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IN A FEDERATION:
BUCHANAN MEETS COASE**

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ABSTRACT

Political Bargaining in a Federation: Buchanan meets Coase*

In recent decades, the issues of federalism and political integration have gained prominence in public debate as well as in the academic realm. A frequently made point is that allowing free secession may protect the minority's interests, thus providing it with an incentive to enter the federation. This Paper explicitly considers the political process in the federation arguing that the option to secede may distort the political choices made by the individual regions to improve their bargaining positions. As a result, the allocation of resources in the federation could well end up being inefficient and unattractive for the minority region. In contrast, limiting the secession possibilities by requiring the consent of a majority of voters through a regional referendum, rather than leaving it to the discretion of the legislature, restores efficiency.

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1 Introduction

Moves towards greater political integration in Europe, the recent break up of the USSR, and calls for secession elsewhere have prompted the emergence of formal analyses of federative constitutional arrangements. An important item in a federal constitution concerns the eventuality of secession by some of the regions. In reality, there are very few constitutions that explicitly guarantee the free right of secession (see Bookman, 1993, for a fuller account as well as for specific case studies). In contrast, the economic literature has produced forceful arguments contending that the right to secede could be a useful disciplining device to prevent the exploitation of a minority by a majority (see Buchanan and Tullock, 1962, and Buchanan and Faith, 1987; Buchanan, 1991, specifically advocates the right of secession as a part of the European Union's constitution).

This paper attempts to shed light on the potential usefulness and limitations of the free right to secede. In brief, it is argued that, in the absence of additional qualifications, granting this right may lead to political extortion by a region considering secession. With this possibility in mind, the region's voters may exploit the political process to elect decision makers who are less interested in sustaining a federation. More precisely, the majority of voters may have an incentive to choose as their representative an individual less favorable toward federative outcome – which is referred to as the delegation effect. These incentives to delegate decision-making powers may, in turn, lead to inefficient allocations.

More specifically, the paper considers two regions whose residents are contemplating the idea of forming a federation. One of the regions has access to the technology of the provision of a local public good, which generates spillover effects for the other region. These effects induce an economic incentive for political integration. Indeed, without the secession option, Coasean bargaining in a federation over the amount of the public good accompanied

by a compensatory transfer would generate an efficient allocation. With the possibility of secession, however, two factors substantiate the incentives to delegate political power to individuals with a low preference for the public good. First, it may affect the secession outcome, making it less attractive for the rival region. Second, it creates a credible threat of secession by understating the preference for a federation. While the presence of the former element depends on the assumption that the elected representatives are able to hold on to power after secession, the second one is robust to it. Thus, in a sense, facilitating secession may undermine the possibility of efficient bargaining envisioned by Coase (Coase, 1960). To prevent the delegation incentives altogether, the constitution of the federation may need to take away the power from the representatives by requiring a referendum on secession, whereby a majority of votes would be required to approve such a move. This argument provides, therefore, a rationalization for the practice of a referendum to decide on secession.

This paper belongs to the growing literature on political integration as studied, for example, in Bolton and Roland, 1997, Casella, 1992, Ellingsen, 1998, and Wärneryd, 1998. Much of that literature is concerned with the benefits and deficiencies of centralized versus decentralized decision making. Incentives to delegate political power was first discussed in Rogoff, 1985, in the context of monetary policy; and in contexts more closely related to that of this paper in Persson and Tabellini, 1992, and Besley and Coate, 1998. The literature on constitutional political economy has devoted considerable attention to the virtues and deficiencies of allowing secession from a federation, see, for example, Chen and Ordeshook, 1994, and Young, 1994. More formal analyses are contained in, for example, Buchanan and Faith, 1987, and Bordignon and Brusco, 2001, the latter focusing on *ex ante* deficiencies of secession. The recent paper Dur and Roelfsema, 2002, is particularly relevant. There, the authors also argue that delegation incentives may distort policies. They do not, however, focus specifically on the issue of secession clauses as an inherent constitutional aspect of a

federation. The paper is also related to the voluminous literature on the Coase theorem. Particularly relevant is the branch of this literature that applies the theorem to the analysis of political outcomes. Wittman, 1989, for example, argues for efficiency of democratic decision making using Coasean logic. However, this is only partly consistent with this paper's argument. While in agreement with Wittman that democratic features, such as frequent elections, may reduce inefficiencies in a federation, it is maintained that as long as secession can be used as a threat these inefficiencies will still be present.

The paper is structured as follows. The next section introduces the basic model used to illustrate the potential inefficiency of decision making in a federation. Section 3 analyzes then the political consequences of allowing free secession as a constraint on the majority, showing that delegation effects are detrimental for federation performance. Section 4 extends the results for egalitarian legislative bargaining, arguing that equality of representation in the federation does not alleviate these detrimental effects. Finally, Section 5 concludes with brief remarks.

