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Working Paper

On Enhanced Cooperation

CESifo Working Paper, No. 996

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Suggested Citation: Bordignon, Massimo; Brusco, Sandro (2003) : On Enhanced Cooperation, CESifo Working Paper, No. 996, Center for Economic Studies and ifo Institute (CESifo), Munich

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ON ENHANCED COOPERATION

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CESIFO WORKING PAPER NO. 996
CATEGORY 1: PUBLIC FINANCE
JULY 2003

PRESENTED AT CESIFO AREA CONFERENCE ON PUBLIC SECTOR ECONOMICS, MAY 2003

An electronic version of the paper may be downloaded
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CESifo *Working Paper No. 996*

ON ENHANCED COOPERATION

Abstract

Should a subset of member states of a federation be allowed to form a sub-union on some policy issue? When centralization is not politically feasible, allowing an enhanced cooperation agreement among a subset of countries permits the latter to gain benefits which would otherwise be lost. However, if in the future the excluded countries also want to join, the fact that a sub-union has been formed in the past may change the status quo to the advantage of the first comers. We show that as long as countries can commit to harmonize at a policy which also takes into account the utility of the excluded country, sub-union formation may be optimal. The relative advantage of a sub-union towards centralization increases when transfers are costly. On the other hand, if commitment is not possible then excluded countries may be penalized. We use these results to discuss of the newly introduced rules for enhanced cooperation agreements in the European Union, suggesting that they might lead to increased centralization.

JEL Code: H1, H7.

Keywords: international unions, fiscal federalism, treaty of Nice, corporate taxation.

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We thank Federico Colombo, Federico Etro, Alessandro Lizzeri and Daniel Sturm for useful comments.We also thank participants to seminars at NYU, Catholic University of Milan, Cesifo Public Economics Meeting and the conference on EU Enlargement: Economic and Institutional Reform.

1 Introduction

Should a subset of the member states of a federation be allowed to get along with further cooperation on particular issues? Which trade-offs are involved in letting them do so? How should the federal institutions be organized to deal effectively with sub-unions of states?

In a static framework, the answers are straightforward. Sub-unions should be allowed if they do not damage the other members of the federation, or if the resulting negative externalities can be compensated for. They should be prohibited otherwise. Governance of such agreements also appears straightforward. When there are no negative externalities, members of the sub-union should be allowed to set the policies as they prefer, with no interference from the other members of the federation. Otherwise,

policies and compensations for externalities should be jointly discussed and approved by all countries in the federation.

Things become more complicated if we move to a dynamic framework. Political conveniences may change over time in ways which cannot be precisely predicted today. As a consequence, even if a sub-union does not damage the other members of the federation today, it might do so *in the future*. For example, the countries outside the sub-union may contemplate joining it in the future, say because cooperation on that particular issue turns out to be convenient *ex post*. Then, even if there are no negative externalities from the sub-union at the present or in the future, the fact that a sub-union has already been established in the past may change the *status quo* to the advantage of the first-comers. In this case, cooperation may occur at worse terms for the late-comers than it would do if the sub-union had been prohibited to start with.

This suggests that one important trade-off in letting sub-unions to be formed is between the increased welfare for the countries joining immediately the sub-union and the expected losses for the other countries in future periods, if the latter also end up joining the sub-union. Furthermore, this also suggests that the optimal governance structure for the sub-unions is far from trivial. For example, it might make sense to allow countries which decide to opt out the sub-union at the beginning to retain some decision power on the sub-union itself. Rules about who can join in the future the sub-union, and at what conditions, also appear to be crucial.

These theoretical considerations may play an important role in many real world cases. An example is given by international trade agreements, such as the Nafta Treaty. Here the issue is whether countries should be allowed to further remove trade barriers through bilateral agreements or if only multilateral agreements involving all countries should be allowed (see Levy, 1997). Other examples are given by the enforcement of policies at local levels, when a policy can be adopted at different times by different local governments. The most salient example however is the European Union (EU). The EU has reached a point at which the heterogeneity among its members is so large to make it difficult to find common policies which would be beneficial for all members, and the incoming EU enlargement is bound to make things worse. Yet, there are still clearly many fields where further policy integration could benefit at least some subsets of EU members, and might in the future benefit all of them if these cooperative agreements turn out to be successful. Traditionally, the EU has coped with these conflicting needs in an *ad hoc* way, looking for intergovernmental agreements which allowed some of the members to go on with further integration while others could 'opt out', at least temporarily. The European Monetary Union and the Shengen treaty are the best known examples of this strategy. In many cases, however, this strategy failed to work entirely. The growing dissatisfaction with this state of affairs led the current EU members to agree on the introduction of well defined procedures to allow for subsets of members to go on with 'enhanced cooperation agreements' (ECA, the technical term for sub-unions), conditioning this possibility to the satisfaction of a number of detailed political constraints[1].

[1]The rules for forming ECAs in the EU were introduced in the Treaty of Amsterdam (1997). The Treaty of Nice (ratified in 2003) removed the veto power which the former treaty left to each country, thus making the implementation of ECAs much easier. At the present, to form an ECA at least 8 EU members must be involved, the ECA must be approved by qualified majority in the Council of

The debate over the role of ECAs is still open. Richard Baldwin et al. (2001), for instance, argue that "After Nice...Council of Ministers' decision making will be enormously difficult...ECAs could become the main engine of future European integration". Other observers do not share this optimistic view. Some contend that ECAs fall way short of what the EU would really need to become an efficient policy making body. Symmetrically, others see ECAs as a hidden way to overcome the unanimity requirement for the adoption of most policies in the EU and fear the formation of a two-speed Europe. However, to our knowledge, no formal analysis has been offered so far to support either claim or to discuss the optimality of the specific provisions introduced in the Treaties for enforcing sub-unions[2].

In this paper, we make a first step in this direction. For the reasons previously pointed out, we believe that in order to cast light on this debate, an explicit dynamic and stochastic framework is required. We develop such a framework on the basis of a very simple model. The task of our analysis is to sharpen our intuition on the problem and not to address any specific policy issues. However, to add concreteness to the discussion, we choose an example where ECAs are likely to become important in the EU, the harmonization of accounting and taxing rules for corporations[3].

In our model, there are two periods and three countries. Two countries have initial accounting standards which are closer than that of the third, so that these two countries are natural candidates to form a sub-union in the first period. In each period, each country can invest capital either at home or partly in the other countries. Harmonization of standards is beneficial because it reduces the costs of investing abroad, but the benefits from this investment are uncertain in the first period.

In this setting we ask whether, on efficiency grounds, harmonization of the standards between the two closer countries (i.e. an ECA) should be allowed in the first period, and under which governance rules for the federation. We begin the analysis considering the benchmark case in which a benevolent planner can freely choose harmonization policies and lump sum transfers for all countries involved. We derive conditions under which ECA should be preferred to either decentralization or complete harmonization in the first period. We show that there is indeed a set of parameters where ECA dominates

Ministers, and the European Commission, which is made by representatives of all EU members, is given a role, depending on the issue, to assess the compatibility of the proposed ECA with the other institutions governing the Union. See Richard Baldwin et al. (2001) for further details.

[2]Formal analysis of the functioning of the peculiar European institutions is surprisingly scarce and it usually focuses on voting procedures. See for instance Widgrén, 2001 on Enhanced Cooperation and Noury et al., 2003 on the European Parliament. See also Inman and Rubinfield, 1998, Wrede, 2002, Perotti, 2001, Tabellini, 2002 and Stehn, 2002 for a general discussion of the allocation of economic competencies between the EU and the member states.

[3]Differences in legal and accounting rules for corporate taxation across the European countries are well known to represent one of the main obstacles for an efficient allocation of capital in Europe, see the Ruding Report (1992) and the survey by Bond et al. (2000). Years of discussions and even several European Commission proposals for across-the-board harmonization have not been successful so far. The difference in current practices across European countries is simply too large for all of them to agree to pay the costs of the adoption of a common standard. Furthermore, the overall benefits - and their distribution across countries- of an harmonization policy are very difficult to assess at the present. However, for historical reasons, differences in accounting standards are lower for subsets of the EU countries than they are for the Union as a whole. It is then quite possible that the adoption of a common standard for corporate income could become one of the first example of enhanced cooperation in the future EU.

all other possible alternatives. Quite intuitively, ECA is better than centralization if the variance of the standards inside the sub-union is sufficiently smaller that the variance in the federation at large. Furthermore, we show that at the optimal enhanced cooperation policy, the country outside the sub-union is never penalized with respect to decentralization. This is so because at this policy, harmonization in the second period, if it happens, still occurs at the same (efficient) level as it does under decentralization.

