Public Goods and Political Unions*

Catherine Hafer       Dimitri Landa
Politics, NYU         Politics, NYU

This Draft: October 2003
Preliminary: Comments Welcome

Abstract

We study a politico-economic model of federations with both federal and supplemental regional provision of a local public good with spillover effects. The conjunction of regional differences in median income levels and externalities of provision induces differences in preferences over federal and regional levels of provision and gives rise to re-distributive tensions within the federation. Although the voters' preferences are not single-peaked, we provide sufficient conditions for the existence of voting equilibrium exists and characterize its properties under alternative federal institutional arrangements. We show that the re-distributive tensions (1) have opposite re-distributive effects of federal mandates with spillovers; (2) lead to Pareto-suboptimal outcomes in selecting against sub-union enhanced co-operation agreements among member-regions; and (3) may explain the empirical puzzle whereby the U.S. states that are the net recipients of federal revenues are less supportive of the incumbent Presidential candidates than the states that are the net federal tax payers.

*Earlier versions of this paper were presented at the meetings of the Association of Public Economic Theory (July 2002), Caltech Conference on Constitutions (May 2003) and European Economic Association (August 2003). We are grateful to Eric Dickson, Bob Erickson, Eric Maskin, Mat McCubbins, and Antonio Rangel for useful comments and suggestions.
1 Introduction

The issue of the composition and structure of political unions or federations is as timely as it has ever been, with the expansion of the European Union leading to some of the most heated debates in European politics in the last decade. In many cases of political unions, the decisions to join and to admit are a function of distinctly political phenomena, such as the perception of a common military threat or the political salience of domestic ethnic groups with cultural or historic affinities for the neighbors. It is, nonetheless, the case that the unions that lead to the creation of common political institutions charged with the implementation of common economic policies are rarely products of political calculations alone,\(^1\) and call for the analysis of distinctly politico-economic mechanisms of union formation.

The existing political-economic explanations for the creation and expansion of such unions have, broadly construed, focused on two causal mechanisms.\(^2\) The first of these mechanisms, requiring more explicit cooperation among members, is that of economies of scale, which make it profitable for states to join forces in the selection of policy because the returns to joint economic action exceed the sum of the returns to the independent actions by the members. Examples of models that explore this mechanism of union-formation include Casella (1992) and Alesina and Spolaore (1997), which focus on the scale effects of trade and Persson and Tabellini (1996a and b), which draws on the scale effects of risk sharing. Difficulties in enforcing agreements on which such unions are based are considered in Bednar (2001) and De Figuiredo and Weingast (2001).

The second prominent political-economic mechanism of union formation focuses on the possibility of members enjoying spillovers in the provision of local and federal public goods in the federation. Papers exploring various elements of this mechanism include Alesina, Angeloni, and Etro (2001a and b) and Cremer and Palfrey (2002). Less explicitly cooperative than the first mechanism, the spillover model more immediately lends itself to the analysis of distributive properties of policy-making in federations - arguably,

---

\(^1\)This is, of course, true of the two most-studied examples of political unions: EU (see, e.g., Inman and Rubinfeld 1998, Emerson et al. 1988) and the US (e.g., Hardin 1999, Ch. 3).

\(^2\)This typology is somewhat orthogonal to those in well-known surveys of economic mechanisms underlying federal systems, e.g., Alesina, Perotti and Spolaore (1995), and Bolton, Roland and Spolaore (1996).
the central source of tension in its conception of federalism.

Our model of federations relies on the spillover mechanism for the explanation of federal structures and considers the incentives faced by the members in what Alesina, et al. (2001b) call “flexible unions” - those with the public good provision on both local and federal levels. We show that this empirically plausible structure of provision combined with the income heterogeneity across regions induces re-distributive tensions within the federation, with consequences that both resemble and significantly differ from those considered in the existing accounts of political economy of federations.

The re-distributive nature federal vs. local decision-making with respect to public good provision is also the key issue in the model of federal mandates by Crémer and Palfrey (2002). If the federal action in the “flexible unions” entails actual provision, federal mandates merely constrain the local provision to be above a particular level. In essence, the difference is one between funded and unfunded mandates, with the key substantive result in the Crémer and Palfrey model demonstrating the re-distributive nature of unfunded mandates in the presence of cross-regional spillovers: the high-demand regions decrease the public good production when they are able to implement federal mandates binding on lower-demanders (they refer to it as “the substitution principle”). The logic supporting the “the substitution principle” is also operative in our model, albeit with significant caveats. If the benefits of high federal mandates for the rich regions come in the Crémer and Palfrey model largely from spillovers from public good in the poorer regions, the benefits of federal over the local provision in our model come mainly from the fact that federal level of provision allows the rich regions to force the poor regions to share in the cost of provision, which would be beneficial even if the rich regions were enjoying no spillovers from the public good provided in the poor regions. We also show that as the economic primitives vary, the incentives supporting the substitution principle in the model with both levels of provision are distributionally complex: the substitution effect is sometimes induced by the decrease in the local provision by the high-demanders, and at other times, in the corresponding decrease by the low-demanders.

While a model of unfunded mandates offers an opportunity to study one of the central sources of tension within federations, direct federal (or inter-regional) public good provision is a prominent phenomenon in many federations.

---

3 Crémer and Palfrey (2002, p. 8).
tions and gives rise to conceptual issues and stylized facts that point to the existence of a relative advantage of a model of federal vs. local decision-making with both levels of provision. One such stylized fact is reported in a recent work by Lacy (2002) on the differences in support for the incumbent party presidential candidate in the “red” (net federal payer) and the “blue” (net federal recipient) states in the US. As Lacy notes,

It would make sense that the states that lose money to the federal government would be more likely to vote for the candidate who promised to cut taxes and reduce the scope of government, and that the states that gain from the federal government would support the candidate who would protect or increase federal spending. The evidence shows that such a story is exactly backwards. In a curious paradox ... Bush won most of the states that benefit from federal spending, while Gore won most of the states that bankroll the federal government. Perhaps more interesting, the states in which Al Gore did worse than Bill Clinton did in 1996 are the states that increased their net take from the federal government in the two years leading up to the 2000 election.\footnote{Lacy (2002, p.2)}

As we show below, the incentives faced by the states in the context of the relationship between the federal and local public good provision suggest that the observed outcome need not be paradoxical. If the public goods in question are substitutes, the presence of across-states externalities may make it so that the net receipt of federal funds to finance the public good provision, coming at some non-zero price, is in the end worse for the states than the costless free-riding on the spillovers from the public good provision in other states. If so, then, the states may be expected to respond precisely as they did in the 2000 elections.\footnote{Another explanation for this behavioral pattern could be differences in the demand for public good induced by the differences in production technologies across states, but such differences (not modeled in this paper) are likely to work in the direction opposite from that which would be necessary for the explanation. It seems difficult to imagine that poorer states, with, among other things, worse economic infrastructures, have a lower need for the public good component in their production technologies.}

