In particular, while the set up of the model is the same as before, the public good conveys two types of joint 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)[11]. A key parameter in this model is the share of 'exclusive' benefits to the producing country relative to total benefits to all of Europe.

With the introduction of 'exclusive' benefits (i.e., 'impure' public goods), Nash reaction functions can become nonlinear and upward sloping – due in part to the possibility of complementarities between the goods provided by different agents (countries). This implies that there could be a multiplicity of Nash equilibria even though all goods are 'normal' goods (in the sense that demand rises/falls with income).[12]

The implications of this more complicated model can be summarized as follows.

- **E1: Nash equilibrium is inefficient:** As in 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 spillover effects.

[11] Clearly, the distinction of only national and European aspects of public goods provision is a simplifying assumption. For example, some important aspects of deposit-taking and credit provision will be associated with very pronounced concentrations at the sub-national (regional) level. On the other side, some international bank conglomerates have a truly global reach. However, the generalization to a multi-layer case is straightforward.

[12] See part 2 of the Annex for a fuller mathematical description of this model. With the introduction of 'exclusive' benefits (i.e., 'impure' public goods), Nash reaction functions can become nonlinear and upward sloping – due in part to the possibility of complementarities between the impure goods provided by different agents (countries). This implies that there could be a multiplicity of Nash equilibria even though all goods are 'normal' goods (in the sense that demand rises/falls with income).

- **E2: Exploitation is mitigated (relative to the case of pure public goods):** 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.[13]

- **E3: Demand functions:** the pure public goods model can be nested into the joint products model. The determinants of demand functions in the latter case are as in the former. However, in the standard pure public goods model, income enters the model in the same way as spillins[14]. In the case of joint products the demand for the public good is influenced in two ways by the increase in other countries' effort devote to the provision of the good: indirectly through full income and directly through spillins.

- **E4: Reaction functions:** In the pure public goods set-up, if both the private and public good are normal goods the slope of the reaction function will be negative (in the interval -1 to - ∞). However, in the joint products case the reaction curves can be positively sloped even when all goods are normal. This requires that the pure and impure public goods are strong complements (Figure 2).

[13] Empirical evidence suggests that the public-good benefits of deposit insurance are mainly local. This outcome is consistent with this proposition, namely that because the benefits are local or exclusive, deposit insurance is provided locally by national authorities. Moreover, there would appear to be few incentives for a transnational scheme for deposit insurance, although this need not exclude the possibility and the existence of benefits of harmonization across jurisdictions.
In the literature on the economic theory of alliances, the joint products model was developed because of an empirical challenge. With available data up to 1964, the burden-sharing pattern across NATO countries seemed in line with the exploitation hypothesis (Olson and Zeckhauser, 1966). However, in the late 1960s and 1970s the hypothesis no longer seemed to apply (see Sandler and Hartley, 1995) for a review and complete references to the relevant literature.

[14] Full income aggregates income with the value of spillins from other countries' provision of the public good. The conept is due to Bergstrom, Blume and Varian (1986).

- **E5: Possibility of Multiple Equilibria**: In cases in which the reaction functions are positively sloped (and non-linear), there may be multiple equilibria (that may be ranked in accordance with the Pareto criterion) [15].

- **E6: Endogenous alliance size (the effects of thinning):** joint products with different degrees of rivalry in consumption lead to the possibility of benefits associated with the partially rival goods. In such case new members will be admitted only as long as the marginal benefits from cost sharing exceed the marginal costs from dilution of the benefits from (partially) rival goods (thinning).

The literature on the economics of alliances suggests that the existence of joint products could in reality make it easier to agree on 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 publicness can influence how coalitions and alliances are formed.

F. Coase's perspective: a fuller discussion.

The very simplified presentation of the Coase Theorem, and its discussion in sub-section D., fails to do justice to the relevance of Coase's insights for the problem at hand. In 1991, Coase was awarded the Nobel Prize in Economics. Oliver Williamson (2005) argues that the essence of Coase's contribution, from his seminal papers (Coase, 1937, 1946, 1960), was to bring the perspective of contracts to bear on the analysis of economic transactions and outcomes. Economics has been the science of choice. Coase advocates the need to complement this traditional perspective with the viewpoint of contracts, thereby bringing together law, economic and organization theory.

Sub-section D above, as most of the Economics literature, focuses on the Coase Theorem, that is on the case with zero bargaining (or transaction costs). The argument covers only a very small part of Coase's contribution. Its extent is confined to sections III and IV of the 1960 paper. The case of zero transaction costs was meant by Coase (see Coase's Nobel Lecture – Coase, 1991) only as an introduction to the much more relevant case of non-negligible transaction costs. The Coase Theorem should be best regarded as an extreme benchmark, as a starting point for further analysis. In the extreme case, Coase (1960) showed that the details of

[15] For a proof of this implication of product complementarity of pure and exclusive goods in the joint product model see Cornes and Sandler (1986) pp. 118-21, following Cornes and Sandler (1984).

liability for damages would not affect efficiency in resource allocation. Costless bargaining in competitive environments would be sufficient to eliminate inefficiencies.

Coase effectively criticized neoclassical economics for taking the firm as a black box. His insight led to a whole new literature on the economic theory of the firm[16].

The standard neoclassical approach to policy analysis looks at policy-making as a welfare-maximizing black box, abstracting from specific legal, institutional and organizational detail. According to Dixit the traditional neoclassical approach to public policy-making regards the policy-maker as an omniscient, omnipotent and benevolent dictator[17].

