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We need more Europe in the Monetary Union. Which Europe? Hints from policy games*

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Abstract

There is now wide agreement that under the pressure of the 2008 crisis serious flaws have emerged in the design of the European Economic and Monetary Union (EMU) as a supranational architecture with the overarching end to generate and distribute collective benefits from integration and "internalisation of externalisities" among highly interdependent countries. Consequently, reforms are invoked ideally aimed at fostering *further integration* among member countries. If we agree that more Europe is needed, we cannot beg the far more controversial question: "Which Europe?" To this end, we introduce a policy game setup of two interdependent countries with reciprocal negative externalities where each sovereign government seeks to optimise its own welfare function reflecting social preferences over policy options and their outcomes. We first establish the welfare losses associated with non-cooperative (Nash) policy choices. Then we examine what kind of supranational policy regimes (SRs) may be subscribed to by both governments according to the Pareto criterion. Two SRs are "technocratic" (they do not take national preferences into account), two are "political" (they do). One such regime that we call "Europe" optimises the additive welfare function of the two countries. The thrust of our analysis is that the technocratic regimes are dominated, so that the single alternative is between Europe and "exit" for non-cooperation. Therefore, our analysis lends support to the view that the strategy of further integration by means of an extended system of binding rules enforced by technocratic agencies may be unsuccessful. Yet an important point is that Europe is the Pareto-dominant regime only within a limited range of asymmetry between countries' social preferences.

Keywords: European Economic and Monetary Union, policy games, design of supranational institutions
JEL Codes: P15, F55, D78

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1. Introduction

One of the consensus views drawn from the global crisis exploded in 2008 is that in Europe, and in its Economic and Monetary Union (EMU) in particular, the crisis was exacerbated and prolonged by deficiencies in its design as supranational architecture of highly interdependent countries with the overarching end to generate and distribute gains from integration and "internalisation of externalities" in order to improve common welfare. (e.g. Baldwin and Giavazzi eds. 2015, 2016).[1] The most compelling problems brought to the forefront by the crisis are two. The first is that the system fails to prevent member countries from pursuing policies in the pure national interest notwithstanding social and economic costs due to mutual negative externalities. The second is that no one is in charge for the EMU as a whole at the supranational level either (with the exception, by statute, of the ECB). In his fine book *Saving Europe*, Carlo Bastasin (2015a) calls the European crisis the "First interdependence war".[2]

Therefore, in order to overcome these flaws, institutional reforms are deemed necessary, ideally aimed at fostering *further integration* on the grounds of (at least) economic policy and governance. This claim has eventually been endorsed by the top European institutions, as most recently testified by the so-called "Five Presidents Report" (Juncker et al. 2015), by speeches of the President of the European Central Bank (e.g. Draghi 2014a, 2014b, 2015), the *White Paper about the future of the EU* (2016) and the

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1 See the classic Oates (1977), and for the EMU Kenen (1995), Mongelli (2010), Spolaore (2015), Eyraud at al. (2017). Empirical studies on interdependencies and policy externalities in the EMU are numerous: see e.g. in't Veld (2013), Berti et al. (2013), European Commission (2014), Alcidi et al. (2015). More recently Alesina et al. (2017) provide up-to-date evidence of increased convergence and interdependence brought about by EMU membership. From this point of view, the EMU architecture has been open to debate and criticisms since its conception (e.g. Buiter et al. 1993, Eichengreen and Frieden eds. 1994, Eichengreen and Wyplosz 1998).

2 In a subsequent paper, he writes: "I am not using the word war lightly. […] The size of the economic crisis, the loss of production measured against the trend, is in the ballpark of a war. It actually amounts to a higher economic cost than all the wars fought by the United States after 9/11, Iraq, and Afghanistan included […] Throughout the crisis, national governments have acted as if their states were or had to become self-sufficient, live within their own means, and stand on their own two feet. [This goal] became the cornerstone of crisis management and of the European system of economic governance that later emerged" (Bastasin 2015b, pp. 5-6)

Reflection Paper on the Deepening of the Economic and Monetary Union (2017) both under the authorship of the European Commission.

Suppose we all agree that we need more Europe. The next question is: "Which Europe?" Even at the scholarly level, let alone the political level, one finds at least three different lines of thought about reform (see also Delatte et al. 2017).

The first moves from the premise that the EMU regulatory framework has proved to be too weak, unable to constrain rational and elected policymakers properly (Eyraud et al. 2017; see also Schuknecht et al. 2011). The typical symptoms are seen in the persistence of the deficit bias in fiscal policy, public debt growth, transmission of public finance distress. Therefore, reforms should deepen and strengthen the original rule-based conception of the EMU embedded in the Treaties. Further fiscal sovereignty devolution is preferably towards, "technocratic", non-political agencies as guardians of the rules (e.g. the European Fiscal Board and national fiscal boards: Asatryan et al. 2017, Beetsma and Debrun 2016).

The second line is instead critical of the fiscal rules apparatus since its was designed to control for the negative externalities of fiscal profligacy but not for those of fiscal austerity, which accounts for the deeper and longer recession in the EMU than elsewhere (e.g. De Grauwe 2013, Manasse 2015; in the vast debate on austerity see the contributions collected by Corsetti (ed.) 2012). A related allegation is that the rules failed as substitute for explicit policy coordination[3].

A third view is that the EMU as a supranational institution lacks "incentive compatibility" with the legitimate role of democratic governments as representatives of social preferences over policies and their outcomes (the notion of incentive compatibility is also introduced by Eyraud et al. 2017; see also Wickens 2016). A role emphasised by the stress of the Treaties on the exclusive national responsibility, and naturally intertwined with the long-lasting question of the democratic deficit of Europe (Bastasin 2015a, Fabbrini 2015).

The second and third view converge towards the idea that tightening the existing regulatory system has already been experimented (the so-called Two

[3] The single exception may be seen in the "European Semester", introduced within the 2011-12 anti-crisis reform package, with the explicit aim of "coordinating" national fiscal policies, which however belongs more to the category of moral suasion than to full-fledged institutional mechanisms (Eyraud et al. 2017)

Pack, Six Pack, Fiscal Compact, etc.) with poor results on crisis management and further deterioration of the "input" and "output" legitimacy of the EMU policymaking process (Scharpf 2015, Schmidt 2015). Reforms should instead address the democracy and legitimacy issues, creating supranational governance mechanisms that prevent interdependence wars by taking national (different) social preferences seriously.

Two critical obstacles on the way of reforms cannot be ignored. The first is the idea of national sovereignty, identity and interests deeply rooted in European citizens. As a matter of fact almost all national governments of different political colours have repeatedly proved unable, or unwilling, to devolve more sovereign powers. The second is that further integration is mostly needed when citizens' pro-Europe sentiments are at historical low and anti-Europe social and political movements for the first time pose serious threats to the whole European construction.[4] Therefore, direction and extent of reforms (if any) will eventually be a political decision reflecting some balance of interests and power across governments. Outcomes are highly uncertain and hardly predictable.

Our aim with this study is to shed some light on the supranational design that may possibly be endorsed by democratic governments on behalf of their citizens moving from first principles in a game-theoretic framework. By first principles we mean the normative and positive literature on the costs and benefits of international unions. If highly interdependent countries may enjoy various benefits in international unions, their cost is represented by some limitations imposed on the pursuit of national social preferences (in the broad sense of interests, cultural traits and national identity) concerning policy choices and their outcomes (Alesina et al. 1995, 2005, 2017, Alesina and Spolaore 1997, Spolaore 2015). This cost increases when social preferences are heterogeneous across the members of the union. As stressed by Alesina et al. (2017), this seems a major hurdle for further sharing of institutions in Europe despite ever increasing integration of member countries under various socio-economic dimensions.

[4] This worrysome picture emerges from a number of empirical studies on the attitude of European citizens towards further integration, especially spurred by the crisis: see e.g. Braun and Tausendpfund (2014), Kuhn and Stöckel (2014), Hobolt and Wratil (2015), Guiso et al. (2014), Farina and Tamborini (2017).

Against this background, by means of a stylised policy game between two interdependent countries with reciprocal negative externalities in the tradition of Cooper (1969) and Hamada (1976), we examine what kind of supranational regime (SR) may achieve a Pareto improvement relative to non-cooperative (NC) strategies dictated by the national social preferences over policy choices embedded into the governments' welfare functions.[5] The NC regime may be regarded as the *status quo ante*, or as the "exit" option from the SR. Two SRs are "technocratic" (they do not take national preferences into account), two are "political" (they do).[6] Some of these regimes mimic existing features in the EMU, others are more forward-looking. Among these, a political SR that we call "Europe" operates with the additive welfare function of the two countries.[7] The thrust of our analysis is that the technocratic SRs are systematically dominated by the NC regime, while Europe emerges as the single alternative to it. In line with the literature recalled above, however, Europe remains the Pareto-dominant regime only within a limited range of asymmetry between countries' social preferences. Therefore, our analysis lends support to the view that the strategy of further integration by means of an extended system of binding rules enforced by technocratic, "non politicised", agencies may be unsuccessful. National social preferences and their legitimate representatives cannot be muted, though their being too dissonant may pose serious challenges to the EMU governance design.