Next, we consider what happens when we introduce real world political imperfections in the system. We consider first the case in which lump sum compensating transfers across countries are not available, but countries can still commit to harmonize in the second period at the efficient standard. We show that in this case the set of parameters such that ECA is optimal unambiguously increases with respect to centralization. Under centralization a single standard is imposed over heterogenous countries, and this makes it more likely that some country will need compensatory transfers. If transfers are costly, this decreases the social welfare generated by centralization. Countries are more homogeneous in a sub-union, which leads to lower transfers. Thus, the social loss caused by the fact that transfers are costly tends to be smaller under enhanced cooperation.

Results are reversed if we assume instead that countries can use lump sum transfers but cannot commit in the first period to harmonization at the efficient standard in the second period. In this case, even if the standard is chosen efficiently in the second period, the countries forming a sub-union have an incentive to manipulate the standard to their advantage in the first period. This implies that if the third country joins in the second period, it is penalized with respect to decentralization. In this case, the enhanced cooperation solution may become sup-optimal with respect to straight centralization or decentralization.

These results have important implications for the present debate in the EU and in other international unions. They suggest that ECA can indeed be a valid alternative to immediate centralization, and that this alternative improves if the federation finds it increasingly more costly to pay compensations to the countries which are more penalized by immediate centralization (a situation which certainly characterizes the present situation in Europe). But for these benefits from ECA to materialize it is necessary to design institutions which prevent the countries forming a sub-union from using their first mover advantage against the excluded countries. This may explain why the present arrangements in the EU allow excluded countries to have some decision power on the sub-union policy itself (through the European Commission and the European Parliament). On normative grounds, the question is whether these arrangements are enough to protect more periferic countries from expropriation. Otherwise, ECAs may lead to inefficient outcomes.

Another important point is that, under the present Treaty of Nice rules, a group of countries can form an ECA without the consent of excluded countries. We show that this is an effective way to increase the probability that a centralized solution will be accepted by all members.

This paper is related to many other pieces of literature. Dewatripont et al. (1995) were the first to note the potential advantages of ECAs (that they term 'flexible integration') on a number of issues in the European Union, and stressed the advantage of experimentation and learning associated with ECAs for other countries as well (a

point which is ignored in our work). Alesina et al. (2001a,b, 2003) analyze a dynamic model, as we do, but their setting is different. They focus on a time inconsistency problem associated with union formation, and they exploit the median voter's theorem to prove that unions will tend to be smaller and more centralized than it would be optimal (see also Roberts (1999)), and propose a number of institutional solutions, including enhanced cooperation mechanisms[4]. Levy (1997) discusses a similar issue, but in a different context. He shows that bilateral trade agreements may undermine political support for multilateral ones, by rising the reservation utility of the median voters in the two countries. More related to the present work is the stream of research originated by the work of Fernandez and Rodrick (1991) on switching majorities in a dynamic and uncertain framework (see Gerard Roland, 2000, chapter 2, for an extensive coverage of this literature and several extensions to political reforms). However, there is no application of this idea to the issue of harmonization and sub-unions.

The rest of the paper is organized as follows. Section 2 presents the model. Section 3 analyzes the benchmark case in which the countries are able to commit and lump-sum transfers are available. Section 4 analyzes how the results are modified when transfers are costly and when the countries are unable to commit to future policies. It also shows that the rules introduced by the Treaty of Nice are likely to lead to more centralization. Section 5 concludes the paper. All the proofs are collected in the appendix.

2 The Model

There are three countries, belonging to a federation, and two periods. Each country is characterized by a different standard θ_i. The set of all possible standards is given by the interval $[0,1]$ and θ_i is the historically determined standard of country i. We assume $\theta_1 = 0$, $\theta_2 \in \left(0, \frac{1}{2}\right)$ and $\theta_3 = 1$, so that the standards of countries 1 and 2 are 'closer' than that of country 3. Standards can be changed, but this is costly, as new laws are to be drafted and approved, professionals (accountants, lawyers, tax officials etc.) need to be trained anew, the inevitable mistakes generated in the transition period have to be fixed and so on. The cost of adopting a new standard is quadratic in the distance of the new standard from the historical one, i.e. if country i adopts the new standard x at time 0 it pays the cost $(x - \theta_i)^2$.

Harmonization of standards is potentially beneficial because it may facilitate capital movements. We assume that each country has one unity $k_i = 1$ of capital available for investment at the beginning of each period. Each country can invest its capital in any of the three countries, using a technology displaying decreasing returns to scale. Let $\mathbf{x} = (x_1, x_2, x_3)$ be the triplet of standards chosen in the three countries. If country i invests an amount k_{ij} in country j at time 0 then the return is:

$$f_{ij}\left(k_{ij}, \gamma, \mathbf{x}\right) = \gamma k_{ij}^{\alpha} - cI_{[k_{ij}>0, x_i \neq x_j]}.$$

where γ is a random variable whose value is unknown at time 0, $\alpha \in (0,1)$ and c is a fixed cost which is paid when capital is invested in a country with a different standard (I is the indicator function, taking value 1 when $k_{ij} > 0$ and $x_i \neq x_j$ and zero otherwise).

[4]See also Alesina and Grilli (1993) and Alesina et al.(2001) for empirical evidence.

We assume that c is very large, so that no country wishes to invest in another country having a different standard[5]. The variable γ is intended to capture the uncertainty about the returns from harmonization. When γ is low, investing capital abroad only brings small benefits, which in turn implies that the costs necessary for harmonization may not be worth paying. When γ is high, harmonization may become convenient if α is small enough. For simplicity, we assume that γ can only take two values[6], $\underline{\gamma} = 0$ with probability $1 - p$ and $\overline{\gamma} = 1$ with probability p. Notice also that we assume that the productivity of the capital invested by country i in country j is independent of the capital invested by other countries. The assumption is not essential, and the analysis could be generalized to account for externalities.

If $x_1 = x_2 = x_3$, standards pose no barrier to the movement of capital. In this case, each country would invest $\frac{1}{3}$ of the capital available in each country. If standards are different, then the optimal investment policy for a given country depends on the value of the parameters. Either a country is included in the set in which a positive investment is made, or it is not. Given our assumed technology, capital is equally divided among the countries in which a positive investment is made, while no investment is made in the other countries.

The countries have to trade off the cost of changing the historically given standards with the new investment opportunities that harmonization of standards brings about. At period 0 the value of the new investment opportunities is uncertain, as it depends on the realization of the parameter γ. At time 1, the uncertainty is resolved and the value of the new investment opportunities is known for sure. More precisely, we assume the following time-line for our model:

1. At time 0 the three countries adopt a triplet of policies $\mathbf{x} = (x_1, x_2, x_3)$. There are three possibilities. The three countries may adopt a common standard, two countries may decide a common standard while the other decides to have a different standard, or each country may have a different standard. Once the decision on the vector $\mathbf{x}$ has been taken, each country decides how to invest its capital among the different countries. The expected utility for country i at time 0 is:

$$-(x_i - \theta_i)^2 + E\left[\sum_{j=1}^{3} f_{ij}(k_{ij}, \gamma, \mathbf{x})\right]$$

   where expectation is taken over the value of γ.

2. At the end of period 0 the value of γ is observed. At this point, a new vector $\mathbf{x}'$ is chosen, according to the rules of the federation. The countries have a new endowment of one unit of capital, and the capital is invested. The utility of country i in the second period is:

$$-\left(x_i' - g(\theta_i, x_i)\right)^2 + \sum_{j=1}^{3} f_{ij}(k_{ij}, \gamma, \mathbf{x}')$$

[5]The assumptions that the cost is fixed and independent of $|x_i - x_j|$, the distance between the two standards, is for simplicity only. The same results can be obtained for more general cost functions.

[6]This formulation implies that the returns from investing at home are also uncertain and may turn out to be zero. This assumption is made only for simplicity; nothing substantial would change if we assumed that only the returns from investing abroad are uncertain.

where g is a function which takes into account the modification of the bliss point as consequence of the choice of the standard in the previous period.

