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A Positive Framework to Analyze Sovereign Bail-outs within the EMU

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A Positive Framework to Analyze Sovereign Bail-outs within the EMU¹

We propose a positive formal framework for analyzing sovereign bail-outs in the context of the European Monetary Union (EMU) with a view to making policy recommendations regarding improvements to the EMU institutional architecture. We build our analysis on a political economic game-theoretic model that allows tracing analytically the dynamics of the political process as well as the conditions and parameters on which the scope and limits of the bail-outs depend. In doing so, we formally take account of the ‘negative externality’ problem that has been central to policy debates related to the EMU’s institutional design and has played an important role in the recent crisis. Contrary to the existing literature, we do not only focus on the economic aspects of such a negative externality, but also look at where they emanate from and interact with the dynamics of the political formation within the EMU. The analysis suggests that, under the present political-economic set-up of the EMU, the bail-outs were inevitable, i.e. a threat of default by one member must, under identifiable conditions, result in sharing the costs of fiscal adjustment by the rest of the members.

Keywords: Sovereign debt crisis, bail-out, negative externality, political economics, game theory, euro, EMU.

JEL classification: E62, F33, H77, C70

I. Introduction

With the outbreak of the sovereign debt crises in 2010, the European Monetary Union (EMU) confronted the biggest challenge in its decade-long history. In an immediate reaction to the deteriorated market sentiments towards the euro, the EU put together two bail-out programs—one for Greece worth EUR 110 billion and one for Ireland worth EUR 85 billion—and a comprehensive stabilization program for the whole euro area, the so called European Stabilization Mechanism (ESM), worth EUR 750 billion.² In the following months, the EU set formal consultations

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²The ESM involves a 3-year stabilization plan that includes EUR 60 billion provided by the European Commission, EUR 440 billion provided in bilateral loans and guarantees by euro area

among the member states that should focus on designing a permanent financial mechanism to safeguard the euro area in the future.

Both the country bail-outs and the ESM have proved highly controversial and generated an intensive debate among economists and policy makers alike who disagree strongly whether this has been the right policy course. Some commentators (e.g., Frankel, 2010; Issing, 2010; Wyplosz, 2010) have argued that providing financial support is a policy mistake, as it undermines the foundations of the EMU (i.e. particularly the ‘no bail-out’ clause and the prohibition of monetary financing) and thus jeopardizes the euro in the long-run by creating a moral hazard problem and hampering the Eurosystem’s credibility. In contrast, others (e.g., Eichengreen, 2010; Padoa-Schioppa, 2010) have argued that letting Greece default would spread the crises to other members, like Spain or Portugal, creating a risk of the EMU break-up which would trigger “the mother of all financial crises”. Hence, in their view, Europe needs to create a strong emergency financing mechanism, eventually backed by higher degree of political integration (e.g., De Grauwe (2010), see also Baldwin et al. (2010) for an interesting overview of the debate).

While the discussion has been intense and the controversies abound, it has suffered from several weaknesses. As it has not generated formal modeling of the bail-out schemes, the discussion has been limited to a large extent to *normative* statements. Moreover, the discussion has focused primarily on the *economic* aspects, even though there has been an agreement that the political-economic considerations feature immanently the dynamics of EMU. It is evident that the bail-outs themselves involved intense negotiations among the euro area members and depended to a large extent on political factors.

In this paper, we wish to push forward the discussion by offering two innovations. First, we propose a formal framework that allows us to conduct a *positive* analysis of the bail-outs in the context of the EMU in a structured manner. Second, we incorporate into the analysis the political-economic aspects of the EMU’s institutional set-up. In doing so, we build on a political economic, game-theoretic model which (by taking into account the interactions between the economic and political factors) helps to understand why and how the parties involved in the crisis arrived at the bail-outs and on what specific conditions this solution depended.

One of the novelties in our work is that we formally take the negative externality problem into account that has been central to policy debates related to the EMU’s institutional design since the very birth of the euro (see, for example, Gros et al., 2005; de Haan et al., 2004, for early contributions within this debate) and played an important role in the specific case of the Greek or Irish crises in the form of—as some commentators call it—a “bail-out blackmail” (see Mayer, 2010). However,

members, as well as EUR 250 billion from the IMF. In addition, the ECB committed to the direct purchase of government bonds on the open market. The bail-out for Greece took the form of a 3-year package of emergency loans, with EUR 80 billion offered by the euro area members and EUR 30 by the IMF.

contrary to the existing literature, we do not only focus on the economic aspects of such a negative externality, but also look at where it comes from and how it interacts with political factors, in particular the dynamics of the political process within the EMU. We ask as to what extent a ‘troubled’ EMU member may negotiate a bail-out due to the existence of a negative externality arising from its potential default.

Furthermore, the model also allows tracing analytically the dynamics of the political-economic formation as well as the parameters on which the scope and limits of a bail-out depend. In doing so, the analysis helps to shed some light on several key policy aspects, such as voters attitude toward fiscal retrenchment and their support for the European integration process and, particularly, how the risk of financial contagion to other EMU members may result in sovereign bail-outs.

We show that the occurrence of bail-outs can be described by a brinkmanship threat game. The analysis determines the scope and limits of such brinkmanship. However, contrary to the existing literature, the disputed pay-offs are characterized by dis-utility rather than utility allocations. A hallmark of the model is that the haggling over the subsequent fiscal costs of adjustment within the EMU is captured in a way that renders the entire threat game analytically tractable (cf. Fahrholz, 2007).

The paper is composed of four sections. The next section presents our analysis in the context of the existing literature. The subsequent section presents the modeling framework, while the final section concludes and discusses some policy implications.