Our analysis is developed as follows. In section 2 we introduce the model, where each of two interdependent countries is characterised by a socially relevant variable y and a policy instrument x that can fully offset adverse

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[5] The model is meant to be applicable to different fields, not necessarily the economic ones.

[6] With this distinction we intersect the literature on the assignment of policymaking to politicians or independent agencies (e.g. Wilson 1989, Besley and Coate 2003, Alesina and Tabellini 2007). With this literature our model shares the point that the assignment is driven by welfare optimisation. Two are the main differences. The first is the supranational setup, such that the agency faces two independent sovereigns, with possibly different welfare objectives. The second is that the key issue is how the mandate of the agency fares with respect to the sovereigns' welfare objectives. In our model the government(s) and the agency execute their respective policy tasks perfectly, whereas the literature is more concerned with different ability, incentives, motivations of the politician and the agency in pursuing the same given task.

[7] This is a classic federal welfare function. Yet we do not examine a fully-fledged federation because this seems beyond reach in the present situation of the EMU.

shocks to y – this we call "good" policy. Interdependence consists of each country's y depending on the other's.[8] The key assumption is that x bears a social cost, let it be a degree of policy aversion, so that each government seeks its own optimal trade-off between a limited use of x and the consequent loss over y by minimising a welfare loss function defined over y and x.[9] In the first place we study the NC (Nash) equilibria that may result, which are characterised by less than full protection of y in both countries, and hence reciprocal negative externalities. These arise not because of interdependence *per se* but because of the cost of the "good" policy. Pareto improvements over the NC equilibria are possible by means of devices that coordinate the two governments on a larger use of x and lower loss over y.[10] In section 3 we examine the four SRs mentioned above ranking them according to their ability to yield a Pareto improvement relative to the NC regime. As anticipated, the technocratic regimes are systematically dominated by the NC regime, whereas Europe emerges as the Pareto-dominant regime conditional on a limited degree of structural asymmetry of the two countries, in particular their relative degree of policy aversion. Section 4 summarises and concludes with some implications for the EMU reform.

2. A simple model of interdependence war

To begin with, we deploy a simple policy-game model of two independent, sovereign countries (i = 1, 2) tied by interdependence. For convenience, and

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[8] Interdependence can also be modelled by means of direct spillover effects of the policy instrument. This choice may be appropriate in further specific cases; it modifies the algebra but not the essence of the problem under examination.

[9] This formalisation is also consistent with the so-called "two level games" introduced by Putnam (1988) in the international relations literature. The first level of the game establishes the menu of choices of the government or of the negotiator *vis-à-vis* its domestic constituency. The second level of the game is played by each government *vis-à-vis* the other. Here the result of the first-level game is embedded into the welfare loss function.

[10] Therefore, we *do* assume all the conditions whereby reciprocal externalities prevent the achievement of Pareto optimality of NC policy choices. As is well known, reciprocal externalities (e.g. pecuniary ones in Walrasian markets) do not necessarily imply this outcome (see Korinek 2016 for a recent treatment), nor are externalities sufficiently important or certain in all possible fields so as to justify policy coordination or cooperation (e.g. Alcidi et al. 2016 for the case of fiscal policy in the EMU). Indeed, our model focuses on one reason that may prevent the adoption of these policies, namely their conflict with social preferences.

without loss of generality, let y_i be the *change* in a socially relevant variable with respect to a desired level (which may well be zero), determined as follows

(1) $y_i = a_i x_i + b_i y_j + u_i$

where the coefficient a measures the effect of the policy instrument x, b the cross-country interdependence, and u is an exogenous shock. The signs of a and b allow the model to be applied to a number of specific cases. Here we shall consider the case where $(a, b) > 0$, but different cases do not modify the essence of the model. We introduce the notion of x as "good" policy in that it is able to counteract any shock to y. Suppose y measures changes in employment, and $u < 0$: then $x > 0$ can counteract the fall in employment. This policy may be "whatever works": e.g. a labour market reform that increases wage flexibility as well as more public investment. We do not discuss policies *per se*: we just assume that one exists with no more efficient (higher a) alternative.[11] Though convenient for expository purposes, it is not necessary for x to be the same for both governments.

After a shock, the effects on y in each country are

(2) $y_i = (u_i + a_i x_i + b_i(u_j + a_j x_j))k \qquad k = (1 - b_i b_j)^{-1}$

with a crucial role played by interdependence. In fact, $b \neq 0$ implies that each country's y also depends on the foreign shock and policy response, in addition to the domestic shock and policy response. Moreover, the common "multiplier" k, which measures the extent of the reciprocal spillovers is larger the larger the coefficients b. The standard condition $b_i b_j < 1$ is assumed.

Note that there exists a pair (x_1^*, x_2^*) such that $(y_1, y_2) = 0$ for any (u_1, u_2). The solution, that we call "full protection", is

(3) $x_1^* = -u_1/a_1, \;\; x_2^* = -u_2/a_2$

with the following important features:

- each government activates x only if, and to the extent that, its own country is hit by the shock
- if both governments choose their respective x^*, each is set independently of the other (no externality effect to be taken into account).

What is the problem then? We now introduce the assumption that the two governments faithfully reflect national social preferences, which include

[11] As regards alternatives to x, the menu of 'good' policies may not be as large as one might like or hope.

protection of y from shocks but also a cost in the use of policy x.[12] This generates a trade-off between protecting y and activating x. Accordingly, governments decide their policy by minimising the standard welfare loss function:

(4) $L_i = -0.5(y^2_i + c_i x^2_i)$

where c measures the loss due to $x \neq 0$ *relative* to the loss due to $y \neq 0$ (i.e. the latter is normalised to 1). Let us call c the degree of policy aversion of the country. Upon minimisation of its loss function, each government decides its optimal activation of x, given by:

(5) $x_i^c = -(u_i + b_i(u_j + a_j x^c_j))\beta_i, \qquad \beta_i = (a_i + c_i/a_i k^2)^{-1}$

where x^c denotes the c-constrained choice of x.

Equation (5) is the optimal reaction function of the government, which includes the domestic shock, the foreign shock and the other government's choice of x. The simultaneous solution of the equations (5) of each government yields the NC (Nash) policy equilibrium, which we denote with (x^N_1, x^N_2). We regard this equilibrium, a kind of Hobbesian "state of nature", as the reservation option for each government such that no other arrangement is feasible if inferior to this.

The key factor in the reaction functions is β, which depends on the cost of x and the degree of interdependence k. Note that β decreases with c (i.e. the more costly is x, the less it is used), and it increases with k (i.e. the stronger the interdependence, the more the governments should use x). This latter feature sheds light on one reason why governments dislike interdependence: it forces them to adopt costly policies more intensively. However, the problem is not interdependence *per se*, but the cost of policies: if $c_i = 0$, then $\beta_i = a_i$, the unconstrained solution x^* would be feasible, and governments could safely ignore interdependence.

Another important result is that, with $(a, b) > 0$, x^c in one country is decreasing with respect to x^c in the other, i.e. they are substitutes. This is indicative of where the interdependence war may originate: the cost of policies adds another reciprocal negative externality. In fact, the higher is c (the lower x^c) for one government, the more the other government should use its own x.

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[12] It would be naive to think that costless policies exist. Typically any policy choice has costly side effects that should be taken into account by the government (from this point of view, c can capture side effects on other non-explicited variables)

Conversely, each government would like a more intensive use of x by the other.

The NC policy regime entails the following effects on y in each country[13]

(6) $y^N_1 = \delta_{11}u_1 + \delta_{12}u_2$

$y^N_2 = \delta_{21}u_1 + \delta_{22}u_2$

where the parameters δ are combinations of (a, b, c), with positive sign. Therefore, y^N in each country is less than protected from *both* the domestic *and* the foreign shock. Note that all δ in each country increase with c_1 and c_2, i.e. the higher the cost of x for *both* governments, the greater the exposure of each country's y to domestic and foreign shocks.

If on the one hand the outcomes (6) for each country represent the socially optimal trade-off against the cost of using x, the exposure of y to foreign shocks may be another seed of the interdependence war. For instance, after inspecting δ_{12}, government 1 might note that if $c_2 = 0$, then $\delta_{12} = 0$, and hence claim that its country is being hurt by the unwillingness of the foreign government to make full use of the "good" policy. Government 2 may claim likewise. The point is that each δ also depends on the domestic c being nonzero. Hence an equally valid claim is that each government exposes its country to shocks because it is unwilling to make full use of the "good" policy.