We allow for changes in the bliss point over time when new standards are adopted.[7]. The two extreme cases are $g(\theta_i, x_i) = \theta_i$ (preferences do not change with the adoption of the new standard) and $g(\theta_i, x_i) = x_i$ (the country fully adapts at time 1 to the new standard adopted at time 0). For simplicity we adopt the linear specification:

$$g(\theta_i, x_i) = \beta x_i + (1 - \beta)\theta_i$$

with $\beta \in [0, 1]$.

Notice that the decision at period 1 is taken after having observed the value of γ. A low realization of γ implies that the gains from cooperation are not as high as expected, and in that case the best thing to do for each country is simply to stick to the new ideal point $g(x_i, \theta_i)$. A high realization of γ will tilt the balance in favor of more integration. Importantly, this may imply that a country which decided *not* to integrate at time 0 might now be willing to harmonize its standard. The main issue becomes what should be done in this case, that is how the new policy $\mathbf{x}'$ should be selected.

3 Efficient Solution

We begin by deriving the efficient decision, that is the decisions about the standards which would maximize the sum of the three countries' utilities. Note that this could also be seen as the case in which all decisions are taken under unanimity rule by a benevolent planner who can enforce costless transfers across countries.

3.1 The Second Period Problem

We start analyzing the optimal decision once the value of γ is known. If the realization is $\underline{\gamma} = 0$ then it is always optimal to decentralize the decision. In this case, each country will select as a new standard $x_i' = g(x_i, \theta_i)$.

If the realization is $\overline{\gamma} = 1$, then further harmonization may be optimal. When a single standard x' is adopted, the sum of the total payoffs in the three countries is:

$$U(x') = \sum_{i=1}^{3} \left(-\left(x' - g(x_i, \theta_i)\right)^2 + 3^{1-\alpha} \right)$$

The efficient solution is then to minimize the total cost $\sum_{i=1}^{3} \left(x' - g(x_i, \theta_i)\right)^2$ with respect to x'. The solution is:

$$x' = \frac{\sum_{i=1}^{3} g(x_i, \theta_i)}{3},$$

[7] The bliss point can move only partially towards the new standard because of adjustment costs. As an example of these adjustment costs, one may think to the accountants or the tax officials who are yet not trained or fully accostumed to the new rules and who would therefore welcome a partial return to the old rules.

yielding a total payoff of:

$$U^c = 3^{2-\alpha} - \sum_{i=1}^{3} \left(\frac{\sum_{i=1}^{3} g(x_i, \theta_i)}{3} - g(x_i, \theta_i) \right)^2 .$$

When countries 1 and 2 only adopt a common policy in period 1 (the 'enhanced cooperation' solution)[8], then the optimal policy is:

$$x' = \frac{\sum_{i=1}^{2} g(x_i, \theta_i)}{2}$$

yielding a total payoff for the federation of:

$$U^{ec} = 2^{2-\alpha} - \sum_{i=1}^{2} \left(\frac{\sum_{i=1}^{2} g(x_i, \theta_i)}{2} - g(x_i, \theta_i) \right)^2 + 1$$

(the third country pays no adjustment cost and gets a return of 1 investing the capital at home). Finally, when standards are different each country only invests domestically and the total payoff is:

$$U^d = 3$$

Which of the three policies is optimal depends on the value of α and on the two triplets (x_1, x_2, x_3) and $(\theta_1, \theta_2, \theta_3)$. There is however a natural monotonicity. Lower values of α make it more convenient to split capital across countries, and therefore tend to favor harmonization. This monotonicity property is made precise in the next proposition.

Proposition 1 *Consider the second period problem when $\gamma = 1$. For every given value of the triplets (x_1, x_2, x_3) and $(\theta_1, \theta_2, \theta_3)$, there are values α_1 and α_2, with $0 < \alpha_1 \leq \alpha_2 < 1$ such that full harmonization is optimal for $\alpha \in [0, \alpha_1]$, enhanced cooperation between countries 1 and 2 is optimal for $\alpha \in (\alpha_1, \alpha_2)$ and decentralization is optimal for $\alpha \in [\alpha_2, 1]$.*

The proposition is quite intuitive. When α is small, it pays a lot to split capital across countries. Thus, full harmonization is optimal. When α is close to 1 the technology is close to constant returns to scale, and the advantage of splitting capital is small. In this case it is better to avoid paying the adjustment costs, and decentralization is optimal. In intermediate cases, enhanced cooperation may be preferred. Notice that the case $\alpha_1 = \alpha_2$ cannot be excluded; in this case enhanced cooperation is never optimal in period 1.

3.2 The Ex-Ante Problem

We now turn to the *ex ante* problem. In order to focus on the dynamic trade-offs of partial integration, we assume that α is sufficiently small, so that full harmonization is always optimal in the second period when $\gamma = 1$. The problem that the planner faces is therefore how to position the standards of the different countries in period 0,

[8] We only consider the case where countries 1 and 2 form a sub-union, as this clearly dominates the alternative sub-unions which could be formed.

taking into account the possibility that with probability p full harmonization will occur in period 1.

Remark. Proposition 1 establishes that full harmonization is optimal for $\alpha \leq \alpha_1$, where the value of $\alpha_1 > 0$ depends on the triplets $\mathbf{x} = (x_1, x_2, x_3)$ and $\boldsymbol{\theta} = (\theta_1, \theta_2, \theta_3)$. This implies that we are restricting ourselves to consider only the case in which α is sufficiently small. In our context, this is the only interesting case. If the second-period optimal policy involves decentralization when $\gamma = 1$, no harmonization ever occurs and the optimal choice for the three countries is simply to stick to their original standards in period 0. If enhanced cooperation between countries 1 and 2 is optimal in the second period, then country 3 never moves from the original standard, and the planner's problem simply reduces to decide whether to adopt a common standard immediately for countries 1 and 2 or wait until time 1. The solution trivially depends on p; if p is large then the two countries immediately harmonize their standard, while if p is small they wait until period 1 and harmonize the standards if $\gamma = 1$. In both cases, harmonization always occurs at the cost-minimizing standard $(\theta_1 + \theta_2)/2$. Notice however that in the second case, as long as both $p > 0$ and $\beta > 0$, countries 1 and 2 will nevertheless move their standards a little bit closer in period 0, in anticipation of the possible harmonization in period 1. This is so because with a convex cost function, it is always optimal to spread the cost of adopting a common standard over the two periods, and $\beta > 0$ allows to make some steps forwards in the period 0. The main point however is that in this case the third country does not move from its original standard in any period, and therefore there is no potential trade-off between the utility of the sub-union and that of the third country.

By the analysis of the previous section, we know that in the second period the planner will choose full harmonization at $\left(\sum_{i=1}^{3} g(x, \theta_i)\right)/3$ when $\gamma = 1$. There are then three cases to consider *ex ante*.

When a common standard x for the three countries is imposed at time zero total expected welfare is:

$$U_0^c(x) = p3^{2-\alpha} - \sum_{i=}^{3} (x - \theta_i)^2 + p\left[3^{2-\alpha} - \sum_{i=1}^{3}\left(\frac{\sum_{i=1}^{3} g(x, \theta_i)}{3} - g(x, \theta_i)\right)^2\right]$$

If a common standard x_1 is only imposed for countries 1 and 2, while country 3 selects x_3 then the expected welfare is:

$$U_0^{ec}(x_1, x_1, x_3) = p\left(2^{2-\alpha} + 1\right) - \sum_{i=1}^{2} (x_1 - \theta_i)^2 - (x_3 - \theta_3)^2 + p3^{2-\alpha}$$

$$-p\sum_{i=1}^{2} (\overline{g} - g(x_1, \theta_i))^2 - p(\overline{g} - g(x_3, \theta_3))^2$$

where $\overline{g} = \left(\left(\sum_{j=1}^{2} g(x_1, \theta_j)\right) + g(x_3, \theta_3)\right)/3$. At last, when in period 1 the countries adopt a triplet (x_1, x_2, x_3) such that the three numbers are different, we have:

$$U_0^d(x_1, x_1, x_3) = p3 - \sum_{i=1}^{3} (x_i - \theta_i)^2 + p\left[3^{2-\alpha} - \sum_{i=1}^{3}\left(\frac{\sum_{i=1}^{3} g(x_i, \theta_i)}{3} - g(x_i, \theta_i)\right)^2\right]$$

We now solve for the optimal policy in the different cases. As a matter of notation, let:

$$U_*^k(p,\beta) = \max_{\mathbf{x}\in\mathbf{X}^k} U_0^k(\mathbf{x})$$

where $k \in \{d, ec, c\}$ refers to the policy adopted in the first period and $\mathbf{X}^k$ is the set of feasible choices given policy k (for example, if $k = c$ then only triplets $\mathbf{x} = (x, x, x)$ are feasible). In the following, when needed to simplify the formulas, we use the notations $\overline{\theta} = \frac{1}{3}\left(\sum_{i=1}^3 \theta_i\right)$ and $\sigma_\theta^2 = \frac{1}{3}\left(\sum_{i=1}^3 \left(\theta_i - \overline{\theta}\right)^2\right)$.