II. Related literature

The bail-outs involved intense negotiations among euro area members and depended a great deal on political factors. Even at the onset of the EMU, Bordo and Jonung (1999) had already highlighted that political factors will be the central determinants of the future of the monetary union. In such a setting, game-theoretic analysis seems highly suitable and instructive.

In fact, there is already a long tradition in modeling strategic interaction (see, for example, Dixit and Nalebuff, 2008; Svejnar, 1986, for a rigorous application to labor markets). Our analysis particularly addresses political-economic aspects of the EMU. In a similar vein, for instance, Fratzscher and Stracca (2009), distinguishing between the ‘EMU core’ and the ‘EMU periphery’, empirically show that, in the absence of effective constraints on domestic policy autonomy, some members’ political-economic formation may exert considerable influence on the EMU as a whole. To some extent, the political-economics setting of our analysis also resembles that of Alesina and Drazen (1991), who argue that domestic fiscal reforms may have significant distributional implications, such that societal groups may seek to pass the fiscal burden on to other groups at the national level. However, our focus is

on the mutual dependence of fiscal policy-making within the EMU-member countries. We particularly account for the interaction between both the national and the European sphere. In this regard, we consider the canonical ‘Schelling conjecture’ (Schelling, 1960; Dixit, 2006, for a reappraisal). The latter metaphor postulates that national executives intermediating between the national and the European level have to craft ratification within the domestic arena. The latter process can also be traced to a permissive consensus of voters and lobbies that can cause substantial political conflict potential. Such a domestically constrained executive can make use of its internal ‘weakness’ to enhance, for instance, its potential for negotiations concerning European fiscal affairs. In the case that an opportunity exists to play off national constituencies against other entities and pass along negative externalities to the latter actors, such a proactive stance toward moral-hazard behavior represents a ‘brinkmanship’ strategy. The scope and limits of such a ‘threat’ may thus represent political leverage, for example, in European fiscal affairs.

At the heart of our political-economic study of the fiscal policy formation within the EMU are negative externalities. The problem arises from the fact that an unsustainable fiscal position and a threat of default by one EMU member may spill-over on to the rest of the EMU members. As indicated earlier, since the birth of the euro, the negative externality problem has been central to all policy debates related to the EMU’s institutional design. In fact, it has been one of the key arguments in favor of the Stability and Growth Pact (SGP): imposing fiscal rules on EMU members would—as it was hoped—counter the tendency for fiscal imbalance and free riding (see, for example, Artis and Winkler, 1998; Beetsma and Uhlig, 1999; Brunila et al., 2001, for the early discussions on the rationales for the SGP and its provisions). Also in the context of the recent euro area crisis, Baldwin et al. (2010) point out that “...in a monetary union without a fiscal union governments might be tempted to run up unsustainable debts and push the ECB to inflate them away or run up high levels of debts that would create negative spillovers for others.”

Apart from linkages between fiscal formation and the overall price level within the EMU, further substantial negative externality effects have also been confirmed empirically. For example, Faini (2006) has shown that expansionary fiscal policy in one EMU member state has an effect not only on the spreads of this particular member’s interest rates, but also—and to an even greater extent—on the average level of interest rates in the whole euro area. In essence, the costs of fiscal profligacy are paid not only by the sinner, but also by other members. However, it is worth noting that these short-term effects have been different during the current round of sovereign debt crises: while interest rates for public debt of, for instance, Spain, Portugal, or Ireland increased in reaction to Greek woes, those for German public debt fell during the course of the overall portfolio rebalancing and a flight to quality within the EMU. However, the recurring need for bail-outs within the euro area may eventually demand too much fiscal assistance on the part of the (still) credit-worthy fellow members. Participants on bond markets will probably find it difficult to refinance their increasing (public and/or private) liabilities as well. This

is to say that fiscal proliferation on the national level causes externalities. Such externalities eventually boil down to severe economic and political cost—especially when bond markets for EMU members with a (still) higher degree of creditworthiness will finally run dry. In the short run, however, the negative externality mostly spreads through a balance-sheet effect, i.e. the deterioration of banking sector balance sheets—for example, in terms of extensive write-offs—in domestic and foreign EMU-member economies.³ The latter effects will most probably negatively impact growth formation at home and, particularly, also abroad, i.e. in other EMU economies. As the subsequent costs adversely affect all the members, such externality may serve as leverage that a particular member can use for negotiating redistribution of its costs of fiscal adjustment within the EMU, i.e. eliciting a bail-out.

III. Modeling framework

In this part of our study, we portray our political-economic modeling framework. In section III.1, we touch upon EMU member interests concerning the preservation of the public good of ‘EMU stability’. This particular public good provides an effective reduction of uncertainty within all parties’ political and economic relations, thus increasing overall welfare, and can solely be realized and maintained jointly. As future costs of preserving ‘EMU stability’ are uncertain, however, this public good represents an incomplete contract, possibly allowing for the emergence of moral hazard behavior and, thus, negative externalities. Given mounting debt and wealth positions within both public and private sectors, incipient financial crises as idiosyncratic shocks may reveal unsustainable fiscal positions and trigger a brinkmanship game.⁴ Section III.2 determines the scope and limits of brinkmanship strategies within the EMU, while the subsequent enquiry into a Nash bargaining solution (Nash, 1953, 1950) yields an easily tractable analytical solution for our brinkmanship threat game (section III.3). The study, therefore, demonstrates to what extent a ‘troubled’ EMU member may negotiate a bail-out due to the existence of moral hazard behavior and subsequent negative externalities arising from its potential default at the onset of a sovereign debt crisis.