Finally, the welfare losses for the two countries have the general form:

(7) $L^N_1 = -\eta_{11}u^2_1 - \eta_{12}u^2_2 + \eta_{13}u_1u_2$

$L^N_2 = -\eta_{21}u^2_1 - \eta_{22}u^2_2 + \eta_{23}u_1u_2$

where the parameters η are combinations of (a, b, c), with positive sign. Again, welfare losses are proportional to domestic as well as foreign shocks. Each country may claim that it would be better–off if *the other* made full use of the "good" policy, whereas *both* would be better-off if *both* made full use of it. The paradox is that interdependence *becomes* a matter of conflict because "good" policies are costly, not the other way round.

It is worth stressing that these results do not depend on asymmetries across countries. Identical countries undergoing symmetric shocks would simply generate the same (x^N, y^N) pair. A numerical example may be useful also for further uses. Let us assume full symmetry as the benchmark case: a_1

[13] The full algebraic solutions of the model are available on request

$= a_2 = 1$, $b_1 = b_2 = 0.25$, $u_1 = u_2 = -1$, $c_1 = c_2 = 1$.[14] The two governments' reaction functions are:

(8) $x^c_1 = 0.66 - 0.13x^c_2$, $x^c_2 = 0.66 - 0.13x^c_1$

These are the straight lines in Figure 1. The curves are the iso-loss levels traced by the two optimal policy responses to a given shock: two points on the same curve correspond to the same loss. The equilibrium values are therefore

(9) $x^N_1 = x^N_2 = 0.59$, $y^N_1 = y^N_2 = -0.55$, $L^N_1 = L^N_2 = -0.323$

For each government, in the space (x_i, y_i) of Figure 2, x^N lies at the tangency between the target-variable function (2) and the loss function (4). In general $|x^c_i| < |x^*_i|$ and $y_i \neq 0$.

[Figure 1]

[Figure 2]

Among the sources of asymmetry, much of the (macroeconomic) literature is concerned with asymmetric shocks; yet structural asymmetries are more relevant in our context, as suggested by literature on the costs and benefits of international unions (Alesina et al. 1995, 2005, 2017, Alesina and Spolaore 1997, Spolaore 2015).

Let us first focus on the degree of interdependence and allow one country to be more dependent than the other, i.e. with a greater b, all other parameters being equal. It can be shown that, in the normal range $b \in [0, 1]$, *ceteris paribus*,

- $\partial x^N_i/\partial b_i > \partial x^N_j/\partial b_i > 0$: greater asymmetric dependence of one country increases the level of the policy intervention of both governments, though more in the more dependent country

[14] This is a purely fictitious example for expository purposes. However, since we shall pay particular attention to the role of interdependence, we have chosen the value of parameter b with a view to the empirical literature on cross-border spillovers in the EMU. These studies are mostly macroeconomic in nature, but they may nonetheless be useful to indicate an order of magnitude of these phenomena. We have drawn the value of 0.25 from in't Veld (2013), who, by means of a simulated multi-country model of the EMU, quantifies the spillovers of a fiscal shock in one country on all the others. 0.25 is exactly the medium-run (three years) spillover effect of a fiscal shock in Germany onto the rest of the EMU, measured as the ratio of the change in the EMU's GDP relative to Germany's. The reverse effect is slightly lower (0.2). Smaller, but of the same order of magnitude, are also the spillovers across the largest members (Germany, France, Italy). The main sources of asymmetry are the dimension of the country and its degree of openness. Alcidi et al. (2015) provide a survey of the (controversial) evidence of fiscal spillovers in the EMU.

- $\partial y^N_i/\partial b_i > 0$, $\partial y^N_j/\partial b_i < 0$: protection of the socially relevant variable is reduced (changes are larger) in the more dependent country but not in the other
- $\partial L^N_i/\partial b_i < \partial L^N_j/\partial b_i < 0$: welfare losses increase in both countries, again more in the more dependent country.

Overall, greater interdependence deteriorates the policy trade-off for all countries, but relatively more so for the more dependent country.

Another important source of asymmetry lies in social preferences. Now let c be larger in one country than in the other. Then, *ceteris paribus*,

- $\partial x^N_i/\partial c_i < 0$, $\partial x^N_j/\partial c_i > 0$: greater policy aversion in one country reduces its level of policy intervention but induces the other to raise its own;
- $\partial y^N_i/\partial c_i > \partial y^N_j/\partial c_i > 0$: protection is reduced in both countries, but more so in the more policy averse one;
- $\partial L^N_i/\partial c_i < \partial L^N_j/\partial c_i < 0$: welfare losses are increased in both countries, again more so in the more policy averse one.

Overall, like dependence, asymmetric policy aversion exacerbates negative externalities and worsens the policy trade-off for both countries, though more intensively for the more policy averse country. This is an important, perhaps counterintuitive, result to which we shall return: as a consequence of negative externalities, the NC policy regime entails larger welfare losses for the more policy averse country than for the less policy averse one.

3. Exploring supranational regimes

The next step in our analysis is to address this question: can governments agree on a better choice of policies? We should first clarify what "better" means. Strictly speaking, by definition of NC equilibrium, no improvement seems possible *for the given social preferences*. The fact that each country would be better-off at $y = 0$ is countervailed by the fact that each country would be worse-off upon activating the policy x^*. Hence improvement here can only mean the Paretian criterion identifying some *different combination of x and y* which makes at least one country better-off and no one worse-off.

This notion can be formalised in the diagram *à la* Edgeworth in the (x_1, x_2) space of Figure 1. The NC equilibrium $N \equiv (x^N_1, x^N_2)$ is Pareto dominated by all combinations of x_1 and x_2 that belong to the north-east grey "lens". For all these combinations belong to iso-loss curves corresponding to smaller losses for both 1 and 2. The set of Pareto undominated combinations is the set of

points in which the iso-loss curves are tangent. These are the points that belong to the hyperbolic curve, or contract curve. The part of the curve that passes through the grey area is the core of this system, that is, the set of Pareto efficient combinations that are also Pareto improvements over the NC equilibrium.

If the game is played repeatedly, with no transaction costs or other "frictions", the folk-theorem ensures that all the points in the core can be achieved as subgame perfect equilibria of the game. Note that in this area no government will ever choose x^*, but *both governments are willing to use x more intensively* so that they get closer to x^*. Which combinations of x would result, however, is not determined a priori. In our symmetric case, the result is[15]

(10) $x^B_1 = x^B_2 = 0.64$, $y^B_1 = y^B_2 = -0.48$, $L^B_1 = L^B_2 = -0.318$

It is easily verified that this solution can be provided by the Nash Bargaining mechanism, which minimises the joint loss function

$$L^B = (L^B_1 - L^N_1)(L^B_2 - L^N_2)$$

In the given conditions, no other Pareto improvement is possible, nor is any other policy assignment. This result can be interpreted as the best possible outcome of the bargaining between two sovereign governments. However, this is a *theoretical* result in the sense that there exist a number of notorious obstacles that may prevent this achievement.[16] First, the operational implementation of the game repetition in the folk-theorem sense requires a set of conditions (from no transaction costs to "memory", from "patience" to consistency) that may easily be violated in international relations with changing governments over time. Second, once the agreement is reached, the problem of compliance arises, so that further specific conditions should be met in order for governments not to breach the agreement. For these reasons, we leave direct sovereign bargaining as a theoretical option in the background, and we explore possible policy regimes at the supranational level as an alternative to the NC regime.

The long-standing, vast theoretical and political literature underpinning the existence and creation of SRs, and in particular the commitment to "ever closer union" by EU members, focuses on the ability of these regimes to

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[15] The point on the contract curve where $x_1 = x_2$.

[16] Eichengreen (2011), Bayoumi (2014), and Frankel (2015) discuss these issues from a historical perspective.

overcome the critical limits of the NC ones that we have seen above, namely reciprocal negative externalities that may entrap countries in Pareto inferior situations, as well as various transaction costs and obstacles that may prevent the achievement of superior policy choices by way of direct sovereign bargaining. The aim of our analysis is not why SRs are created, but how they can promote "good" policy choices and prevent exit of incumbent countries. As a matter of fact, we know from the first principles recalled above that, if the sovereign bargaining solution existed, no other solution would Pareto-dominate it. Hence no SR would ever come into existence in the first place. If two countries subscribe to a SR, they signal that the option of sovereign bargaining is not feasible. However, the option of exit from the SR to the NC regime is always possible.

In our model, by SR we mean a system consisting of the two countries and a supranational entity (variably) entitled to enact a policy assignment (x_1, x_2) for each country according to an objective defined in its entitlement.

We shall examine four SRs, some of which stylise existing features of the EMU, while others are more forward-looking. However, on purpose we shall remain below the level of a complete federal union, since at present this seems out of reach for the European countries. As said above, critical in this kind of comparative analysis of regimes is that an outside option is always available. That is, each SR should be compared not only with the others, but also with the alternative of no SR. This will be the NC regime.