On the contrary, the approach, advocated by the new institutional economics approach (of Coase, Dixit, North, Ostrom, Willamson and others), insists that legal, institutional and organizational detail matters.

The transaction cost approach recognizes that all contracts are incomplete, given that they may be applied in circumstances completely unforeseen (and unforeseeable) by the contracting parties. Dixit (1996) proposes a taxonomy of transactions costs in: first, incomplete and / or asymmetric information; second, opportunism; and third, asset specificity. We find it useful to add bargaining (or coordination costs). An argument, made by Coase (1991) makes the point in a completely clear way. He says: "Another consequence of the assumption of zero transaction cost, not usually noticed, is that when there are no costs of making transactions, it costs nothing to speed them up, so that eternity can be experienced in a split second." In our context the point is made even more relevant if we recognize that the contact curve (the geometric locus of the Coase outcomes in Figure 1) includes multiple solutions (as a matter of fact an infinite number) that are ordered from the viewpoint of the welfare of the two players. With multiple possible outcomes the assumption of zero bargaining costs does not make sense in even in the context of theory.

The remarks above have far-reaching policy implications (stressed by Williamson, 1996, 2008 and by Dixit, 1996). They contrast the use of Pareto optimality and what they label the "remediableness criterion" for evaluating public policies. It is worthwhile to quote Williamson (2008) in full:

"The remediableness criterion for evaluating public policy proposals is to be contrasted with that of the Pareto criterion. Whereas the latter typically scants issues of feasibility and implementation, the remediableness criterion makes express provision for both. Thus the remediableness criterion holds that an extant practice or mode of organization for which no feasible superior mode can be described and implemented with expected net gains is presumed to be efficient … Reference to implementation entails looking ahead to uncover obstacles to implementation, after which the mechanisms are worked out. And presumptions

[16] See Kroszner and Putterman, 2009, for a review, references and readings.

[17] See Bergson, 1938, Samuelson, 1947 and Graaf, 1957 for classical presentations. Stiglitz, 1989 presents a more recent update that includes relevant qualifications while maintaining the fundamental characteristics of the approach. The comment by Douglass North included in the book is particularly useful.

of efficiency are rebuttable – possibly by showing that the initial conditions (often of a political kind) are not acceptable." (underlined in the original).

Another very important strand of the argument, associated with the research program started by Coase, is associated with Elinor Ostrom. It relates to a wealth of empirical and experimental evidence that shows that people, in decentralized settings, depart systematically from simple game-theoretic predictions[18]. Elinor Ostrom has been able to explain why decentralized, voluntary arrangements are able to deliver collective benefits. The variables that she identifies as having a systematic impact on outcomes are (Ostrom, page 188):

"1. The total number of decision-makers,

2. the number of participants minimally necessary to achieve collective benefits,

3. the discount rate they use,

4. similarities of interests,

5. the presence of participants with substantial leadership or other assets."

She documents the relevance of her analysis with reference to one of the theoretically most difficult problems for decentralized solutions: the case of common property resources[19].

Finally, experimental evidence (as surveyed, for example by Ledyard, 1995) can be brought to bear. The experimental literature makes it clear that apparently small changes in the design of experiments matter a lot for the results. It has proven surprisingly difficult to find clear and robust results. Nevertheless, it is the case that subjects in experimental environments do contribute to the provision of public goods in situations where non-contribution is a dominant strategy. There are dimension of human cooperation that game theory does not seem capable of capturing. Ledyard asks the question: what improves cooperation? He finds that the literature he covers has produced very few robust findings and, moreover, that it has not been able to identify the way the various relevant factors interact to produce outcomes. Nevertheless, he is able to report two factors that systematically have a strong impact on the ability of individuals to cooperate: marginal payoffs and communication. The relevance of marginal payoffs has been shown both by considering asymmetric payoffs among individuals – those who have higher marginal payoffs make higher voluntary contributions – or by increasing the number of individuals – when everybody's marginal payoff goes down contributions decline. These finding are in line with the private provision of public goods models of sub-sections C and E. In our view, the relevance of marginal payoffs corresponds to the intuition of most economists according to which: incentives matter!

[18] John Nash, left Priceton for Rand, after he obtained his Ph.D. There, his most successful research (joint work with John Milnor) has on controlled experiments well before the start of the now thriving field of experimental economics. The results showed systematic departures from Nash´s theory. Those departures highlighted the importance of information possessed by the participants in the experiments and revealed a systematic concern with fairness. The experiment was, at the time, considered a failure.
[19] See, for example, Hardin, 1968.

Communication, in turn, has been shown to enhance voluntary contributions. This is puzzling for the case in which there is one single dominant strategy equilibrium (like in a standard prisoners' dilemma game). According to theory, communication should not matter in such cases. In contrast, when there are multiple equilibria, communication may help individuals coordinate on the selection of one collectively satisfactory allocation of resources. Orbel, Dawes and van de Kragt (1990) suggest that communication "works either because it provides an occasion for (multilateral) promises or because it generates group identity – or possibly some combination of those two hypotheses".[20] One interesting finding in this literature is that the effect of communication seems to increase with repetition. Another factor favoring cooperation is the ability of individuals' to verify consistency of action with others' announcements.

