FLEXIBLE INTEGRATION

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Abstract

For a club such as the European Union, an important question is when, and under which conditions, a subset of the members should be allowed to form "inner clubs" and enhance cooperation. Flexible cooperation allows members to participate if and only if they benefit, but it generates a free-rider problem if potential members choose to opt out. The analysis shows that flexible cooperation is better if the heterogeneity is large and the externality small. The best possible symmetric and monotonic participation mechanism, however, is implemented by two thresholds: A mandatory and a minimum participation rule. Rigid and flexible cooperation are both special cases of this mechanism. For each of these thresholds, the optimum is characterized.

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1. Introduction

The future of the European Union is in disarray. After years of negotiations, the members finally agreed at June 18, 2004, on a Constitution for Europe, defining new rules for how to make collective decisions. Since some countries must ratify the constitution by referendums, it is currently uncertain whether it ever will be implemented. If not, it is quite likely that a core group of countries proceed with deeper integration alone, leaving out a periphery set of members at the status quo. Critiques argue that this will lead to a dissolution of the EU at worst, or a division between first-rate and second-rate citizens at best. Supporters, however, argue that such an approach is the only way of solving the conflict between enlargement and deepening cooperation (discussed by e.g. Alesina, Angeloni and Etro, 2001).

This idea is not new. Dewatripont *et al.* (1995) argues in favor of such "flexible integration", defined by a "common base" in which all members must participate, and "open partnerships" where subsets of countries may cooperate additionally. The common market should be a part of the common base, while the currency union is a prime example of open partnership.

Whether a subset of a club should be allowed to form "inner clubs" is a general problem, not limited to the European example. The advantage of such flexibility is that participation can be limited to those and only those that benefit from this. However, if a country's participation has positive externalities on other participants or non-participants, then a free-rider problem arises in which too few members will join the inner club.

This paper analyses whether such flexible integration is indeed better than traditional non-flexible integration, where all or none of the members participate.

I present a simple model with linear payoff functions. A country may benefit from participating in the inner club, and its participation may affect other participants. The members that do not participate may also be affected by the inner club, though their benefit may be smaller if the inner club is e.g. providing and excludible public. I find that flexible integration is better than non-flexible integration if and only if the heterogeneity is large, the externality small, and if the outsiders cannot easily be excluded.

Both flexible and non-flexible integration are special cases of a more general mechanism. If the participation mechanism, a mapping from the set of votes to the set of participants, must be symmetric and monotonic, then it is always defined by two boundaries $\underline{m}$ and $\overline{m}$, where $\underline{m} \leq \overline{m}$. If less than $\underline{m}$ wants to participate, then the inner club should be prohibited. If, on the other hand, more than $\overline{m}$ wants to participate, then all members should be obligated to. Participation should be voluntary only if the number of participants is strictly between these boundaries. Such boundaries are indeed observed in reality. The Kyoto protocol, for example, was only valid if at least 55% of the polluters ended up ratifying the treaty. If Russia, then, had chosen not to ratify the treaty, the Kyoto protocol would be invalid according to these rules, and this made Russia pivotal in implementing the treaty for all participants. In this way, the "mandatory participation rule" at 55% could to some extend reduce the free-rider problem among potential participants. Similarly, the "minimum participation rule" $\overline{m}$ forces everyone to participate in a situation where the incentive to free-ride is extremely large (i.e. when most other members do participate). The analysis shows that if the heterogeneity is small and the externality large, then $\underline{m}$ should increase and $\overline{m}$ decrease.

Minimum participation rules are common, particularly for environmental agreements. Barrett (2003) lists 297 environmental treaties, where only 9 do *not* specify a minimum participation threshold. The Kyoto protocol, for example, was valid only if at least 55% of the polluters ended up ratifying the treaty. If Russia, then, had chosen not to ratify the treaty, the Kyoto protocol would be invalid according to the rules. Russia was thus pivotal for implementing the treaty, and unable to free-ride on the other participants.

Returning to the European Union, its current Treaty (Article 43) does lay out conditions for when "enhanced cooperation" is allowed. The subgroup should, for example, be open to all and respect the rights of non-participants. The subgroup must also include at least eight member states. Moreover, for most types of policies, mandatory participation is attained if supported by a qualified majority. Thus, the functioning of the EU is indeed characterized by a pair of mandatory and minimum participation rules.