2 The benchmark model

The model will be kept at the simplest level. Consider two regions, indexed $k = 1, 2$, contemplating formation of a federation. Region 1 is populated with a unit measure of individuals; the measure of individuals in region 2 is d , $0 < d \leq 1$. Region 1 has access to the production technology of a local public good. The cost of producing x units of this good is assumed quadratic to enable the derivation of closed-form solutions:

$$(1) \quad c(x) = x^2/2$$

All individuals in each region have identical incomes and linear utilities, but differ in their

preferences towards the public good. We let Y_k denote the income level of region k 's residents. The preferences of individual i in region 1 are

$$(2) \quad u_i(x, z_i) = a_i x + z_i$$

where z_i is the amount of the private good consumption, and a_i – the parameter reflecting public good preferences - belongs to a positive compact interval $[\underline{a}, \bar{a}]$. Although not technically necessary, for interpretational purposes the distribution of a 's in the population will be assumed symmetric, with A denoting its mean (and the median) value.

The production of the public good in region 1 entails spillover effects for region 2's residents, whose preferences therefore are

$$(3) \quad v_i(x, z_i) = b_i x + z_i$$

where the spillover parameter b_i belongs to a compact interval $[\underline{b}, \bar{b}]$ and can in principle be both positive or negative, to reflect the possibly negative nature of the spillover effect; the distribution of b 's in the population will also be assumed symmetric, and B will denote its mean and median.¹ The spillover effect provides the economic rationale, of course, for the regions to form a federation. Good x , which generates the spillover effect can be interpreted as infrastructure or defense spending, from which a neighboring region can benefit, or alternatively, pollution spoils, which cause it harm. In general, therefore, the argument is applicable to both positive and negative spillovers.² The assumed linearity of preferences greatly simplifies the argument and its interpretation, but is not essential. I suppose that the distribution of regional preferences is such that the economy's median voter belongs to region 1. This assumption, again, simplifies the interpretation of some of our results.

Allocations in this economy will specify the amount of good x produced in region 1 and the amount of interregional transfers. Since individual incomes are identical, the

transfers will be assumed identical as well, so that T will denote the amount of the transfer made by each region 2's resident. Likewise, all region 1's residents, being equally endowed, equally share in the cost burden of the production of the public good x and receive the same transfer. The budget is assumed to be balanced, so that the amount of transfer received by each resident in region 1 is dT . The ranges of preference parameters and income levels will be assumed such that, unless explicitly specified otherwise, under all schemes considered below no individual will find herself credit constrained. We can, therefore, write the utility functions as follows:³

$$(2') \quad u_i(x, z_i) = a_i x - c(x) + dT = a_i x - x^2/2 + dT$$

and

$$(3') \quad v_i(x, z_i) = b_i x - T$$

As a benchmark, note that maximization of aggregate welfare implies that the socially optimal amount of the public good is

$$(4) \quad x^{opt} = A + dB$$

and the resulting average utility level is then:

$$(5) \quad w^{opt} = (A + dB)^2 / [2(1 + d)]$$

We now consider the outcome of decentralized regional decision making. Suppose that region 1 determines the amount of the public good produced, and region 2 determines the amount of the transfers to region 1. Both decisions are assumed to be made by the respective regions' representatives, who are elected by a majority vote within a region. Note that the preferred amount of the public good for a region 1's resident is given by maximizing (2') with respect to x and equals a_i , and that all region 2's residents prefer a zero transfer. This implies that in a decentralized equilibrium, there is no incentive for strategic delegation, and

the respective median voters in the two regions will be elected. Their choices will then be $x^{dec} = A$, $T^{dec} = 0$, which upon substitution yields the resulting individual equilibrium utility levels: $u_i^{dec} = a_i A - A^2/2$, and $v_i^{dec} = b_i A$.

The aggregate welfare levels in each region and the overall average utility level are therefore as follows:

$$(6) \quad U^{dec} = A^2/2, V^{dec} = BA, w^{dec} = (A^2/2 + dBA)/(1+d)$$

Comparison with the welfare optimum benchmark reveals that the amount of the public good provided under decentralization is lower or higher depending on whether the average spillover effect, B , is positive or negative. In any case, however, the average overall utility level is lower under decentralization. This result echoes those in the standard framework on fiscal federalism, whereby interregional spillovers are not internalized through decentralized decision making, see Oates, 1972.

It is easy to indicate the scope for welfare improvement in each region relative to decentralization.⁴ In particular, a marginal increase in the provision of the public good by region 1's residents, accompanied by their compensation in the form of a transfer by region 2's residents would increase welfare in both regions. And social optimum can be achieved, at the same time causing a Pareto improvement relative to the decentralized outcome. Specifically, ensuring region 1 a higher level of welfare while securing the efficient amount of the public good implies that the following inequality must hold: $A(A+dB) - (A+dB)^2/2 + dT \geq A^2/2$. Similarly, to guarantee region 2 a higher level of welfare, the following should be satisfied: $B(A+dB) - T \geq BA$. Combining these constraints implies the following range of transfer values, which lead to socially optimal improvement: $dB^2/2 \leq T \leq B^2$.