Our model also allows us to offer a novel positive analysis of an issue of enhanced sub-union cooperation, which has become increasingly important...
in the European Union. As the EU continues to expand, it becomes more and more heterogenous and less able to reflect in its union-level political and economic decision-making the interests shared by particular segments of its membership. The consequence of this development is the interest in exploring the possibility of sub-union arrangements that would allow for the policy-coordination among some, but not all members. Examples of such coordination include the Shengen Treaty, the European Monetary Union and others. The typical approach to such sub-union arrangements, exemplified by the 2002 Treaty of Nice, which lays out the specific conditions that must be satisfied in order for such arrangements to be allowed, has been normative - from the standpoint of the possibility of their negative effects on other members of the union.⁶

As our analysis demonstrates, there exists another, completely distinct, set of incentives regarding the policy-making within a union which inhibits the occurrence of enhanced sub-union cooperation even when it directly benefits the non-participating members. Significantly, these incentives are distinct from those that induce local cheating on federal agreements studied in Bednar (2001) and De Figueiredo and Weingast (2001). We show that the non-participating members themselves may face a commitment problem, whereby they respond to the sub-union agreements with the down-ward adjustment of the federal tax rate and in so doing increase the opportunity costs of such agreements.⁷

In the first section to follow we present our results on the existence and the properties of the equilibrium in federations with joint provision. The following section addresses the issues of constitutional variation, including political decentralization and sub-union cooperation. The final section offers a brief discussion by way of a recap.

⁶The academic analysis of enhanced cooperation is scarce. It includes Dewatripont (1995) and, more recently, Bordignon and Brusco (2003), who study the possibility of negative effects on other union members in a dynamic framework.

⁷Other papers that are relevant to ours include Epple and Romano (2000) - a model of agent-level voluntary provision supplementing single-unit collective provision; Helsey and Strange (1998) - a model of single “private government” supplementing public sector services and leading to a drop in the public sector provision; and Besley and Coate (2000) - a model of regions receiving different levels of public good in the centralized provision.
2 The Model

2.1 Notation and Primitives

The sequence of the game is as follows. First, using majority rule, regions comprising the union choose their federally provided level of public good and, simultaneously, by intra-regional (“domestic”) majorities, regional levels of voluntary supplemental provision. Following the realization of the collective and the regional provision levels, citizens of the union engage in individual production of a consumable good that requires as its inputs the public good and private investment. Finally, the output goods are consumed by their respective producers.

There are \( n \) regions with \( m \leq n \) regions participating in the union and \( l \) members of the federation engaging in supplemental local provision. The corresponding sets member regions are denoted as \( N \), \( M \), and \( L \) respectively, with \( L \subseteq M \subseteq N \). In the interests of tractability, all regions are assumed to have equal populations.

\( c_j \) — consumption of median agent in region \( j \)

\[
c_j(x_j, y_j) = Ax_j^ay_j^b,
\] (1)

where \( y_j \) is public good enjoyed by \( j \) and \( x_j \) is the private investment by \( j \). Agents draw their utility exclusively from \( c \), with \( \frac{\partial u_j(c)}{\partial c} > 0 \) and \( \frac{\partial^2 u_j(c)}{\partial c^2} < 0 \), and \( a + b \geq 1 \).

Additionally, we use the following notation to denote the corresponding income variables:

- \( h_j \) is income of agent \( j \);
- \( H^T \) is the total income of federation;
- \( H = (H_1, H_2, ..., H_j, ..., H_m) \) is the vector of regional incomes, with \( H_j \) as the total income in a generic region \( j \).

We assume the simplest possible technology for producing public goods:

\( y = BI \),

where \( I \) is the level of investment into provision and \( B > 0 \) is multiplicative constant.

Let \( s_L < 1 \) be externalities from public goods produced in other localities, measured as the proportion of those goods that are enjoyed by another region. \( s_F(m) \) is the benefits derived from federally provided public goods,
measured as a proportion of the goods enjoyed. We interpret $s_F$ to reflect both the direct impact (from the federal provision in own district) and the indirect impact (via cross-regional spillovers from the federal provision in other districts). As a composite function of $m$, $s_F(m)$ reflects both the component increasing in $m$ to indicate benefits from coordination with other regions and decreasing in $m$ to indicate congestion. Unless indicated otherwise, $m$ is constant throughout our analysis, and so, we suppress the argument in $s_F(m)$ throughout. $s_L$ and $s_F$ can be treated as rates of substitution of own regions’ locally provided public good for other regions or federal public goods. We assume that the private investment is numeraire, i.e., the “monetary unit.”

The government faces a balanced budget constraint, so all revenue is invested in public goods at the corresponding level of government.

$$y_j = t^F H^T B s_F + B t_j H_j + s_L \sum_{k \in \mathbb{L} \setminus j} B t_k H_k$$

$$x_j = h_j (1 - t^F - t_j)$$

where $t^F$ is federal tax rate and $t = (t_1, t_2, ... t_j, ... t_m)$ is the vector of local tax rates; $t_j, t^F \in [0, 1]$.

### 2.2 The Politico-Economic Equilibrium

The Politico-Economic Nash Equilibrium (PENE), is the symmetric subgame-perfect Nash Equilibrium in undominated strategies, $(t^{F*}, t^*)$, such that the federal tax rate $t^{F*}$ is chosen by majority rule and, for all $j$,

$$t^*_j(t_{-j}, t^F; s_F(\cdot), s_L, H, a, b) = \arg \max c_j(t_j, t_{-j}, t^F; \cdot)$$

and in any pair-wise vote between $t^{F'}$ and $t^{F''}$, every voter chooses

$$\arg_{(t^{F'}, t^{F''})} \max c_j(t^F, t^*(\cdot), \cdot).$$

Solving by backward induction, we find agent $j$’s preferred tax rate in region $j$, $t_j$, given $t_{-j}$ and $t^F$.