Consider first the case of decentralization. The first order conditions can be written as:

$$p\beta\left(\beta\left(\frac{\sum_{j=1}^3 x_j}{3} - x_i\right) + (1-\beta)\left(\overline{\theta} - \theta_i\right)\right) = (x_i - \theta_i)$$

for $i = 1, 2, 3$. Summing up the three FOCs we have $\sum_{j=1}^3 x_j = 3\overline{\theta}$, so that in the second period the optimal point is $\overline{\theta}$. Substituting, we get:

$$x_i^d = \theta_i + \frac{p\beta}{(1+p\beta^2)}\left(\overline{\theta} - \theta_i\right) \tag{1}$$

The optimal choice under decentralization is a weighted average of the current standard θ_i and the standard to be adopted in case of harmonization. Despite the fact that in the current period no harmonization occurs, for $\beta > 0$, it is convenient to move the standard towards $\overline{\theta}$ in anticipation of the possible harmonization in the future period since, with a convex cost function, this decreases the expected cost of harmonization. The extent of the movement today depends on how likely is harmonization tomorrow (i.e. how large is p) and how effective is the movement today in changing the ideal point (i.e. how large is β). Formally, the weight $p\beta/\left(1+p\beta^2\right)$ increases in p and β, reaching a maximum of $\frac{1}{2}$ when harmonization occurs with probability 1 and there is immediate adaptation to the new standard. In that case the cost of harmonization is sustained with probability 1, and the countries move half-way to the optimal standard to be set in the following period.

It is worth noting at this point that country i is willing to choose voluntarily the point x_i^d provided it is assured that the standard $\overline{\theta}$ will be chosen in case of centralization in the second period. In other words, in order to implement the decentralized allocation a benevolent planner does not have to intervene directly in the choice of standard of each country. Rather, the outcome can be implemented simply by making a commitment to having centralization at $\overline{\theta}$ whenever $\gamma = 1$, and then letting the countries choose their standards independently.

The expected welfare under decentralization is:

$$U_*^d(p,\beta) = 3\left(1 + 3^{1-\alpha}\right)p - 3\frac{p}{1+p\beta^2}\sigma_\theta^2$$

Consider now the case of enhanced cooperation. The first order conditions with respect to x_1 and x_3 yield:

$$(\theta_1 + \theta_2) - \frac{\beta p(1-\beta)}{3}(\theta_1 + \theta_2 - 2\theta_3) + \frac{2\beta^2 p}{3}x_3 = \left(2 + \frac{2\beta^2 p}{3}\right)x_1$$

$$\theta_3 + \beta^2 p \frac{2}{3} x_1 + \frac{\beta (1-\beta) p}{3} (\theta_1 + \theta_2 - 2\theta_3) = \left(1 + \frac{2\beta^2 p}{3}\right) x_3$$

Solving the two equations we obtain:

$$x_1^{ec} = \frac{\theta_1 + \theta_2}{2} + \frac{\beta p}{(1+\beta^2 p)} \left(\overline{\theta} - \frac{\theta_1 + \theta_2}{2}\right)$$

$$x_3^{ec} = \theta_3 + \frac{\beta p}{(1+\beta^2 p)} \left(\overline{\theta} - \theta_3\right)$$

Notice that $(2x_1 + x_3)/3 = \overline{\theta}$, so that if countries harmonize in the second period, they do so again at $\overline{\theta}$.

The solution under enhanced cooperation is similar to the one we obtained under decentralization and can be explained along the same lines. Under enhanced cooperation the countries behave as in the decentralized solution, but with countries 1 and 2 'combined' together in a single country with an ideal point equal to their mid point, $(\theta_1 + \theta_2)/2$. To see this just note:

$$x_1^{ec} = \frac{x_1^d + x_2^d}{2} \qquad\qquad x_3^{ec} = x_3^d$$

and from (1), x_1^{ec} is the standard which would be chosen under decentralization by a country with original standard $(\theta_1 + \theta_2)/2$.

The intuition for this result is simple. Under enhanced cooperation, the planner must solve two problems at once. First, it must choose a common standard for the two countries joining the sub-union. Second, it must optimally adjust this standard in anticipation of the (possible) harmonization of the second period. Since harmonization in the second period, if it does so, occurs at $\overline{\theta}$, the optimal solution is then to adopt the decentralized solution for the sub-union as a whole, and then split in two the extra costs for harmonization between the two countries, choosing the mid point between their (optimal) decentralized solutions.

To make this point clearer, we can exploit further the fact that x_1^{ec} is equal to the decentralized solution for a country with standard $(\theta_1 + \theta_2)/2$ to write total utility under enhanced cooperation as:

$$U_*^{ec} = p\left(2^{2-\alpha} + 1 + 3^{2-\alpha}\right) - 3\frac{p}{1+p\beta^2}\sigma_\theta^2 - \frac{(\theta_2 - \theta_1)^2}{2} Z(p,\beta)$$

where:

$$Z(p,\beta) \equiv 1 + p(1-\beta)^2 - \frac{p}{1+p\beta^2}$$

The total expected cost under enhanced cooperation is equal to the cost under decentralization, plus an extra term which measures the additional costs imposed on countries 1 and 2 from partial harmonization. Since $Z(p,\beta)$ is strictly positive for any value of p and β, these extra costs are increasing in the distance $|\theta_2 - \theta_1|$. Notice that:

$$\frac{dZ}{dp} = -\frac{(1 + (\beta^2 p + 1)(1-\beta))}{(1+p\beta^2)^2}\left(p\beta^2 + 1 - p\beta\right)\beta < 0$$

and

$$\frac{d^2 Z}{d^2 p} = \frac{2\beta^2}{(1+p\beta^2)^3} > 0$$

so that Z is a decreasing and convex function of p.

For future reference, it is also useful to compute the utility that each country enjoys under enhanced cooperation. For country 3, as $x_3^{ec} = x_3^d$, welfare is exactly the same under enhanced cooperation and under decentralization. The utility of country i, with $i = 1, 2$, is obtained substituting x_1^{ec}. This gives:

$$U_{*i}^{ec} = p\left(2^{1-\alpha} + 3^{1-\alpha}\right) - \frac{p}{1+p\beta^2}\left(\theta_i - \overline{\theta}\right)^2 - \frac{(\theta_2 - \theta_1)^2}{4} Z(p, \beta).$$

Note, as argued above, that the cost that each country joining the sub-union pays is equal to the one paid under decentralization plus half the extra cost needed to harmonize the standards of the two countries at period 0. This result will be useful when we discuss the case of costly transfers.

Finally, it is immediate to see that in the case in which harmonization occurs immediately then the optimal standard is $x^c = \overline{\theta}$. The expected welfare under immediate harmonization can then be written as:

$$U_*^c(p, \beta) = p2 \times 3^{2-\alpha} - 3\left(1 + p(1-\beta)^2\right)\sigma_\theta^2.$$

3.3 A Comparison

We are now in a position to compare the welfare of the federation under the three different regimes. Some computations yield the following relations:

$$U_*^{ec} - U_*^d = p\left(2^{2-\alpha} - 2\right) - \frac{(\theta_2 - \theta_1)^2}{2} Z(p, \beta) \tag{2}$$

$$U_*^c - U_*^{ec} = p\left(3^{2-\alpha} - 2^{2-\alpha} - 1\right) - \frac{3}{2}\left(\theta_3 - \overline{\theta}\right)^2 Z(p, \beta) \tag{3}$$

$$U_*^c - U_*^d = p\left(3^{2-\alpha} - 3\right) - 3Z(p, \beta)\sigma_\theta^2 \tag{4}$$

Expected benefits are always higher under centralization than under decentralization, but so are the costs. Enhanced cooperation is an intermediate case, which allows to reap some of the advantages of harmonization at lower costs than centralization. In particular, other things being equal, it is clear that the advantage of enhanced cooperation versus centralization increases when the distance $\theta_3 - \overline{\theta}$ increases. Signing the effect of β on the difference between the utility functions under the different regimes is more difficult, since $Z(p, \beta)$ is not monotone in β. However, we can prove the following result.