To sum up,

Proposition 1. Decentralized equilibrium is inefficient. An interregional contract requiring region 1 to provide a larger amount of the public good (in the case of positive spillovers), supplemented with a monetary transfer from region 2's residents in the range specified above would increase the aggregate welfare in both regions and yield a socially optimal allocation.

3 Secession clauses

To examine how secession can lead to exploitation of the minority by the majority, suppose that the regions first decide, by majority vote, whether or not to enter the federation. A federation can only be formed if approved by both regions' majorities. This corresponds to the reality of, say, the European Union formation and particularly its enlargement, whereby accession decisions were at times made by referenda in individual countries.⁵ It is often argued that in important matters as this direct elicitation of the electorate preferences is the preferred option.⁶ Then, if the federation is formed, the decisive voter, i.e., region 1's representative dictates the allocation. Without any constitutional constraints, the federation outcome is expected to yield an efficient allocation of resources, but it could be extremely biased in favor of region 1. The efficiency part of the claim follows directly from Coase's theorem, which suggests that, when transaction costs are small, a Pareto-efficient allocation will necessarily be achieved through voluntary transactions or bargaining (see Dixit and Olson, 2000, for a fuller discussion and interpretation of this theorem). The distributional part follows again from Coase's insight that the final allocation hinges on the initial allocation of property rights. In our formulation, these property rights are fully determined by the nature of the political process, whereby region 1's majority decides on allocations.

Because property rights are assigned to region 1, whose representative is the decisive voter, the federation outcome is expected to be unfavorable for region 2, which then prevents

region 2's residents from approving the move to join a federation in the first place. Thus, despite a potential for welfare improvement through internalization of the spillover effect, the federation will not be formed because of time inconsistency. Indeed, the purpose of constitutional constraints is to prevent inefficient decision making in a federation, see Buchanan, 1991, and Buchanan and Faith, 1987. Specifically, the former argues that secession clauses could be useful in the context of the European Union, thus allowing for a more flexible federation. To quote:

"...the threat of secession offers a means of insuring that the central government will, indeed, stay within those boundaries of political action defined by the general interests of all citizens in the inclusive territory." (Buchanan, 1991, p. 620)

Hence, we proceed to study the precise nature of secession clauses that allow federation formation, showing that they could well be an ineffective means to the above end.

3.1. Decision making through representation

Suppose first that an elected representative is entitled to decide whether or not his region stays in the federation. If he decides to opt out, the federation breaks up, and the regions determine their respective policies independently. Suppose first that the elected representatives also make policy decisions after secession, which is likely to be the case if the regions are not committed to the routine of periodic elections. The equilibrium then consists of $x^{sec} = a_R$ and $T^{sec} = 0$.

We model the decision making within the federation using Coasean legislative bargaining between the regions' representatives. This is in the spirit of the recent literature, which emphasizes political considerations in federative decision making, see Besley and Coate 1998. To illustrate the outcome of this procedure, we begin by assuming that the

bargaining proposal is made by region 1's representative; in the next section, a more complete model of legislative decision making is offered.

The bargaining proposal made by region 1's representative, therefore, maximizes his utility, while guaranteeing region 2's representative his utility level under secession, $b_R a_R$; thus, it solves:

$$(7) \quad \text{Max } (a_R x - x^2/2 + dT)$$

$$\text{s.t. } b_R x - T \geq b_R a_R$$

The solution is $x = a_R + db_R$, $T = db_R^2$, and the resulting utility levels are:

$$(8) \quad {}^1u_i(a_R, b_R) = -(a_R + db_R)^2/2 + a_i(a_R + db_R) + d^2b_R^2, \quad {}^1v_i(a_R, b_R) = b_i(a_R + db_R) - db_R^2$$

where the left superscript denotes the identity of the proposing region's representative.

Differentiating with respect to a_R and b_R respectively we note that the identities of the preferred representatives for voter i are as follows:

$$(9) \quad a_R^i = \text{Max } \{a, a_i - db_R/2\}, \text{ if } i \text{ resides in region 1, and } b_R^i = \text{Max } \{b, b_i/2\}, \text{ if } i \text{ resides in region 2}$$

In particular, the former can be viewed as a reaction function of the optimal choice of a region 1's representative for any representative chosen in region 2. The strategic delegation effects are already transparent: the optimal representative from the viewpoint of region 2's voter has a lower preference for the public good than his own.

Since these optimal choices are monotonic functions of the voters' preference parameters, the voters with median values in each region, A in region 1, and B in region 2, are pivotal. Assuming an internal solution, the equilibrium choices of representatives, therefore, are

$$(10) \quad a_R^e = A - dB/2, \quad b_R^e = B/2, \quad x^e = A, \quad T^e = d(B/2)^2$$

Substituting into the individual utility function and aggregating we obtain:

$$(11) \quad U^e = A^2/2 + (dB/2)^2, \quad V^e = BA - d(B/2)^2, \quad w^e = (A^2/2 + dBA)/(1+d)$$

Comparing this with the decentralized outcome, we observe that region 1 attains higher aggregate welfare, while region 2 attains lower welfare, and the average welfare is the same as under decentralization. In this case, therefore, region 2's residents will veto the formation of the federation by staying out. Note that the willingness of region 2's residents to join in the federation is a decreasing function of the public good spillover effect. In other words, the more socially valuable formation of the federation is, the less willing they are to join.