To begin with, each SR will be compared with the latter, whereas an overall comparison of regimes will be presented at the end of this section. Regime ranking will be organised according to the Pareto criterion: in order to be incentive compatible with governments' voluntary and unanimous agreement, a regime R should not be Pareto inferior to any other option R' – formally, for all i $R \succ_i R' \leftrightarrow L^R_i \geq L^{R'}_i$. Since the model hinges on four parameters for two countries, in many cases there is no univocal general result. In order to keep our treatment manageable and meaningful, we shall adopt the full symmetry case of section 2 as point of reference, whereas, for the reasons discussed above, we will focus in particular on the role of asymmetries of policy aversion in the two countries.

3.1. Technocratic regimes. Decentralised

To begin with, we examine *Technocratic Regimes*. In a Technocratic Regime (TR), each government underwrites a treaty that confers upon a

supranational entity (a technocratic agency (TA)) the entitlement to enforce the use of "good" policies independently of the social preferences of the individual countries about such policies. "Independently" may mean that the TA operates under its own loss function, which, generally, does not coincide with that of the government(s) – this is the case in the standard literature on independent central banking. We consider two types of TRs: the first is *decentralised*, the second is *centralised*.

In the decentralised TR, the TA exerts the powers defined above in the form of policy prescriptions, while policy implementation is left to the responsibility of each government. More specifically, the TA is endowed with the power to prescribe the policy response of each government conditional on the observed shock, to monitor its implementation, and eventually to sanction non compliance. An obvious reference is the fiscal regulatory framework of the members of the EMU and the role of the European Commission therein.

The policy prescription of the TA should be consistent with its mandate. In fact, the first fundamental question in the normative theory of independent agencies is the determination of their mandate. How is the TA's objective function shaped? What are the relevant variables? Should the "good" policy be pursued unconditionally or is the TA allowed to have its own (independent) preferences?

Consistently with the policy problem under examination, let the mandate be the unconditional pursuit of the "good" policy in function of the socially relevant variable – i.e. a hypothetical loss function of the TA would have to include the arguments (x_i, y_i) and $c = 0$. Hence the TA always chooses the policy assignment (x^*_1, x^*_2). This may appear a rather extreme version of independence; however, it helps emphasise the role of the TA as the supranational institution committed to overcoming the reciprocal negative externalities generated by policy aversion.[17] Anyway, what follows qualitatively applies to any TA's degree of policy aversion lower than (c_1, c_2).

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[17] As a matter of fact, regarding for instance the Stability and Growth Pact, we have often heard the warning that the Commission's prescriptions should not be "politicised", but should integrally and faithfully follow from application of the rules. The modifications made to the rules allowing for consideration of the cyclical position of the economy, exceptional circumstances, etc., concern the way in which the shock and its impact on the economy are evaluated (i.e. the magnitude of x^*), while they do not allow for any political evaluation of the policy implementation. Indeed, after the 2003 episode of the majoritarian rejection by Finance Ministers of the Commission's recommendation to open the Excessive Deficit Procedure against

In order to assess the decentralised TR, it should first be noted that no government ever prefers (x^*_1, x^*_2) to the NC equilibrium (x^N_1, x^N_2). In fact, consider the optimal response function (5) of government i, and suppose it believes that government j will comply with the TA's prescription, i.e. $x^*_j = -u_j/a_j$. Then, i's optimal response is $x_i^c = -u_i\beta_i < x^*_i$ which makes x^*_j suboptimal. Knowing this, no government will ever comply. Any different *ex ante* commitment by governments has no value *ex post*. The best the TA can do is to sanction non-compliance with the "good" policy x^*, which is indeed present in the EMU regulations. A way to introduce this sanction is to extend the governments' loss function with the additional cost $p(x - x^*)^2$, where p denotes a penalty proportional to $x \neq x^*$. The penalty coefficient should be equal for all countries. Therefore,

$$L^D_i = -0.5(y^2_i + c_i x^2_i + p(x_i - x^*_i)^2)$$

Now the government perceives a cost when activating x but also a cost to the extent that $x \neq x^*$. The new optimal choice of x for each government is therefore

$$(11) \quad x_i^c = p\beta'_i\, x_i^* - (u_i + b_i u_j + b_i a_j x^c_j)\beta''_i$$

$$\beta'_i = (a_i^2 k^2 + (c_i + p))^{-1}, \quad \beta''_i\,(a_i + (c_i + p)/a_i k^2)^{-1}$$

It can be seen that the penalty p is a double-edged sword. On the one hand, it induces the government to get closer to x^*; on the other, it makes the policy more costly and hence pushes in the opposite direction (β'_i and β''_i are both decreasing in p). In the case of the assumed loss function, the difference $x_i^c - x_i^*$ proves to be decreasing in p. However, there is no finite value of p such that $x_i^c = x_i^*$.

The welfare loss itself is sensitive to p. The overall effect results from the composition of better y, higher x and smaller $(x - x^*)$. In general, however, $\partial L^D_i/\partial p < 0$. Since $L^D_i = L^N_i$ for $p = 0$, it follows that increasing the penalty increases the welfare loss monotonically, i.e. $L^D_i < L^N_i$ for any $p > 0$. Hence, this regime embeds a critical trade-off on the dimension of the penalty. On the one hand, the TA may wish to set a large penalty in order to push the governments towards full compliance, but a large penalty generates large welfare losses that jeopardise compliance. The other side of the coin is that keeping the penalty sufficiently small of course does not generate a major improvement in the NC equilibrium. In conclusion, as long as governments

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Germany and France, the reverse majority mechanism was introduced in order to limit the governments' power to veto the Commission's prescriptions.

agree on this regime they prefer paying the penalty to full compliance, and sanctioning non compliance *per se* cannot be seen as the failsafe way to enforce the adoption of the "good" policy on a decentralised basis.[18]

3.2. Technocratic regimes. Centralised

In the centralised TR, each government devolves its sovereignty to the TA, which is now endowed with the power to enact policy directly on behalf of the entire entity represented by the countries together. The reference here is to the European Central Bank (ECB) or to an interpretation of the "European Minister of Finance" envisaged in the Five Presidents Report (Juncker 2015) as an independent non-political agency.[19] This regime may at first glance appear the best one to the extent that the TA has *the power to enact the "good" policy in each country*. However, on closer inspection this is too hasty a conclusion.

By analogy with the decentralised TR, also the central TA has zero "good" policy aversion[20]. If this is the case, we already know for sure that that no country prefers the policy assignment (x^*_1, x^*_2) to the NC equilibrium (x^N_1, x^N_2). The argument that the central TA, having the power to implement (x^*_1, x^*_2), will overcome non-cooperative behaviour by national governments and will deliver full protection of the variable y for both countries, does not take into account that this result *may not be* optimal *vis-à-vis* the (excessive) activation of policy x according to the national preferences.

In the second place, the ability of the TA to implement the "good" policy on a differentiated country basis may encounter non-trivial problems. One is that the TA may not have the right tools to do this job. It would need detailed information on the structure of each economy and their interactions. Moreover, this information ought to be common knowledge in order to avoid

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[18] The self-defeating effect of penalties on compliance is a well-known paradox first reported by Gneezy and Rustichini (2000). Whether in practice governments' non-compliance with commitments, rules, etc. is as systematic as it should be theoretically is an open question. For the evidence about compliance in the EU see e.g. Börzel T. A. (2001) and Beache D. (2006).

[19] This interpretation is transparent in the words of the Presidents of the Bank of France and of the *Bundesbank*, François Villeroy de Galhau and Jens Weidmann (2016). See also Beetsma and Debrun (2016) on independent fiscal boards and Asatrya et al. (2017) on the European Fiscal Board.

[20] As well known, the "single mandate" statute of the ECB for price stability, unlike "dual mandate" statutes, epitomises a central bank whose loss function has inflation (our y) as single argument.

complaints about the fairness of the TA. The experience of the ECB is quite telling in this respect. By statute, the ECB *is not allowed* to pursue *ad hoc* policies on a national basis. Its Asset Purchase Programme launched in 2015, the so–called "quantitative easing", where the country distribution of purchases is crucial, has been carefully designed in order to overcome objections on this ground with the consequence of weakening its chances of success (Saraceno and Tamborini 2015). It is quite likely that, in the case of fiscal policy, or other public policies, these obstacles would be even harder to overcome.

Therefore, we further characterise this regime as one where the TA operates with reference to the *aggregate variables* (*X, Y*), and its policy is enacted equally in all countries.[21] Accordingly, let X be the centralised policy variable, and $Y \equiv y_1 + y_2$ the aggregate target variable. The structural relationship between Y and X at the aggregate level results to be :

(12) $Y = (AX + U)k$

where $A = a_1(1 + b_2) + a_2(1 + b_1)$, $U = u_1(1 + b_2) + u_2(1 + b_1)$.[22]

For any aggregate shock U, the unconditional policy response of the TA, such that $Y = 0$, is

(13) $X^* = -U/A$.

Note that, as a consequence of the zero policy aversion of the TA, X^* "sterilises" the externalities due to interdependence.

How do *national* welfare losses rank in this regime with respect to the NC one? In general, the comparison for each country is now between $L^N_i = L(y^N_i, x^N_i)$ and $L^T_i = L(y^T_i, X^*)$.