Proposition 2 *There exist two values p^* and p^{**}, with $0 < p^* \leq p^{**} < 1$ such that when $p \in [0, p^*]$ decentralization at period 0 is optimal, when $p \in [p^*, p^{**}]$ enhanced cooperation is optimal, and when $p \in [p^{**}, 1]$ then centralization is optimal.*

Intuitively centralization always dominates decentralization when p is close to 1, so that it is very likely that harmonization will be successful. On the other hand, decentralization always dominates centralization when p is close to 0, as it is very likely that harmonization would not bring trade benefits. However, the proposition also implies that for intermediate values of p, enhanced cooperation may be the efficient solution of a social welfare maximization problem. Notice that the optimal policy in this case entails some change in the standard of the excluded country in the first period as well. However, as shown above, under enhanced cooperation the excluded country adopts the decentralized solution. This implies that, if countries are able to commit to harmonization at $\overline{\theta}$ in the second period, then country 3 would voluntarily choose x_3^{ec} in the first period. We will come back to this in the next section.

Proposition 2 only establishes that $p^* \leq p^{**}$. If $p^* = p^{**}$ then enhanced cooperation is never optimal, and the optimal policy switches from decentralization to centralization as p increases. Whether or not the set (p^*, p^{**}) is empty depends on the parameters of the problem, and in particular on the values of β and θ_2. Intuitively, the main factor which may affect the optimality of the enhanced cooperation solution is the distance between θ_2 and θ_1. When the bliss points of the two countries are very close, the cost of setting an identical standard for countries 1 and 2 in the first period is small and it might therefore be worth paying it to have the additional benefits of partial harmonization. On the other hand, if $\theta_2 = \frac{\theta_1+\theta_3}{2}$ (country 2 is equally distant from the other two countries) then the costs of partial harmonization are very high and enhanced cooperation is less likely to be optimal. Building on this intuition, we now prove:

Proposition 3 *If $\theta_2 = \theta_1$ then $p^* = 0$ and $p^{**} > 0$. When θ_2 increases, p^* increases and p^{**} decreases.*

Since all the functions are continuous, the proposition implies that when θ_2 is sufficiently close to θ_1 then the interval (p^*, p^{**}) is certainly non-empty. The interval shrinks as θ_2 increases. When θ_2 increases the value of σ_θ^2 decreases, reaching a minimum at the point $\theta_2 = \frac{\theta_1+\theta_3}{2}$. Since the utility of both U_*^c and U_*^d depends negatively on σ_θ^2, they increase. This is intuitive, as a lower σ_θ^2 implies that it is less costly to centralize in the second period. This effect is also present in the case of enhanced cooperation, but there is now a countervailing effect. When θ_2 increases, the distance between θ_2 and θ_1 increases and this increases the cost of harmonizing the standard for countries 1 and 2 in the first period. It can be shown that when θ_2 is close to θ_1 the effect relative to σ_θ^2 prevails, so that U_*^{ec} increases. However, as θ_2 gets closer to $\frac{\theta_1+\theta_3}{2}$ the second effect prevails, so that U_*^{ec} actually decreases. At any rate, the presence of the second effect implies that in general U_*^{ec} grows more slowly than U_*^d and U_*^c, therefore reducing the set of values of the parameters in which enhanced cooperation is optimal[9].

[9] This does not imply that when $\theta_2 = \frac{\theta_1+\theta_3}{2}$ enhanced cooperation is never optimal. For instance, for $\alpha = \beta = 0$ and $\theta_2 = 1/2$, enhanced cooperation is optimal for $3/32 > p > 2/32$. The reason is that under enhanced cooperation costs are always lower than under centralization. Hence, even if the benefits from harmonization are extremely high, it might be worth moving from decentralization to enhanced cooperation, rather than to centralization directly, as p increases.

4 Applications

So far we have derived conditions under which enhanced cooperation may dominate the alternatives, in the benchmark case in which nondistorting transfers can be used and efficient solutions are enforced. As we have shown above, under any of the three mechanisms considered, harmonization in the second period always occurs at the efficient level $\overline{\theta}$ when $\gamma = 1$. Thus, if nondistortionary transfers are available, the efficient solution can always be implemented when the countries decide by unanimity and are able to write at period 0 an agreement (contract) contingent on the realization of γ.

In this section we pose the following question: Does the case for enhanced cooperation become more robust under more realistic constraints on the working of the federation? We discuss how the results change when transfers are costly and when the countries are unable to commit to future choices, and we conclude with an analysis of the rules for ECAs as included in the recent Treaty of Nice.

4.1 Costly Transfers

Suppose that compensating transfers across countries cannot be made or can be made only at a cost, for example because money has to be collected through distortionary taxation[10]. However, in the first period countries can still write a binding contract, committing them to harmonize at the efficient level $\overline{\theta}$ in the second period whenever $\gamma = 1$. The important implication is that the formation of a sub-union in the first period does not affect the choice of the standard in the second period, and therefore cannot reduce the welfare of the excluded country. More specifically, assume the following decision process:

1. At time 0, all countries agree to harmonize standards at $\overline{\theta}$ in period 1 if $\gamma = 1$.
2. At time 0, a benevolent planner also makes a proposal about the current period, possibly together with a set of transfers. If the planner proposes enhanced cooperation or centralization and the proposal is unanimously accepted then the prescribed policies and the proposed transfers are enacted. Otherwise, no transfer takes place and the countries are free to select the standard they desire in the current period.

Under the decision procedure spelled out above, each country can at least obtain a utility equal to the utility obtained under the decentralization policy. This is so because, as we have shown above, if no harmonization occurs at period 0, but it is known that in the second period harmonization will occur at $\overline{\theta}$, the best choice for each country coincides with the decentralized option.

This implies that under enhanced cooperation or centralization each country has to be guaranteed a reservation utility at least equal to:

$$U_{*i}^{d} = p\left(1 + 3^{1-\alpha}\right) - \frac{p}{1 + p\beta^2}\left(\theta_i - \overline{\theta}\right)^2.$$

[10] In the context of the European Union intergovernmental compensating transfers are typically not used, suggesting a very high cost for transferring funds. When a country is hurt by some policy decision, it is often compensated by distorting other pieces of legislation or through sectorial or regional grants which, in principle, should be used for different objectives. See Tabellini (2002) on this point.

When deciding which policy to implement, the planner has now to take into account these individual rationality constraints. If any of the constraints is violated at the optimal solution described in the previous section, then the planner will have to take measures to accommodate the country not receiving enough utility. This can be done either through costly transfers or by distorting the policies proposed in the first period away from the efficient level. In any case, the social value of the policy is reduced when transfers are costly.

We now notice that whenever the values of the parameters are such that the sum of the utilities under enhanced cooperation is greater than the sum of the utilities under decentralization (that is, $U_*^{ec} \geq U_*^d$) then each country obtains a utility equal at least to U_{*i}^d.

Proposition 4 *If $U_*^{ec} \geq U_*^d$ then $U_{*i}^{ec} \geq U_{*i}^d$ for each i; furthermore, it is always the case that $U_{*3}^{ec} = U_{*3}^d$.*

The implication of the proposition is that a policy of enhanced cooperation can *always* be implemented without transfers, provided that the countries are able to commit to harmonization at $\overline{\theta}$ in the second period. Therefore, the fact that transfers are costly and individual rationality constraints have to be satisfied has no impact whatsoever on the social welfare which can be attained under enhanced cooperation. A decentralization policy also does not require transfers.

This leads to the conclusion that the only policy which is penalized under costly transfers is centralization. In turn, this implies that when transfers are costly the set of parameters such that enhanced cooperation is superior to centralization unambiguously (weakly) expands.

In terms of implementation, the proposition also means that the enhanced cooperation policy could be entirely decentralized. The two countries forming the sub-union could be left to decide as they wish the policy to be implemented in the first period and the excluded country would be left free to adjust. Provided that the countries are able to commit to harmonization at $\overline{\theta}$ in the second period, the two countries would autonomously choose the optimal solution for the sub-union and the third country would choose the optimal decentralized solution. Furthermore, *ex post* it would still be true that the optimal centralization policy in the second period is $\overline{\theta}$.