This is summarized as follows:

Proposition 2. Granting the possibility of free secession is not sufficiently effective to prevent inefficiency provided that the voters, by electing appropriate representatives, can understate the regional preferences for the public good. In this case, the federation outcome yields the same level of the public good and the same overall welfare level as under decentralization, while it reduces the welfare of the minority regions' residents relative to decentralization.

The intuition behind this result is as follows (see also Figure 1 for its illustration). Region 2's residents, in anticipation of a large transfer that would be imposed upon them in a federation by region 1's residents, elect a representative with a low preference for the public good. This lowers their tax bill, but at the same time reduces the amount of the public good produced. Region 1's residents also prefer to understate their public good preference by

electing an appropriate representative, which creates a credible threat that in case of secession a low amount of good x will be produced, resulting in a relatively low utility level of region 2's residents. This, in turn, enables imposition of a higher transfer from region 2 to region 1, while reducing the amount of the public good.

The outer line in Figure 1 represents the efficiency frontier, and D is the decentralized equilibrium point. Its location within the frontier indicates the inefficiency of decentralization. The inner line, which passes through D , is the efficiency frontier from the perspective of the elected representatives; $S(a_R, b_R)$ represents the secession outcome when the representatives make all decisions.

Delegation changes the set of attainable welfare combinations, and the bargaining offer made by region 1's representative brings the economy to point E – on the efficiency frontier with respect to the regions' representatives, but below the true efficiency frontier.

INSERT FIGURE 1 HERE

3.2. New election round

Now suppose that following secession a new election is held, and policy decisions are made by the newly elected representatives. Because in such a case there is no delegation in the *ex post* secession case, this is tantamount to assuming that policies are directly voted on. The majority voting equilibrium then consists of $x = A$ and $T = 0$. Anticipating this outcome, the bargaining proposal made by region 1's representative solves:

$$(12) \quad \begin{aligned} & \text{Max } (a_{Rx} - x^2/2 + dT) \\ & \text{s.t. } b_{Rx} - T \geq b_R A \end{aligned}$$

The solution is $x = a_R + db_R$, $T = b_R a_R + db_R^2 - b_R A$, and the resulting utility levels are:

$$(13) \quad {}^1u_i(a_R, b_R) = -(a_R + db_R)^2/2 + a_i(a_R + db_R) + d(b_R a_R + db_R^2 - b_R A),$$

$${}^1v_i(a_R, b_R) = b_i(a_R + db_R) - (b_R a_R + db_R^2 - b_R A)$$

Differentiating with respect to a_R and b_R respectively and arguing that voters with median preference parameters are decisive in electing the representatives as before, we obtain:

$$(14) \quad a_R^e = A, b_R^e = B/2, x^e = A + dB/2, T^e = d(B/2)^2$$

Substituting into the individual utility function and aggregating we obtain:

$$(15) \quad U^e = [A^2 + (dB/2)^2]/2, \quad V^e = BA + d(B/2)^2, \quad w^e = [A^2/2 + dBA + 1.5$$

$$(dB/2)^2]/(1+d)$$

Comparing with the decentralized outcome, we note that both regions now gain in the federation. However, comparison of the average welfare level with the optimal one reveals that the equilibrium outcome is still inefficient, in particular, resulting in underprovision of the public good. (This outcome is represented by point G in Figure 1.)

The above discussion has revealed that the presence of delegation effects makes it impossible to achieve an efficient allocation of resources by allowing free secession from the federation. It also indicates that requiring a direct referendum over the decision to secede as a constitutional part of the federation may be necessary to restore efficiency. To see this, suppose that the break up of the federation occurs only if approved by a majority of votes in a region. Since the propensity to secede is a decreasing function of the public good preference, this implies that, to prevent the break up, the allocation offer in the federation has to make the respective median voters in the two regions better off relative to secession. Thus, an offer made by region 1's representative should solve:

$$(16) \quad \text{Max } (a_R x - x^2/2 + dT)$$

$$\text{s.t. } Bx - T \geq BA$$

so that $x = a_R + dB$, and $T = B(a_R + dB) - BA$, with the resulting utility levels of

$$(17) \quad {}^1u_i(a_R, b_R) = a_i(a_R + dB) - (a_R + dB)^2/2 + dB(a_R + dB) - dBA,$$

$${}^1v_i(a_R, b_R) = (b_i - B)(a_R + dB) + BA$$

Maximization of the utility function of region 1's voter with respect to a_R yields

$$(18) \quad a_R = a_i$$

and the utilities of region 2's voters are independent of the identity of the region's representative.

