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Journal of Urban Economics 57 (2005) 242–257
JOURNAL OF Urban Economics
www.elsevier.com/locate/jue

On the endogenous allocation of decision powers in federal structures

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Received 14 April 2004; revised 23 November 2004

Available online 5 January 2005

Abstract

This paper provides a political-economy explanation of the degree of centralization in economic policy making. To determine which policies are to be centralized, regions select representatives who then negotiate the degree of centralization and the regional cost shares of centrally decided policies. We show that the resulting degree of centralization is suboptimally low. Voters strategically delegate to representatives who are averse to public spending and hence prefer decentralized decisions in order to reduce their region's cost share. When spillovers are asymmetric, strategic delegation is stronger at the periphery than at the center.

JEL classification: H11; H41; H77

Keywords: Political economy; Fiscal federalism; Endogenous centralization; Constitutional design

1. Introduction

Most countries have more than one layer of government. Supra-national entities, such as the European Union, feature federal structures by construction. One of the most important questions arising in this context is how much decision power to allocate to each level of

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0094-1190/$ – see front matter
doi:10.1016/j.jue.2004.11.002

government. In Europe, this issue goes by the name "subsidiarity" and has been hotly debated for years. Economists have contributed to this debate by analyzing the costs and benefits of centralization. Hardly anyone, however, expects a purely normative outcome, given the high profile of the issue and the political heat surrounding it. And indeed, most European summits are rife with stories of shady backroom deals, be it in Nice or elsewhere.

This paper breaks new ground by providing a political-economy explanation of the degree of centralization in economic policy making. For concreteness, we focus on the provision of regional public goods which exhibit interregional spillovers. We develop a model of local public good provision that incorporates a continuum of local public goods. These goods differ with respect to the degree of interregional spillovers. The difference in utility received from central versus decentralized decision making on the public good gives rise to a surplus from centralization that depends positively on the extent of the spillover for a particular public good and on the individual's preference for public spending. Comparing the average surplus to a given fixed cost of centralization, we can identify a critical degree of spillover that divides the range of local public goods into two groups: Below the threshold, the decision on a particular local public good should—from the perspective of a benevolent social planner—be taken in a decentralized way, whereas public goods with higher spillovers are ideally decided on at the center.

The main contribution of our paper lies in going beyond this normative analysis. To determine which policies are decided at the center and which in a decentralized way, we consider a political equilibrium that results from the following political process: By majority vote, each region elects a citizen candidate as its representative. These regional representatives then form a house of representatives and decide on the degree of centralization. At the same time, they have to negotiate the regional cost shares of centrally decided policies. We model these negotiations as Nash-bargaining over the degree of centralization with side-payments that determine the regional cost shares.

We show that the degree of centralization thus determined falls short of the social optimum, even though the latter is preferred by each region's median voter. This discrepancy is due to strategic delegation: Representatives with a low preference for public spending are in a better bargaining position because they enjoy only a relatively small surplus from centralization. Such representatives are therefore able to obtain a favorable cost share for their region. Knowing this, the median voter in each region strategically delegates the representation of the region to someone who is less keen on public goods in order to pay lower contributions. However, these representatives also prefer less centralization. As a result, they agree to centralize fewer policies than would be optimal for the median voter.

One important extension of our model is the generalization to asymmetric regions. In particular, we consider asymmetric interregional spillovers because this type of asymmetry has an interesting core-periphery interpretation. As in the symmetric case, voters in both regions elect representatives who are less keen on public spending than the median voter. Focusing on the limit case where only one of the two regions receives spillovers whereas there is no externality in the other direction, we show that the strategic delegation effect is stronger at the periphery and less pronounced at the core. This bears interesting implications for EU enlargement as it predicts that the representatives of the accession countries are less integration-minded.

Our paper builds on a large literature on the normative and positive aspects of fiscal federalism.[1] In his seminal contribution, Tiebout [25] emphasizes the benefits of differentiated local public good provision. Oates [18] compares costs and benefits from centralization and derives the well-known "Decentralization Theorem" as a guideline for the division of decision powers between central and local governments. The benefits and costs are also analyzed in Brueckner [8] who contrasts benefits à la Tiebout with the negative effects of tax competition.