G. A Summary of Section 2.

The model of private provision of public goods -- as developed by Olson and Zeckhauser (1966) in their economic theory of (military) alliances -- can be applied to study a wide range of situations of collective action in an international context. The model can be applied to financial stability, considered as a pure public good. In that context, standard results apply (see, for example Bergstrom, Blume and Varian, 1986 and Cornes and Sandler, 1986) summarized as propositions C1 to C5 in sub-section C. The key findings are that the non-cooperative equilibrium is inefficient and that there is a tendency for the large countries to be exploited by the small.

It is the case, however, that the activities of financial firms are concentrated territorially. Therefore, it is important to depart from the assumption that financial stability is a 'pure' public good.

A workable alternative is model financial stability as giving rise to joint products: a local stability good and a broader system-wide public good. The construction is very flexible. As for the case of a pure public good, the implications from the model of joint public goods are summarized as propositions E1 to E6 in sub-section E. The presumption of inefficiency of non-cooperative equilibrium proves robust. However, the exploitation result is no longer a general finding. More generally, the scope for cooperation is enhanced in the joint products set-up. This finding is entirely in line with experimental evidence showing that marginal payoffs (incentives) do matter for behavior.

The concept used to determine non-cooperative solutions for the game is Nash equilibrium. We have contrasted Nash equilibrium with cooperative Coase solutions that can be expected to emerge in the case of costless bargaining (no transaction costs). As Coase (1960) showed, institutional details do not matter when transactions

[20] As quoted in Ledyard (1995) page 157.

costs are naught. Speaking loosely (following North, 1990) cooperation can be expected to be approximated when interaction is repeated, when individuals possess good information on the past actions of others, and when the number of involved individuals is relatively small. In any case, due to asymmetric and incomplete information and bargaining and coordination costs, many empirical cases of collective action will depart strongly from the zero-transaction cost benchmark. In all these cases institutions and institutional detail do matter. This raises a thorny issue: how do institutions emerge? How do they persist? How do they change? Bates (1988) stresses that resorting to institutions and their development as a way of resolving collective action problems itself raises a collective action problem. This question of institutional supply is central and often disregarded. In the next section we will consider some aspects of the evolution of the European financial supervisory and regulatory framework.

III. European supervisory and regulatory framework to maintain financial stability.

A. European cross-border financial regulation and supervision[21]

The framework for EU cross-border banking regulation and supervision derives from banking directives, first adopted in the context of the Single Market Programme of 1985-92. It is comprised of four main elements: **EU-wide rules** (implying a degree of harmonization across member states), **mutual recognition** of national rules, enforcement of all rules based on **national responsibility** (in line with home-country control), and **close cooperation** among competent authorities at both EU and national levels. Application of the framework varies, depending on the legal structure of the bank (i.e., whether it is a branch or subsidiary) and its business model, in particular the extent to which it engages in cross-border business and has cross-border exposures.

In the EU, financial market integration is part of the Single Market process and is, thereby, actively promoted. Financial integration unambiguously favors competition, liquidity and cost minimization. Its impact on financial stability is ambiguous, however. On the one hand, a large and integrated market allows for additional scope for risk spreading and risk diversification. On the other hand, integration increases inter-connections cross-border. Increases the potential for spillover effects and opens opportunities for regulatory arbitrage. More generally, there is tension between a policy that actively encourages private entities to ignore national borders and national responsibility for rule enforcement. This section and the next discuss how the tension is addressed in the EU and what may be done to improve cooperation.

There are presently less than 50 EU cross-border banking groups – from a total of more than 8,500 banks – with significant holdings of cross-border assets and liabilities. All other banking institutions have primarily national businesses and exposures. Accordingly, the overwhelming majority of banking institutions, in principle, can be well regulated and supervised within the decentralized EU as it takes advantage of the local knowledge and expertise of local supervision.[22] By contrast, supervision of the cross-border exposures of the larger banking groups would seem to require additional efforts to ensure that relevant spillover effects are effectively internalized. The issue is central for financial stability as cross-

[21] This section draws on Berrigan, Gaspar, and Pearson (2009).

[22] We do not mean to imply that all is well regarding supervisory frameworks and practices in individual EU member states. Garcia, Lastra, and Nieto (2009) survey and analyze EU member states' supervisory frameworks and practices and find that they diverge widely among EU members. They find (on pp. 244-45) that not all supervisors have the tools necessary to induce effective remedial action for banks whose capital decline below minimum regulatory levels or who engage in excessive risk taking. In particular, they find that "not all supervisors can levy fines, remove errant managers, impose stricter capital requirements, require a remedial plan, appoint a special inspector, impose condition on the chartered bank, or restrict business activities including the prohibition of any capital expenditure. Not all supervisors can curtail owners' voting rights, initiatee reorganization or winding-up procedures, or appoint a conservator to run it." Supervisory powers to prevent asset transfers also varies widely across EU member states.

border banks are important in the EU banking sector (e.g. cross border banks hold more than 68% of total assets of the EU banking sector).

For the other banks that, as seen above, constitute the large majority of banks in the EU the current arrangements for regulation and supervision are not problematic. The scope of their activities more-or-less matches the way supervision and regulation were designed to operate.