To begin with, the policy response X^*, activated in each country, achieves the target $Y = 0$, but it generally does not ensure that all $y_i = 0$. In fact, the outcome is

(14) $y^T_i = (a_j u_i - a_i u_j)A^{-1}$

That is to say, the two countries display opposite symmetric effects that sum up to zero. The adjustment of y in each country depends on the distribution of shocks and the composition effects of the parameters a_i, i.e. the

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[21] Indeed, according to other interpretations of the "European Minister of Finance", its role concerns control over the *aggregate* fiscal stance of the EMU consistently with the monetary policy stance (e.g. Draghi 2014a).

[22] Assuming that the TA knows the correct *aggregate* equation of Y (e.g. by means of correct estimation of the aggregate variables) does not imply that it also possesses full information about the underlying structural parameters of each country.

effectiveness of policy X^* in each country. It certainly happens, however, that in one country the shock is under-adjusted and in the other is over-adjusted, or that X^* is too little where it is less effective and too much where it is more effective. Therefore, full protection ($Y = y^T_i = 0$) is possible only if two conditions hold: 1) symmetry of policy effectiveness ($a_1 = a_2$), 2) symmetric shocks ($u_1 = u_2$).

In order to have a reference point, let us first consider the full symmetry case (the common values are written without country index). This entails that full protection holds, i.e. $y^T = 0$, $X^* = -u/a$ for both countries . The welfare loss for both countries is therefore:

$$(15) \qquad L^T = -\frac{u^2}{2a^2}c$$

Note that $X^* = -u/a$ is the same individual policy choice x^* that would yield $y = 0$ with zero policy aversion, thus we already know that this policy choice is strictly dominated by the NC one for both governments. With our numerical parameters (see section 2), we obtain $X^* = 1$, which implies that the welfare losses are $L^T = -0.5$ compared to $L^N = -0.323$.

It should be recalled, however, that, for both countries, $\partial L^N/\partial b < 0$, i.e. the welfare loss in the NC regime also increases with the degree of interdependence, which is instead sterilised by the central TA. Hence the regime ranking for both countries depends, *cet. par.*, on the combination of parameters c and b. It can be shown that for any $c > 0$, and $b \in [0, 1]$, the differential loss created by the centralised TR decreases as b increases, which indicates the relative benefit of centralised policy under stronger interdependence. However, the NC regime always dominates.

Let us now focus on asymmetric policy aversion. Without loss of generality, we can set $c_2 = 1$ as standard value, and let c_1 vary as a dimensionless variable ($c_1 = 2$ means that the policy aversion of country 1 is twice that of country 2 etc.). This kind of asymmetry creates an interesting reversal of attitudes between the two governments, but it does not allow for Pareto-improving arrangements. On the one hand, we know that, in the NC regime, higher policy aversion in one country exerts a negative externality on the other. Hence we may expect that the *lower policy-aversion* country may prefer the centralised TR in order to bridle the other. This preference is however conditional on the degree of interdependence. In fact, there exists a decreasing frontier of values (c_1, b), in the domain $c_1 \in [1, \infty]$, $b \in [\bar{b}, 1]$,

beyond which $L^T_2 > L^N_2$ ($\bar{b} = 0.34$ in our example). That is to say, country 2 prefers the centralised TR only if country 1's policy aversion or the degree of interdependence are *sufficiently large*. On the other hand, according to (15), the higher policy-aversion country in this regime undergoes a worse welfare loss than the other, and there is no value $c_1 > 1$ with $b \in [\bar{b}, 1]$ such that the centralised TR is preferred. Figure 3 exemplifies the differential loss of the two countries, $L^T_i - L^N_i$, as a function of c_1 in the standard case of $b = 0.25$ (the TR is always dominated for both countries) and with "very high" interdependence $b = 0.5$ (country 2 switches in favour of the TR only beyond $c_1 \geq 2.13$).

[Figure 3]

Therefore, our conclusion is that the centralised TR may be effective in protecting the socially relevant variable at the aggregate level. It also shields each country against the (larger) welfare losses due to (greater) interdependence, but it is unlikely to be preferred to the NC regime by both countries even in the case of full protection of the socially relevant variable at the country level.

3.3. Political Regimes. Hegemony

Having highlighted the limits that the pure TRs may encounter, we now move to "political" regimes, i.e. regimes where the supranational policy authority in some way embeds national preferences.

As a first step, we modify the previous model of the central policy authority in such a way that it chooses the optimal aggregate policy X by minimising its own loss function with nonzero policy aversion c^P

(16) $L^P = -0.5(Y^2 + c^p X^2)$

Given the target-variable function (12), the optimal policy is

(17) $X^P = -UA/(A^2 + c^p/k^2)$, $Y^P = Ukc^p/(A^2k^2+c^p)$

In the first place, note that this centralised policy, unlike that of the pure TA, in general does not deliver full protection of the aggregate variable, i.e. $Y^P \neq 0$. Moreover, it suffers from the same "one-size-doesn't-fit-all" problem: in general $y^P_i \neq$, $Y^P \neq 0$, with a mirror opposite effect in the two countries, unless the two countries are fully symmetric. On the other hand, for $c^p > 0$, $X^P < X^*$, i.e. in this regime the central authority also enacts the "good" policy to a lesser extent. Thus, overall, this regime might be preferred to the central TA by both countries.

The crucial point is how the policy aversion c^p is determined. If the aim is to elicit legitimisation and ownership of the regime, reference should be made to the social preferences expressed by the member countries. If these have equal policy aversion, $c_1 = c_2 = c$, the solution is easy: $c^p = c$. In our benchmark case of full symmetry, the welfare loss of both countries in this regime is given by

(18) $L^P = -(\theta_1 c + \theta_2 c^2)u^2$

where the parameters θ are combinations of (a, b), with positive value. For any $c > 0$, this regime certainly dominates the centralised TR. With our parameter values, the results are $X^P = 0.88$, $y^P = -0.16$, $L^P = -0.397$.

As to the comparison with the NC regime, the key factor is the degree of interdependence in the system. Recall that greater interdependence increases welfare losses for both countries in the NC regime. Hence, the regime ranking depends on the interplay of the parameters c and b. There exists an increasing frontier (c, b) in the domain $c \in [0, \infty]$, $b \in [\bar{b}, 1]$, *beyond* which $L^P > L^N$ ($\bar{b} = 0.75$, and $b \geq 0.78$ given $c = 1$ in our example). The meaning is that this regime dominates the NC one only if interdependence exceeds a critical value (which, according to our empirical standard is extremely high).

The determination of the policy aversion of the central authority is problematic when the countries differ in this dimension. Here we examine the case in which the central authority is "hegemonised" by one country. We do not examine how hegemonisation takes place. For instance, hegemonisation may be the result of the negotiation process leading to the establishment of the central authority.[23] In the hegemonic regime (HR), the central authority chooses the optimal aggregate policy X^H by minimising the loss function

(19) $L^H = -0.5(Y^2 + c_i X^2)$

where i is the hegemon country, and for concreteness we assume that this is the country with the lowest policy aversion.[24] The aggregate results for X^H and Y^H are the same as in (17) after substituting $c^p = c_i$.

Now the key role is played, *cet. par.*, by the difference in policy aversion between the two countries, with a result similar to that for the centralised

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[23] Hegemonic regimes have long been studied in international relations (e.g. Kindleberger 1981, Keohane 1980). The weight of German "preferences" in the (Franco-German) design of the ECB and of the fiscal regulations of the EZ is documented by several authors (e.g. Eichengreen and Frieden (eds.) 1994). The hegemonic drift of the EMU crisis management is carefully examined by Bastasin (2015a, ch. 17) and Fabbrini (2015, ch.2).

[24] Hence, the centralised TR can be regarded as a special case of HR where $c_i = 0$.

TR, i.e. the HR, though preferable to the former, may not achieve a Pareto improvement with respect to the NC regime.

Let the two countries be symmetric except for policy aversion, with $c_1 > c_2$, and let country 2 be the hegemon, with $c_2 = 1$. The two countries face the following welfare losses

(20) $L^H_1 = -(\theta_1 c_1 + \theta_2)u^2$, $L^H_2 = -(\theta_1 + \theta_2)u^2$

For the hegemon the welfare loss of the HR is now constant and independent of c_1. Then the strategic reasoning runs as in the centralised TR. Account should be taken of the fact that in the NC regime the larger c_1, the stronger the negative externality and the welfare loss for country 2 itself. Again, there exists a decreasing frontier of values (c_1, b), in the domain $c_1 \in [1, \infty]$, $b \in [\bar{b}, 1]$, beyond which $L^H_2 > L^N_2$ ($\bar{b} = 0.21$ in our example).