In a recent contribution, Besley and Coate [5] use a political economy model to analyze local public good provision.[2] Their model features only one public good and strategic delegation influences its provision level. In our framework, on the other hand, the political process determines the centralization decision itself, which requires a range of different public goods. Another difference regards the cost shares of centrally decided public goods. Besley and Coate [5] assume that both regions share the costs according to an exogenous rule, whereas in our model the cost allocation is determined endogenously.

Segendorff [24] considers strategic delegation in a Nash-bargaining model which allows for side payments. In his approach, elected representatives bargain over the levels of local public goods with full interregional spillovers. As in our paper, voters delegate decisions to a representative with a lower preference for public goods to improve the region's position in the bargaining game with the other region. In contrast to our paper, however, strategic delegation cannot influence the degree of centralization because in Segendorff [24] it is taken as given.[3]

Redoano and Scharf [22] deal explicitly with the question of policy centralization. Their model features two regions that differ with respect to the preference for one public good. They compare the policy outcome under a direct referendum on policy centralization with that of a representative democracy. The elected representatives in their model decide on the supply of the public good and—in the representative system—also on the question of centralization. Strategic delegation may then favor policy centralization: Voters in the jurisdiction with a high preference for the public good elect a representative with a low preference to facilitate a consensus with the representative of the low-preference jurisdiction.[4] As in Besley and Coate [4], Redoano and Scharf [22] assume an exogenous cost sharing rule and hence the motive for strategic delegation that is crucial in our paper does not play a role in theirs. In contrast to Redoano and Scharf [22], we focus on the constitutional stage, where representatives decide the allocation of decision powers between central and regional governments along with the cost shares. Subsequently, the centralized or decentralized executives in our model choose the public good levels that maximize the respective social welfare.

[1] Rubinfeld [23] and Oates [19] provide an overview of this literature and the issues involved.

[2] For related models see also Ferretti and Perotti [14], Chari et al. [10], Cheikbossian [11], Lockwood [17], or Dur and Roelfsema [12].

[3] See also Buchholz et al. [9] who apply strategic delegation to the issue of decision making on international environmental agreements.

[4] Feld et al. [13] incorporate rent extraction of elected representatives into a political economy analysis of the centralization decision.

Last but not least, there exists an important strand of literature that analyzes the formation (as well as the break-up) of political unions.[5] A recent contribution is Alesina et al. [1]. As we, they analyze the degree of centralization, i.e. the scope of a political union, by considering a range of public goods with different spillovers. However, their direct democracy approach does not allow for strategic delegation with respect to the centralization decision, which is the driving force behind our results. In a related setting, Panizza [21] derives the degree of centralization as the outcome of a sequential game between a Leviathan-type government and the voters.

The remainder of this paper is organized as follows: Section 2 presents the economic model. In Section 3, we introduce the political process and derive the political equilibrium. Section 4 analyzes the case of asymmetric regions. Section 5, finally, offers concluding remarks.

2. Economic model

The economic framework underlying our model is a familiar setup in the context of regional public good provision. There are two regions, indexed by $i \in \{1, 2\}$, which, for the time being, are assumed to be symmetric. Each region is populated by a continuum of citizens, and we normalize the mass of each region's population to one. Citizens differ within regions with respect to their personal preference for public spending. This preference is captured by the parameter α, which is distributed uniformly over $[\alpha_{\min}, \alpha_{\max}]$. The utility of individual α in region i then takes the form:

$$U_\alpha(c_i, g_i, g_{-i}) = c_i + \alpha \int_0^1 \left[\ln g_i(\beta) + \beta \ln g_{-i}(\beta)\right] \mathrm{d}\beta, \tag{1}$$

where c_i is the consumption of a private good and the $g_i(\beta)$ are continua of local public goods in each region. These public goods are indexed by β, the extent of the interregional spillover, that is assumed to be distributed uniformly over the unit interval $[0, 1]$. Having a range of public goods is a salient feature of our setup that allows us to model the centralization decision in continuous fashion.[6]

On the production side, each citizen earns an exogenous income of y, and the cost of providing public goods in terms of the private good is equal to one for all public goods. To finance their provision, the government collects lump sum taxes that are uniform within each region.