It follows that, at the voting equilibrium, delegation does not take place, so that the median voter A in region 1 gets elected. This then generates an efficient allocation resulting in particular in the efficient amount of the public good, $x = A + dB$. In this case, the bargaining offer made by region 1's median voter would have brought the economy to point F in Figure 1, on the efficiency frontier.

To sum up,

Proposition 3. If secession is followed by an additional election round, a majority of individuals in both regions benefit from the formation of a federation relative to decentralization, although the resulting equilibrium is still inefficient. Furthermore, a constitution requiring the consent of a majority of voters in a region for the federation break up eliminates the delegation effects and generates an optimal allocation.

The above discussion reveals that additional constitutional provisions might be needed to restore efficiency in the presence of secession. The nature of these provisions is to eliminate the incentives to delegate political power with the aim of affecting the secession

outcome and its evaluation by the representatives. Without them, the federation architecture is insufficient to achieve the goals preached by the proponents of secession clauses.

4 Legislative bargaining in a federation

In this section, the previous analysis is extended to allow a more egalitarian legislature, where the regions determine their policies in the federation through bargaining. The assumption here is that when the two regions form a federation, it operates under a legislative procedure, which captures the minimum winning coalition view of policy making, see Riker, 1962, Besley and Coate, 1998. According to this view, the legislature operates under a minimal majority rule, allocating benefits only among the members of the majority coalition. Because in principle there could be many minimal winning coalitions, the identity of the decisive coalition may not be deterministically given. We first analyze the outcome of such legislative bargaining without allowing secession, and then explicitly consider the effects of the secession option.

4.1. Bargaining without secession

Assume that the legislature operates as follows. First, each region elects its representative. Then a representative is chosen to make a binding allocation offer. The only constraint we impose on such offers is that the proposed allocations yield non-negative utilities. To allow for regional differences in size to play a role, we assume that a representative is selected to make an offer with a probability that is equivalent to the region's relative size. Note that the significant difference between this decision-making procedure and the majority voting rule of the previous section is that now the minority region has political power in the federation that is proportional to its size. This has important consequences for the ability of the majority

region to extract surplus, implying in particular that it may no longer wish to form the federation. In particular, relegating the analytical details to the appendix, we obtain

Proposition 4. The richer and the less populous region 2 is the more advantageous federation outcome is for region 1. In particular, if region 2 is sufficiently populous and/or poor, decentralization is the preferred outcome for region 1's residents.⁷

The richer region 2 is the larger is the amount of transfers that can be solicited from it in the federation. The more populous region 2 is, however, the more politically powerful it will become if the federation is formed. Thus, if region 2 is both populous and poor, entering a federation will be vetoed by region 1's voters despite its overall welfare advantages, see point *H* in Figure 1 above illustrating this.⁸ This result can be interpreted in terms of time inconsistency. If region 1 could precommit itself to allocation policies in the envisioned federation, this outcome would clearly be superior relative to decentralization. Without precommitment, however, formation of federation leads to some loss of political control resulting in a lower ability to affect the allocation decisions. Moreover, this effect is bigger the more relatively populous region 2 is. As a result joining the federation may well be voted down by region 1's residents despite its welfare advantages.

4.2 Bargaining with secession

In this subsection, we extend the previous results assuming the following operation of the legislature. First, each region elects by a majority vote a representative. Then a region's representative is chosen at random to make an allocation offer of (x, T) , which is implemented if agreed upon by the other representative. If the offer is rejected, secession results, and the respective representatives make their own regional decisions independently,

so that region 1's representative determines the amount of the public good, and region 2's representative determines the amount of the transfer.

Assuming for analytical simplicity that the regions are of the same size, so that $d = 1$, we summarize the results - fully derived in the appendix:

Proposition 5. Bargaining in a federation among elected regional representatives generates delegation effects. As a result, the aggregate welfare level at equilibrium is identical to the one obtained under decentralization, region 1 being better off under bargaining and region 2 being better off under decentralization. If elections are held following the secession, bargaining in a federation, although still suboptimal, leads to a higher welfare level than decentralization.

5 Concluding remarks

Conventional wisdom recognizes that Coaseian bargaining should internalize interregional spillovers, which will lead to an efficient allocation of resources in a federation. To improve the lot of a minority in such bargaining, free exercise of the option to secede has been advocated by influential authors. The argument there is that granting such right is likely to induce favorable incentives to join the federation.

This paper's contribution is in studying the exact nature of secession clauses that could facilitate the functioning of a federation. We find that, if the decision on secession is made by elected representatives via legislative bargaining, the outcome is likely to be inefficient. The reason is that it may induce the voters to distort their political choices by electing representatives with a low preference towards joining the federation. Consequently, the allocation of resources obtained as a result of legislative bargaining is inefficient and,

depending on the details of the legislative procedure, may not even be welfare superior to the decentralized outcome. In particular, the federation outcome can only be superior to decentralization if an election round follows secession. A fully efficient allocation of resources is restored in a federation only if the decision making power on secession is taken away from the legislators and given to the electorate. In contrast, without these features the federation outcome is inferior to decentralization from the viewpoint of the minority region's residents.