The literature comparing flexible and rigid cooperation is small. Dewatripont *et al.* (1995) argue in favor of more "flexible integration", defined by a "common base" in which all members must participate, and "open partnerships" where only a subset participates. The internal market should be a part of the common base, while the currency union should be an open partnership. Thygesen (1997) suggests the opposite, and claims that some asymmetry and discrimination may be necessary in order to encourage more members to participate. Berglöf *et al.* (2006), on the other hand, argue that the possibility to form open partnerships may be exactly what motivates outsiders to join, since they are assumed to suffer by a negative externality otherwise. Bordignon and Brusco (2006) provide one of the few formal analysis on whether flexible is better than rigid integration. The problem with flexible integration is, they argue, that the participants may coordinate on standards that do not take into account the utility of outsiders and future potential members. Only if they can commit on a standard taking these preferences into account should flexible integration be allowed. This paper, in contrast, takes free-riding to be the major drawback of flexible integration. Rigid cooperation is an extreme way of dealing with this problem; defining mandatory and minimum participation rules is generally better.[1]

There are just a few papers on mandatory participation rules, or "federal mandates". Crémer and Palfrey (2000, 2006) argue that such mandates are too strict in the political equilibrium. The intuition is related to the one provided in this model. With its focus on majority thresholds, this paper also contributes to the large literature on majority rules, including e.g. Buchanan and Tullock (1962), Aghion and Bolton (2003), Gersbach and Erlenmaier (2001), and Harstad (2005). These papers assume that some kind of side transfers between the members is possible. Elsewhere (Harstad, 2006), I have argued that the members may want to prohibit side transfers since these could lead to conflicts and delay when preferences are private information. Thus, this paper abstracts from side payments, although information is complete. A super-majority rule, in this context, is optimal if and only if no members are prohibited from participating in inner clubs.

The literature on minimum participation rules is small as well. With a finite number of members, Black *et al.* (1993) estimate the effect of the rule by numerical simulations, while Rutz (2001) assumes all members to be identical. Both contributions take the rule as exogenously given and predict that it will bind in

[1]The paper is also related to the large literature on whether regional trade agreements are a stepping stone or a stumbling block for global free trade (see e.g. Bhagwati, 1991 and 1993, Burbidge *et al.*, 1997, and Aghion *et al.*, 2006).

equilibrium. This paper, however, allows for aggregate shocks and, then, the rule may not bind. Also Carraro *et al.* (2004) endogenize the rule, but they abstract from heterogeneity and aggregate shocks. Barrett (2003) summarizes some of this literature, and suggests that the minimum participation rule may also be a coordination device.

The next section presents the very simple model. Section 3 employs the model to study flexible and non-flexible integration, it shows that each is first-best only in very special cases, and derives conditions which can be used to select the best rule. Section 4 shows that if the participation mechanism must be symmetric and monotonic, then it is characterized by the two thresholds $\underline{m}$ and $\overline{m}$. The following subsections find that $\underline{m}$ should increase and $\overline{m}$ decrease if the heterogeneity is small and the externalities large. Since the analysis is only a first attempt to study such rules, it hinges on several restrictive assumptions. The EU Treaty, as discussed in Section 5, is indeed characterized by these two thresholds. The final section concludes.

2. A Simple Model

Consider a club with a set of members I. Some of these may form an inner club to deepen integration or implement an additional project. This may have benefits as well as costs, and, in isolation, the net value to member $i \in I$ is drawn to be

$$v_i = v - \epsilon_i - \theta,$$

where ϵ_i and θ are some individual and aggregate shocks, respectively. The ϵ_is are independently drawn from a uniform distribution with mean zero and density

$1/h$:

$$\epsilon_i \text{ iid } \backsim U\left[-\frac{h}{2}, \frac{h}{2}\right].$$

To simplify, let there be a continuum of members, $I \equiv [0,1]$, such that the distribution of the ϵ_is is deterministic and uniform on $[-h/2, h/2]$. Then, h measures the ex post heterogeneity in values. If we order the is according to increasing ϵ_is, then $v_i = v + h/2 - hi - \theta$.