We now derive, for future reference, the provision levels of regional public goods that result under decentralized and centralized decision making by a welfare maximizing government. Notice that centralized decision making means that the interregional spillovers are internalized. It does not imply that the actual provision levels of a particular regional

[5] See e.g. Alesina and Spolaore [2,3], Bolton and Roland [6], or the earlier survey by Bolton et al. [7].

[6] Note that working with only one public good and performing comparative statistics on the spillover level would not give the same results as it would restrict the centralization decision to a binary choice.

public good are the same across regions. Furthermore, note that utilitarian welfare maximization in our framework corresponds to maximizing the utility of the average citizen $\bar{\alpha}$ who, due to our distributional assumption, coincides with the median.

Under decentralized decision making, the welfare maximizing local governments ignore the citizens in the other region and focus exclusively on the welfare of their own average voter. Let $b_i(g(\beta);\alpha) \equiv \alpha[\ln g_i(\beta) + \beta \ln g_{-i}(\beta)] - g_i(\beta)$ denote the net benefit from the regional public good β to citizen α in region i. In other words, this is the utility arising from a particular regional public good minus the per capita cost of providing it. Each local government maximizes $b_i(g(\beta);\bar{\alpha})$ over $g_i(\beta)$ and provides the following level of the regional public good β:

$$g_i^d(\beta) = \bar{\alpha} \quad \forall \beta \in [0,1] \text{ and } i \in \{1,2\}. \tag{2}$$

We see that the public good levels under decentralized decision making do not depend on the extent of the spillover β to the foreign region because these spillovers are ignored and not internalized.

Under centralized decision making, on the other hand, the interregional spillovers are internalized. At the same time, centralized decision making also has its disadvantages: It creates additional overhead at the center because a new union-wide administration is needed to administer the centralized policies.[7] In addition, it is harder for a centralized authority to overcome informational asymmetries and provide the right type and quantity of local public goods that suit local tastes. To capture these disadvantages of centralization in a parsimonious way, we assume that centralization entails a fixed cost of f per capita.[8] This shorthand representation of the drawbacks of centralization serves to guarantee an interior solution.[9] Weighing the advantages and disadvantages of centralization and taking into account our symmetry assumption, the central authority considers equally the net benefit accruing to the average citizen in both regions and maximizes $b_1(g(\beta);\bar{\alpha}) + b_2(g(\beta);\bar{\alpha}) - 2f$. The resulting provision levels under centralization are:

$$g_i^c(\beta) = \bar{\alpha}[1+\beta] \quad \forall \beta \in [0,1] \text{ and } i \in \{1,2\}. \tag{3}$$

We see that under centralized decision making the provision levels increase not only in the average preference for public spending $\bar{\alpha}$ but also in the extent of interregional spillovers β. This is because these spillovers are now internalized. Comparing centralized versus decentralized decision making, Eqs. (2) and (3) reveal that decentralized decision making leads to lower provision levels. Again, this is because the interregional spillovers are internalized by the central authority whereas they are ignored by local decision makers.

From a normative standpoint, it is clear which policies should be decided centrally and which policies should be decentralized. Let $s(\beta;\alpha) \equiv b(g^c(\beta);\alpha) - b(g^d(\beta);\alpha) - f$ denote the net surplus from centralization. Inserting the provision levels just derived, we have

[7] Admittedly, the national authorities that lose their previous administrative role could potentially be shut down or down-sized. However, this hardly ever seems to happen, at least not in Europe. As a case in point, consider the creation of the European Central Bank which did not lead to the abolition of the national central banks.

[8] Note that we could model the disadvantages of centralization more explicitly. However, since it is only the net surplus from centralization that drives our results, we refrain from doing so.

[9] Without any disadvantage every policy would be centralized. Since such a corner solution is not observed in reality, we rule it out by incorporating both, advantages and disadvantages of centralization.

$s(\beta;\alpha) = \alpha[1+\beta]\ln[1+\beta] - \bar{\alpha}\beta - f$. At one extreme, this surplus is negative for public goods with low interregional spillovers because the fixed cost dominates the benefit. At the other extreme, the surplus is positive for public goods with high spillovers as long as the fixed cost is not too large.[10] The critical spillover threshold β^* that follows from utilitarian welfare maximization is (implicitly) given by:

$$s(\beta^*;\bar{\alpha}) = 0. \tag{4}$$

Below this threshold, the provision of a public good is best decided in a decentralized way, whereas above the threshold centralized decision making dominates. This is the reference point to which we will compare the politically determined outcome. We now turn to its derivation.