The fact that the enhanced cooperation policy does not require transfers to be implemented does not hold generally. For example, if we considered a federation with a larger number of countries and sub-unions composed by more than two countries it may be that (costly) transfers across the countries joining the sub-union and/or distortions in the first period policy would also be needed to support the enhanced cooperation solution. However, it would still be true that as long as countries can commit to harmonize at the efficient level in the second period, the excluded countries would not need any compensating transfers. Furthermore, as long as the variance of the standards inside the sub-union is smaller than that of the federation at large, it would always be true that the extra costs needed to support enhanced cooperation would be strictly lower that those needed to support centralization. Hence, the insight that the presence of costly transfers increases the efficiency of the enhanced cooperation with respect to centralization holds more generally.

4.2 No Commitment

Assume now that costless transfers can be enforced but that the three countries can no longer commit at time 0 on the standard at which harmonization should occur in the next period. In many relevant cases, there may simply be no way to enforce this kind of commitment in a federation, as the countries may find it optimal *ex post* to agree to a different policy. This generates a standard temporal inconsistency problem, since the countries may now try to use their choice of the standard in the current period in order to influence the decision in the subsequent period[11].

We study this problem by assuming the following set up. Suppose that the standards of the three countries have not been harmonized at period zero. Then, at period 1, if $\gamma = 1$ the planner proposes harmonization at the efficient point:

$$x^c = \frac{\sum_{i=1}^{3} g(x_i, \theta_i)}{3} = \beta \frac{\sum_{i=1}^{3} x_i}{3} + (1-\beta)\overline{\theta},$$

where x_i is the standard adopted by country i at time 0. This is the choice which maximizes the sum of the utilities at time 1, and it will be accepted unanimously since, when $\gamma = 1$, each country prefers centralization. Hence, under decentralization, the countries will know for sure that with probability p, centralization will occur at $\sum_{i=1}^{3} g(x_i, \theta_i)/3$ in period 1.

Suppose now that decentralization prevails at period zero, so that the three countries are free to choose their own standard. If each country is left free to move its standard, it must then realize that by moving its own standard at time 0 it is also going to affect the harmonized standard which will be enforced with probability p at time 1, since $\sum_{i=1}^{3} g(x_i, \theta_i)/3$ depends on x_i (whenever $\beta > 0$). With no commitment, what we are after is then a Nash equilibrium in the choices of the standards in the first period. The next proposition describes this equilibrium.

Proposition 5 *If decentralization prevails in the first period then, in the unique Nash equilibrium, the choice of country i is:*

$$x_i^{NE} = \theta_i + \frac{\frac{2}{3}p\beta}{1 + \frac{2}{3}p\beta^2}\left(\overline{\theta} - \theta_i\right).$$

Notice that when the standards x_i^{NE} are chosen in period 0, harmonization of the standards in the period 1, when it happens, occurs again at $\overline{\theta}$. Comparing the first period choices in the Nash equilibrium with what should occur under a commitment to $\overline{\theta}$ in case of harmonization, it is immediate to see that $\left|x_i^d - x_i^{NE}\right| > 0$. This implies that, while the choice at the second period is unchanged, in a Nash equilibrium each country moves less in the first period than under commitment[12]. The intuition is

[11] In general, the countries belonging to a federation can only commit to follow determinate procedures, rather than commit to implement a given policy. In the case of the EU, for example, choices regarding the admission of new members or further integration on particular issues are taken by the Council following pre-determined decision rules, and are not decided *ex ante* on the bases of the realization of particular contingencies.

[12] For instance, when $p = \beta = 1$ the optimal choice would be to cover half of the distance from $\overline{\theta}$ and θ_i in the first period. In a Nash equilibrium the countries only cover 2/5 of it.

straightforward. In choosing its standard in period 0 under decentralization and no commitment each country has to trade-off two effects. On the one hand, by moving away from its historical standard it reduces the expected costs of harmonization to be paid in the period 1. On the other hand, by keeping its choice in period 0 closer to its historical standard, it forces the planner in period 1 to choose an harmonization policy which is closer to its preferred point. At the equilibrium point, these efforts to manipulate the choice of the agenda setter at time 1 are frustrated, as the countries end up by exactly offsetting each other and harmonization still occurs at $\overline{\theta}$. However, as a result of these contrasting incentives, each country moves less than it would be optimal to do to minimize its total expected costs. The conclusion is that the lack of commitment decreases the social value of a decentralization policy.

On the contrary, it is immediate to see that, as long as the countries can enforce costless transfers, centralization is not affected by the lack of commitment. If the countries accept to harmonize the standards at $\overline{\theta}$ at period zero, then the same standard will be optimal subsequently (when $\gamma = 1$).

Consider now the case of enhanced cooperation. Since lump sum transfers are available, the two countries in the sub-union will choose the standard which minimizes the sum of their costs. From the previous analysis, we know that this standard will be determined as if the cost function of the sub-union were given by $2\left(x_1 - \frac{\theta_1+\theta_2}{2}\right)^2$. However, in setting up this standard, the two countries must also realize that their choice in the first period is going to affect the choice of the planner in the second period. In this case, we have the following equilibrium.

Proposition 6 *There is a unique Nash equilibrium in the positioning game between the sub-union of countries 1 and 2 on one side and country 3 on the other side. The values x_1 and x_3 are:*

$$x_1 = \frac{\theta_1 + \theta_2}{2} + \left(\frac{3p\beta}{9 + 5p\beta^2}\right)\left(\overline{\theta} - \frac{\theta_1 + \theta_2}{2}\right)$$

$$x_3 = \theta_3 + \frac{6p\beta}{(9 + 5p\beta^2)}\left(\overline{\theta} - \theta_3\right)$$

One important conclusion coming from proposition 6 is that:

$$\frac{2x_1 + x_3}{3} = \overline{\theta} + \left(\frac{p\beta}{9 + 5p\beta^2}\right)\left(\overline{\theta} - \theta_3\right) < \overline{\theta}$$

so that in the second period the standard chosen in the case of harmonization turns out to be strictly lower than the efficient quantity $\overline{\theta}$. The reason lies in the asymmetry existing between the sub-union and the third country in terms of influence on the final standard. When the sub-union moves the current standard by Δx, the final standard moves by $\frac{2}{3}\beta\Delta x$, while a movement of Δx by the third country moves the final standard only by $\frac{1}{3}\beta\Delta x$. Also notice that:

$$\frac{3p\beta}{9 + 5p\beta^2} < \frac{\frac{2}{3}p\beta}{1 + \frac{2}{3}p\beta^2} < \frac{6p\beta}{(9 + 5p\beta^2)}$$

so that the countries in the sub-union move their standards less, and the third country more, than in the decentralized Nash equilibrium.

Since centralization is unaffected by lack of commitment, the conclusion is then that the case for enhanced cooperation becomes weaker when commitment is impossible. More precisely, the set of parameters such that immediate centralization is better than enhanced cooperation unambiguously expands.

4.3 Enhanced Cooperation in the Treaty of Nice

We can use our framework to evaluate the impact of the rules for the formation of ECAs in the European Union, as recently introduced in the Treaty of Nice. A stylized representation of these rules in our context could go as follows:

1. A (qualified) majority of Member States can agree to form an ECA on selected issues. The approval of countries not belonging to the ECA is not necessary, but all countries have the right to enter into the agreement if they so desire.

2. Common policies can be changed only by unanimous agreement[13] of the countries belonging to the ECA.

The Treaty does not contemplate any mechanism for monetary compensation in relation to the formation of ECAs. Furthermore, no clear mechanism for committing to future changes of the current policies seems to be in place[14]. Therefore, the actual mechanism set up in the Treaty can be characterized as one in which neither monetary compensation nor commitment take place, and furthermore ECAs do not need unanimity to be implemented.

Our previous analysis has shown that the lack of commitment tends to favor centralization, while the lack of monetary transfers penalizes the centralized solution. Those conclusions were obtained under the assumption that an individual rationality constraint had to be satisfied for each country. The actual rules in the European Union allow for the formation of ECAs even if the excluded countries do not agree. The main difference with the previous analysis is therefore that the individual rationality constraint for those countries need not be satisfied.

Proposition 6 shows that, when there is no commitment, the formation of an enhanced cooperation damages the interests of the excluded country. The conclusion was obtained under the assumption that in the second period a socially optimal standard (that is, $\sum g(x_i, \theta_i)/3$) would be chosen in the second period. The rules contained in the Treaty of Nice reinforce this effect, since the standard in the second period can only be changed by unanimity. This essentially implies that, once a standard is set by

[13] The decision rules for a sub-union are the same that prevail for the EU at large on the same subject. As we are here discussing of corporate taxation and accounting rules, the decision rule is unanimity.