In contrast, cross-border banks have restructured their organizations to profit from the integrated single market for financial services. Many have centralized key functions irrespective of their legal structure (branch-based or subsidiary-based). As business models and internal organizational structures change, the supervision of individual legal entities within a banking group becomes increasingly less relevant. At the same time the risk of duplication of reporting and inconsistent supervisory requirements increases. The case of cross-border banks illustrates what in the de Larosière Report has been identified as the lack of a consistent and harmonized set of core rules. According to the Report, national specificities should be identified and eventually eliminated when their removal would: (i) improve the functioning of the single market; (ii) avoid distortions of competition or regulatory arbitrage; (iii) improve the efficiency of cross-border financial activity in the EU. Implicit in the foregoing is the necessity to co-operate in crisis management.

In the context of EU regulation and supervision, the expression "close cooperation among the competent national authorities" may be interpreted as the challenge of managing the transition from a non-cooperative Nash equilibrium (point N in the graph) to an efficient Coasian collective-action outcome that is Pareto optimal (along the CC line in the graph). The discussion above suggests that in many dimensions the supervisory and regulatory framework in the EU already approximates such a situation. At the same time, current arrangements do not seem sufficient for banking groups with substantial cross-border activities. Furthermore, the situation is likely to become even more challenging as the single financial market deepens. Last, but not least, the Global Crisis has shown that, with highly interconnected international financial markets, local financial disturbances can spread systemically.

EU policy makers have recognized for some time that there is the potential for externalities and spillover effects from the cross-border exposures of large complex financial institutions and in the supervision for them. As a result, the EU approach to reforming banking regulation and supervision has been a gradual intensification of cross-border cooperation among the relevant national authorities. A key building block of the reform has been the establishment of Lamfalussy process. In particular, the Level 3 committees constitute an important element in solving the collective action problem, as identified by Coase, through voluntary cooperation.[23] In addition, the EU has over time, designed and created information-sharing and coordination mechanisms, mostly informal and non-binding. These mechanisms to date have operated in the context of EU committees (for example, the Banking Supervision Committee) and have been made explicit in the form of memoranda of understanding for information sharing and coordination in supervision. Specifically, an EU-wide MOU on cross-border cooperation between national supervisors, central banks, and finance ministries has

[23] See Speyer (2008) for a complete presentation of the Lamfalussy framework.

been in place since 2005 and has been extended to cover all the main financial sectors with effect from July1, 2008.[24]

These EU mechanisms for information sharing and cooperation are in addition to the EU's participation in international and global forums where regulatory and supervisory information sharing and cooperation occurs, for example within the Basel Committee on Banking Supervision, the Financial Stability Board, and the various forums under the auspices of the International Monetary Fund. While it is the case that financial integration has progressed farther in the EU and, in particular in the euro area, than elsewhere in the world, it is also the case that global financial integration has also progressed. Therefore, spillover effects and externalities also operate at the global level, albeit to a lesser extent, in most cases.

Taken together, all of these EU measures constitute substantial progress in responding to the growing cross-border dimensions in EU financial markets. Accordingly, the EU can be seen as being well past the non-cooperative Nash outcome in many of the relevant dimensions of cross-border banking regulation and supervision.

Having said this, the systemic financial crisis has revealed significant weaknesses in the framework for supervising financial institutions in all of the major financial centers. There is now greater recognition in the EU of the need for closer cooperation to minimize the costs of cross-border spillovers and negative externalities. This has encouraged EU leaders, policy makers, and institutions to reconsider the potential benefits of a pan-European financial-stability framework or architecture. The European Commission has assumed a leadership role in the process of formulating recommendations for establishing a new European financial framework and architecture aimed at safeguarding EU financial stability (see Box 1 on Timeline for EU Financial Architecture Reform).

The culmination of this fairly rapid process is manifest in the Commissions legislative proposals of September 23, 2009, following the recommendations in the de Larosière report (released on February 25, 2009) that enhances the EU's ability to safeguard European economic stability as well as national financial stability. The legislation proposes the establishment of two new bodies at the European level.

First, at the macro-prudential level, the legislation would establish the European Systemic Risk Board with the responsibility for identifying and assessing EU systemic risks and vulnerabilities. It could issue warning and make recommendations, but it would have to rely on 'moral suasion and peer pressure' to convince those who are warned to change their behavior.

Second, at the micro-prudential level, the legislation would establish a new European System of Financial Supervision (ESFS) comprised of three separate supervisory authorities to oversee institutions providing banking, securities, and insurance and pension financial services. The ESFS would be responsible for harmonizing the European 'rule book' for national supervisors and would also have the authority to resolve disagreements between countries

[24] See Berrigan, Gaspar, and Pearson for further details.

and to coordinate actions during a crisis, which the Commission will have the authority to declare.

Although the Commission's legislative proposals shift some of the responsibility for safeguarding financial stability to the European level, the independent powers of these new bodies are limited so as not to infringe on existing national authorities. Most importantly for some countries, both new bodies will have to conduct their activities and fulfill their responsibilities without impinging on member countries' fiscal prerogatives and priorities. Thus, the new supervisory authority at the EU level will not have the authority to declare an institution insolvent and thereby impose fiscal obligations on a member country; this authority will remain with the national authorities. The proposals will not become law until approved by European and national lawmakers.

In the jargon of the models described in Section 2, the objective of this new EU approach to financial supervision and surveillance would be to internalize even further the spillover effects that originate in the national orientations that now prevail. The proposals should be regarded as opening an evolutionary process. The creation of the EFSB and the ESFS provide structures where enduring interaction will take place. They facilitate communication and monitoring. Theoretical results, empirical and experimental evidence suggest that these changes will support cooperation. However, as in Dixit (1996), it is clear that the situation is too complex and the way is too uncertain to allow for any presumption of optimality.