³Note that the negative externality arises here in the political economics context. On purely economic considerations, it can be argued that letting an EMU member default could be efficient as it would strengthen incentives for structural reforms among all EMU countries concerning public and private sector lending. In other words, the default would lead to a sort of ‘positive externality’ (see, for example, Frankel, 2010). On the one hand, however, reforms that eventually benefit all are often resisted or delayed and a growing body of literature explains how such ‘inefficient’ outcomes can be compatible with rational behavior (e.g., Rodrik, 1996). On the other hand, one would risk an epidemic crisis via financial contagion (see, particularly, section III.2.2).

⁴Regarding the connection between public and private sector liabilities, we draw on the reasoning in Burnside et al. (2001). These authors refer to the role of prospective public deficits associated particularly with implicit bailout guarantees to failing private sectors in a crisis scenario.

III.1. Crucial junctures

In our study, we assume two types of representative players involved in the game-theoretic setting that depicts challenges arising from a (mal-designed) political-economic configuration of the euro area. Within the EMU, there is a group of countries which suffers from the twin problems of public debt sustainability and external debt sustainability. These ‘twin deficit’ countries—think of Greece, Ireland or Portugal—are labeled ‘ TD ’. The second group of countries—think of Finland, Germany, Luxembourg—is characterized rather by current account surpluses within the euro area and sustainable public debt position (henceforth labeled ‘ CA ’).⁵ Later, we assume that only one particular TD_i —i.e. a member that is afflicted with an incipient sovereign debt crisis—faces an imminent default risk, although other TD s are also susceptible to such crisis. This assumption allows us to bring the structure of the model closer to the ongoing discussion and to take into account the potential contagion effect on other EMU members and its implications for final outcomes.⁶

Both representative players TD_i and CA are interested in sustaining ‘EMU stability’ in terms of preserving smooth functioning of the EMU. From the viewpoint of TD_i , membership in the euro area is advantageous, as it does not only entail influencing EU policies contingent on effective European decision-making procedures, but also provides access to financial markets and to real external resources (since the euro loosens external budget constraints for TD_i). At the same time, membership in the euro area is beneficial for CA , as it supports its export-oriented policy stance. A reversal of this policy stance and associated adjustment of production processes would incur CA with short run costs. This applies, in particular, when deteriorated balance sheets within the private sector would deteriorate real production processes.

Against this background, a public good of ‘EMU stability’ exists, whose deterioration in the course of one member’s default would make all players worse off. While the individual motivation is different, the interest in preserving a smooth operation of the EMU is shared by all players. Hence, both TD_i and CA have some willingness-to-pay for preserving ‘EMU stability’ and their membership within the EMU. However, the problem with the provision of ‘EMU stability’ is that countries with different incentives to be an EMU member face different constituency constraints, and there is no automatic financing mechanism for unwinding severe fiscal and macroeconomic imbalances within the EMU. In fact, for this reason of

⁵Sustainability of public finances is understood here in relative terms. While such a relative position is key for the financial markets in the short- and medium-run, which is the focus of this analysis, one has to remember that, due to demographic problems, all EU member countries face severe challenges for their public finances. According to the OECD, with no policy change, demographic changes alone will cause the average debt level to rise to 500% of GDP by 2060.

⁶The IMF has been an important player during negotiations on previous bail-outs. For simplicity, we do not formally include the IMF into the game. Integrating another external actor into the model would certainly not rule out the issue of severe negative externalities stemming from the institutional set-up of EMU.

rather incomplete political integration, Europe faces severe problems in mitigating negative externalities in fiscal affairs.

Both the mutual willingness-to-pay for ‘EMU stability’ and the negative externality problem are the foundations of negotiating fiscal costs of adjustments within the EMU—i.e. (financial) contributions to safe-guarding ‘EMU stability’. In this context, an individual TD_i player may resort to a brinkmanship strategy, as its potential default would create negative externality costs. Within the scope and limits of such brinkmanship strategy, CA might be credibly threatened to actually reveal its willingness-to-pay for ‘EMU stability’—i.e. redistributing costs shares for safe-guarding the euro area. Accordingly, TD_i may effectively elicit a bail-out by the rest of the EMU members.

Importantly, for all players, there is the risk of an overall worst outcome for such maneuvering on the brink, which, eventually, boils down to a break-up of the euro area. In such an instance, European integration may probably be stopped or even reversed. Either way, we consider this option to be politically riskier than bailing-out ailing economies within the EMU. This overall worst outcome constitutes the threat within the brinkmanship, which is not under full control by the players but originates within financial markets. As soon as it turns out that the threat is indeed credible—i.e. endangering a smooth functioning of the EMU—brinkmanship may ensue from some general adversities of the present configuration of the EMU in terms of moral hazard behavior among EMU members.

III.2. The brinkmanship game

In this section, we extensively enquire into the brinkmanship game g . After introducing essential features and propositions in section (III.2.1), we reconsider the negative externalities (section III.2.2), which are key drivers within this threat game. Finally, we are able to identify conditions for successful brinkmanship—i.e. eliciting a bail-out in section III.2.3—contingent on the present political-economic configuration of the EMU.

III.2.1. Taking stock

There is a single TD_i (denoted as player $j = 1$, whereby $i = 1, \dots, n$) and a representative CA (player $j = 2$) in place of the group of current account surplus countries within the euro area (see section III.1). The players with quasi-linear preferences allocate their initial endowment over some level of the dividable public good of ‘EMU stability’.⁷ The first player TD_i has complete but imperfect information regarding CA ’s willingness-to-pay for preserving the smooth functioning of the

⁷We may, hence, ignore effects of the provision of this public good on prices and consequently on the consumption of private goods.