3. Political equilibrium

The highly politicized nature of the decision on the allocation of decision powers casts doubt on whether the normative outcome of Section 2 will prevail. It is more realistic, in our view, to regard the allocation of decision powers as being determined politically. This meta-decision is an important part of the constitutional design, which is certainly subject to political pressures. In the European Union, for instance, the constitution is being drafted as we write and the political maneuvers involved are all too obvious. It is this process that we model here and that will lead to a politically chosen spillover threshold.

The process of political decision-making we envisage has three stages: In the first stage, citizens of each region choose a representative by majority vote. In the second stage, the elected representatives of both regions decide jointly on the set of public goods—or, more generally, the policies—that are to be decided centrally, and on how to share the cost of centrally decided policies. In the third stage, the respective executives—at the center or in each region—determine the quantities of the local public goods to provide.

Solving the game backwards, we start by considering the decision on how much of each local public good to provide. Subsequently, we analyze the joint decision by given local representatives on which policies to centralize and on how to share the cost. Finally, we determine the identities of the representatives chosen in regional elections.

3.1. Provision of public goods

We assume that the provision levels of all local public goods are decided "optimally"—in the sense of maximizing the respective social welfare—whether these decisions are taken at the center or in a decentralized way. This assumption implies that the identity of the representatives who decide on centralization does not influence the provision of the public goods. There are several reasons that motivate this assumption: As we have already mentioned, the political economy aspects of the provision of local public goods have been

[10] Specifically, it is positive for all individuals for high spillovers ($\beta \to 1$) as long as $\alpha_{\min} > [f+\bar{\alpha}]/[2\ln 2]$. We henceforth assume that $0 < f < \alpha_{\min}[2\ln 2] - \bar{\alpha}$ in order to guarantee an interior solution for all α. Note that a corner solution might still give rise to strategic delegation, but since such extremes do not occur in reality—at least not in the European case at hand—we abstract from this possibility.

researched extensively. In this paper, we instead focus on the allocation of decision powers. Keeping the provision decision as simple as possible allows us to elucidate this more fundamental issue. At the same time, it prevents the results from becoming too unwieldy. The obvious alternative, namely that the elected representatives also decide on provision levels, is more involved while producing qualitatively similar results.[11]

More importantly, we view the centralization decision as a constitutional choice that is decided ahead of time by different decision-makers from the ones that determine day-to-day policy. Voters, when electing these different types of policy-makers, have different objectives in mind. In the end, our assumption is motivated by the example of the European Union. While the centralization decision appears highly contested, the actual policy making—in our framework the provision of the local public goods—seems to be much more routine. We therefore think of these decisions as being taken by bureaucrats at the center (the commission in Brussels) or at the regional level who maximize social welfare and choose the respective public good levels as determined above. That is, the provision of the local public goods, decided on by the central or local authorities, is given by Eqs. (2) and (3) respectively. This assumption enables us to concentrate on the centralization decision that is the focus of this paper.

3.2. Centralization decision

In this subsection, we analyze the allocation of decision powers, taking as given the identities of the regional representatives, α_i^{rep} for $i \in \{1, 2\}$. That is, the regional elections have supposedly taken place and the elected representatives now have to decide on the spillover threshold. Put differently, they choose which local public goods are to be decided at the center and which local public goods remain under the control of the regional governments. In making this decision, they are aware of the resulting provision levels, namely the ones we have determined previously.

The elected representatives bargain not only over the centralization of decision powers. They also negotiate the respective contributions towards the funding of the centrally decided regional public goods. Equivalently, they have to agree on a side payment that is paid by one region to the other. Note that a side payment of zero corresponds to the case in which each region pays exactly for the provision of its own regional public goods. Given that most negotiations in the European context involve the distribution of costs, allowing for side payments seems to be a realistic feature of our model.[12]

More formally, the representatives choose the spillover threshold β^* and the side-payment Z of region 2 to region 1 in order to maximize the Nash-product:

$$\left(\int_{\beta^*}^{1} s\left(\beta; \alpha_1^{\text{rep}}\right) \mathrm{d}\beta + Z\right) \times \left(\int_{\beta^*}^{1} s\left(\beta; \alpha_2^{\text{rep}}\right) \mathrm{d}\beta - Z\right), \tag{5}$$

[11] The calculations for this case are available from the authors upon request.