The state parameter θ is an aggregate shock which shifts all the individual values of the project. To arrive at explicit solutions, let also θ be uniformly distributed:

$$\theta \sim U\left[-\frac{\sigma}{2}, \frac{\sigma}{2}\right].$$

In "isolation", i would like to be a member if $v_i > 0$. However, i is not isolated. If i contributes to the project, then also the n other members benefit from i's participation, and this benefit, or "externality", is denoted e. Member i's participation may also be beneficial to the mass $1 - n$ that does not participate, and this benefit is measured by q. If the members can exclude non-members to some extent, then $q < e$. Thus, for a given n, i's value of participating is $v_i + en$, while if i does not participate, she earns qn.

I will assume that for some θ, the value of the project is so small that no-one wants to participate (not even v_0). Denote this critical value $\overline{\theta}$:

$$v + h/2 - \overline{\theta} = 0.$$

For a small enough θ, however, everyone wants to participate (even v_1). Denote this critical value $\underline{\theta}$:

$$v - h/2 - \underline{\theta} + (e - q) = 0$$

If $\underline{\theta} > \overline{\theta}$, then we typically have two equilibria where either everyone or no-one wants to participate. The reason is that when more members participate, the benefit of becoming members of the inner club increases, and this outweights the increased costs when more and more reluctant members join. To make the problem interesting, assume that

$$h > e - q,$$

such that $\overline{\theta} > \underline{\theta}$. Then, a subgroup of I would like to participate whenever $\theta \in (\underline{\theta}, \overline{\theta})$.

3. Flexible v Rigid Integration

Before analyzing the equilibrium, it is worthwhile to study the first-best number of participants. Clearly, if only $n < 1$ participate, then the members should be the set $[0, n]$, since these are the one benefiting most. Throughout the analysis, I will implicitly assume that these are the members actually participating.

Proposition 1: If (3.1) does not hold, then $n = 1$ is optimal if $v + e - \theta > 0$, while $n = 0$ is optimal otherwise. Assuming (3.1) holds, the optimal n is given by (3.2).

$$\text{If } h > 2(e-q), \text{ then} \tag{3.1}$$

$$n_* = \frac{v + h/2 - \theta + q}{h - 2(e-q)} \tag{3.2}$$

if this $n_* \in [0,1]$.[2]

Proof: If n members join, the social value is

$$\begin{aligned}
&\int_0^n (v_i + en)\, di + \int_n^1 (qn)\, di \\
&= nv + nh/2 - hn^2/2 - \theta n + en^2 + qn(1-n) \\
&= n(v + h/2 - \theta + q) - n^2(h/2 - e + q). \qquad (3.3)
\end{aligned}$$

For small enough θ, the first parenthesis is positive and it is beneficial that some members contribute. If the second parenthesis is negative, $h/2 - e + q < 0$, then there is increasing returns to scale since the value of adding new members increases faster than their marginal cost is increasing. Thus, (3.1) is the second-order condition necessary for an interior n_*, which can be found by maximizing (3.3) wrt n. *QED*

3.1. Rigid Integration

With rigid integration, I will mean that either everyone, or no-one, has to contribute. Of these two alternatives, it is clearly better that all contribute if and only if $v + e - \theta > 0$, which is equivalent to $v_{1/2} + e \geq 0$, i.e. that the median

[2] More formally, this and similar expressions should be written as

$$\begin{aligned}
n_* &= 0 \text{ if } \frac{v + h/2 - \theta + q}{h - 2(e-q)} < 0 \\
n_* &= \frac{v + h/2 - \theta + q}{h - 2(e-q)} \text{ if } \frac{v + h/2 - \theta + q}{h - 2(e-q)} \in [0,1] \\
n_* &= 1 \text{ if } \frac{v + h/2 - \theta + q}{h - 2(e-q)} < 1.
\end{aligned}$$

voter prefers integration. Thus, a simple majority rule implements the best binary choice. Comparing with Proposition 1, we get the following result immediately:

Proposition 2: Under non-flexible integration, the best majority rule is $m = 1/2$. This is first-best if and only if (3.1) does not hold, that is, if the heterogeneity h is low and the externality e large. Otherwise, too many contribute if $\theta \leq v + e$, while too few contribute for $\theta > v + e$.