There are two notable features in this finding. The first is that, perhaps unexpectedly, the HR may not be systematically preferred to the NC regime by the hegemon country itself: preference for the HR requires combinations of sufficiently large policy aversion of the other country or high interdependence. The reason is that, although hegemonised, the central authority optimises the aggregate variables of the two countries, which, cet. par., is suboptimal for country 2. The second feature is that in the HR the (c_1, b) frontier that determines its dominance region is lower than in the centralised TR, which makes the dominance region larger (or, so to speak, more exit-proof). On the other hand, as $c_1 > 1$, the welfare loss of country 1 in the HR increases more than in the NC regime for any $b \in [\bar{b}, 1]$, so that $L^H_1 < L^N_1$. Therefore, there is no way that the HR can be preferred by both countries. Figure 4 replicates Figure 3 showing the differential loss of the two countries, $L^H_i - L^N_i$, as a function of c_1 in the standard case of $b = 0.25$ and with "very high" interdependence $b = 0.5$ (note that in both cases country 2 displays a switch in favour of the HR for values of c_1 sufficiently large, and the switch occurs earlier when interdependence is stronger).

[Figure 4]

3.4. Political regimes. Europe

We now move to a fourth possible regime, one in which a third player acts as a "mediator" of the policy game, call it "Europe". Europe does not have coercive power, but it can "indicate" to the two players a combination of x_1 and x_2. As in the standard supranational models, Europe uses a Utilitarian loss function and minimises the sum of the two countries' welfare losses:

(21) $L^E = L_1 + L_2$

Once again, the European regime (ER) may or may not be Pareto improving depending on the characteristics of each country. It is known that policy assignments given by the type of loss function (21) are Pareto superior to the NC equilibrium if the countries are fully symmetric. Indeed, they coincide with the Nash Bargaining solution. Algebraically, the symmetric policy assignment is $x^E > x^N$; it coordinates the two governments on a larger use of x, and allows both countries to achieve $y^E > y^N$ so that $L^E > L^N$ is always strictly verified for both countries (see (10)).

The picture is more ambiguous when the countries are not symmetric. The ranking between the loss generated by the ER and by the NC regime for each country is not univocal but depends on the relative size of the relevant parameters. In the case of asymmetric policy aversion, it can be shown that a critical value of c_1 exists up to which both countries prefer the ER to the NC one.

Let c_2 =1 and $c_1 > 1$ as usual. Recalling that for $c_1 = 1$, $L^E_1 = L^E_2 > L^N_1 = L^N_2$, the question is whether this regime ranking holds for any $c_1 > 1$, or a preference switch occurs for any country. We already know that in the NC regime $\partial L^N_1/\partial c_1 < L^N_2/\partial c_1 < 0$, i.e. with higher c_1, welfare falls more for country 1 than for country 2. In the ER, the welfare losses of the two countries are

(22) $L^E_1 = -\lambda_1 u^2$, $L^E_2 = -\lambda_2 u^2$

where (λ_1, λ_2) are combinations of parameters (a, b, c_1) and, also in this regime, $\partial L^E_1/\partial c_1 < L^E_2/\partial c_1 < 0$. This feature reflects the direct consequence of country 1 being more policy averse, and country 2 less policy averse, for any level of (x^E_1, x^E_2) indicated by the ER. At the same time, it should be considered that $\partial x^E_1/\partial c_1 < 0$, $\partial x^E_2/\partial c_1 > 0$: the ER, by coordinating both governments on a higher level of x, while "balancing" their respective social preferences, requires an additional policy "effort" which is *lower* for the more policy-averse country 1 and *higher* for the less policy-averse country 2. Therefore, in order to answer the above question, the point is, for each country, under which regime, beyond $c_1 = 1$, the marginal welfare loss is larger. The result depends on the magnitude of c_1 relative to (a, b, u).

For instance, with our parameter values the preference switch does occur in an interesting way. For country 1, the marginal welfare loss in the ER is smaller than in the NC regime, whereas the opposite holds for country 2. This fact is crucial for the final step of the comparison with the NC regime. In fact,

the preference for the ER increases with c_1 for country 1 and decreases for country 2. Both countries are better-off with the ER only up to a certain degree of asymmetry beyond which the less policy-averse country is worse-off with respect to the NC equilibrium.[25]

The region of agreement of the two countries is non-empty for any degree of interdependence $b \in [0,1]$ but it shrinks when b is higher, as shown by Figure 5 which displays the differential loss for each country, $L^E_i - L^N_i$, as a function of c_1 in the standard case of $b = 0.25$, and with "very high" interdependence, $b = 0.5$. Therefore, a combination of high asymmetry in policy aversion and/or strong interdependence may jeopardise the ER. Note that interdependence plays a twofold role. On the one hand, as expected, it plays in favour of the ER since it generates large welfare losses in the NC regime. On the other, it should be taken into account that in the ER the two governments agree on a greater policy effort, the greater the stronger is interdependence.

[Figure 5]

3.5. Overall regime ranking when countries' policy aversions differ

In order to highlight our findings and their implications, we now summarise the welfare loss ranking of the SRs and the exit option of the NC regime. Although the main qualitative results expounded so far have general validity, for concreteness we still make use of the numerical model introduced in section 2. To this end, we assume full symmetry, except in policy aversion, and the standard degree of interdependence ($a_1 = a_2 = 1$, $b_1 = b_2 = 0.25$, and $u_1 = u_2 = -1$). Country 2 is taken as benchmark for policy aversion ($c_2 = 1$). The exercise consists in drawing and comparing the levels of welfare losses in each regime and each country as functions of the policy aversion of country 1. For any value of c_1 the Pareto dominant regime is the one with the lowest loss for both countries. The result can be seen in Figure 6.

[Figure 6]

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[25] A paradox appears here. At first sight, one might think that it is country 1 (say Greece, or Britain) that suffers most from remaining in Europe owing to its higher policy aversion. However, at some level of asymmetry, it is country 2 (say Germany) with lower policy aversion that suffers more and opts out for non-cooperation. The point is that, as seen above, in the NC regime the welfare loss increases with policy aversion. By implication, the exit threat of high policy-aversion countries is not credible (whereas it is for low policy-aversion countries) or is based on miscalculation of their welfare losses in the NC regime.

First recall that when $c_1 = 1$ we are in the full symmetric case, and as already explained Europe is the dominant regime. Any other SR is dominated, for both countries and in the same order, by the NC regime. Let us recall why. The decentralised TR with penalty (not reported) is systematically dominated by the NC regime for any non-zero penalty. It may however dominate the others for a sufficiently small penalty. The centralised TR is dominated by all the others, because, although it grants full protection of the variable y in each country, it ignores social preferences and it fails to deliver a better trade-off with the required effort in the use of the "good" policy $X^* = 1$. With equal policy aversion, the regime with political central authority (coincident with HR) ranks in the middle.

Now let us examine the regime ranking for each country when their policy aversion differs ($c_1 > 1$). In the first place, for both countries the centralised TR continue to be dominated by all the others. The next is the HR, and interestingly, as explained above, this is true also for the hegemonic country 2, unless country 1's policy aversion is sufficiently high. Therefore, the single alternative remains Europe *vs*. the NC regime. However, this exercise makes it clear that while the high policy-aversion country 1 always prefers Europe to non-cooperation, the low policy-aversion country 2 agrees on Europe only up to a threshold level of policy aversion of country 1 ($c_1 = 1.5$) beyond which country 2 switches to non-cooperation. Europe is the dominant regime only within a limited range of asymmetry in social preferences between countries.

4. Conclusions

If we agree that we need more Europe in the Monetary Union, we cannot beg the far more controversial question: "Which Europe?" In a two-country policy game setup, we have examined what kind of SRs may be subscribed to by sovereign governments that seek to minimise their own welfare loss functions over policy options that may bear a social cost. Two SRs are "technocratic", i.e. they do not take national preferences into account, two are "political", i.e they do. Some of these regimes mimic the existing set-up of the EMU, others are more forward-looking in the spirit of recent documents and plans to reform the EMU. Among the latter, one that we have called "Europe" mimics a classic federal institution, i.e. it minimises the additive loss function of the two countries. We have studied the Pareto ranking of the SRs relative to the *staus quo ante*, or "exit" option, of the NC (Nash) regime.

The main result of our analysis is that TRs are dominated by the NC regime, and that the true eventual alternative is between Europe and the NC regime. We have also shown, however, that the agreement on Europe may not be unconditional. A critical factor is asymmetries across countries, notably in the degree of policy aversion. If this is too large, the *lower policy-aversion country* minimises its welfare loss by opting out for the NC regime, whereas the same option for the higher policy-aversion country may not be credible or based on miscalculation of the welfare losses of non-cooperation.

The main implication is that the strategy of further integration by extending and strengthening the EMU regulatory framework based on rules enforced by technocratic, "non politicised", agencies may not be successful. In a viable, i.e. incentive compatible, SR national preferences over policy options cannot be muted. A symptom can be read in the drift towards disguised *de facto* "politicisation" by way of the disorderly enlargement of the so-called intergovernmental method.[26] The fundamental reason is that if countries perceive the exit option as a means to freely pursue national optimal policies, then no viable, i.e. incentive compatible, supranational regime can be designed where national social preferences are totally ignored. As a matter of fact, fully-fledged federal systems do not operate by enacting "good" policies at the level of each federal unit independently of their social preferences, but by aggregating social preferences of federal units through the electoral system, and then allocating different competences and powers across the various levels of government. However, sharp differences across countries may jeopardise their agreement for Europe.