EMU. As indicated above, the reason for distinguishing between particular TD s is that there might be a contagion effect (i.e. a negative externality) in the course of a likely bail-out for a single TD_i . Furthermore, we assign bargaining power to both players: μ_i is the bargaining power of a TD_i and ν_{-i} the particular corresponding bargaining power of CA , with $\mu_i + \nu_{-i} = 1$. At the heart of our brinkmanship game is the haggling between the TD_i and CA over sharing the costs of fiscal adjustments within the EMU, i.e. the contributions to safe-guarding ‘EMU stability’. These costs are denoted as $F_i = (f_i, f_{-i})$ (henceforth, ‘fiscal adjustment costs’) for the specific TD_i . By the same token, benefits with respect to safe-guarding a single TD_i are denoted as $B_i = (b_i, b_{-i})$ —the benefits b_i stand for preserving membership within the EMU and providing access to financial markets and external resources. At the same time, from the perspective of CA , the subsequent b_{-i} represents the benefits, for example, from euro area membership as a prerequisite for its export-oriented stance.⁸

In this regard, another issue concerns the ‘limited willingness to pay’ feature of CA , which is the extent to which CA countries within the euro area actually pay for TD_i ’s failure in fiscal consolidation, possibly incurring other EMU members with negative externality costs in terms of ‘default costs’ $D_i = (d_i, d_{-i})$. A deterioration of the public good of ‘EMU stability’ entails, above all, costs for TD_i . However, CA will also suffer from a default, as it has a stake in EMU. However, CA has a particular subsidiary role: while TD_i will not accept costs higher than its fiscal adjustment costs f_i in exchange for contributing to ‘EMU stability’, CA will administer fiscal assistance within the limits of their maximum willingness to pay if $d_{-i} > f_{-i}$. Accordingly, CA will have limited liability amounting to a share θ_i of total F_i , with $0 < \theta_i \leq 1$. This is to say, CA countries will, at most, transfer funds to TD_i amounting to f_{-i} , because beyond that point their willingness to pay for preserving ‘EMU stability’ would be exhausted too. The following proposition can be derived from these considerations:

$$\theta_i = \begin{cases} 0 & \text{if } f_{-i} \geq d_{-i} \\ 0 < \theta_i < 1 & \text{if } f_{-i} < d_{-i} < 2f_{-i} \\ 1 & \text{else} \end{cases} . \quad (1)$$

Bearing the entire F_i reflects each player’s maximum willingness to pay for successfully managing an incipient sovereign debt crises within the EMU. In this regard, the fiscal adjustment costs reflects each player’s cost tolerance in escalation processes of brinkmanship. The rationale of such brinkmanship is that TD_i threatens to cause the overall worst pay-off ensuing from the realization of D_i . In doing so, it can, under identifiable conditions, pass a share of the fiscal adjustment costs,

⁸We assume that the benefits are the same for both players as it renders the game simpler to solve. One may rightly argue that benefits can be different for, say, a big economy like Germany and a small one like Greece or Ireland. However, assuming that the benefits were not symmetric would not change the general tone of our results, so we have decided to keep the game as simple as possible.

F_i , on to the rest of the EMU members. If a credible brinkmanship evolves, then both players will not maximize their piece of the pie, but minimize their respective share of fiscal adjustment costs during negotiations. The present bargaining problem is thus characterized by (F_i, D_i) , where $F_i \subset \mathbb{R}_+^{*2}$ is a vector combination of feasible dis-utility allocations. The disagreement is the outcome if both parties' negotiations break down. In that case, markets will notice that both TD_i and CA cannot agree on an appropriate policy solution for TD_i that helps safe-guard 'EMU stability', i.e. redistributing the fiscal adjustment costs amounting to F_i . This will then, in turn, trigger a default. This way, the realization of D_i at 'disagreement' is equivalent to the occurrence of default costs D_i . The following costs arise in this game $g(F_i, D_i | \theta_i)$: first, there are the above mentioned fiscal adjustment costs F_i for bail-outs around which the negotiations revolve. If the subsequent haggling on distributing F_i were to break down, then a default will occur, and both players will be stuck with the disagreement—i.e. the threat point—comprising the actual 'default costs' D_i contingent on θ_i .

Further reservations regarding the delineated basic characteristics of this brinkmanship game are as follows: on the one hand, the question arises whether TDs should form a cartel to strengthen their brinkmanship vis-à-vis other EMU members. On the other hand, one may also raise the question whether other EMU countries within the euro area can announce in advance that they will club together in order to punish the first country which dares to practice brinkmanship. This is to say that they might pursue an enter-deterrance game. However, because of the coordination problem and competition between all EMU members, both scenarios are unlikely. As to the first scenario, if it becomes evident that some particular TDs explicitly coordinate a brinkmanship strategy, then this may lead financial markets and other members of the EMU to discriminate more between both group of countries, TDs and CAs . Also, since—as we have assumed before—only TD_i is facing an imminent default risk, other TDs will not be willing to join as it might signal to private (and public) creditors in financial markets that they also face an imminent default risk. As to the second scenario, the coordination problem among CA countries arises because of uncertainty regarding their future potential need for assistance.⁹

Successful brinkmanship is especially dependent on the two given probabilities ϕ and ψ_i which are independent of each other and endogenous. The latter depicts the fact that the cost structure determines the probability values. From the perspective of a TD_i , ϕ denotes the probability of encountering an 'reserved' CA or a 'lavish' one with a probability $1 - \phi$. The more reserved the CA , the lower is the probability of executing successful brinkmanship. At this stage, we also take up the political-economic point that a TD_i as an EU member has a say in the Euro-

⁹The scope for an enter-deterrance game is limited also by the fact that, due to problems of effective monitoring, assessing fiscal policy and identifying deliberate infringement to fiscal rules in the EMU is a complicated issue. For example, Jaeger and Schuknecht (2007) discuss this issue in the context of pro-cyclical fiscal positions and boom-bust phases. With regard to boom-bust cycles within the EMU, please also refer to Backé and Wójcik (2008).

pean decision-making process. Hence, TD_i may link this kind of ‘politics’ as a tool when seeking a CA ’s consent to any agreement (see section III.1). In line with this rationale, we assume that values of ϕ are smaller than 1. At the same time, $\phi > 0$ because CA has at least some willingness to pay for preserving ‘EMU stability’ in line with the considerations in section III.1). Hence, we accordingly reject corner solutions of ϕ , such that $0 < \phi < 1$.