APPENDIX A: Legislative bargaining

Bargaining without secession

To study the equilibrium outcome in this case, first note that now there are no delegation incentives, and that voters with the median preference parameters will be elected in each region. The offer made by a representative maximizes his utility subject to the constraint of guaranteeing a non-negative utility to the other representative; thus, it solves

$$(19) \quad \text{Max } (Ax - x^2/2 + dT)$$

$$\text{s.t. } Y_2 + Bx - T \geq 0$$

and the solution is ${}^1x = A + dB$, ${}^1T = Y_2 + B(A + dB)$. Similarly, solving for the case where region 2's representative acts as the proposer we obtain: ${}^2x = A + dB$, ${}^2T = [-Y_1 + ((dB)^2 - A^2)/2]/d$.

Recalling that the likelihood of being recognized to as a proposer is $1/(1+d)$ for region 1's representative and $d/(1+d)$ for region 2's representative, the expected welfare of region 1's residents is

$$(20) \quad U = [A^2 - (dB)^2]/2 + ({}^1T + d({}^2T))/(1 + d) =$$

$$[A^2 - (dB)^2]/2 + [Y_2 + B(A + dB) - Y_1 + ((dB)^2 - A^2)/2]/(1 + d)$$

which is obtained by substituting 1T and 2T as given above. To determine whether or not region 1's residents would approve the decision to enter a federation, (20) needs to be higher than the utility level under decentralization, $A^2/2 + Y_1$. Then, differentiation of the welfare difference, $[Y_2 + B(A + dB) - (2+d)Y_1 - (d((dB)^2 + A^2)/2)]/(1 + d)$, leads to the result in Proposition 4.

Bargaining with secession

To study the ensuing equilibrium of legislative bargaining, first note that the amounts of the public good and of the transfer in case of secession are $x^{sec} = a_R$, $T^{sec} = 0$, so that the resulting utility levels of the two representatives are $u_R^{sec} = a_R^2/2$, and $v_R^{sec} = b_R a_R$. We then turn to the study of the bargaining offers. When region 1's representative makes an offer, it maximizes the utility of region 1's representative while guaranteeing region 2's representative the utility level under secession; thus, it solves problem (7), and the results are given in (8). When region 2's representative makes an offer, it maximizes the utility of region 2's representative while guaranteeing region 1's representative the utility level under secession:

$$(21) \quad \text{Max } (b_R x - T)$$

$$\text{s.t. } a_R x - x^2/2 + T \geq a_R^2/2$$

As with (7), the solution, $x = a_R + b_R$, $T = b_R^2/2$, internalizes the spillover effect and yields the same level of the public good, but results in a lower level of transfer. The utility levels achieved in this case are:

$$(22) \quad {}^2u_i(a_R, b_R) = -(a_R + b_R)^2/2 + a_i(a_R + b_R) + b_R^2/2, \quad {}^2v_i(a_R, b_R) = b_i(a_R + b_R) - b_R^2/2$$

Note that in both cases above the amount of the public good produced equals the sum total of its valuations by the regional representatives, whereas the amount of the transfer only depends on the valuation of region 2's representative.

Before proceeding with the analysis of the election stage, suppose for a moment that the bargaining offers in the federation are directly voted on by the electorate, so that the median voter in each region, voter A in region 1 and voter B in region 2, are pivotal in making the offers. Then the above analysis implies that the bargaining offers made in each of the two considered cases are efficient. The difference between their outcomes is purely distributional and reflects the initial allocation of property rights, i.e., the identity of the proposing region. The aggregate expected utilities in each region and overall average utility are then as follows:

$$(23) \quad U = -(A+B)^2/2 + A(A+B) + 3B^2/4, \quad V = B(A+B) - 3B^2/4, \quad \text{and } w = (A+B)^2/4$$

Comparing with the optimal solution presented above we note that the aggregate level of welfare is the same, reflecting again the essence of the Coase theorem.

Now we study the majority choice of the representatives in each region. The expected utility of region 1's voter, prior to knowing whose representative will get to make an offer, is:

$$(24) \quad U_i = ({}^1u_i + {}^2u_i)/2 = -(a_R + b_R)^2/2 + a_i(a_R + b_R) + 3b_R^2/4$$

Differentiating with respect to a_R we obtain the reaction function, i.e., the identity of preferred region 1's representative from voter i 's perspective as a function of the identity of region 2's representative:

$$(25) \quad -x + a_i = 0, \quad \text{or } a_R^i = a_i - b_R$$

Similarly, the expected utility of region 2's voter is

$$(26) \quad V_i = (v_i^1 + v_i^2)/2 = b_i (a_R + b_R) - 3b_R^2/4$$

and differentiation gives the preferred representative:

$$(27) \quad b_i - dT/db_R = 0, \text{ or } b_R^i = 2b_i/3$$

In both cases, the identity of the preferred representative is a monotonic function of the voter's identity. This implies that in each region the voter with the median taste for the public good, which by assumption is identical to the mean, is pivotal in determining its representative. In equilibrium, therefore, the elected representatives are:

$$(28) \quad a_R^e = A - 2B/3, \quad b_R^e = 2B/3$$

Thus, the delegation effect implies that the median voters prefer other individuals to be elected as representatives. Note that, when the spillover effect is positive, the elected representatives in both regions have a lower than the median preference for the public good. The reason for this is that the voters in each region are interested in understating their preference for the public good so as to decrease the anticipated utility level of the other region's elected representative in case of secession. Likewise, if the spillover effect is negative, the elected representatives in both regions have a higher than the median preference.