One financial-stability policy area where the current situation may be far from a Coasian equilibrium and, accordingly, where there are significant remaining challenges is crisis management and in particular the resolution of troubled (near insolvent or insolvent) financial institutions with significant cross-border exposures. This is an area where there are acknowledged and significant potential weaknesses and spillover costs for taxpayers that have been amply demonstrated by the most recent crisis. This is discussed next.

B. European bank insolvency resolution regimes

One of the important lessons from the global financial crisis is clearly stated by the Basel Committee on Banking Supervision in its consultative document issued for comment on September 17, 2009.[25]

> "Existing legal and regulatory arrangements are not generally designed to resolve problems in a financial group operating through multiple, separate legal entities. This is true of both cross-border and domestic financial groups. There is no international insolvency framework for financial firms and a limited prospect of one being created in the near future. National insolvency rules apply on a legal entity basis and may differ depending on the types of businesses within the financial group. Indeed, few countries, if any, have tools for resolving domestic financial groups – as distinct from individual deposit-taking institutions – in an integrated manner in their own jurisdictions."

[25] See Basel Committee on Banking Supervision (2009).

Many of the financial institutions that were at the center of the crisis and which encountered liquidity problems and were subject to rumors of insolvency received very large government subsidies and capital injections in the United States and in many EU countries. Had there been more effective resolution and wind-up regimes, it is likely that government financial commitments would not have been as large and that a greater number of financial institutions managed in a more orderly fashion. The risk now is that institutions that received state aid will require continuing subsidies and will be unable to provide sufficient credit for sustaining potential growth.

Compared with other EU areas of cooperation, the situation regarding bank insolvency regimes may well be closest to the suboptimal Nash outcome. As the BCBS consultative document suggests, the situation is far from what would be considered optimal and significant challenges remain. Although this problem is a global one – and pertains to complex global banks licensed in other jurisdictions such as the United States – the challenges and solutions would seem to be unique within the EU. Why? As noted earlier, at the same time that financial integration is being encouraged and pan-European institutions are emerging, the regime for supervising them and resolving problems has remained national.

EU member countries and European institutions – notably the European Commission and the ECB – have recognized these challenges for some time and have endeavored to forge consensus solutions to deal with the winding up of troubled and insolvent banking institutions. However, this area is fraught with practical and political difficulties ranging from significant difference in the laws and regulations governing bankruptcy to differences in the powers of supervisors to declare a bank insolvent. As a result, there has been little movement in the direction of creating a European approach to resolving banking problems.

Consider the case of the resolution of Fortis, formerly a bank with significant operations in Belgium, Luxembourg, and the Netherlands. Up until September 28, 2008 when it was rendered insolvent, Fortis had a complex multi-national holding structure – a bank holding company incorporated in Belgium: banking subsidiaries incorporated in the Netherlands and Luxembourg; an investment management subsidiary incorporated in Belgium; an insurance business with three subsidiaries; and other business subsidiaries in the United Kingdom, France, Germany, Turkey, Russia, and the Ukraine.[26]

In late September 2008, Fortis encountered liquidity problems, primarily the result of large withdrawals by business customers, amid rumors of insolvency. On September 28th, a press release indicated a burden sharing arrangement in which the Benelux countries would partially nationalize the Group by injecting €11.2 billion. In the event, by October 3rd it became clear that this arrangement would not be implemented. Instead, each government rescued the national parts of Fortis incorporated within their own jurisdictions.

The Basel Committee has drawn the following lessons from this one example:

[26] For further details and analysis see Čihák and Nier (2009).

- "The Fortis case illustrates the tension between the cross-border nature of a group and national frameworks and responsibilities for crisis management. This led to a solution along national lines, which did not involve intervention through statutory resolution mechanisms;

- The usefulness of formal supervisory crisis management tools appears to be limited in a situation where the institution needs to be stabilized rapidly and at the same time the continuity of business needs to be ensured in more than one jurisdiction. For example, some formal tools, when disclosed, can further undermine market confidence or may trigger termination and close-out netting events in financial contracts, with counterproductive effects;

- The Fortis case illustrates the tension between the need to maintain financial stability, for which a bank under certain circumstances needs to be resolved in the public interest and with public support, and the position of the shareholders of such a bank (i.e. dilution of their stake). Currently, Dutch and Belgian financial supervisory legislation does not permit effective special measures to be taken to resolve individual banks in a manner which maintains financial stability in urgent situations and which overrides the rights of shareholders; and

- Despite a long-standing relationship in ongoing supervision and information sharing, the Dutch and Belgian supervisory authorities assessed the situation differently. Differences in the assessment of available information and the sense of urgency complicated the resolution."