The probability ψ_i basically describes the likelihood of externalities by triggering voter alienation toward enacted fiscal consolidation processes, i.e. saddling the electorate with the full amount of fiscal adjustment costs F_i .¹⁰ Uncertainty regarding the constituency’s reaction to stipulated fiscal retrenchment processes may buttress TD_i ’s political leverage in negotiations vis-à-vis CA . If the electorate was completely ‘europhile’, then there would be no room for the government to saddle other EMU members with any form of externality costs, since imposing fiscal austerity would not cause any political upheaval. In fact, the subsequent probability ψ_i would be zero in such circumstances. At the same time, we expect that voters, as well as their delegated governments, must also rank the benefits B_i as valuable. Otherwise, any efforts toward fiscal consolidation within TD_i would be unacceptable, and a government would be unable to craft consensus toward its contribution to safe-guarding ‘EMU stability’ in the domestic arena. In line with the aforementioned reasoning, we accordingly exclude corner solutions so that $0 < q_i < 1$. Some political resources, therefore, exist on the national level, which a government in TD_i may play off against CA in intergovernmental negotiations on the European level.

If the conditions for successful brinkmanship are met, then CA will dance obligingly to TD_i ’s tune and share some fiscal adjustment costs F_i in terms of providing a bail-out. In the following paragraphs, we determine the Nash strategies, i.e. the mutually best responses which will eventually constitute a sub-game perfect Nash equilibrium of the brinkmanship game g .

We proceed with the analysis of the political-economic, game-theoretic model by simplifying things without a loss of generality: given that both players’ maximum willingness to pay for ‘EMU stability’ in terms of still reaping the benefits B_i from the smooth functioning of the euro area corresponds to the total F_i , we can normalize $f_{ij} = b_{ij} = 1$. Hence, we can transform the brinkmanship game $g_1(F_i, D_i | \theta_i)$ to the form $\tilde{g}(\tilde{F}_i, \tilde{D}_i | \theta_i)$, with $0 \leq \tilde{f}_{ij} \leq 1$, $\tilde{f}_{ij} \in \tilde{F}_i$, $\tilde{F}_i \subset \mathbb{R}^2$. Again, the standard assumption holds that $\tilde{f}_{ij} = (f_{i1}, f_{i2})$ is a non-empty, convex, and compact set. In this game $\tilde{g}(\tilde{F}_i, \tilde{D}_i | \theta_i)$, a single TD_i quasi maximizes the corresponding CA ’s share of fiscal adjustment costs for safe-guarding ‘EMU stability’, i.e. saddling them with negative externality costs. The negotiations may lead to a new outcome \tilde{f}_i for TD_i . In turn, TD_i burdens CA with the share $\tilde{f}_{-i} = (1 - \tilde{f}_i)$. Accordingly, the players’ continuous utility functions $u_{(i)j}(\tilde{f}_{(i)j})$ are $u_{i1}(\tilde{f}_{i1}) = \tilde{f}_{i1} = \tilde{f}_i$ and

¹⁰Here, national strikes in ‘ailing’ EMU-member economies provide a vivid example how political uncertainty on the national level may bring about political leverage in international negotiations.

$u_2(\tilde{f}_{i2}) = \tilde{f}_{i2} = (1 - \tilde{f}_i)$. The following paragraphs deal with the the structure of players' strategies and pay-offs.

III.2.2. Contagion and multiple fiscal assistance

Regarding the strategic interaction between TD_i and CA , two different sub-games of $\tilde{g}(\tilde{F}_i, \tilde{D}_i | \theta_i)$, due to complete but imperfect information, have to be taken into consideration. First, TD_i does not know whether it will encounter a reserved (ϕ) or a lavish ($1 - \phi$) CA . In this context, specific default costs have to be considered. On the one hand, a single crisis has the potential to trigger further defaults of all $n TD_i$. This would be the overall worst pay-off from the viewpoint of CA . Therefore, fearing such exorbitant costs, the primary goal of CA would be to sustain the support in each TD_i for safe-guarding ‘EMU stability’. From this point of view, it may be more beneficial to be lavish. Second, CA may display a rather reluctant attitude toward providing bail-outs because any obvious generosity would intensify moral hazard behavior, which possibly requires transferring n -times \tilde{F}_i . Due to CA ’s ambiguous attitude toward providing fiscal assistance, the TD_i ’s pay-offs have to be weighted with a probability ϕ for encountering a reserved and $1 - \phi$ for a lavish CA .