The resulting expected utilities, in each region and overall average utility, are given by substituting (28) into (24) and (26) and summing up:

$$(29) \quad U^e = A^2/2 + B^2/3, \quad V^e = B(A - B/3), \quad w^e = (A^2/2 + BA)/2$$

Comparison with the decentralized outcome reveals that the aggregate utility of region 1's residents is higher while that of region 2's residents is lower in the federation, while the

overall average welfare under federation is the same as in the decentralized solution, reproducing the results of the previous section. The intuition here is that region 1's voters, by electing their representative, indirectly determine the choice of the amount of the public good, and region 2's voters indirectly determine the amount of the transfer. This, in turn, implies that their uncoordinated election outcomes would resemble the decentralization outcome. The bargaining outcome is, however, preferred to decentralization by region 1's voters and is inferior to it by region 2's voters, because the secession outcome is biased in favor of the former: since region 1 controls the provision of the public good, a transfer to region 1's residents is needed to cause an increase in the amount provided.⁹

APPENDIX B (not intended for publication): Post-secession elections

In this case, in the post-secession stage there are no delegation incentives, hence the regional median voters are pivotal in setting the respective policies. Thus, the equilibrium is $x = A$, $T = 0$, implying that the utility levels of the two representatives are $u_R^{sec} = a_R A - A^2/2$, and $v_R^{sec} = b_R A$. Now consider the bargaining stage. The situation when region 1's representative makes an offer was analyzed in section 3; the resulting utility levels are:

$$(A1) \quad {}^1u_i(a_R, b_R) = -(a_R + b_R)^2/2 + a_i(a_R + b_R) + b_R(a_R + b_R) - b_R A,$$

$${}^1v_i(a_R, b_R) = b_i(a_R + b_R) - b_R(a_R + b_R) + b_R A$$

When region 2's representative makes an offer, it maximizes the utility of region 2's representative while guaranteeing region 1's representative the utility level under secession:

$$(A2) \quad \text{Max } (b_R x - T)$$

$$\text{s.t. } a_R x - x^2/2 + T \geq a_R A - A^2/2$$

The solution is $x = a_R + b_R$, $T = a_R A - A^2/2 - a_R(a_R + b_R) + (a_R + b_R)^2/2$, and the utility levels achieved in this case are:

$$(A3) \quad {}^2u_i(a_R, b_R) = a_i(a_R + b_R) - a_R^2 - a_R b_R + a_R A - A^2/2,$$

$${}^2v_i(a_R, b_R) = b_i(a_R + b_R) - [a_R A - A^2/2 - a_R(a_R + b_R) + (a_R + b_R)^2/2]$$

Next we can study the majority choice of the representatives in each region. The expected utility of region 1's voter, prior to knowing whose representative will get to make an offer, is:

$$(A4) \quad U_i = ({}^1u_i + {}^2u_i)/2 =$$

$$[-(a_R + b_R)^2/2 + 2a_i(a_R + b_R) + b_R(a_R + b_R) - b_R A - a_R^2 - a_R b_R + a_R A - A^2/2]/2$$

Differentiating (A4) with respect to a_R and equating to zero we obtain

$$(A5) \quad a_R^i = (2a_i + A - b_R)/3$$

Similarly, the expected utility of region 2's voter is

$$(A6) \quad V_i = ({}^1v_i + {}^2v_i)/2 = \\ \{2b_i(a_R + b_R) - b_R(a_R + b_R) + b_R A - [a_R A - A^2/2 - a_R(a_R + b_R) + (a_R + b_R)^2/2]\}/2$$

and differentiation gives the preferred representative:

$$(A7) \quad b_R^i = (2b_i + A - a_R)/3$$

In equilibrium, the anticipated electoral choices are mutually realized, so that (A5) and (A6) are simultaneously satisfied.

This implies that, in equilibrium, the elected representatives are:

$$(A8) \quad a_R^e = A - B/4, \quad b_R^e = 3B/4$$

so that the level of the public good provided is $x^e = A + B/2$. This is higher than under decentralization, but lower than the optimal amount.

The resulting expected utilities, in each region and overall, are given by substituting the equilibrium values into (A4) and (A6) and summing up:

$$(A9) \quad U^e = A^2/2 + 3B^2/16, \quad V^e = BA + 3B^2/16, \quad w^e = (A^2/2 + BA + 3B^2/8)/2$$

Comparison with (8) and (5) reveals that, relative to decentralization, bargaining in a federation achieves a higher aggregate level of welfare in each region, hence overall. The average welfare level, however, is lower than the optimal one.