Substituting (2) into (1), yields

$$c_j(t^F, t, \cdot) = A((1 - t^F - t_j)h_j)^a(B(t^F H^T s_F + t_j H_j + s_L \sum_{k \in \mathbb{M} \setminus j} t_k H_k))^b$$

7
Since voters’ utilities are assumed to be maximized at the greatest feasible value of consumption, agent $j$’s problem is, then:

$$\max_{t_j} \left[ A((1 - t^F - t_j)h_j)^a(B(t^F H^T s_F + t_j H_j + s_L \sum_{k \in M \setminus j} t_k H_k))^b \right].$$

To locate any interior solution, we obtain the FOC, which (after reducing and simplifying) yields:

$$t_j = \begin{cases} \frac{b}{a + b} \left[ b(1 - t^F) - a(t^F H_j^T s_F + s_L \sum_{k \in M \setminus j} t_k H_k) H_j \right] \\ 0 \quad \text{otherwise} \end{cases}$$

(4)

Note that $t_j$ is independent of $h_j$. This is because, as a consequence of the regions having identical marginal rates of substitution between the private and public investment, and of the tax being a flat rate on endowment, the domestic politics within regions (i.e., politics of the determination of the supplemental levels of public good), is essentially trivial: holding constant the federal tax $t^F$, agents within regions will have identical preferences over internal taxation levels financing the supplemental provision of the public good. (This is not the case across regions because of the possibility of free-riding implicit in the inter-regional spillovers.)

We can now state the following lemma, which is instrumental in proving the main results of the model:

**Lemma 1** In any symmetric equilibrium: (a) The participation in the supplemental local provision of the public good is monotonically increasing in regional income $H_j$; (b) Among the participating regions, the equilibrium supplemental local levels of public good are monotonically increasing in regional income $H_j$.

**Proof.** (a) The proof is by contradiction. Suppose for some pair of regions $j$ and $k$, $H_j > H_k$ and $t_k H_k > 0$. Suppose, further, that $t_j H_j = 0$. Then, from (4)

$$\frac{b}{a + b} (1 - t^F) H_j \leq \frac{a}{a + b} (t^F H_j^T s_F + s_L \sum_{j \in M \setminus j} t_l H_l).$$

(5)
From $H_j > H_k$,

$$\frac{b}{a+b}(1-t^F)H_k < \frac{b}{a+b}(1-t^F)H_j.$$ 

Combining with (5), we get

$$\frac{b}{a+b}(1-t^F)H_k \leq \frac{a}{a+b}(t^F H^T s_F + s_L \sum_{M\setminus j} t_i H_i).$$  

(6)

Because $t_j H_j = 0$,

$$s_L \sum_{M\setminus j} t_i H_i = s_L \sum_{M} t_i H_i = s_L \sum_{M\setminus k} t_i H_i + s_L t_k H_k.$$

Substituting back into (6), we have:

$$\frac{b}{a+b}(1-t^F)H_k < \frac{a}{a+b}(t^F H^T s_F + s_L \sum_{M\setminus k} t_i H_i + s_L t_k H_k).$$

Re-arranging:

$$\frac{b}{a+b}(1-t^F)H_k - \frac{a}{a+b}(t^F H^T s_F + s_L \sum_{M\setminus k} t_i H_i) < \frac{a}{a+b}s_L t_k H_k. \quad (7)$$

From (4) and $t_k H_k > 0$, the left-hand side of this inequality must be equal to $t_k H_k$. Since, by assumption, $s_L < 1$, it follows that $\frac{a}{a+b}s_L < 1$, and so (7) is a contradiction.

(b) Suppose $H_j > H_k$. If $t_k H_k = 0$, then, by part (a), $t_j H_j \geq t_k H_k$. If $t_k H_k > 0$, then, by part (a), $t_j H_j > 0$.

$$t_k H_k = \frac{b}{a+b}(1-t^F)H_k - \frac{a}{a+b}(t^F H^T s_F + s_L \sum_{M\setminus j,k} t_i H_i + t_j H_j))$$

$$t_j H_j = \frac{b}{a+b}(1-t^F)H_j - \frac{a}{a+b}(t^F H^T s_F + s_L \sum_{M\setminus j,k} t_i H_i + t_k H_k))$$

Substituting $t_k H_k$ into $t_j H_j$ and re-arranging, we get

$$t_j H_j = \frac{a+b}{a+b+as_L}(\frac{b}{a+b}(1-t^F)H_j - \frac{a}{a+b}(t^F H^T s_F + s_L \sum_{M\setminus j,k} t_i H_i))$$

$$+ \frac{(a+b)^2}{(a+b+as_L)(a+b-as_L)} \frac{a}{a+b}s_L \frac{b}{a+b}(1-t^F)(H_j - H_k).$$
Similarly,
\[
t_k H_k = \frac{a + b}{a + b + as_L} (-b \frac{a}{a + b}(1 - t^F) H_k - \frac{a}{a + b}(t^F H^T s_F + s_L \sum_{M \cup j, k} t_l H_l)) + (a + b)^2 \frac{a}{a + b + as_L} \frac{b}{a + b + as_L} (a + b - as_L) (1 - t^F)(H_k - H_j).
\]

Comparing these two expressions, it is easy to see that from \( H_j > H_k \), and \( a, b, s_L, s_F > 0 \), and \( t^F < 1 \), it follows that \( t_j H_j > t_k H_k \).  

Let \( L(t^F) \) be the set of members which engage in supplemental local production, i.e., for which \( t_j > 0 \). Let \( |L(t^F)| = l \). If we index the regions from richest to poorest, i.e., so that \( H_1 \geq H_2 \geq ... \geq H_l \geq ... \geq H_m \), the key consequence of this lemma for the present model is that \( l \) must be the highest integer s.t. \( t_l H_l > 0 \), i.e., it has to be such that both \( t_l H_l > 0 \) and \( t_{l+1} H_{l+1} \leq 0 \). Hence, \( \sum_{j \in M} t_j H_j = \sum_{j \in L} t_j H_j \), and from (4) and symmetry, we can write
\[
\sum_{j \in M} t_j H_j = \sum_{j \in L} t_j H_j = \frac{1}{a + b + as_L(l - 1)} (b(1 - t^F) \sum_{k \in L} H_k - as_F t^F H^T l).  \tag{8}
\]

Substituting (8) into (4) and solving for \( t_j H_j \) where \( t_j > 0 \), we get:
\[
t^*_j H_j = (1 - t^F) H_j - \frac{a}{b} s_F t^F H^T - \frac{as_L}{a + b + as_L(l - 1)} ((1 - t^F) \sum_{k \in L} H_k - \frac{a}{b} s_F t^F H^T l),  \tag{9}
\]
where, from the above ordering of \( H_j \) and (9), \( l \) and \( L(t^F) \) are formally defined by the following system of inequalities:
\[
\begin{cases}
(1 - t^F) H_l - \frac{a}{b} s_F t^F H^T > as_L(a + b + as_L(l - 1))^{-1} ((1 - t^F) \sum_{k \in L} H_k - \frac{a}{b} s_F t^F H^T l) \\
(1 - t^F) H_{l+1} - \frac{a}{b} s_F t^F H^T \leq as_L(a + b + as_L(l - 1))^{-1} ((1 - t^F) \sum_{k \in L} H_k - \frac{a}{b} s_F t^F H^T l)  \tag{10}
\end{cases}
\]

Together (9) and (10) determine the symmetric Nash equilibrium in the simultaneous-move local provision game. Given this solution to the subgame, we proceed to determining the agents’ preferences over federal tax
rates. These preferences depend critically on the relative merits, from an individual’s point of view, of the federal and the local means of provision. Assuming that an agent wishes to procure more public good, she will prefer to do so through the level of government that gives her the higher return on her tax dollar. Whether that is federal or local government depends on the values of the primitives, given equilibrium behavior.