[12] In the theoretical bargaining literature—see, for example, Hart and Mas-Colell [16]—our assumption corresponds to the transferable utility case.

where $s(\beta;\alpha_i^{\text{rep}})$ is the surplus of the representative α_i^{rep} from centrally deciding on public good β and we have made use of the objective function:

$$V_i\big(\beta^*, Z; \alpha_i^{\text{rep}}\big) = y \pm Z + \int_0^1 b_i\big(g_i^d(\beta); \alpha_i^{\text{rep}}\big)\,\mathrm{d}\beta + \int_{\beta^*}^1 s\big(\beta; \alpha_i^{\text{rep}}\big)\,\mathrm{d}\beta.$$

The maximization of (5) can be broken down into two steps: first, the representatives maximize the aggregate payoff by choosing the appropriate threshold β^*, and second, they divide it among themselves by agreeing on the side-payment Z.[13] In particular, they decide to centralize the decision over the local public good with spillover β as long as the aggregate surplus for this particular good, $\Delta(\beta;\alpha^{\text{rep}}) \equiv s(\beta;\alpha_1^{\text{rep}}) + s(\beta;\alpha_2^{\text{rep}})$, is non-negative. The politically optimal threshold β^* is (implicitly) given by:[14]

$$\Delta\big(\beta^*;\alpha^{\text{rep}}\big) \equiv \big(\alpha_1^{\text{rep}} + \alpha_2^{\text{rep}}\big)[1+\beta^*]\ln[1+\beta^*] - 2\bar{\alpha}\beta^* - 2f = 0. \tag{6}$$

It is straightforward to show how the preferences for public spending of the two regional representatives influence the equilibrium threshold β^*: Using the implicit function theorem, we have $\mathrm{d}\beta^*/\mathrm{d}\alpha_i^{\text{rep}} = -\Delta_{\alpha_i^{\text{rep}}}/\Delta_{\beta^*}$. Since both the denominator and the numerator are positive, it follows that $\mathrm{d}\beta^*/\mathrm{d}\alpha_i^{\text{rep}} < 0$. The higher the preference for public spending of each representative, the lower is the politically chosen β^*, or, put differently, the more decisions are taken at the center. Note that this dependence on α^{rep} reflects the interim nature of our result—we do not yet know who will ultimately represent the region.

Second, the first-order condition for the politically optimal equilibrium side payment Z^* can be written as:

$$Z^*\big(\beta^*;\alpha^{\text{rep}}\big) = 0.5\int_{\beta^*}^1 \big(s\big(\beta;\alpha_2^{\text{rep}}\big) - s\big(\beta^*;\alpha_1^{\text{rep}}\big)\big)\,\mathrm{d}\beta,$$

or alternatively, substituting for the surplus functions, as:

$$Z^*\big(\beta^*;\alpha^{\text{rep}}\big) = 0.5\int_{\beta^*}^1 \big(\alpha_2^{\text{rep}} - \alpha_1^{\text{rep}}\big)[1+\beta]\ln[1+\beta]\,\mathrm{d}\beta, \tag{7}$$

where the politically chosen allocation of power, β^*, is defined by Eq. (6).

The total contributions of both regions towards financing the centrally decided local public goods then amount to:

$$T_1^*\big(\beta^*;\alpha^{\text{rep}}\big) = \int_{\beta^*}^1 g_1^c(\beta)\,\mathrm{d}\beta - Z^* + (1-\beta^*)f,$$

[13] The validity of this argument follows from combining the first order conditions of maximizing the above Nash-product. $S_1'(S_2 - Z) + S_2'(S_1 + Z) = 0$ and $(S_2 - Z) - (S_1 + Z) = 0$ imply that $S_1' + S_2' = 0$ which is the first order condition of maximizing the aggregate payoff, where S_i is shorthand for the integral of $s_i(\cdot)$.