The TD_i ’s feasible set of strategies is comprised of two choices: ‘consolidate’ or ‘not-to-consolidate’. The latter strategy consists of practicing brinkmanship in terms of reluctance toward urgently needed fiscal consolidation measures. TD_i may be rather inclined toward protecting its national constituency from the short-run adversities of austerity policies.¹¹ If TD_i chooses to ‘consolidate’, i.e. not to practice brinkmanship, it forgoes both the opportunity to pass a share \tilde{f}_i of fiscal adjustment costs on to CA as well as nurturing its electorate. This would be the best pay-off from the perspective of CA . When TD_i relies on a strategy of choosing ‘not-to-consolidate’, the outcome ultimately depends on the reaction of CA . The latter player can choose a strategy of ‘bail-out’—i.e. immediately providing fiscal assistance—, ‘stall’ in terms of not revealing its willingness to pay but to play back the ‘negative externality’ by sending a reminder about intensifying fiscal consolidation within the domestic arena, or ‘no-bail-out’ by definitely declining any demanded fiscal assistance. The according pay-offs are as follows: if TD_i chooses a strategy of ‘consolidate’, then it receives zero, whereas CA receives the entire benefits of secured ‘EMU stability’, i.e. further smooth operation of the euro area, amounting to 1. If TD_i chooses ‘not-to-consolidate’ and CA reins in TD_i ’s prospective default—i.e. a bail-out—, then TD_i receives the aspired alleviation of fiscal adjustment costs in the amount of \tilde{f}_i . In this case, CA receives a pay-off $(1 - \tilde{f}_i)$. Taking into account the principle of equal treatment within Europe, however, CA may possibly also have to deal with transfer payments—for instance, via

¹¹Here, our analysis obviously bears some resemblance with Alesina and Drazen (1991): the argument refers to front-loaded benefits and delayed costs of not taking fiscal consolidation measures.

some kind of a special purpose vehicle—to all TD_i amounting to n -times the size of $(1 - \tilde{f}_i)$. If CA chooses to ‘stall’, TD_i may be stuck with default costs amounting to $-q_i$. The latter pay-off hinges upon TD_i ’s likelihood of losing public support for fiscal retrenchment and consequently defaulting. Simultaneously, CA receives the pay-off $(-\psi_i\theta_i + 1 - \psi_i)$, or $(-\psi_i\sum_{i=1}^n \theta_i + 1 - \psi_i)$ in the case of possibly spreading defaults via contagion among all TD s. When choosing ‘no-bail-out’, CA would immediately cut out TD_i . Such policy would, above all, deteriorate the public good of ‘EMU stability’. In this occasion, all players would suffer from the realization of default costs \bar{D}_i , where the pay-off is $(-1, -\theta_i)$, in line with the aforementioned proposition (see equation 1).

III.2.3. Conditions for successful brinkmanship

A brinkmanship strategy has to meet some prerequisite conditions. In particular, successful brinkmanship has to be effective and acceptable. The effectiveness condition of such brinkmanship rests on the extent of TD_i ’s default: as CA is increasingly affected by costs, a TD_i ’s threat gains more credibility. In this respect, the probability of default is subject to a critical threshold: if the respective probability is too small, CA cannot be coerced into providing fiscal assistance. However, the credibility of the brinkmanship strategy is also dependent on whether the outcome is acceptable to TD_i . If the probability of a default is too high and, hence, the acceptability condition cannot be reached, then TD_i will have to ‘consolidate’. In turn, this player will entirely incur the envisioned fiscal adjustment costs for sustaining ‘EMU stability’.

The TD_i ’s brinkmanship will be successful, which means eliciting the desired extra funds amounting to \tilde{F}_i , if it constitutes a credible threat. In this regard, TD_i ’s brinkmanship may be effective if the expected pay-off of CA from a choice to ‘bail-out’ is higher than from a decision to ‘stall’ when taking into account possible contagion, i.e. defaults spilling over to other TD s. Therefore,

$$1 - \tilde{f}_i > -\psi_i \sum_{i=1}^n \theta_i + 1 - \psi_i.$$

Accordingly, the minimum probability $\psi_{i,min}$ has to be

$$\psi_{i,min} > \frac{\tilde{f}_i}{\sum_{i=1}^n \theta_i + 1}. \quad (2)$$

The probability $\psi_{i,min}$ is the lower bound of the brinkmanship for TD_i . Below this level, CA would choose a strategy of ‘no-bail-out’, even if it is lavish. However, with a probability of ϕ , TD_i may feel that the strategy ‘not-to-consolidate’ is too risky with regard to encountering a reserved CA . At the same time, TD_i

will encounter a lavish *CA* with a probability of $(1 - \phi)$, which will choose a strategy of ‘bail-out’, given that the effectiveness condition holds. Therefore, TD_i will pose a probabilistic threat if its expected pay-off is higher than a zero pay-off from choosing to ‘consolidate’ for a given $0 < \psi_i < 1$:

$$-\psi_i + \tilde{f}_i(1 - \phi) > 0,$$

resolving of which results in

$$\psi_{i,max} < \tilde{f}_i \frac{1 - \phi}{\phi}. \quad (3)$$

Accordingly, the acceptability condition depends on values for ϕ . Therefore, values for ϕ have to be below a critical threshold.¹² From the proposition $\psi_{i,min} < \psi_{i,max}$, it follows that the upper bound is:

$$\phi_{max} < \frac{\sum_{i=1}^n \theta_i + 1}{\sum_{i=1}^n \theta_i + 2} < 1. \quad (4)$$

Additionally, there is also a type of lower bound: if the probability ϕ for encountering a reserved *CA* is very small, TD_i will always find the brinkmanship acceptable. This holds when

$$\tilde{f}_i \frac{1 - \phi}{\phi} \geq 1.$$

Hence, ‘not-to-consolidate’ is always acceptable for critical values

$$\phi_i^0 \leq \frac{\tilde{f}_i}{\tilde{f}_i + 1}. \quad (5)$$

If the probability ϕ for a reserved *CA* satisfies the acceptability condition, then the following proposition must be valid:

$$\phi^* \in \Phi^*, \quad \Phi^* := \{\phi^* \mid \phi^* \leq \phi_{max} < 1, \phi^* \in \mathbb{R}_+^*\} \quad (6)$$