**Lemma 2** For each \( t^F \), there is a unique \( L(t^F) \) consisting of \( l(t^F) \) richest regions.

**Proof.** Fix \( t^F \). We prove by contradiction. Let \( L^* \) and \( L^{**} \) both satisfy (10). From Lemma 1, participation is monotonic, so, without loss of generality, let \( L^* \subseteq L^{**} \) and \( l^* \leq l^{**} \).

First, we prove that \( \sum_{L^*} t_k^* H_k = \sum_{L^{**}} t_k^{**} H_k \). By assumption, \( t_j^{**} > 0 \) and \( t_j^* = 0 \). From (4), \( \sum_{L^*} t_k^* H_k > \sum_{L^{**} \setminus \{t_j^{**}\}} t_k^{**} H_k \). \( \exists j \leq l^* \), s.t. \( t_j^* > t_j^{**} \), which, in turn, implies that \( \sum_{L^{**} \setminus j} t_k^{**} H_k < \sum_{L^{**} \setminus j} t_k^* H_k \), and from (4), \( t_j^* \) and \( t_j^{**} \) are s.t.

\[
\sum_{L^*} t_k^* H_k = \sum_{L^{**}} t_k^{**} H_k.
\]

By assumption, \( l^{**} \)'s best response to \( \sum_{L \setminus \{t_j^{**}\}} t_k H_k = \sum_{L^{**} \setminus \{t_j^{**}\}} t_k^{**} H_k \) is \( t_j^{**} \). Call it \( t_j' \). It follows that \( t_j'H_j^* = \sum_{L^*} t_k^* H_k - \sum_{L^{**} \setminus \{t_j^{**}\}} t_k^{**} H_k \) is a contradiction. ■

Let \( l_{\text{max}} = |L(0)| \) be the number of regions that engage in local provision when there is no federal provision of the public good, i.e. such that

\[
H_{l_{\text{max}}} \geq \frac{a s_L}{a + b + a s_L (l_{\text{max}} - 1)} \left( \sum_{1}^{l_{\text{max}}} H_k \right) \geq H_{l_{\text{max}} + 1}
\]

The conjunction of Lemmas 1 and 2 implies that the range of \( t^F \) can be partitioned into \([0, t_{l_{\text{max}}}], [t_{l_{\text{max}}}, t_{l_{\text{max}} - 1}], ..., [t_F, 1]\), so that each of these intervals defines a range of \( t^F \), corresponding to a unique \( L \). These intervals are bounded by the federal tax rates, \( t_j^F \) (not necessarily optimal, from region \( j \)'s standpoint), at which an additional region \( j \) ceases local provision, i.e.,
at which $t_j^*(i_j^F) = 0$. Substituting $t_j^* = 0$ and $l = j$ into (9) and solving for $t^F(\equiv i_j^F)$, we obtain

$$i_j^F = \frac{(a + b + as_L(j - 1))H_j - as_L\sum_{1}^{j} H_k}{(a + b + as_L(j - 1))H_j + (a + b - as_L)\frac{a}{b} s_F H^T - as_L\sum_{1}^{j} H_k},$$

(11)

which $\forall j \leq l_{\text{max}}$ is greater than 0. Then, for $t^F < i_j^F$ and $t_j \in [0, t_j^*(i_j^F, .))$, $j$ wishes to procure more public good through increased taxation.

**Lemma 3**

(1) Locally optimal federal tax rates for all regions that do not engage in local provision at those tax rates are identical.

(2) The orderings of any two locally optimal $t^F$ by regions that do not engage in local provision at either of those two values of $t^F$ are identical.

**Proof.**

(1). $\forall t^F$, we have defined a unique $L(t^F)$. Consider $j > l_{\text{max}}$. $\forall t^F, t_j^*(t^F) = 0$.

$$c_j(t^F, t^*(t^F), L(t^F))) = A((1 - t^F)h_j)^a(B(t^F H^T s_F + s_L \sum_{L^*(t^F)} t_k H_k))^b.$$

Substituting $\sum_{L^*(t^F)} t_k H_k$ from (8):

$$c_j(.) = A((1 - t^F)h_j)^a(B(t^F H^T s_F + \frac{s_L(b(1 - t^F) \sum_{L(t^F)} H_k - as_F t^F H^T l)}{a + b + as_L(l - 1)})^b).$$

Since $L(t^F)$ and $l$ are constant on each subinterval, we can find all local maxima that do not occur on boundaries of the partition by finding $t^F$ s.t. ...
\( \frac{\partial c_j}{\partial t^F} = 0 \) for \( t^F, L(t^F) \). Re-arranging terms, we obtain:

\[
\frac{\partial c_j}{\partial t^F} = ABh_j((1 - t^F)h_j)^{a-1} \left[ B(t^F H^T s_F + \frac{S_L}{a + b + as_L(l - 1)}(b(1 - t^F) \sum_{L(t^F)} H_k - as_F t^F H^T l)) \right]^{b-1} \\
- a(t^F H^T s_F + \frac{S_L}{a + b + as_L(l - 1)}(b(1 - t^F) \sum_{L(t^F)} H_k - as_F t^F H^T l)) \\
+ (1 - t^F) b(H^T s_F - \frac{S_L}{a + b + as_L(l - 1)}(b \sum_{L(t^F)} H_k + as_F H^T l)) \\
\]

\( \frac{\partial c_j}{\partial t^F} = 0 \) if and only if the last two lines of this expression are equal to 0. Since their value does not depend on any region-specific features, the solutions \( t^F \) will be the same \( \forall j \notin L(t^F) \), which completes the proof of part (1).