[14] All EU countries may participate at the discussion about the policy to be selected in a ECA, but only the countries joining the ECA have the right to vote on this policy, according to the EU rules prevailing for the subject where the ECA is formed. Notice that where the so called 'co-determination' procedure is in place, the European Parliament is also involved in voting on the sub-union policy. The European Parliament decides by simple majority, and all countries, including those not belonging to the sub-union, partecipate to the ballot. For further details, see again Baldwin et al. (2002) and Erik Berglof et al. (2003).

an ECA in the first period, it cannot be changed in the second period. Basically, a country remaining out of the ECA in the first period faces a 'take it or leave it' deal in the second period: Integration can only be achieved at the terms established by the countries who formed the ECA in the first period.

There is no reason to expect that the outcome under such rules should be efficient. The interesting question however is whether they tend to induce more or less centralization. We now argue that the rules for ECAs introduced in the Treaty of Nice make centralization a more likely outcome. The basic reason is that the third country may prefer to join immediately the ECA (thus yielding immediate centralization), and so have a say in the choice of the standard, rather than wait until the second period and be forced to accept the standard chosen by the other countries.

To make this argument more precise, observe that without commitment Proposition 6 implies that country 3 is worse off with respect to decentralization, and therefore it would approve an ECA only if compensated with a monetary transfer or with a distortion in the standard chosen by the two countries forming the sub-union. When this is impossible, enhanced cooperation is rejected. In such a situation the only two possible outcomes are centralization and decentralization, and centralization prevails if and only if it is superior to decentralization for the three countries.

Suppose now that the approval of country 3 is no longer necessary, and that for certain values of the parameters countries 1 and 2 find it profitable to form an enhanced cooperation in the first period. Then the relevant comparison for country 3 is between the utility obtained under centralization and the utility obtained when the remaining two countries form an ECA. Since this is strictly lower that the utility obtained under decentralization, country 3 will be prepared to accept centralization more often than in the previous case. We therefore have the following proposition.

Proposition 7 *If the countries cannot commit to future policies and no monetary transfers are available then centralization occurs more often under the rules established in the Treaty of Nice than under a rule which requires unanimity in the first period to form an ECA.*

Notice that the proposition states that centralization, rather than enhanced cooperation, is more likely. In other words, the introduction of the rules to form ECA's in the EU may be in reality just a device to bypass the objections to further centralization of some countries[15]. Is this good or bad for social welfare? This depends on whether one believes that the rules existing before the introduction of ECA were biased against centralization or not. Many observers would agree that, when reaching agreements inside the European Union, establishing proper monetary transfers or installing mechanisms to commit to change future decisions is difficult. This might tend to bias the

[15]In this sense, the European Commission, which was the great sponsor of the introduction of ECA in the Treaty of Nice and in particular of the removal of the veto power on ECA assigned to all countries in the previous Treaty of Amsterdam, may have 'outsmarted' the countries. Baldwin et al. (2002), in fact, argue that the more restrictive decison rules introduced in the Treaty of Nice for the European Council were the result of a deliberate attempt made by some countries to delay further centralization in the EU. But our analysis suggests that these countries may have underestimated the centralization impact of the new rules for ECA's formation.

decisions excessively towards the *status quo*, which in the many cases means decentralization. The introduction of rules allowing for ECAs even without the consent of excluded countries may be a partial remedy.

5 Conclusions

We began this work by asking when it would be optimal to let some member countries of a federation to form a sub-union, and under which decision rules for the federation. This paper suggests the following answers. The basic trade-off in letting sub-unions to be formed is between the increased welfare for the countries joining immediately the sub-union and the expected losses for the other countries in future periods, as a consequence of a possible change in the status quo. Hence, the introduction of enhanced cooperation mechanisms is certainly Pareto improving as long as the excluded countries can be guaranteed against, or compensated for, this change in the status quo. We showed that there may be a role for enhanced cooperation even in the benchmark case of costless transfers and unanimity rules, as there may be cases where the lower costs for supporting harmonization in a sub-union (due to the lower variance of the standards in the sub-union than in the federation) may dominate the extra expected benefits from immediate centralization. We also showed that this efficiency role for enhanced cooperation tends to increase when compensating transfers become impossible or more costly to enforce.

The beneficial effects of enhanced cooperation however hinge on the fact that the countries joining the sub-union can commit not to change the status quo in the future or to compensate the excluded countries for this change. If they cannot, then enhanced cooperation may be harmful for the excluded countries and for the welfare of the federation at large. This results from the greater power that the countries in the sub-union have in influencing the future standards.

Our results offer some important insights on the functioning of federations such as the European Union. First, they may help to explain why the introduction of enhanced cooperation is sometimes opposed by excluded countries. Second, in terms of the governance rules for the federation, our results strongly suggest that, lacking commitment power, countries which decided to opt out of the sub-union, should however be involved in the decision process of the sub-union. Finally, we have shown that when ECAs can be formed without the consent of excluded countries centralization becomes more likely. The Treaty of Nice has set up formal rules for the formation of ECAs which do not require the consent of excluded countries. We have shown that this may lead to an increase in the level of centralization.

Our analysis could be extended in several directions. First, we assumed that after the first period uncertainty is resolved, and countries automatically learn whether it is optimal to centralize or not. In reality, forming an ECA might be the only way to find out if centralization on a given function is beneficial. Sub-unions might then be thought of as offering a public good to all members of the Union and issues of free-riding and protection of the investment, through admission policies to the sub-union, would arise naturally. Also, there are natural complementarities between different policies which we have completely overlooked here. For example, foreign policy harmonization would

naturally bring about centralization of defence policy. This then suggest that issues of the optimal timing of enhanced cooperation agreements, discussing which functions should be centralized first (along the line of Roland (2000)'s approach to reforms), may provide interesting insights in the functioning of international unions. We believe that an analysis of these issues would provide interesting avenues for further research.

Appendix

Proof of Proposition 1. Let $U^c(\alpha)$ and $U^{ec}(\alpha)$ be the values of U^c and U^{ec} as a function of α. We want to prove that the two curves cross exactly once on the interval $[0,1]$. To see that the two curves cross at least once, observe that the functions are continuous and that $U^c(0) > U^{ec}(0)$, $U^c(1) < U^{ec}(1)$. To see that they can cross at most once, observe that the difference $(U^c(\alpha) - U^{ec}(\alpha))$ is strictly decreasing for all values of $\alpha \in [0,1]$. Let us call α^* the point at which $U^c(\alpha^*) = U^{ec}(\alpha^*)$.

Now notice that the payoff under decentralization, $U^d = 3$, is independent of α. Furthermore, both $U^c(\alpha)$ and $U^{ec}(\alpha)$ are decreasing functions and $U^d < U^c(0)$, $U^d > U^{ec}(1)$. Now let α_1 be the unique solution to $U^c(\alpha) = \max\left\{U^d, U^{ec}(\alpha)\right\}$. Then centralization is optimal in the interval $[0,\alpha_1]$. If $\alpha_1 < \alpha^*$ then decentralization is optimal over the interval $[\alpha_1, 1]$. If $\alpha_1 = \alpha^*$ then there is a unique value $\alpha_2 \geq \alpha^*$ such that $U^{ec}(\alpha_2) = 3$. Clearly, enhanced cooperation is optimal on (α_1, α_2) and decentralization is optimal on $[\alpha_2, 1]$. ■

Proof of Proposition 2. We start observing that at $p = 0$ we have $U_*^d(0) > U_*^{ec}(0) > U_*^c(0)$, while at $p = 1$ we have $U_*^d(1) < U_*^{ec}(1) < U_*^c(1)$. Furthermore, using the expressions (2)-(4) and the fact that Z is decreasing and convex in p we can conclude that each pair of curves crosses only once. Call $\widehat{p} \in (0,1)$ the value such that $U_*^c(p) = U_*^d(p)$, $\widetilde{p} \in (0,1)$ the value such that $U_*^c(p) = U_*^{ec}(p)$ and, finally, call $\overline{p} \in (0,1)$ the value such that $U_*^{ec}(p) = U_*^d(p)$. At this point we define $p^* = \min\{\widehat{p}, \overline{p}\}$ and $p^{**} = \max\{\widehat{p}, \widetilde{p}\}$ and we are done. ■

Proof of Proposition 3. If $\theta_2 = \theta_1$ then by inspection $U_*^{ec}(0,\beta) = U_*^d(0,\beta)$, which implies $p^* = 0$ and $U_*^{ec}(p,\beta) > U_*^d(p,\beta)$ whenever $p > 0$ (in fact, when $\theta_2 = \theta_1$ we have $x_1^d = x_2^d = x_1^{ec}$; decentralization and enhanced cooperation prescribe the same policies).