[14] To ensure a unique maximum we assume $\Delta_{\beta^*}(\beta^*;\alpha^{\text{rep}}) > 0$.

$$T_2^*(\beta^*;\alpha^{\text{rep}}) = \int_{\beta^*}^{1} g_2^c(\beta)\,\mathrm{d}\beta + Z^* + (1-\beta^*)f.$$

Substituting Eq. (3) for the centrally decided level of public goods g_i^c and Eq. (7) for the equilibrium side-payment Z^*, we have:

$$T_i^*\big(\beta^*;\alpha^{\text{rep}}\big) = \int_{\beta^*}^{1} \bar{\alpha}[1+\beta]\,\mathrm{d}\beta + 0.5\big(\alpha_i^{\text{rep}} - \alpha_{-i}^{\text{rep}}\big)\varepsilon(\beta^*) + (1-\beta^*)f,$$

$$\text{with}\quad \varepsilon(\beta^*) \equiv \int_{\beta^*}^{1} [1+\beta]\ln[1+\beta]\,\mathrm{d}\beta > 0. \tag{8}$$

We see that the contribution a region has to pay increases in the preference of its representative for public goods, α_i^{rep}. On the other hand, it decreases in the preference of the other region's representative, α_{-i}^{rep}. The reason is that the greater a representative's gusto for public goods, the weaker is her position in the negotiations and, consequently, the higher the contribution this region has to pay. Conversely, the weaker the position of her opponent in the negotiations, the less the own region pays.

Comparing both regions' contributions, we see that region 1 pays more if its representative has the greater desire for public goods, and vice versa. Only if both representatives have exactly the same preference for public spending will the contributions be equal. This turns out to be the outcome in the symmetric case. However, the off-equilibrium effects are crucial for the voters' decision whom to elect. It is to these elections that we now turn.

3.3. Selection of representatives

We are now in a position to analyze the first stage of the political process: In regional elections, voters in each region choose a regional representative. These representatives are citizen candidates in the sense of Osborne and Slivinski [20] and Besley and Coate [4], which means that they have the same (type-dependent) preferences as ordinary citizens. When choosing their representative, voters are aware that the equilibrium allocation of decision power β^* and the side-payment Z^* depend on the identities of the representatives. Voters in region i thus choose their representative α_i^{rep} to maximize the following utility imputation:

$$V_i\big(\beta^*\big(\alpha^{\text{rep}}\big), Z^*\big(\beta^*\big(\alpha^{\text{rep}}\big);\alpha^{\text{rep}}\big);\alpha\big) = y \pm Z^* + \int_0^1 b_i\big(g_i^d(\beta);\alpha\big)\,\mathrm{d}\beta + \int_{\beta^*}^{1} s(\beta;\alpha)\,\mathrm{d}\beta. \tag{9}$$

Substituting for the side-payment from (7), the surplus from centralization s, employing (6) and the definition of $\varepsilon(\beta^*)$ from (8), the first-order condition of this one-dimensional voting problem takes the form:

$$\frac{\mathrm{d}V_i(\cdot)}{\mathrm{d}\alpha_i^{\mathrm{rep}}} = -\frac{\varepsilon(\beta^*)}{2} + \big(\alpha_i^{\mathrm{rep}} - \alpha\big)[1+\beta^*]\ln[1+\beta^*]\frac{\mathrm{d}\beta^*}{\mathrm{d}\alpha_i^{\mathrm{rep}}} = 0. \tag{10}$$

Since $\varepsilon(\beta^*) > 0$ and $\mathrm{d}\beta^*/\mathrm{d}\alpha_i^{\mathrm{rep}} < 0$, Eq. (10) can only be satisfied if $\alpha_i^{\mathrm{rep}} < \alpha$. That is, each voter would like to elect a representative whose preference for public spending is lower than the voter's own preference.

Ultimately, it will be the median voter in each region who selects the regional representative.[15] This is because the candidate the median voter prefers is also preferred by a majority of voters over any alternative candidate in a pairwise election. The above first order condition then implies that the preference for public spending of both elected representatives in equilibrium is lower than the median voters' preference for public spending, or $\alpha_i^{\mathrm{rep}} < \tilde{\alpha}$. Instead of representing the region herself, the median voter prefers to select a representative with a lower preference for public spending. In other words, she strategically delegates the representation of the region to someone who is less keen on public goods. The driving force behind this result is the median voter's desire to obtain a favorable cost share for her region.