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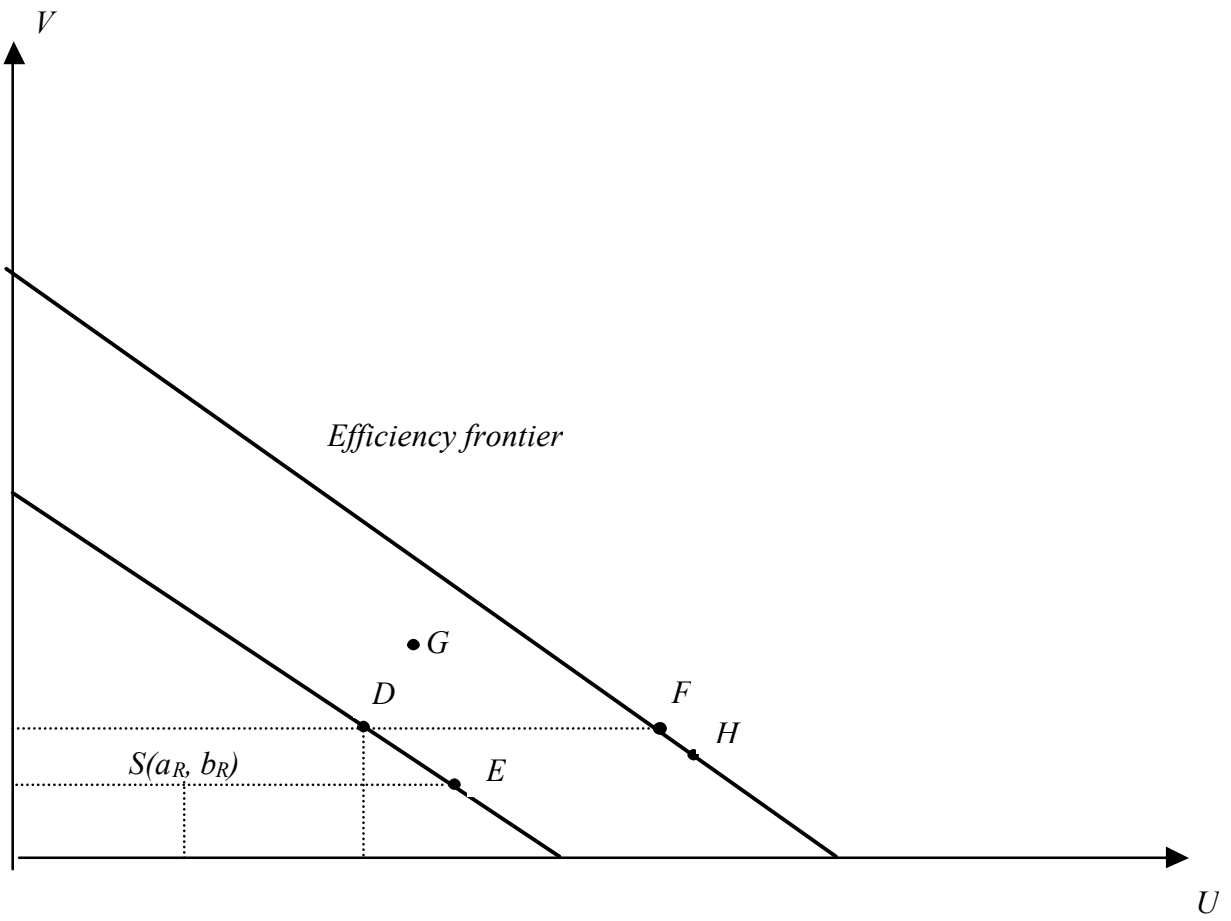


FIGURE 1

¹ More specifically, B is the mean of the probability measure of b .

² Note that complete information is assumed. This is in order to distinguish our line of reasoning from the substantial literature on Coaseian bargaining under asymmetric information, which is well known to generate inefficiencies.

³ Whenever possible, the utilities will be scaled down by the regional income level.

⁴ To facilitate interpretations here and below, we shall assume henceforth positive spillovers.

⁵ Such as with Denmark, Ireland, Norway, Switzerland, as well as with some of the eastern European countries heading for accession.

⁶ Why this is typically the case is an interesting question, which we do not address here.

⁷ This result obviously hinges on the assumption that there are no constitutional constraints on transfers.

⁸ Analysis of the benefits of joining the federation from region 2's perspective proceeds similarly.

⁹ A complete analysis of a situation where following secession a new election is held and policies are set by the newly elected representatives is available on request. This situation is likely to occur when the majority coalition lacks the ability to precommit itself to not conducting periodic elections. It can be shown that, in line with the analysis of the previous section, delegation incentives and the resulting inefficiency are smaller in such a case.