According to Proposition 1, the first-best requires that everyone or no-one contributes if $h < 2(e - q)$, because then the spillover effects on participants are more important than the heterogeneity between the members. Naturally, this outcome can be implemented by a majority rule. That the best majority rule is $m = 1/2$ follows from the assumption that the ϵ_is are symmetrically distributed, and it then follows from May's Theorem.

3.2. Flexible Integration

If there is flexible integration, then whoever wants to, becomes a member of the club. Those who do not want to participate can abstain and perhaps free-ride on the contributors. Naturally, these leads to too few participants whenever the externalities are positive. If there are no externalities, such that $e = q = 0$, then i's participation only affects i's utility, and i's decision of whether to participate, is optimal.

Proposition 3: Under flexible integration, the number of participants n_F is given by (3.4). Thus, if $e = q = 0$, $n_F = n_*$. But $n_F < n_*$ if $e \geq q \geq 0$ with at least one strict inequality.

$$n_F = \frac{v + h/2 - \theta}{h - (e - q)} \text{ if } \in [0, 1]. \tag{3.4}$$

Proof: Anticipating n (or taking n as given), i becomes a member if

$$v_i + n(e - q) > 0$$

The marginal member, n_F, is then willing to join if

$$v + h/2 - hn - \theta + n(e - q) \geq 0 \Rightarrow \text{ (3.4)}$$

It is simple to compare n_F and n_* to verify Proposition 1. *QED*

3.3. Flexible or Rigid Integration?

While flexible integration may lead to free-riding and too few participants, non-flexible integration treats everyone the same no matter whether they benefit or lose from further integration. It is thus important to study which is better.

Proposition 4: Flexible integration is better than non-flexible integration if and only if (3.6) holds, which is more likely if h is large, e small and q large.

Proof: From (3.3) and (3.4), we can easily calculate the welfare under flexible integration:

$$\begin{aligned} & n_F(v + h/2 - \theta + q) - n_F^2(h/2 - e + q) \\ = & \left(\frac{v + h/2 - \theta}{h - (e - q)}\right)(v + h/2 - \theta + q) - \left(\frac{v + h/2 - \theta}{h - (e - q)}\right)^2 (h/2 - e + q) \\ = & \left(\frac{v + h/2 - \theta}{h - (e - q)}\right) q + \left(\frac{v + h/2 - \theta}{h - (e - q)}\right)^2 h/2. \end{aligned} \tag{3.5}$$

For $\theta \leq \underline{\theta}$, $n = 1$ whether integration is flexible or not, so we only need to compare the integrals of welfare for $\theta \in \left[\underline{\theta}, \overline{\theta}\right]$. Integrating (3.5) over this interval gives:

$$
\begin{aligned}
& \frac{q\left[(v+h/2-\underline{\theta})^2-\left(v+h/2-\overline{\theta}\right)^2\right]}{2\sigma\,(h-e+q)}+\frac{h\left[(v+h/2-\underline{\theta})^3-\left(v+h/2-\overline{\theta}\right)^3\right]}{6\sigma\,(h-e+q)^2} \\
= \; & \frac{q\,(h-e+q)^2}{2\sigma\,(h-e+q)}+\frac{h\,(h-e+q)^3}{6\sigma\,(h-e+q)^2} \\
= \; & (h-e+q)\,(3q+h)/6\sigma
\end{aligned}
$$

For non-flexible integration, under the optimal majority rule $m = 1/2$, welfare is $v + e - \theta$ whenever $\theta \leq v + e$, otherwise welfare is zero. Integrating welfare from $\theta = \underline{\theta}$ to $v + e$ gives:

$$
\begin{aligned}
& (v+e)(v+e-\underline{\theta})/\sigma-\left[(v+e)^2-(\underline{\theta})^2\right]/2\sigma \\
= \; & (v+e)(h/2+q)/\sigma-\left[(v+e)^2-(v-h/2+e-q)^2\right]/2\sigma \\
= \; & (v+e)(h/2+q)/\sigma-\left[2\,(v+e)\,(h/2+q)-(h/2+q)^2\right]/2\sigma \\
= \; & (h/2+q)^2/2\sigma
\end{aligned}
$$