To prove the second part, observe that $\frac{\partial \sigma_\theta^2}{\partial \theta_2} = -\frac{2}{3}\left(\overline{\theta} - \theta_2\right)$, so that:

$$\frac{dU_*^c}{d\theta_2} = 2\left(1 + p(1-\beta)^2\right)\left(\overline{\theta} - \theta_2\right)$$

$$\frac{dU_*^d}{d\theta_2} = 2\frac{p}{1+p\beta^2}\left(\overline{\theta} - \theta_2\right)$$

Furthermore, using the envelope theorem and rearranging we have:

$$\frac{dU_*^{ec}}{d\theta_2} = 2\left(1 - p\beta(1-\beta)\right)(x_1 - \theta_2) + 2p(1-\beta)\left(\overline{\theta} - \theta_2\right),$$

where the first term is negative and the second is positive. We now show:

$$\frac{dU_*^c}{d\theta_2} > \frac{dU_*^{ec}}{d\theta_2} \qquad\qquad \frac{dU_*^d}{d\theta_2} > \frac{dU_*^{ec}}{d\theta_2},$$

This will be enough to reach our conclusion. To see this, remember that for a given θ_2 the value $\overline{p} = p^*(\theta_2)$ is defined by the equality

$$U_*^d(\overline{p}, \theta_2) = U_*^{ec}(\overline{p}, \theta_2).$$

If we now keep $\overline{p}$ fixed and we increase θ_2 by a small amount $\Delta\theta_2$ we have:

$$U_*^d\left(\overline{p},\theta_2+\Delta\theta_2\right)>U_*^{ec}\left(\overline{p},\theta_2+\Delta\theta_2\right).$$

Therefore, the value $\overline{\overline{p}}=p^*\left(\theta_2+\Delta\theta_2\right)$ at which

$$U_*^d\left(\overline{\overline{p}},\theta_2+\Delta\theta_2\right)=U_*^{ec}\left(\overline{\overline{p}},\theta_2+\Delta\theta_2\right)$$

must satisfy $\overline{\overline{p}}>\overline{p}$. An analogous reasoning holds for the value p^{**}.

The only thing left to do is to check the inequalities. We have:

$$\frac{dU_*^c}{d\theta_2}-\frac{dU_*^{ec}}{d\theta_2}=2\left[1-p\beta\left(1-\beta\right)\right]\left(\overline{\theta}-x_1\right)>0,$$

since $x_1<\overline{\theta}$. We also have:

$$\frac{dU_*^d}{d\theta_2}-\frac{dU_*^{ec}}{d\theta_2}=2p\beta\left[\beta\frac{1-p\beta\left(1-\beta\right)}{1+\beta^2p}\right]\left(\overline{\theta}-\theta_2\right)-2\left(1-p\beta\left(1-\beta\right)\right)\left(x_1-\theta_2\right)$$

which is strictly positive since $x_1<\theta_2$ and $\overline{\theta}>\theta_2$. ■

Proof of Proposition 4. It is immediate to see that the utility of country 3 is the same under decentralization and under enhanced cooperation. Therefore, the condition $U_*^{ec}\geq U_*^d$ is equivalent to:

$$U_{*1}^{ec}+U_{*2}^{ec}\geq U_{*1}^d+U_{*2}^d$$

Now observe that for $i=1,2$ we can write:

$$U_{*i}^{ec}-U_{*i}^d=p\left(2^{1-\alpha}-1\right)-\frac{1}{4}\left(\theta_1-\theta_2\right)^2Z\left(p,\beta\right).$$

Therefore $U_{*1}^{ec}-U_{*1}^d=U_{*2}^{ec}-U_{*2}^d$ and the conclusion follows. ■

Proof of Proposition 5. Country i chooses x_i in the first period to solve:

$$\min_{x_i}\qquad\left(x_i-\theta_i\right)^2+p\left(\beta x_i+\left(1-\beta\right)\theta_i-\left(\beta\left(\frac{x_i}{3}+\sum_{j\neq i}\frac{x_j}{3}\right)+\left(1-\beta\right)\overline{\theta}\right)\right)^2$$

The first order condition (which is also sufficient) for country i is:

$$2\left(x_i-\theta_i\right)+2p\left(\frac{2}{3}\beta x_i+\left(1-\beta\right)\theta_i-\left(\beta\sum_{j\neq i}\frac{x_j}{3}+\left(1-\beta\right)\overline{\theta}\right)\right)\frac{2}{3}\beta=0$$

The system of three equations has the unique solution:

$$x_i^{NE}=\theta_i+\frac{\frac{2}{3}p\beta}{1+\frac{2}{3}p\beta^2}\left(\overline{\theta}-\theta_i\right).$$

■

Proof of Proposition 6. Countries 1 and 2 choose x_{12} in the first period to solve:

$$\min_{x_1} \qquad (x_{12}-\theta_{12})^2 + p\left(\beta x_{12} + (1-\beta)\,\theta_{12} - \beta\left(\frac{2x_{12}+x_3}{3}\right) - (1-\beta)\,\overline{\theta}\right)^2$$

where $\theta_{12} = (\theta_1+\theta_2)/2$. The first order condition is:

$$(x_{12}-\theta_{12}) + p\left(\beta x_{12} + (1-\beta)\,\theta_{12} - \left(\beta\left(\frac{2x_{12}}{3}+\frac{x_3}{3}\right) + (1-\beta)\,\overline{\theta}\right)\right)\frac{1}{3}\beta = 0$$

while the condition for x_3 is

$$(x_3-\theta_3) + p\left(\beta x_3 + (1-\beta)\,\theta_3 - \left(\beta\left(\frac{2x_{12}}{3}+\frac{x_3}{3}\right) + (1-\beta)\,\overline{\theta}\right)\right)\frac{2}{3}\beta = 0$$

Solving for the two equations we obtain:

$$x_{12} = \theta_{12} + \left(\frac{3\beta p}{9+5p\beta^2}\right)\left(\overline{\theta}-\theta_{12}\right)$$

$$x_3 = \theta_3 + \frac{6p\beta}{(9+5p\beta^2)}\left(\overline{\theta}-\theta_3\right) = \theta_3 - \frac{12p\beta}{(9+5p\beta^2)}\left(\overline{\theta}-\theta_{12}\right).$$

■

Proof of Proposition 7. When no commitment and no monetary transfers are available, country 3 always rejects an ECA. Therefore, if individual rationality has to be satisfied, the only possible outcomes are centralization and decentralization. For a given set of parameters, let U^c_{*i} and U^d_{*i} be the utilities obtained by country i under centralization and decentralization respectively. Then centralization occurs if $U^c_{*i} \geq U^d_{*i}$ for each i.

Suppose next that countries 1 and 2 are given the possibility of forming an ECA without the approval of country 3, and furthermore that country 3 can always join and ECA and obtain the centralized solution. If we call U^r_{*i} the reservation utility of country i under the new rule, then it must be the case that $U^r_{*i} \geq U^d_{*i}$ if $i = 1, 2$, while $U^r_{*3} \leq U^d_{*3}$. This follows from the fact that country $i \in \{1, 2\}$ can always block an ECA if the utility is less than U^d_{*i}, so the utility achieved when centralization is not implemented must necessarily be at least U^d_{*i}. On the other hand, country 3 is made worse off with respect to decentralization whenever countries 1 and 2 form and ECA.

Also observe that an ECA cannot be formed if country 3 prefers centralization, since in this case country 3 could join the ECA and obtain the centralized outcome. Therefore, the set of parameter values for which centralization occurs weakly expands. In particular, if $U^c_1 < U^d_1$ or $U^c_2 < U^d_2$ then centralization does not occur either before or after the introduction of enhanced cooperation. If $U^c_1 \geq U^d_1$ and $U^c_2 \geq U^d_2$ then:

a) If $U^c_3 \geq U^d_3$ then centralization occurs before and after the introduction of ECA, so that no change occurs. .

b) If $U^c_3 < U^d_3$ then decentralization prevails before the ECA. After the ECA we have centralization if $U^r_{*3} \leq U^c_3 < U^d_3$.

We conclude that in all cases either centralization is maintained or it is introduced where it was not present before. ■

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