It may be argued that our theoretical comparison between SRs and the NC regime ignores other broader factors that may play a role in favour of "remain".[27] One factor may be that membership in SRs, as is certainly the case with the EMU, encompasses a large number of ends and means, so that a negative balance in one field does not necessarily lead to leave. Another factor that we have not considered is the cost of exit, which may be substantial. However, this argument should not be overstated. First, exit

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[26] Penetrating, detailed analyses of this process are provided by Bastasin (2105a) and Fabbrini (2103, 2015). In light of our model, our own criticism of the intergovernmental method is that it has been disguised and disorderly, whereas it should be harnessed within openly political institutions.

[27] See Mongelli (2010) and Cohen (2012) for a discussion of these factors. "Defective but defended, [the euro] will simply endure" (Cohen 2012, p.689)

costs may indeed be dramatically huge; yet they are largely undeterminable ex ante, hence we do not have a solid basis to plug them into a theoretical model as *deus ex machina*. Second, the Brexit case, and the growing popularity of the exit option in other key EU countries, suggest that the mere threat of exit costs may not be sufficient to reverse the preference for exit. Third, in the long run, the strength of a SR, especially when legitimacy or "ownership" are important elements, cannot only hinge on the prohibitive cost of exit.[28]

There are two main political-economic implications for Europe as a viable SR to be investigated further. The first is the progressive reduction of asymmetries. The so-called "structural reforms" in a variety of fields, that play a central role in the EMU governance strategy, can be read in light of this aim. However, the actual efficacy and viability of this long-standing, restless, strategy is open to question, the more so the closer the reforms are to entrenched social preferences. More fundamentally, should supranational institutions be conceived as means to reduce national differences or as a means to cope with national differences?

The second implication is that, as taught by the theory and practice of international agreements[29] , compensations may be necessary. In our model, the recipient of compensation is the *less policy-averse country*. Compensation may be pecuniary or non-pecuniary, such as benefits in other fields open to negotiation. One major form of compensation to be further analysed in our setup is the change in the weights of countries in the policy decision making process represented by the joint loss function of the two countries. It can be expected that, in order to prevent the less policy-averse country from leaving, the weight granted to its social preferences should be increased *vis-à-vis* the policy aversion of the other country, though not beyond the point where it the latter that leaves.

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[28] "For all its resilience, our union is still incomplete […] Ultimately, Member States have to be better off inside than they would be outside. The reason for this is as follows: if there are parts of the euro area that are worse off inside the Union, doubts may grow about whether they might ultimately have to leave. And if one country can potentially leave the monetary union, then this creates a replicable precedent for all countries" (Draghi, 2014b, p.2)

[29] Bordo and James (2016) make use of this argument in drawing their road map towards the EMU Fiscal Union.

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Figure 1

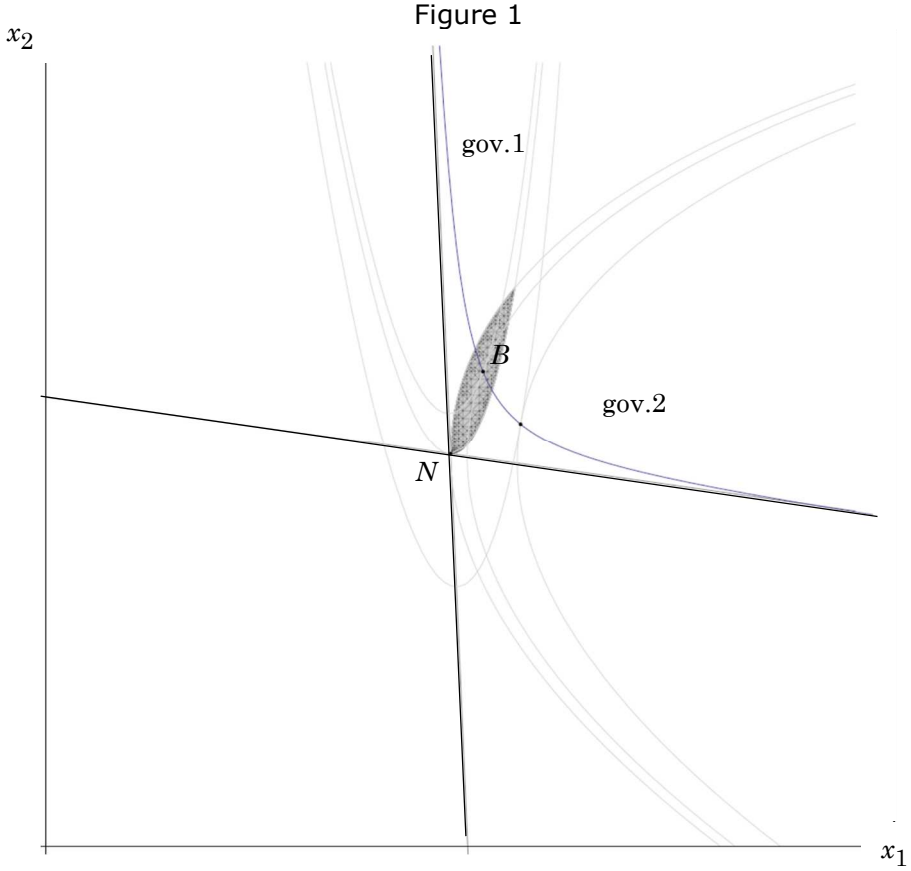


Figure 2

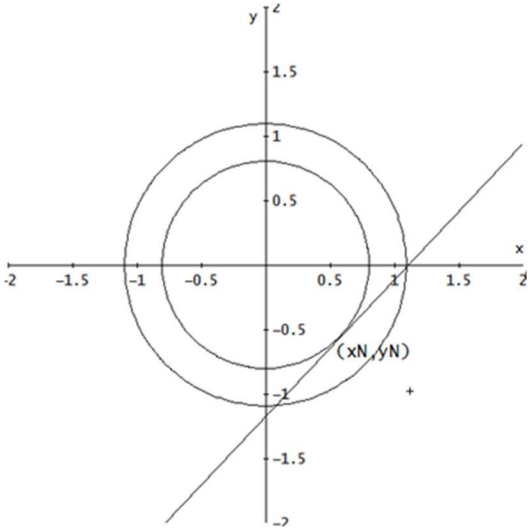
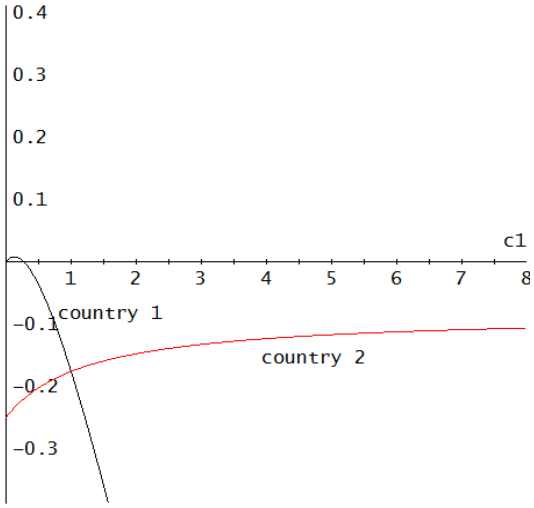


Figure 3. Differential loss $L^T_i - L^N_i$ with increasing policy aversion of country 1

(a) $c_2 = 1$, $b = 0.25$



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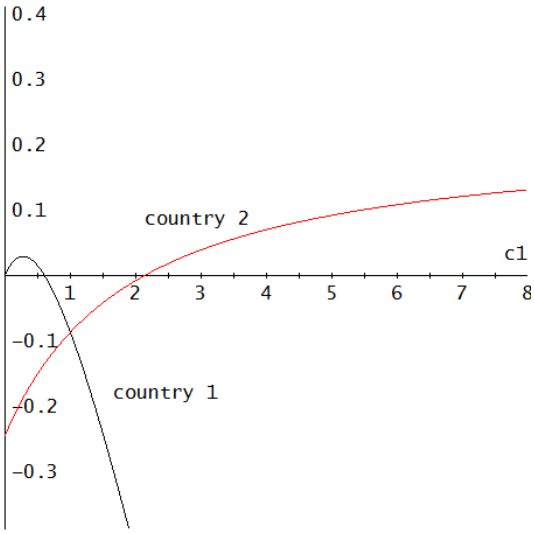

Note: negative values of the differential loss indicate preference for the NC regime

Figure 4. Differential loss $L^H_i - L^N_i$ with increasing policy aversion of country 1