Flexible is better than fixed iff

$$
\begin{aligned}
(h-e+q)\,(3q+h)/6\sigma &> (h/2+q)^2/2\sigma \\
(h-e+q)\,(3q+h) &> 3\,(h/2+q)^2 \\
h^2/4+hq &> eh+3qe \\
h(h+4q)/4 &> e(h+3q) \qquad (3.6)
\end{aligned}
$$

Suppose the inequality holds with equality. If then h increases, e decreases or q increases marginally, then (3.6) holds. *QED*

This result deserves some discussion. Quite intuitively, it says that if the heterogeneity h is large, then flexible integration is better than non-flexible integration. The members are then too different to require them all to do the same. If the externality e is large, however, then flexible integration leads to free-riding and too few will participate in equilibrium. This means that it may be beneficial to force everyone to participate, even if the heterogeneity is positive. The spillover effect q on non-participants goes in the other direction, however. The reason is roughly the following: Why a larger q does not affect the utility under non-flexibility (there are then no outsiders), it increases the utility under flexible integration, since non-participants become better off. Thus, flexible integration becomes relatively better.

It is worthwhile to notice that the expected value of participation, v, has no effect on the optimal mechanism. The reason is simply that a larger v shifts the critical θs up by the very same amount, whether integration is flexible or non-flexible.

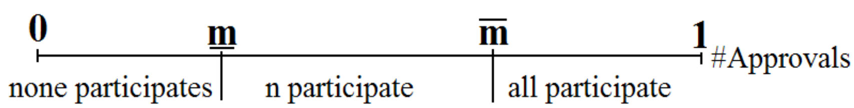
Above, I simply assumed that if integration were non-flexible, then the majority rule were $m = 1/2$. In reality, a larger majority is often used in political settings. Since $m = 1/2$ is optimal, a larger majority rule makes the non-flexible regime worse, and thus flexibility relatively better.

Corollary 1: The larger is the majority rule, the better is flexible compared to non-flexible integration.

4. The General Mechanism

In the language of mechanisms, flexible cooperation is a mapping from i's vote $w_i \in \{0,1\}$, where $w_i = 1$ indicates a "yes" for participation, to whether i should participate, $p_i \in \{0,1\}$, where $p_i = 1$ indicates that i should participate. This mechanism is simply $p_i = w_i$. Rigid integration, on the other hand, is a mapping from the total number of yes-votes, $w \equiv \|w_i \mid w_i = 1\|$, to $\{p_i\}_i$, and the mechanism can be stated as $p_i = 1$ if and only if $w \geq m$. In general, we may want a mechanism from both w and w_i to $p_i \in \{0,1\}$. Such a mechanism is, in fact, always characterized by a pair $(\overline{m}, \underline{m})$, where $\overline{m} \geq \underline{m}$. Let $|I|$ represent the number of individuals. Then:

Proposition 5: If the participation mechanism $M : \{0,1\}^{|I|} \rightarrow \{0,1\}^{|I|}$ is symmetric and monotonic, then it is implemented by a pair $(\overline{m}, \underline{m})$, where $\overline{m} \geq \underline{m}$.



Proof: By "symmetric" I here mean that all members that vote the same, should be treated similarly, and that a permutation of the w_js, $j \neq i$, should have no effect on p_i. The mechanism M is a mapping from all the members' votes to all the members' participation decision. Suppose $v_i = 0$. Symmetry implies that only the number of yes-votes determine whether i should participate, not their identity. Monotonicity implies that there is a cut-off, such that if and only if the number of yes-votes is above this threshold, i should participate. Let $\overline{m}$ denote this threshold. Similarly, there should be a threshold for the number of yes-votes if $v_i = 1$, such that i should participate if the number of yes-votes is above this threshold. Call this threshold $\underline{m}$. Requiring M to be monotonic in v_i as well, $\overline{m} \geq \underline{m}$. *QED*

Non-flexible integration is a special case where $\underline{m} = \overline{m}$, while flexible integration is another special case where $\underline{m} = 0$ and $\overline{m} = 1$. This section finds conditions under which it is optimal to choose $\underline{m} > 0$ and $\overline{m} < 1$, such that flexible integration is dominated by "semi-flexible" integration.