Thus it is clear from the Fortis case that differences across EU countries in laws, regulations, and delegated authorities to governments, courts, and regulators provide formidable obstacles to the timely and low-cost resolution of banking institutions regardless of whether they are entirely incorporated in one jurisdiction or in several; needless to say the resolution obstacles are more difficult to overcome in the case of banks that are incorporated in several jurisdictions and for nonbank financial institutions. [27]

European policy makers have attempted to address this issue over the years, but it has taken a long time to reach a consensus and the outcome has been regarded as unsatisfactory for resolving institutions – as the crisis has revealed. As early as 1988, the EU tabled a proposal for a directive on the resolution of credit institutions. However, it was not until 2001 that the Directive on Reorganization and Winding-up of Credit Institutions was finally adopted (Directive 2001/24/EC). Moreover, it is only recently that the directive has been [adopted] by all member countries. There is not much literature analyzing this directive, but authors seem

[27] For further analyses, see Hupkes (2000), Garcia, Lastra, and Nieto (2009), and Čihák and Nier (2009).

to agree that it has not advanced the convergence or integration of EU member states' resolution regimes very far.[28, 29]

In light of the crisis, further initiatives have been taken both within the context of the ECOFIN and the Commissions work. Regarding the former, in October 2007 the ECOFIN established principles of crisis management and in June 2008 it adopted the crisis management Memorandum of Understanding. These initiatives were aimed at enhancing voluntary cooperation and fiscal burden sharing in the resolution of cross-border institutions. But they are suggestive and non-binding. Moreover, countries have found it difficult to cooperate during this crisis because of the pace and virulence of the market turbulence and its impact on financial institutions.[30]

As discussed earlier, the de Larosière report also recommended further actions. Recommendation 13 of the report states that a transparent and clear framework for managing crises should be developed; that all relevant authorities in the EU should be equipped with appropriate and equivalent crisis prevention and crisis intervention tools; and that legal

[28] According to Čihák and Nier (2009): "The Directive stipulates that the competent authorities of the home country that granted the banking license has sole power to initiate and implement all reorganization measures provided for in the law of the home country and that these measures have full effect throughout the EU. This adopts the "single-entity" and "universality principles for all European banking institutions and ensures that resolution measures taken by the home authority apply equally to all cross-border branches. These principles do not however apply to the case where a banking institution entertains (wholly-owned) subsidiaries in a different country within the EU. Such a subsidiary is viewed instead as a legally separate entity with a separate license. For subsidiaries, therefore, it still holds that insolvency proceedings can be brought in every jurisdiction where a failed bank maintains an establishment. This is an important constraint, because much of the recent cross-border expansion in European banking markets has been through subsidiaries. Matters become very complex for a LCFI [large complex financial institution] with numerous branches and operationally-integrated subsidiaries."

[29] Likewise, according to Garcia, Lastra, and Nieto (2009): "The objectives of the Directive 2001/24/EC are rather narrow and, in accordance with the objectives of the treaty, mainly aimed at the elimination of "any obstacles to the freedom of establishment and the freedom to provide services within the Community." The directive is neither particularly aimed at preserving EU financial stability nor at limiting public and private costs of bank crisis resolution. Directive 2001/24/EC does not seek to harmonize national legislation concerning reorganization measures and winding-up proceedings (including a common rule of bank closure), rather it ensures mutual recognition and coordination of these procedures by the member States of the EU, based upon the principle of home-country control, as well as the necessary cooperation between authorities. It embraces the principles of unity and universality single entity approach to liquidation, and the equal treatment of creditors. In spite of the far reaching effects, the Directive is subject to interpretation as the definition of reorganization measures and the definition of winding-up proceedings contained in the Directive are open definitions. As a result, the range of measures foreseen by national law and falling under the Directive's definition of reorganization measures and winding-up procedures is rather varied. In addition, the responsible authority (administrative or judicial) and the grounds that trigger the reorganization and winding up procedures vary within EU countries." The paper further analyzes the directive in some detail and recommends revisions to it that more directly aim at maintaining financial stability and minimizing the costs of resolution.

[30] Čihák and Nier (2009) agree with this assessment.

obstacles which stand in the way of using these tools in a cross-border context should be removed, with adequate measures to be adopted at EU level.

{To be completed}

IV. CONCLUDING REMARKS.

In this paper, we have argued that the Global Crisis 2007-10 revealed the potential perils and costs of international economic and financial linkages and spillover effects. Effective policy action in any one country was, in many cases, conditional on actions being taken elsewhere. The magnitude and speed of spillovers, observed during the Global Crisis, is unprecedented. These effects are particularly strong in the European Union and, in particular, within the single European financial market. In the paper we focus on the financial-stability aspects of these effects and the policies designed to deal with them. Specifically, the paper focuses on the European framework for financial regulation and supervision.

The paper introduces game-theoretic modeling as a way of providing conceptual clarity and rigor in examining these important policy challenges. Specifically we resorted to the Economic Theory of Alliances (Olson, 1965 and Olson and Zechauser, 1966). The framework has already been applied in the academic and policy literatures to a wide variety of transnational issues including climate change, energy security, international trade, financial stability and tax competition.

In this paper we contrast a non-cooperative Nash equilibrium with an efficient co-operative Coase equilibrium. The model makes it possible to consider, in detail, for specific institutional arrangements and situations ("rules and circumstances of the game") whether the outcome of interaction among policy makers approximates Nash or Coase type decision making and equilibria. Outcomes are seen as depending on international and national institutional arrangements, on the territorial distribution of the net benefits from policy actions, on the completeness and symmetry of available information, on transactions and bargaining costs and on the ability to credibly commit to future policy action.

For example we have emphasized the importance of the result that if national and collective benefits are complements and the national component is important it may be relatively easier to resolve the collective-action problem and approximate the Coasian process and outcome. In contrast, when transactions costs are important, information is asymmetric, and the collective gains from co-operation are small (compared to the distribution across countries), the outcome can be expected to be closer to the non-cooperative Nash solution.