Regarding $\psi_{i,min}$, the probability ψ_i in a brinkmanship strategy has to remain below the critical threshold $\psi_{i,max}$. Above that value, TD_i will refrain from a strategy of ‘not-to-consolidate’ because it fears mutual detrimental effects. Therefore,

¹²Otherwise, $\psi_{i,max}$ in inequality 3 would have to be even smaller than $\psi_{i,min}$ in inequality 2 for some high values of ϕ . That would render any brinkmanship fruitless as it becomes effective but not acceptable.

for every given probability $0 < \phi < 1$, the probabilistic threat is credible when a country-specific ψ_i^* is an element of the finite set Ψ_i^* . The according proposition is:

$$\psi_i^* \in \Psi_i^*, \quad \Psi_i^* := \{\psi_i^* \mid \psi_{i,min} \leq \psi_i^* \leq \psi_{i,max}, \psi_i^* \in \mathbb{R}_+^*\} \quad (7)$$

When the endogenous effectiveness and acceptability conditions for the parameters ϕ and ψ_i are satisfied, TD_i will resort to brinkmanship. CA 's response to TD_i 's brinkmanship is to immediately transfer fiscal adjustment costs to TD_i amounting to the share \tilde{f}_i . This is equivalent to TD_i passing the respective portion of fiscal adjustment costs on to current EMU members, i.e. eliciting a bail-out. At this stage, TD_i will then henceforth commit to fiscal consolidation, since there are, for the time being, no further opportunities to pass costs on to other EMU members. This is because, beyond that point, CA 's willingness to pay for safe-guarding 'EMU stability' is exhausted—although a newly incipient sovereign debt crisis may restart another brinkmanship round.

The remainder of our game-theoretic analysis focuses on a companion bargaining game, which ensues as soon as the conditions for successful brinkmanship are met. Here, we consider a Nash bargaining solution (NBS) for distributing TD_i 's fiscal adjustment costs at the onset of a sovereign debt crisis within the EMU. This is to say that we ascertain each player's contribution to safe-guarding 'EMU stability'.

III.3. The bargaining game

Given that all characteristics of the companion bargaining game are common knowledge, the players look ahead and anticipate the reciprocal best responses. Due to this backward induction, negotiation time is irrelevant and the bargaining game comes to an immediate solution.¹³ This portion of the game-theoretic analysis still pertains to the game $\tilde{g}(\tilde{F}_i, \tilde{D}_i \mid \theta_i)$ and only introduces the NBS to shed some more light on the relevance of political leverage in bargaining on bail-outs. In this respect, the game \tilde{g} is completed by Nash bargaining on the non-empty, convex, and compact set comprising any convex combination of the aforementioned vector $\tilde{F}_i \in \mathbb{R}_+^{*2}$. According to the NBS, only Pareto-efficient solutions have to be dealt with. The particular shares $\tilde{f}_{i1} = \tilde{f}_i$ of 'fiscal adjustment costs' that TD_i can pass on to CA , such that the latter player carries the share $\tilde{f}_{i2} = 1 - \tilde{f}_i$, represent the bargaining outcome. The NBS is derived from the Nash product weighted with the respective bargaining power:

$$\max_{\tilde{f}_{ij}} (\tilde{g}(\tilde{F}_i, \tilde{D}_i \mid \theta_i)) = (u_{i1}(\tilde{f}_{i1}) - u_{i1}(\tilde{d}_{i1}))^{\mu_i} (u_{i2}(\tilde{f}_{i2}) - u_{i2}(\tilde{d}_{i2}))^{\nu-i}. \quad (8)$$

¹³In line with this rationale, the obvious see-sawing in a run-up to a bail-out—in terms of announcing and stipulating fiscal retrenchment on the 'tumbling' economies' level and deliberating up bail-outs at the European end—represents the preparatory stage before both camps finally put their cards on the table.

Given the players' utility functions, the maximization problem in light of $\tilde{D}_i = (-1, -\theta_i)$ (see equation 1) is

$$\max_{\tilde{f}_{i1}, \tilde{f}_{i2}} \tilde{g}(\tilde{F}_i, \tilde{D}_i | \theta_i) = (\tilde{f}_i + 1)^{\mu_i} ((1 - \tilde{f}_i) + \theta_i)^{\nu_{-i}}.$$

Given that $\mu_i + \nu_{-i} = 1$, the subsequent first-order condition implies that the equilibrium is

$$\tilde{f}_i^* = \begin{cases} \text{not defined} & \text{if } (1 + \theta_i)\mu_i - \nu_{-i} \leq 0 \\ 0 < \tilde{f}_i < 1 & \text{if } (1 + \theta_i)\mu_i - \nu_{-i} \leq 1 \\ 1 & \text{else} \end{cases}. \quad (9)$$

With respect to the completed (transformed) brinkmanship game \tilde{g} , the NBS may, hence, comprise the outcome tuple $(\tilde{f}_i^*, (1 - \tilde{f}_i^*))$. Considering the specific characteristics of the NBS, the combination of both players' strategies can also be represented in terms of their respective reaction functions R_{ij} . Due to complete information, TD_i can anticipate CA 's optimal choice. Hence, its own best response is:

$$R_{i1}(\tilde{f}_{i2}^*) = \begin{cases} \text{not defined} & \text{if } (1 + \theta_i)\mu_i - \nu_{-i} \leq 0 \\ 0 < \tilde{f}_i \leq 1 & \text{if } 0 < (1 + \theta_i)\mu_i - \nu_{-i} \leq 1 \\ 1 & \text{else} \end{cases} \quad (10)$$