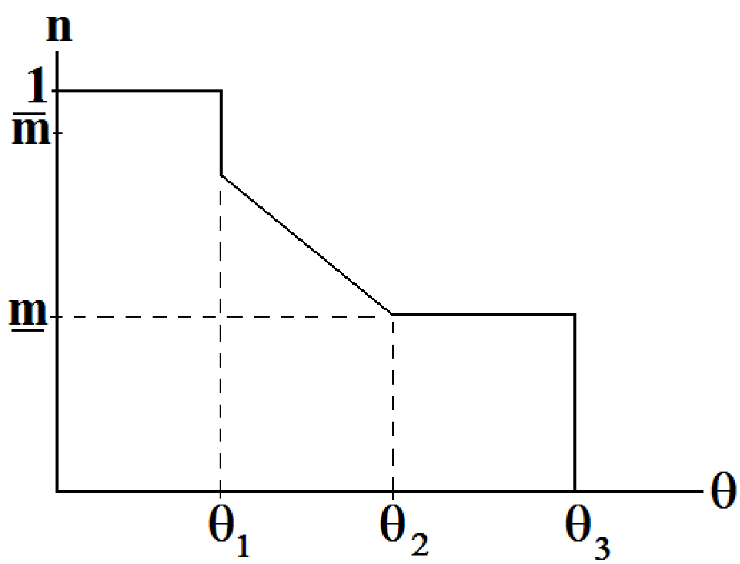
4.1. When are $\underline{m}$ and $\overline{m}$ independent?

Clearly, the state parameter θ will determine the number of participants in equilibrium. If $\underline{m}$ and $\overline{m}$ are sufficiently different, there will exist θs where in equilibrium everyone participate; $n \in (\underline{m}, \overline{m})$ participate; exactly $\underline{m}$ participate; and no-one participates. Then, we can study the two choices of $\underline{m}$ and $\overline{m}$ in turn.

Proposition 6: If (4.1) holds, then (i) n as a function of θ looks like Figure 2, (ii) the optimal $\underline{m}$ is independent of $\overline{m}$, and visa versa.[3]

$$(\overline{m} - \underline{m})(h + q) > e(1 - \underline{m}) \tag{4.1}$$

[3] If (4.1) does not hold, the analysis would be very similar but more complicated. Since it does not add much intuitively, and due to space and other constraints, analyzing this case is beyond the scope of the present paper.



Proof: If θ is so small that $\overline{m}$ binds, $i = \overline{m}$ realizes that if she approves, everyone is forced to. The critical θ, θ_1, makes i indifferent:

$$\begin{aligned} v + h/2 - \overline{m}h - \theta_1 + e &= qn_F = q\left(\frac{v + h/2 - \theta_1}{h - e + q}\right) \\ \overline{m}h - e &= \left(\frac{h-e}{h-e+q}\right)(v + h/2 - \theta_1) \\ \theta_1 &= v + h/2 - (\overline{m}h - e)\left(\frac{h-e+q}{h-e}\right) \end{aligned} \quad (4.2)$$

For (4.2) to hold, $\overline{m}h - e > 0$. Welfare is then $u_1 = v + e - \theta$.

For a somewhat larger θ, less than $\overline{m}$ approves and only n_F contribute. Welfare is then (3.5), here defined as u_2. However, for a sufficiently large $\theta = \theta_2$, $n_F = \underline{m}$:

$$\begin{aligned} \underline{m}(h - e + q) &= v + h/2 - \theta_2 \\ \theta_2 &= v + h/2 - \underline{m}(h - e + q). \end{aligned}$$

For θ such that $n_F < \underline{m}$, $i \in (n_F, \underline{m})$ realizes that she is pivotal for integration to proceed. For the critical θ, θ_3, the marginal member $i = \underline{m}$ is indifferent:

$$v + h/2 - h\underline{m} - \theta_3 + \underline{m}e = 0 \Rightarrow$$

$$\theta_3 = v + h/2 - \underline{m}(h - e)$$

Welfare is then

$$\begin{aligned} u_3 &= \underline{m}v + \underline{m}^2 e + \underline{m}(1 - \underline{m})q - \underline{m}(\theta - h/2 + h\underline{m}/2) \\ &= \underline{m}\,(v + q + h/2 - \theta) - \underline{m}^2\,(h/2 - e + q)\,. \end{aligned}$$