The Global Crisis dramatically revealed weaknesses in the area of banking supervision and regulation. As a result of the systemic financial crisis, there is now greater recognition in the EU of the need for closer cooperation to minimize the costs of cross-border spillovers and negative externalities. This has encouraged EU leaders, policy makers, and institutions to reconsider the potential benefits of a pan-European financial-stability framework or architecture. The European Commission has taken initiatives to push forward a new European financial framework and architecture aimed at safeguarding EU financial stability. The culmination of this fairly rapid process is manifest in the Commissions legislative proposals of September 23, 2009. The legislation proposes the establishment of two new bodies at the

European level. First, at the macro-prudential level, the legislation would establish the European Systemic Risk Board with the responsibility for identifying and assessing EU systemic risks and vulnerabilities. Second, at the micro-prudential level, the legislation would establish a new European System of Financial Supervision comprised of three separate supervisory authorities to oversee institutions providing banking, securities, and insurance and pension financial services.

The reform of European financial supervision and regulations starts a process. It will evolve over time and it will only be possible to evaluate it on the basis of its practice. The whole process should be regarded as institutional building. Success is difficult and should not be taken for granted. Crucial tests include:

First, the production and sharing of crucial information;

Second, the timeliness and effectiveness of preventive steps including more effective market regulation and institutional supervision; and,

Third, the effectiveness of crisis management and resolution procedures.

Annex: Private provision of public goods. The "pure" public goods case and the joint-products case[31].

1. Decentralized decision-making for 'pure' public goods.

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

$U_i = U_i(y^i, Q, T) = U_i(y^i, q^i + Q_{-i}, T)$, where: [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 '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:

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

[31] For textbook presentations of the various models presented in the annex see Cornes and Sandler (1986) or Sandler and Hartley (1995). They also include a complete set of references to the relevant literature.

[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, ..., n=27) can now be formalized as,

$\underset{y^i, q^i}{Max} \{U_i (y^i, q^i + Q^*_{-i}, T)\}$ subject to $I^i = y^i + p\,q^i$, where, [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, 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, $MRS^i_{Qy} = p$.

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 $\sum_{j=i}^{n} MRS^j_{Qy} = p$. 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: the joint products case.

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

$Z = z^i + Z_{-1} = \beta(q^i + Q_{-i})$. Each country's utility function can now be represented as,

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

Following the same approach as before the optimization problem for country i can be written as:

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

If β = 1 (α = 0), equation 5 is equivalent to a pure public good model. If α = 1 (β = 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, $p = \alpha MRS^i_{xy} + \beta MRS^i_{zy}$. 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.

Figure 1: Nash and Coase in the Pure Public Goods Model.

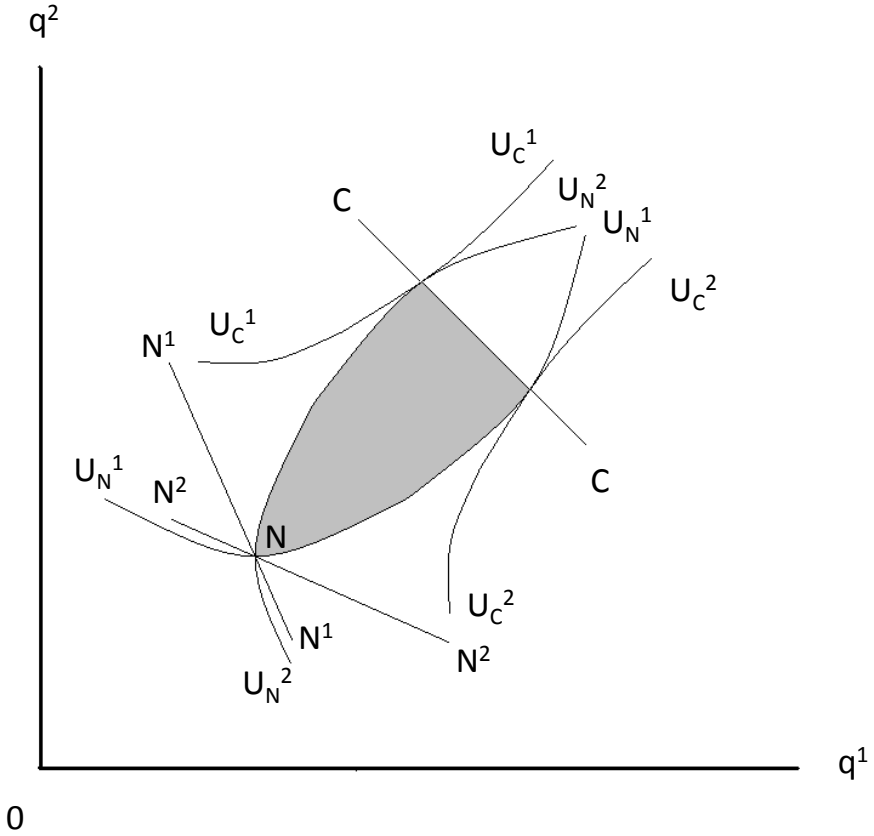


Figure 2: Positive Reaction Function in the Joint Products Model.