(2). Consider two tax rates, \( t^{F'} \) and \( t^{F''} \), such that some agent \( j \)'s consumption is locally maximized at each and another agent \( k \notin L(t^{F'}) \cup L(t^{F''}) \). Without loss of generality, let \( c_j(t^{F'}, .) > c_j(t^{F''}, .) \). Evaluating (12) at the optimal values (13) for \( t^{F'} \) and \( t^{F''} \) and simplifying, \( c_j(t^{F'}, .) > c_j(t^{F''}, .) \) yields

\[
\left[ \frac{(a + b - as_L)s_F H^T - bs_L \sum_{L''} H_k}{(a + b - as_L)s_F H^T - bs_L \sum_{L''} H_k} \right]^a \left[ \frac{a + b + as_L(l'' - 1)}{a + b + as_L(l' - 1)} \right]^b > 1.
\]

Since this condition is independent of \( h_j \) and \( H_J \), preferences over \( (t^{F'}, L') \) pairs are the same for all \( j \) not contributing locally at those values of \( t^F \), which completes the proof.

The following lemma provides a sufficient condition to guarantee that if a region is providing the public good locally at a given federal tax rate, then it strictly prefers a higher federal tax rate. By implication, each region’s most-preferred federal tax rate is one at which it will not find it necessary to engage in supplemental local provision. These results are instrumental in proving the subsequent proposition, which specifies a sufficient condition for regions’ most-preferred federal tax rates to be increasing in regional income, i.e., for richer regions to prefer (weakly) higher federal taxes.
Lemma 4 If $\frac{\partial c_j(t_F^*, t^*(t_F))}{\partial t_F} > 0$ at $t_F = 0$, then

1. $\forall j, \forall t_F < \hat{t}_j^F, \frac{\partial c_j(t_F^*, t^*(t_F))}{\partial t_F} > 0$
2. $t_j^{F*}(t^*, .) \geq \hat{t}_j^F(t^*, .)$

Proof. First, consider $j$ such that $\hat{t}_j^F = 0$. Then (1) is vacuously satisfied and (2) is tautological. Suppose $\hat{t}_j^F > 0$. The net benefit of a marginal increase in $t_F$ must be smaller for the richer region because (1) its direct cost is greater because tax is proportional; and (2) the sum of the off-setting decrease in own local provision and spillovers from other regions’ local provision is greater; while (3) the marginal increase in the amount of federal public good is the same across regions. It follows, then, that $\frac{\partial c_j(t^{F*}, .)}{\partial t_F} > \frac{\partial c_1(t^{F*}, .)}{\partial t_F}$. But, given that the sum of other regions’ local provision and 1’s local provision are both linear in $t_F$, decreasing in $t_F$, continuous, and bounded below by 0, and given that the marginal cost of $t_F$ is constant, the marginal benefit of federal provision must be increasing on $[0, t_F^1)$, i.e., $\frac{\partial c_j(t^{F*}, .)}{\partial t_F} > 0$. It must, therefore, be that $\frac{\partial c_j(t^{F*}, .)}{\partial t_F} > 0$, establishing (1). (2) is an immediate implication of (1).

The next result gives a sufficient condition for the federal tax rates to be increasing in regional income. This condition also turns out to be sufficient for guaranteeing the existence of the voting equilibrium in the federal provision subgame (Proposition 2 below). Without such a restriction on the parameters of the model, it is possible for the benefits received through central provision of the public good to be so small that the richest regions prefer pure local provision, i.e. $t_F = 0$. In such an instance, poorer regions may still desire federal provision because their share of the cost of federal provision is smaller than that of the richer regions.

Proposition 1 $t_j^{F*}(t^*, .)$ is weakly increasing in income if $\frac{\partial c_1(t^F, t^*(t_F))}{\partial t_F} > 0$ at $t_F = 0$.

Proof. We begin by proving the following claim:

Claim: The richest region’s most-preferred federal tax rate is either 0 or $\frac{b}{a+b}$.

Proof: From the richest region’s equilibrium strategy in the local provision subgame, there must exist $t_F^1$ s.t. $t_1^1(t_F^1) > 0$. Fix such a $t_F^1$. Suppose next that $\frac{\partial c_1(t^{F*}, t^*(t_F))}{\partial t_F} > 0$ at $t_F^1$. An additional unit of federally provided public good has constant cost for region 1. Because aggregate local provision of
implies that the requirement simultaneously satisfy the first order condition, where on \( \hat{t}^*(3) \), we get which of them corresponds to the global maximum for \( c \). From Lemma 4, \( t_{j}^{F^*} = \frac{b}{a+b} \). Suppose now that \( \frac{\partial c_j(t_F^*, t_{F^*}^*)}{\partial t_{F^*}} \leq 0 \). Then \( j \) prefers spending the marginal unit on local rather than federal provision. The cost of a unit of federal good is constant, but the benefits of additional federal provision are (partially) offset by reductions in other regions’ local provision. Thus, as we decrease \( t_F \), other localities produce weakly more public good, and the benefit of decreasing \( t_F \) weakly increases, as we further decrease \( t_F \). Since the cost of local provision is constant wrt \( t_F \), if \( j \) prefers local to federal provision at \( t_F \), and \( j \) is a local provider, then \( j \) must prefer local to federal provision at \( t_F^* \), \( t_F^* < t_F \). This completes the proof of the claim.

By Lemma 4, \( t_{j}^{F^*} = \frac{b}{a+b} \) and \( \hat{t}_j^* \). From Lemma 1, \( t_{j+1}^{F^*} \leq \hat{t}_j^* \) \( \forall j \leq l_{max} \). From Lemma 3, region \( j + 1 \) has a local maximum at every local maximum of \( j \) on \([\hat{t}_j^*, 1]\), and the greatest of them is identical to that of \( j \). From Lemma 4(1), if \( j + 1 \) has another local maximum, it must be on \([\hat{t}_{j+1}^*, \hat{t}_j^*]\). Thus, either \( t_{j+1}^{F^*} = t_j^{F^*} \) or \( t_{j+1}^{F^*} < t_j^{F^*} \). \( \forall j > l_{max} \). Lemma 3 implies that \( j \)’s greatest local maximum on \([\hat{t}_{l_{max}}^*, 1]\) is at \( t_{l_{max}}^{F^*} \). Thus, either \( t_j^{F^*} = t_{l_{max}}^{F^*} \) or \( t_j^{F^*} < t_{l_{max}}^{F^*} \). \( \implies \)