From the perspective of CA , the corresponding reaction function is:

$$R_{i2}(\tilde{f}_{i1}^*) = \begin{cases} \text{not defined} & \text{if } 2\nu_{-i} - \theta_i\mu_i \leq 0 \\ 0 < (1 - \tilde{f}_i) \leq 1 & \text{if } 0 < 2\nu_{-i} - \theta_i\mu_i \leq 0 \\ 1 & \text{else} \end{cases} \quad (11)$$

Here, it becomes obvious that CA 's actual willingness to pay for bailing out TD_i depends on the distribution of bargaining power. The less bargaining power ν_{-i} CA exhibits, the higher are the values for \tilde{f}_i^* . Consequently, TD_i can elicit more funds amounting to \tilde{f}_i^* from CA as their bargaining power μ_i increases.¹⁴

The players' reaction functions R_{ij} (equations 10 and 11) constitute the unique sub-game perfect Nash equilibrium, incorporating a specific NBS of the transformed threat game $\tilde{g}(\tilde{F}_i, \tilde{D}_i | \theta_i)$, given conditions for successful brinkmanship (see propositions in equations 6 and 7). This is to say that, for effective and acceptable

¹⁴The 'not defined' outcomes represent corner solutions, at which the 'costs of default' exceed the sum of players' willingness-to-pay for safe-guarding 'EMU stability'. The interpretation is obvious: 'too-big-to-be-bailed-out' would result in a de facto default, turning the incipient sovereign debt crisis into a case of public insolvency. By definition, this would annul the joint public good of 'EMU stability' and, hence, result in an alteration of the underlying political-economic configuration of the EMU. However, we still confine ourselves to a discussion of an *incipient* sovereign debt crisis, possibly allowing for the brinkmanship threat game.

brinkmanship, CA 's response to TD_i 's credible brinkmanship strategy is to burden itself with 'fiscal adjustment costs' amounting to the share of $(1 - f_i)$. Thus, TD_i passes the respective 'fiscal adjustment costs' on to other EMU members. When obtaining a share \tilde{f}_i of 'fiscal adjustment costs', TD_i will abstain from further attempts to promote a hazardous fiscal policy stance. This is because, at that point, CA 's willingness to pay for contributing to the public good of 'EMU stability' is exhausted. Thus, there is no more moral hazard related to fiscal policy at this stage. However, in this respect, another caveat might be in order: as the modeling framework calculates one TD 's brinkmanship vis-à-vis CA , such a threat at an incipient sovereign debt crisis has been one particular round in the 'boxing match', as such a crisis scenario may occur again. Insofar, one may expect that newly incipient but random sovereign debt crisis within the EMU to mark the starting point for another round of the outlined threat game. In this regard, the institutional setup of the EMU is the ground for brinkmanship, whereas 'crisis' acts as a catalyst within the overall process.

IV. Conclusions and policy implications

In this paper, we have presented a formal framework to analyze the political economics of sovereign bail-outs within the EMU. We have based our study on a political-economic, game-theoretic analysis that helps to understand why and how the parties involved arrived at the bail-outs and on what conditions this outcome depended. In doing so, we have formally taken account of the negative externality problem that is central to policy debates related to the EMU's institutional design and played an important role in the Greek and Irish crises. Contrary to the existing literature, we have not only focused on the economic aspect of such a negative externality, but also looked at how it arises and interacts with the dynamics of the political process in the EMU. The analysis suggests that, under the present political-economic set-up of the EMU, the bail-outs were inevitable, i.e. a threat of default by one member must, under identifiable conditions, result in sharing the costs of fiscal adjustment by the rest of the members.

As to the policy implications, in our analysis, we have formally shown that the EMU problems do not only ensue from the member countries' fiscal problems alone, but from the interactions of these problems with the actual political configuration of the EMU. Differences in effective decision-making procedures within the political sphere may help to explain differences in 'crisis scenarios' across various currency areas. For example, the political leverage of members within the US currency area such as California—whose fiscal woes do not wreak such havoc as is the case with the euro area—is seemingly much lower relative to economies within the EMU. In other words, it formally confirms that the sheer fact that countries share the same currency does not necessarily have to lead to negative externalities between them. If this was the case, the fiscal problems in Ecuador, a dollarized

country, would give rise to a threat to the dollar—evidently this is not the case (see Balcerowicz, 2010). Successful brinkmanship as a deliberative stance toward ‘negative externalities’ hinges on the possibility of saddling others with some kind of ‘costs of default’.

From this result follow some policy implications.¹⁵ It suggests that, in future discussions of a possibly reformed EMU, more weight should be given to policies that address the political-economic sources of fiscal, negative externalities within the euro area, including those related to incentives generated within the political negotiation process. Against this background, the analysis suggests that different policy alternatives aimed at minimizing the effects of negative externalities can be designed on three separate levels: i) on the constituency level: policies should aim at increasing the electorates perceived costs of default, which would limit the inclination toward fiscal imbalance and the subsequent run-up of unsustainable debt; ii) on the government level: policies should aim at weakening the political leverage and bargaining position of troubled countries vis-à-vis the rest of the EMU, thus mitigating brinkmanship strategies; iii) on the markets level: policies should aim at creating mechanisms to reduce uncertainty and stabilize market reactions in the case of a potential default, thus decreasing the scope for negative externalities, particularly via financial contagion. Overall, the policies should aim at increasing the perceived costs of a default relative to the short-term political costs of economic adjustment. This would serve as a deterrent to brinkmanship, stimulate fiscal discipline, and decrease the scope of the inherent negative externality problem within the EMU.

¹⁵See, in particular, Belke (2010) for a general, political-economic discussion of numerous reform proposals for EU economic governance.

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