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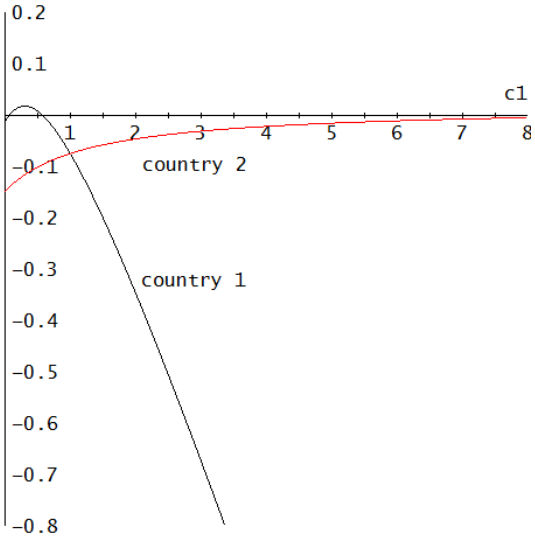

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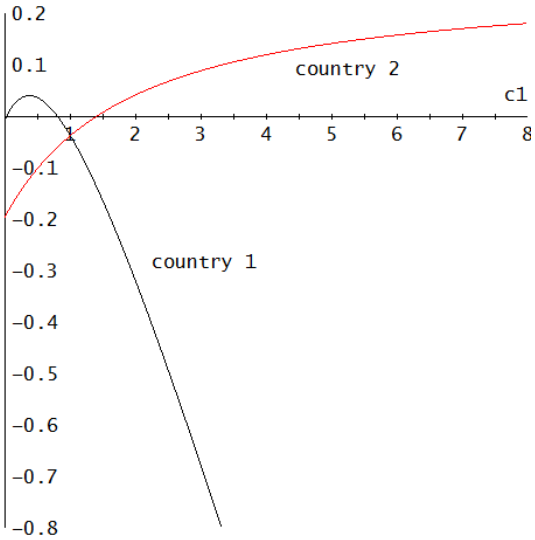

Note: negative values of the differential loss indicate preference for the NC regime

Figure 5. Differential loss $L^E_i - L^N_i$ with increasing policy aversion of country 1

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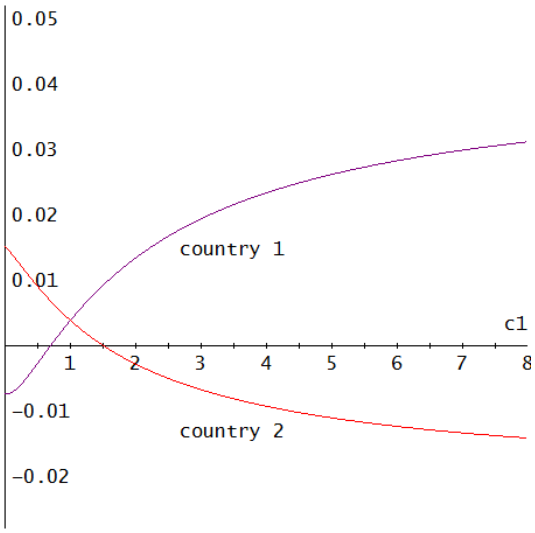

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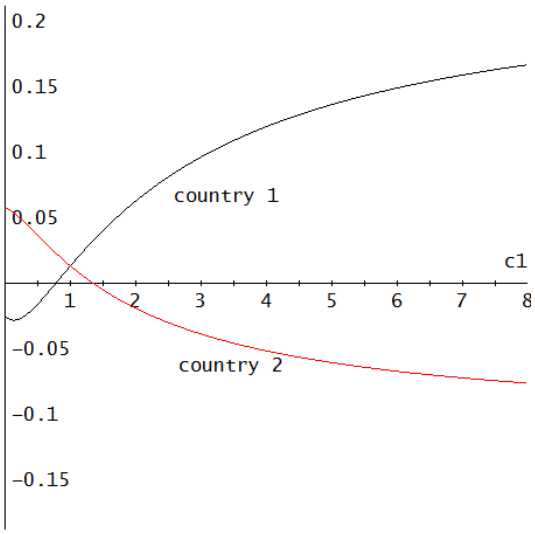
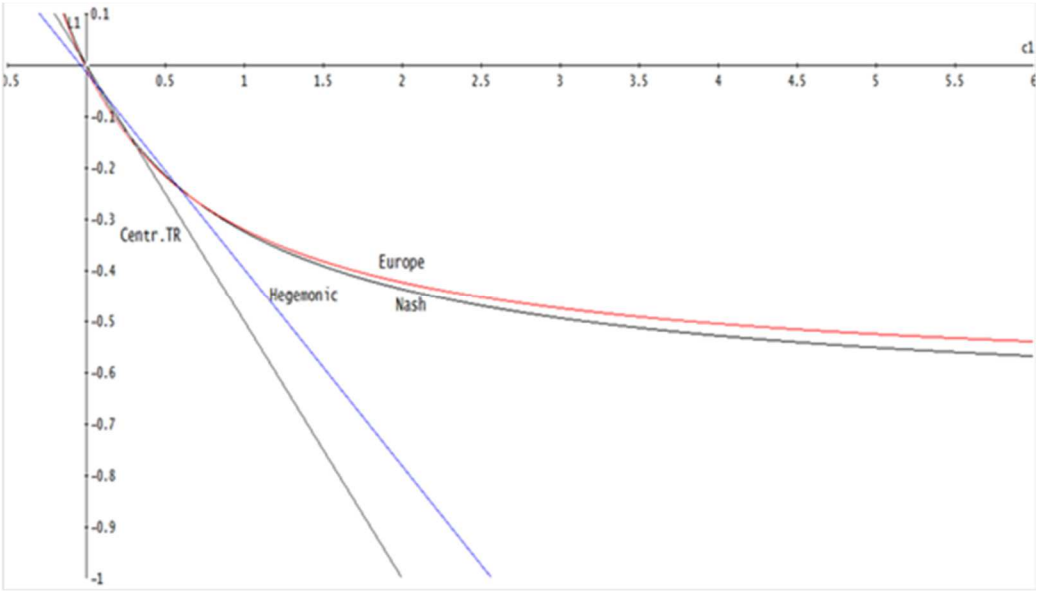
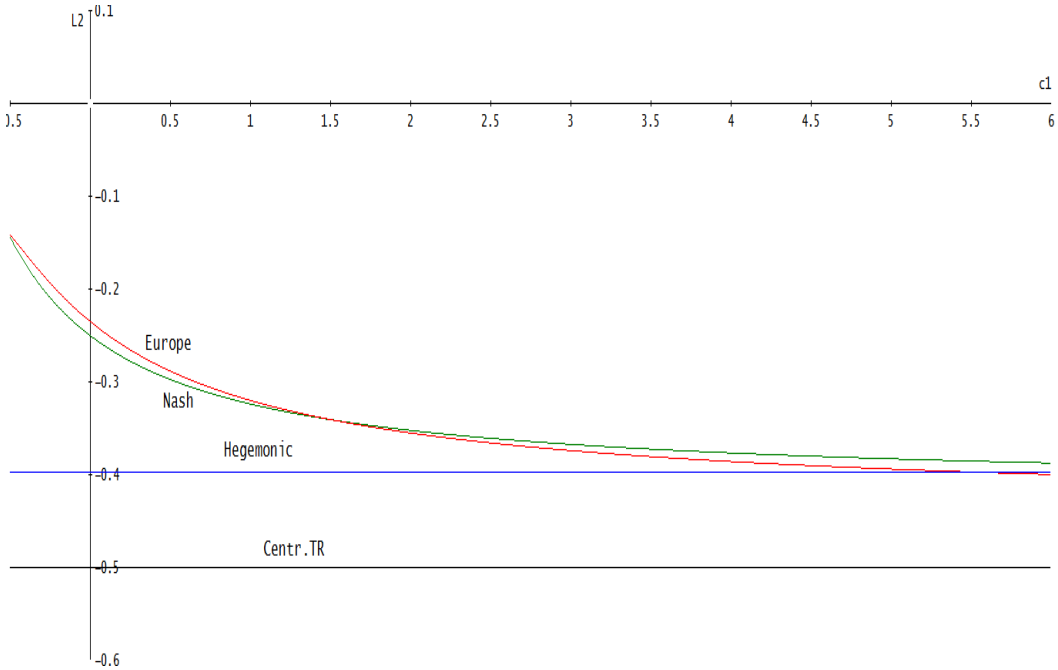


Note: negative values of the differential loss indicate preference for the NC regime

Figure 6
Regime ranking for country 1 with increasing policy aversion relative to country 2



Regime ranking for country 2 with increasing policy aversion of country 1



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1) sustainable growth and 'best practice',

2) reform of EU policies and the EU budget,

3) capital markets and the regulation of the financial sector and

4) governance and macroeconomic policy in the European Monetary Union.

Its task is also to transfer its research results to the relevant target groups in government, business and research as well as to the general public.