This has important implications for the equilibrium allocation of decision powers. Given that the elected representative is less keen on public spending than the median voter and recalling that the equilibrium threshold decreases in the preference parameter of the representative, it follows that the politically chosen spillover threshold $\beta^*(\alpha^{\mathrm{rep}})$ exceeds the threshold $\beta^*(\tilde{\alpha})$ that would be chosen by the median voter, were she to represent the region herself. Note that the latter threshold is socially optimal as the median and the average voter coincide due to our distributional assumption. Compared to the socially optimal spillover threshold then, we conclude that the politically chosen threshold is suboptimally high. In other words, strategic delegation leads to less centralization than is socially optimal. The driving force behind this result is again the objective of obtaining a lower cost share.

Notwithstanding this objective, the equilibrium side payment Z^* equals zero in the symmetric case. Each region pays for its own local public goods and the contributions of the regions to fund centrally decided policies are exactly equal. However, this particular aspect of our result is an artifact of the symmetry assumption which we now relax.

4. The asymmetric case

Let us now generalize the model to account for asymmetries between regions. In particular, we want to study the case of asymmetric spillovers which turns out to be of special importance in the context at hand.[16] Suppose that regions differ with respect to the extent

[15] In Appendix A, we show that the above utility imputation satisfies the single-crossing property which, according to Gans and Smart [15], is a sufficient condition to invoke the median voter theorem.

[16] Other potential asymmetries that can be incorporated into our model are fixed costs of centralization that differ across regions and also asymmetric tastes for the public good. As for the former, it is straightforward to

of spillovers they receive from the local public goods in the other region. This type of asymmetry has two interesting interpretations: First, a region could be located downstream (or leeward) of the other region and thus benefit from pollution reductions upstream (or upwind) whereas the opposite is generally not true. Perhaps even more interesting is the second interpretation: Think of one region as the core and the other as the periphery. Usually, the region located at the periphery receives higher benefits from the public goods provided in the central region than vice versa. Take as an example a German *autobahn* or French *autoroute* and compare them to the same type of public good in peripheral countries such as Ireland or Portugal. Clearly, the freeways in core countries benefit residents of the peripheral countries more than the other way round.

We integrate this type of asymmetry into our model as follows: Generalize the net benefit of region i from a public good with spillover β to take the form $b_i = \alpha \ln g_i + \alpha\lambda_i\beta \ln g_{-i} - g_i$, where $\lambda_i \in [0, 1]$ differs across regions. The term λ determines to what extent a region benefits from the local public good β provided in the other region. As before, we start by determining the provision levels if decisions are taken locally versus when they are taken at the center. The public good levels under decentralization are $g_1^d = g_2^d = \bar{\alpha}$ just as in the symmetric case. Since spillovers are not taken into account, their asymmetry does not change the public good levels in this case. Under centralization, on the other hand, provision levels do differ by region. In particular, the resulting provision levels are $g_i^c = \bar{\alpha}[1 + \lambda_{-i}\beta]$. Substituting these levels back into the benefits and subtracting the fixed cost gives a surplus from centralization of $s_i(\beta; \alpha) = \alpha \ln[1 + \lambda_{-i}\beta] + \alpha\beta\lambda_i \ln[1 + \lambda_i\beta] - \bar{\alpha}\lambda_{-i}\beta - f$.

We now turn to the second stage of the political process where the degree of centralization is determined conditional on the identity of the representatives. As in Section 3.2, the degree of centralization and the side payment are chosen by the elected representatives, α_i^{rep} for $i \in \{1, 2\}$. These representatives maximize the Nash-product (5) as before. The equilibrium spillover threshold β^* is again given by the condition $\Delta(\beta^*; \alpha^{\text{rep}}) = 0$, which now takes the form:

$$\Delta\big(\beta^*; \alpha^{\text{rep}}\big) \equiv \big(\alpha_1^{\text{rep}} + \alpha_2^{\text{rep}}\beta^*\lambda_2\big)\ln[1 + \lambda_2\beta^*] + \big(\alpha_2^{\text{rep}} + \alpha_1^{\text{rep}}\beta^*\lambda_1\big)\ln[1 + \lambda_1\beta^*] - \bar{\alpha}\beta^*(\lambda_2 + \lambda_1) - 2f = 0. \tag{11}$$