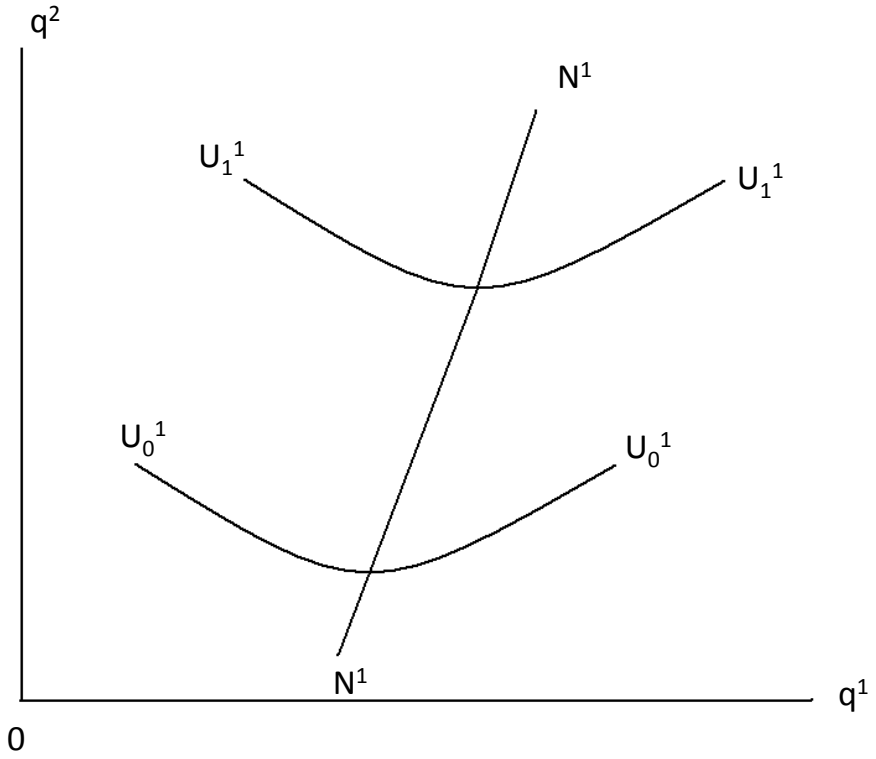
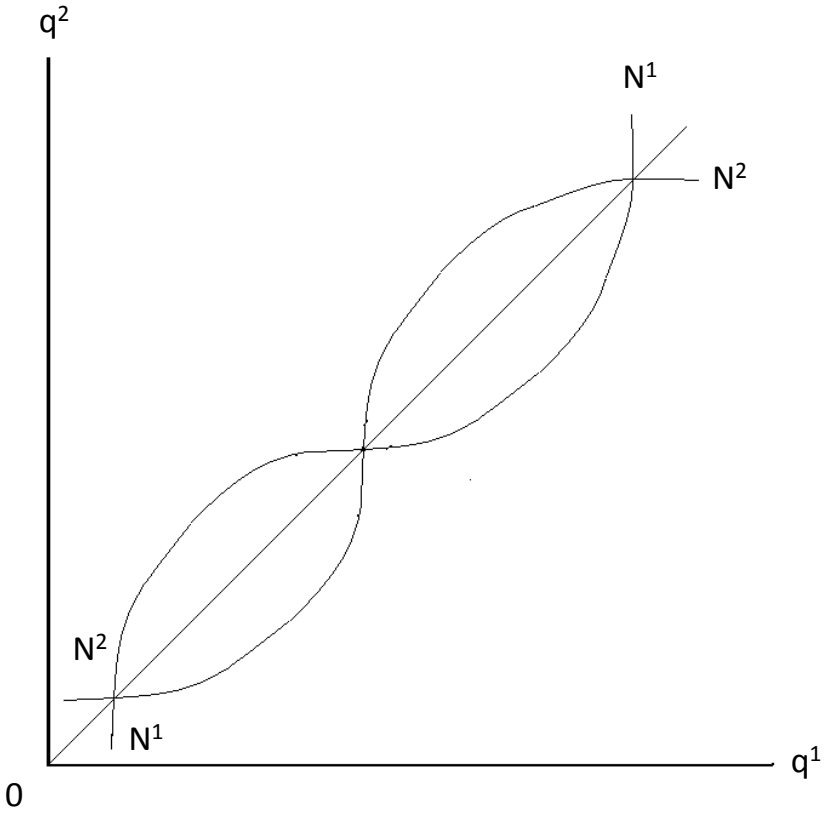


Figure 3: Possibility of Multiple Equilibria in the Joint Products Model.



Box 1: Timeline for EU Financial Architecture Reform

October 8, 2008: President Barroso establishes the high-level group headed by Jacques de Larosière to consider and propose EU financial sector reforms.

February 25, 2009: The de Larosière Group issues its report recommending the creation of a European Systemic Risk Council (now Board) to improve the assessment and identification of EU "systemic risk" at the macro-prudential level and a new European System of Financial System comprising supervisory agencies for banking, securities, and insurance and occupational pensions institutions at the micro-level.

March 2009: EU communications in which the de Larosière recommendations receive broad EU endorsement with some reservations about not removing sovereign fiscal authority regarding the costs of maintaining financial stability.

May 27, 2009: European Commission Communications details its plans for drafting legislation and implementing reforms, endeavoring to have a new system operating in 2010.

June 19-20, 2009: Brussels European Council Presidency conclusions agree overall outline of reforms with reservations about sovereign fiscal responsibility and binding mediation.

September 23, 2009: European Commission issues draft legislation for implementing reforms.

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