Consider the case in which condition \( \frac{\partial c_j(0, l)}{\partial t_F} > 0 \) holds, that is, that \( t_j^{F^*} \in [\hat{t}_j^*, 1]\) and \( j \) does not contribute at \( t_j^{F^*} \). We have identified a unique \( L(t_F) \), and a partition of \([0, 1], \hat{t}_F \), such that \( L(t_F) \) is constant on each sub-interval. We can, then, find the federal tax rate that maximizes \( j \)’s consumption \( t_j^{F^*} \in [\hat{t}_j^*, 1]\) by identifying the local extrema on \([\hat{t}_j^*, 1]\) and determining which of them corresponds to the global maximum for \( j \). Substituting (8) into (3), we get \( j \)’s consumption level, \( c_j \), when \( j \) is not a supplemental supplier:

\[
c_j(t_F) = A((1 - t_F)h_j) a(B(t_F H^T s_F)
+ \frac{S_L}{a + b + a s_L (l - 1)} (b(1 - t_F) \sum_{k \in L} H_k - a s_F t_F H^T l)) b
\]

A federal tax rate \( t_j^{F^*} \) corresponding to a local extremum for \( j \) must simultaneously satisfy the first order condition, where \( L = L(t_j^{F^*}) \) from (10), and the requirement \( t_j^{F^*} \in [\hat{t}_{l+1}^*, \hat{t}_l^*] \) where \( l = |L(t_j^{F^*})| \). The first order condition
is equivalent to

\[ t^{F*}_j = \frac{bH^T s_F(a + b - as_L) - (a + b)bs_L \sum_{L(t^{F*}_j)} H_k}{(a + b)H^T s_F(a + b - as_L) - (a + b)bs_L \sum_{L(t^{F*}_j)} H_k} > 0. \tag{13} \]

The second condition is equivalent to the system of inequalities \( t^{F*}_{l+1} \leq t^{F*}_j < t^{F*}_l \). Substituting from (11) and rearranging terms, we obtain

\[ (a+b+as_L(l-1))H_{l+1} < (a+b-as_L)H^T s_F-bs_L \sum_{L} H_k < (a+b+as_L(l-1))H_l. \tag{14} \]

Having identified the local extrema for \( j \) on \([\hat{t}^F_j, 1] \), and given that \( t^{F*}_j \in [\hat{t}^F_j, 1] \), we can determine which one is the global maximum for \( j \) by directly comparing consumption at each of the candidate tax rates.

Federal tax rate is not chosen by a single region, however; it is determined by majority rule in the federation as a whole. First recall that voters in the same region share the same induced preferences over \( t^F \). The outcome of majority rule in the federation as a whole is, therefore, identical to the outcome of weighted voting among member states, where weights are proportional to states’ populations. Moreover, since, by assumption, all regions have equal populations, we can restrict our attention to simple majority rule among regions. Given the possible multiplicity of local optima, however, we cannot rely on Black’s theorem for aggregating the preferences over \( t^F \). Nonetheless, as the following proposition shows, the majority core is well-defined when the sufficiency condition identified in Proposition 1 holds.

**Proposition 2** Suppose that \( \frac{\partial c_1(t^F, t^*(t^F))}{\partial t^F} > 0 \) at \( t^F = 0 \). Then there exists a Condorcet winner, which coincides with the global optimum of the median voter.

**Proof.** Let \( t^{F*} \) be the globally optimal federal tax rate for the region with median income. By Lemma 4, \( t^{F*} > \hat{t}^F_{\text{median}} \). By Lemma 1, for all regions \( j \) poorer than the median, \( t^{F*} > \hat{t}^F_j \). From Lemma 3, the median region’s preference for \( t^{F*} \) implies that all poorer regions also prefer \( t^{F*} \) to any \( t^F > t^{F*} \). Hence \( t^{F*} \) beats any \( t^F > t^{F*} \) by majority rule. For region \( j \) richer than the median, \( j \) either engages in local provision at \( t^{F*} \), and hence, from Lemma 4, prefers \( t^{F*} \) to any \( t^F < t^{F*} \), or does not engage in local
provision, in which case it also has a local optimum at $t^F_*$. From Lemma 1 and Lemma 3 (1), no region richer than the median has a local optimum that is not also a local optimum of the median. By Lemma 3 (2), any region $j$ that is richer than the median and does not engage in local provision at $t^F_*$ prefers $t^F_*$ to any $t^F \in [\hat{t}^F_j, t^F_*)$. From Lemma 4, $j$ also prefers $\hat{t}^F_j$ to any $t^F < \hat{t}^F_j$, and therefore prefer $t^F_*$ to any $t^F < \hat{t}^F_j$. Thus, all regions richer than the median prefer $t^F_*$ to any $t^F < t^F_*$, and so $t^F_*$ is the Condorcet winner.

Figure 1 depicts graphs of $c(t^F)$ for three regions satisfying the condition in the statement of the proposition. The region 1, which has the highest income, has a unique maximum, and all other regions have a local maximum at the same tax rate. Regions 2 and 3 also have a local maximum at a lower tax rate, at which the richest region would engage in some local provision of the public good. The graph depicts a situation in which the poorest region prefers the lower federal tax rate because it can enjoy benefits from the richest region’s local provision without bearing any of the costs.

Because the most-preferred federal tax rate of the region with the median income beats every other possible tax rate under majority rule, we can restrict our attention to identifying the globally optimal federal tax rate for the median region. Let $\hat{t}^F_M$ represent the lowest federal tax rate at which the median region does not provide public goods at the local level (possibly 0). Define $T = \{t^F | t^F > \hat{t}^F_M \text{ and } t^F \text{ satisfies (13) and (14)}\}$. Let $t^F_\max = \arg_T \max c_M(t^F, t^*(t^F))$, the globally optimal federal tax rate for the median region. The following proposition summarizes the preceding discussion, characterizing the politico-economic equilibrium of the (fixed membership) game when $\frac{\partial c_1(0, \cdot)}{\partial t^F} > 0$ holds:

**Proposition 3** The following conditions obtain in the PENE:

1. The outcome of majority rule is $t^F_\max \leq \frac{b}{a+b}$.
2. Regions in $L(t^F_\max)$ engage in a supplemental provision of the public good with positive region-specific supplemental provision levels defined by condition (9) evaluated at $t^F_\max$.
3. The majority of the members of the federation do not engage in supplemental production.
Figure 1: Preferences over federal tax rates

c(t^F)

1
2
3

t^F \quad b/(a+b) \quad t^F

18
Proposition 3 characterizes the strategic incentives faced in the federal systems with two levels of public good provision by the regions heterogeneous in income. Under the condition that ensures the existence of the Condorcet winner in the federal provision subgame, a majority of federation members select a low federal tax rate, anticipating that a minority of wealthier members will provide additional amounts of the public good. Because members enjoy positive externalities from public goods provided by other regions, free-riding on the wealthier members at a lower level of provision is sometimes more attractive for the majority than a more efficient level of provision that entails paying a higher federal tax. It is always the case that, in equilibrium, a majority of member regions do not locally supplement the provision of the public good, and all regions that do provide the good locally favor increasing the federal tax rate.