Clearly, $\theta_3 > \theta_2$ and $\theta_2 > \theta_1$ under (4.1). Then, expected welfare is:

$$\frac{1}{\sigma}\left[\int_{-\sigma/2}^{\theta_1} u_1 d\theta + \int_{\theta_1}^{\theta_2} u_2 d\theta + \int_{\theta_2}^{\theta_3} u_3 d\theta\right] \tag{4.3}$$

By introspection, maximizing over $\underline{m}$ and $\overline{m}$ can proceed in steps. *QED*

4.2. Madatory Participation Rules

Let's first study the rule $\overline{m}$. If more than $\overline{m}$ approves, everyone has to integrate. If slightly less than $\overline{m}$ approves, only the approving members proceed. Since flexible integration leads to free-riding and too few members, the rule $\overline{m}$ may be good since it forces free-riders to participate. However, if the heterogeneity is large, then $\overline{m}$ implies that some members with very high costs are forced to participate. We may thus expect a low $\overline{m}$ to be optimal if the externalities are large, while a larger $\overline{m}$ is better when the heterogeneity is large. If q is small, outsiders benefit little and it is worthwhile to reduce $\overline{m}$ in order to make them participants and thus benefit. The following result shows that this intuition is indeed correct.

Proposition 7: It is optimal to set $\overline{m} < 1$ and according to (4.4). Thus, $\overline{m}$ should increase in h, decrease in e, and increase in q.

$$1 + \left(\frac{\overline{m}h - e}{h - e}\right)^2 - 2\overline{m} = 0 \tag{4.4}$$

Proof: Since $\overline{m}$ only affects θ_1, it is worthwhile to increase $\overline{m}$ as long as $u_2 > u_1$. This implies:

$$\left(\frac{v + h/2 - \theta_1}{h - e + q}\right)^2 h/2 + \left(\frac{v + h/2 - \theta_1}{h - e + q}\right) q > v + e - \theta_1$$

$$\left(\frac{\overline{m}h - e}{h - e}\right)^2 h/2 + \left(\frac{\overline{m}h - e}{h - e}\right) q > \left(e - h/2 + (\overline{m}h - e)\left(\frac{h - e + q}{h - e}\right)\right)$$

$$\begin{aligned} \left(\frac{\overline{m}h - e}{h - e}\right)^2 h/2 - \left(\frac{\overline{m}h - e}{h - e}\right)(h - e) + h/2 - e &> 0 \\ 1 + \left(\frac{\overline{m}h - e}{h - e}\right)^2 - 2\overline{m} &> 0 \end{aligned}$$

which clearly holds for small $\overline{m}$, while it does not hold when $\overline{m} \to 1$. The left-hand side is a u-shaped function in $\overline{m}$ which equals zero at $\overline{m} = 0$ and at some $\overline{m} \in (0, 1)$ where the slope of the function is negative and thus the second-order condition holds. *QED*[4]

4.3. Minimum Participation Rules

The rule $\underline{m}$ says that no subgroup of size less than $\underline{m}$ can integrate alone. Such a rule may appear odd when there are positive externalities from those who are participating, particularly if the heterogeneity is large such that some members

[4] In the proof, I assumed that $\overline{m}h - e > 0$. However, even if this were not the case, it is easy to show that $\overline{m} < 1$ is optimal.

will benefit a lot if they integrate. However, by requiring $\underline{m}$ to participate, these members realize that they cannot free-ride and that they are pivotal for any integration to proceed. This mitigates the free-rider problem, suggesting that $\underline{m}$ should be positive when externalities are positive and large, as were the case for the Kyoto protocol of climate gas reductions. However, a large heterogeneity means that even when less than $\underline{m}$ approves, some members may benefit a lot, and these should be allowed to contribute. Thus, if the heterogeneity is large, $\underline{m}$ should be small. The following proposition shows that this intuition is correct indeed.

Proposition 8: It is optimal that $\underline{m} > 0$ if $h < e + q$, i.e. if the heterogeneity is small and the externalities large.