The properties of PENE identified in Proposition 3 suggest that the joint federal and local provision has distributive consequences that are the opposite of those of a federal mandate. Whereas, as Cremer and Palfrey (2002) show, the use of federal mandates favors the rich regions over the poorer regions by allowing the former to enjoy the spillover effects from forcing high levels of local provision in the poorer regions, our analysis implies that the poorer regions may find it useful to use the policy tools offered by the joint federal and local provision to “free ride” on the local provision in the richer regions. Note that when \( \frac{\partial c_1(0, \cdot)}{\partial t_F} \leq 0 \), i.e., when the condition that ensures that \( t_F^* \) is increasing in \( j \)'s income is violated, either the free-riding by the poorer regions persists (whenever \( t_F^* \) is increasing in \( j \)'s income) or the rich regions’ preferred federal tax rate is 0 and weakly below that preferred by the poorer regions. In the latter case, the distributive effects of joint provision once again favor the poorer regions, but through a more familiar directly redistributive causal mechanism. As a matter of institutional choice, we should, then, expect the federations that are dominated by the poorer regions to favor the joint provision systems over the mandate systems, and vice versa.

3 Constitutional Variation

3.1 Federal (De-)centralization

Our next result is, in the light of Proposition 3, not unexpected. Suppose that members of the federation could determine their preferred federal structure:
choosing between the centralized structure that reserves the authority to provide public goods for the federal level alone ("rigid union"), and the more decentralized "flexible union" modeled in our game. As the proposition below shows, the regions' preferences will vary with both their economic and the political circumstances. Call regions $j$ such that $t_F^* \geq b \frac{a}{a+b}$ "rich" and regions $k$ such that $t_F^* < b \frac{a}{a+b}$ "poor." Then:

Proposition 4 When $c_M(b \frac{a}{a+b}, 0) \geq c_M(t^*, t^*(.))$ for all $t^F \in T^F$, all members of the federation are indifferent with respect to the centralization in the provision of the public good. Otherwise, the rich regions prefer greater centralization, while the poor regions greater decentralization in provision.

Proof. Consider first the case when the rich regions are pivotal. Then, both they and the poor regions are indifferent between the flexible and the rigid unions, since in both cases, the rich regions will be dictating the "high" level of federal provision. Suppose, however, that the poor regions are pivotal. Then, they must have a strict preference for the flexible unions, in which they set a "low" federal provision level and enjoy the spillover effects from the supplemental provision by the rich regions, over the rigid unions, in which, in the absence of "free" spillovers and given the identical marginal rates of substitution between the public and the private investment in their utility functions, they must drive up the federal level of provision to the point preferred by the rich regions. For the same reason, the rich regions would have the opposite preference.

This result contrasts with that of Alesina et al. (2001b), who argue that the flexible union must be Pareto-preferred to the rigid union. As Proposition 4 shows, that conclusion cannot be sustained in the presence of the strategic effects we characterize in this section.

3.2 Enhanced Sub-union Cooperation

Our model offers an endogenous rationale for the possibility of enhanced sub-union cooperation. Suppose, throughout this subsection, that $\frac{\partial c_1(0, .)}{\partial t^F} \leq 0$. If $t^F$ is controlled by the relatively poor regions, and extra-local public good provision is more efficient, there is a subset of (relatively wealthy) federation members which would have preferred a higher $t^F$ and which could benefit from "joining forces" in the extra-local albeit sub-union provision. To consider the prospect of such agreements, assume that there exists a group of
members (a “sub-union”) all which are potentially interested in enhanced sub-union cooperation (note that we do not assume that it necessarily includes all members of the federation that could benefit from it). Let $SU \subseteq M$ be the set of sub-union members with $|SU| = SU$ and let $H^{SU}$ be the total income in $SU$. Assume that membership in the sub-union is fixed. The sequence of the game is as follows: first, members of the federation choose $t_F$ by majority rule of the federation; then, members of the sub-union choose $t^{SU}$ by consensus, followed by individual federation members’ choices of their local tax rates. Assume that a member of $SU$ obtains benefits from the sub-union provision of public good at a rate of $s_{SU}$ per unit of resource devoted to provision. Members of $M \setminus SU$ obtain benefits from $SU$’s provision at rate $s_L$.

To keep things simple and to capture the voluntary nature of enhanced cooperation agreements, we assume that the sub-union tax rate is the most preferred $t^{SU}$ of the lowest income member $j \in SU$. Then, $t^{SU}$ is such that $t_j = 0$.

Consider the case where members of $SU$ prefer funding the public good provision through the federation to funding it through the sub-union and funding it through the sub-union to funding it locally. Does optimal $t_j^F$ decrease in $t^{SU}$? Suppose the pivotal federation member is a not a local provider. Is it enjoying more spillovers with enhanced cooperation ($t^{SU} > 0$) than without it ($t^{SU} = 0$)? Because the pivotal federation member is not providing locally, it has at least a weak preference for transferring the marginal unit of endowment to private investment and away from the public investment.\footnote{The restriction to Nash behavior is capturing the logic of a commitment problem between the pivotal member of the federation and the potential members of the sub-union.} If so, then, if it enjoys more spillovers, it would decrease $t^F$, and in so doing, increase the costs and so dampen the prospects of enhanced cooperation. We prove then, the following proposition:

**Proposition 5** (1) The strategic responses of non-participating members of the federation may inhibit the prospects of Pareto-improving enhanced cooperation agreements. (2) Such agreements are more likely to occur when the spillover effects for union non-participants are smaller.

**Proof.** The overall size of spillovers enjoyed by a federation member who does not participate in the sub-union is $s_L(t^{SU}H^{SU} + \sum_L t_kH_K)$. To evaluate
how it responds to enhanced cooperation, we begin by deriving the optimal
and equilibrium values of its components.