Proof: The derivative of (4.3) w.r.t. $\underline{m}$ is positive whenever

$$(u_2 - u_3)\theta_2' + \int_{\theta_2}^{\theta_3} u_3' dt + u_3\theta_3' > 0$$

The first term is zero, while the second and the third can be calculated to be, respectively,

$$\underline{m}q\left[q + \underline{m}e - 3\underline{m}q/2\right] \text{ and}$$
$$-\underline{m}\left(\underline{m}h/2 + (1 - \underline{m})q\right)(h - e).$$

The sum of the terms are positive if

$$q\left[q + e - h\right] - \underline{m}\left(3q^2 - h\left(2q + e - h\right)\right)/2 > 0.$$

Clearly, if $\underline{m}$ is small, the expression holds if $q(q + e - h) > 0$.[5] *QED*

[5] If $\left(3q^2 - h\left(2q + e - h\right)\right)/2 > 0$, the second-order condition would hold and the optimal $\underline{m}$ will be interior. It is then easy to see that the optimal $\underline{m}$ increases in e.

5. The EU Treaty, Reviewed

The future of European Integration is fiercely debated. After some of the member states have rejected what other regarded as the next European Constitution, the question is whether a subgroup of the members should be allowed to go further than others. This is the idea of flexible integration (Dewatripont *et al.*, 1995).

This question motivated the analysis of this paper. Currently, the Treaty of the European Union does allow enhanced cooperation between a subset of the member states, under certain conditions. It should, according to Article 43 (j), be open to all members, should they wish to participate. Moreover, Article 43 (f) states that enhanced cooperation must "not constitute a barrier to or discrimination in trade", and it should, according to Article 43 (h), "respect the competences, rights and obligations of those Member States which do not participate therein". For this reason, the externalities may be believed to be positive.

A simple model is presented where flexibility and rigidity can be compared. Flexibility, it turned out, is better than rigidity if the heterogeneity is large and the externality small. Since enlargement of the union is likely to increase heterogeneity, a larger union should allow for more flexibility. Such flexibility must be committed to in advance, however, since after the heterogeneity between the member states has materialized, a majority of the countries tend to support rigidity too often compared to what is optimal.

The extensive use of qualified majority voting in the EU makes it possible for a sufficiently large majority to impose participation on the other members, even if Article 43 would allow them to cooperate alone. Such a "mandatory participation rule" combines aspects of flexible and rigid cooperation, and it is better than both, the analysis shows. Moreover, this majority requirement should indeed be a super-majority, exactly as practiced in the EU. This qualified majority rule should, according to the analysis, increase in the heterogeneity but decrease in the externality. After the heterogeneity between the members is realized, however, the majority of countries prefer a simple majority rule, thus imposing mandatory participation too often compared to what is optimal. Again, the constitutional rules should be determined behind the veil of ignorance to avoid excessive rigidity.

As one of the requirements for enhanced cooperation, Article 43 (g) states that at least eight members have to participate. Such minimum participation rules are also common for environmental agreements, where the externality is often large. The minimum participation rule may mitigate free-rider problems, the analysis shows, but the optimal threshold varies from policy to policy. In particular, the threshold should be larger if the externality is large, but smaller if the heterogeneity is large. When the heterogeneity between the countries is realized, however, there may exist no minimum

6. Concluding Remarks

The analysis in this paper shows that flexible cooperation is better than the rigid one-size-fits-all approach if the externality is small and the heterogeneity large. Both regimes, however, are special cases of the combination of mandatory and minimum participation rules which, together, implement any monotonic and symmetric participation mechanism. If the heterogeneity increases, the mandatory participation rule should increase while the minimum participation rule should decrease, thus allowing for more flexibility. If the externality increases, however, the mandatory participation rule should decrease while the minimum participation rule should increase, thereby mitigating the free-rider problem.

Although the model is motivated by the European Union, it can be applied to many other contexts. Should the labor standards in a firm, for example, be applied to union-members or to everyone? How does the answer to this question depend on the number of employees that are members of the union? Or, to take another example: Should representatives of a political party vote according to the party's majority decision, and which majority threshold should be used to decide upon this? By introspection, these questions raise dilemmas similar to those analyzed above, although the model may need to be modified. Thus, alternative contexts should motivate extending the model in future research.

Technically, the analysis stopped short of pointing out any possible interaction between mandatory and minimum participation rules. If the two thresholds were close, such that the number of participants were never strictly between them, then the optimal thresholds should be jointly determined, not separately as done above. Furthermore, since the above participation mechanism is unable to induce the first-best number of participants, future research should analyze other institutional details (more general mechanisms) that could improve upon mandatory and minimum participation rules.

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