For a generic \( j \in SU \) (i.e., not necessarily the marginal member),

\[
c_j = A((1 - t_j - t^{SU} - t^F)h_j)^a[B(t_j H_j + s_{SU} t^{SU} H^{SU} + s_F t^F H^T + s_L \sum_{k \in L \setminus j} t_k H_k)]^b.
\]

\( j \)'s FOC for consumption optimization with respect to \( t_j \) yields

\[
t_j H_j = \begin{cases} 
\frac{1}{a+b} \left[ (1 - t^{SU} - t^F) b H_j - a(s_{SU} t^{SU} H^{SU} + s_F t^F H^T + s_L \sum_{k \in L \setminus j} t_k H_k) \right] \\
\quad \text{if } 1 - t^{SU} - t^F \geq \frac{a}{b H_j} (s_{SU} t^{SU} H^{SU} + s_F t^F H^T + s_L \sum_{k \in L \setminus j} t_k H_k) \\
0 \quad \text{otherwise}
\end{cases}
\]

For \( i \notin SU \),

\[
c_i = A((1 - t_i - t^F)h_i)^a[B(t_i H_i + s_F t^F H^T + s_L(t^{SU} H^{SU} + \sum_{k \in L \setminus i} t_k H_k)]^b.
\]

Solving \( i \)'s FOC with respect to \( t_i \), we get:

\[
t_i H_i = \begin{cases} 
\frac{1}{a+b} \left[ (1 - t^F) b H_i - a(s_F t^F H^T + s_L(t^{SU} H^{SU} + \sum_{k \in L \setminus i} t_k H_k)) \right] \\
\quad \text{if } 1 - t^F \geq \frac{a}{b H_i} (s_F t^F H^T + s_L(t^{SU} H^{SU} + \sum_{k \in L \setminus i} t_k H_k)) \\
0 \quad \text{otherwise}.
\end{cases}
\]

Next, we find \( \sum_{k \in L \setminus i} t_k H_k \) (for \( i \notin SU \)) and \( \sum_{k \in L \setminus j} t_k H_k \) (for \( j \in SU \)).

Let \( Q \subseteq SU \) is the set of all members of the sub-union engaged in local
provision in equilibrium and \( q = |Q| \). Then, for \( j \in SU \),

\[
\sum_{j \in SU} t_j H_j = \sum_{j \in Q} t_j H_j = \frac{b}{a+b}(1 - t^{SU} - t^F) \sum_{k \in Q} H_k \\
- \frac{a}{a+b} \left[ q(s_{SU} t^{SU} H^{SU} + s_F t^F H^T) + s_L q \sum_{k \in L} t_k H_k - s_L \sum_{k \in Q} t_k H_k \right].
\]
Simplifying, we get:
\[(a + b - as_L) \sum_{j \in Q} t_j H_j = b(1 - t^{SU} - t^F) \sum_{k \in Q} H_k
\]
\[-aq(s_{SU} t^{SU} H^{SU} + s_F t^F H^T + s_L \sum_{k \in L} t_k H_k).\]

Similarly, for \(i \notin SU\),
\[\sum_{i \in L \setminus SU} t_i H_i = \sum_{i \in L \setminus Q} t_i H_i = \frac{b}{a + b} (1 - t^F) \sum_{k \in L \setminus Q} H_k
\]
\[-\frac{a}{a + b} \left[ (l - q)(s_L t^{SU} H^{SU} + s_F t^F H^T + s_L \sum_{k \in L} t_k H_k) - s_L \sum_{k \in L \setminus Q} t_k H_k \right],\]
which yields:
\[(a + b - as_L) \sum_{i \in L \setminus Q} t_i H_i = b(1 - t^F) \sum_{k \in L \setminus Q} H_k
\]
\[-a(l - q)(s_L t^{SU} H^{SU} + s_F t^F H^T + s_L \sum_{k \in L} t_k H_k).\]

Summing this expression with (16) to obtain \(\sum_{k \in M} t_k H_k\), which equals \(\sum_{k \in L} t_k H_k\), and solving for \(\sum_{k \in L} t_k H_k\) yields
\[\sum_{k \in L} t_k H_k = b(1 - t^F) \sum_{L \setminus SU} H_k - bt_{SU} \sum_{j \in Q} H_j
\]
\[-als_F t^F H^T - a((l - q)s_L + qs_{SU})t^{SU} H^{SU}
\]
\[= \frac{a + b + as_L(l - 1)}{a + b + as_L(l - 1)}.\]

Substituting into (15) and setting \(t_j = 0\), we next solve the program
\[\max_{t^{SU}} c_{j \in SU}(.)\]

to find the optimal \(t^{SU}\) as determined by its pivotal (marginal) member:
\[t^{SU} = (1 - t^F) \frac{b}{a + b}
\]
\[(a + b - as_L) s_F t^F H^T + as_L b(1 - t^F) \sum_{k \in L} H_k
\]
\[-a \frac{a}{a + b (a + b + as_L(l - 1)) s_{SU} H^{SU} - s_L (a(l - q)s_L + qs_{SU}) H^{SU} + b \sum_{Q} H_j}.\]
Note that $t^{SU}$ is independent of income. Substituting in the optimal value of $t^{SU}$ from (18), and (17) evaluated at the optimal $t^{SU}$, we can now evaluate the difference in the size of spillovers with (at the optimal $t^{SU}$) and without (at $t^{SU} = 0$) the enhanced cooperation agreement. That difference is

$$[H^{SU} - \frac{1}{a + b + as_L(l - 1)}(a(l - q)s_L + qs_{SU})H^{SU} + b \sum_{Q}H_k]$$

$$\cdot[(1 - t^F)\frac{b}{a + b} - \frac{a}{a + b(a + b + as_L(l - 1))s^{SU}H^{SU} - s_L(a(l - q)s_L + qs_{SU})H^{SU} + b \sum_{Q}H_k}]$$

If $t^{SU} > 0$, the second factor of this product must be greater than 0, else the cooperation is vacuous. It follows that the enhanced cooperation produces more spillovers if and only if

$$H^{SU} - \frac{1}{a + b + as_L(l - 1)}(a(l - q)s_L + qs_{SU})H^{SU} + b \sum_{Q}H_k > 0,$$

which simplifies to

$$(a + b - as_L - aq(s^{SU} - s_L))H^{SU} - b \sum_{Q}H_k > 0. \quad (19)$$

This condition, then, fully characterizes the circumstances under which the prima facie feasible enhanced cooperation is impeded by the strategic response of other members of the federation. When (19) holds, the effect of enhanced cooperation agreements is unambiguously Pareto-improving.

(2). Taking derivatives and recalling that $q \geq 1$, it is easily seen that the satisfaction of (19) is obtained more readily with higher values of $s_L$. As this proposition shows, the political economy of enhanced sub-union cooperation may be rife with the strategic incentives that are in a position to undermine even the universally Pareto-improving actions. (Note that when (19) fails, the difference in spillovers is negative and so would have a negative effect on the welfare of other federation members. At least in the context of EU, such agreements are unlikely to be authorized.) One constructive policy consequence of this realization may be that the possibility of enhanced cooperation should not be left as purely laissez-faire even when such a cooperation would have no short- or long-term negative consequences for any of
the federation members. A recognition of the existence of a collective-action problem and attempts to overcome it with, inter alia, side-payments from the non-participating members of the federation, may go some distance in alleviating the strategic problems identified in this section.

4 (A Very Brief) Discussion

To be written.
References