The equilibrium side payment $Z^*(\beta^*; \alpha^{\text{rep}})$ now amounts to

$$Z^*\big(\beta^*; \alpha^{\text{rep}}\big) = 0.5\int_{\beta^*}^{1}\big(\alpha_2^{\text{rep}}\beta\lambda_2 - \alpha_1^{\text{rep}}\big)\ln[1 + \lambda_2\beta]\,\mathrm{d}\beta - 0.5\int_{\beta^*}^{1}\big(\alpha_1^{\text{rep}}\beta\lambda_1 - \alpha_2^{\text{rep}}\big)\ln[1 + \lambda_1\beta]\,\mathrm{d}\beta$$

show that, while affecting the side-payment, they do not change the extent of strategic delegation and hence the degree of centralization. The latter type of asymmetry, which has been considered in Besley and Coate [5] and Redoano and Scharf [22], leads to ambiguous results in our setup.

$$-0.5\int_{\beta^*}^{1}\bar{\alpha}\beta(\lambda_1-\lambda_2)\,\mathrm{d}\beta, \tag{12}$$

where $\beta^*=\beta^*(\alpha^{\mathrm{rep}})$ is implicitly given by (11). We see that, as before, the side payment increases with the taste for public goods of the representative α_2^{rep} and decreases with the preference of the representative α_1^{rep}.

Given this policy outcome, we now turn to the first stage of the model where each voter and, in particular, the median voter maximizes her own utility by selecting the region's representative. The first order conditions pertaining to the respective optimization of the utility imputation (cf. (9) in Section 3.3) take the following form:

$$\frac{\mathrm{d}V_1(\cdot)}{\mathrm{d}\alpha_1^{\mathrm{rep}}}=\left[\frac{\mathrm{d}Z^*}{\mathrm{d}\beta^*}-s_1(\beta^*;\alpha)\right]\frac{\mathrm{d}\beta^*}{\mathrm{d}\alpha_1^{\mathrm{rep}}}+\frac{\mathrm{d}Z^*}{\mathrm{d}\alpha_1^{\mathrm{rep}}}=0, \tag{13a}$$

$$\frac{\mathrm{d}V_2(\cdot)}{\mathrm{d}\alpha_2^{\mathrm{rep}}}=\left[-\frac{\mathrm{d}Z^*}{\mathrm{d}\beta^*}-s_2(\beta^*;\alpha)\right]\frac{\mathrm{d}\beta^*}{\mathrm{d}\alpha_2^{\mathrm{rep}}}-\frac{\mathrm{d}Z^*}{\mathrm{d}\alpha_2^{\mathrm{rep}}}=0. \tag{13b}$$

We see that the representative's preference for public goods influences the voters' utility indirectly and directly: First, the identity of the representative changes the equilibrium threshold spillover β^* and thereby the side-payment the region receives (pays) as well as the surplus on goods that are now centralized. Second, the representative's type changes the side-payment directly, as we have seen above. Substituting the explicit expressions for all these terms into the first-order conditions, we have:

$$-\left(\alpha_1^{\mathrm{rep}}-\alpha\right)\frac{(\ln[1+\lambda_2\beta^*]+\lambda_1\beta^*\ln[1+\lambda_1\beta^*])^2}{\Delta_{\beta^*}}-\frac{\varepsilon_1(\beta^*)}{2}=0, \tag{14a}$$

$$-\left(\alpha_2^{\mathrm{rep}}-\alpha\right)\frac{(\ln[1+\lambda_1\beta^*]+\lambda_2\beta^*\ln[1+\lambda_2\beta^*])^2}{\Delta_{\beta^*}}-\frac{\varepsilon_2(\beta^*)}{2}=0, \tag{14b}$$

with $\varepsilon_i(\beta^*)\equiv\int_{\beta^*}^{1}(\ln[1+\lambda_{-i}\beta]+\beta\lambda_i\ln[1+\lambda_i\beta])\,\mathrm{d}\beta$. As in the symmetric case, $\varepsilon_i(\beta^*)>0$ for $\beta^*<1$ implying that $\alpha_1^{\mathrm{rep}}<\bar{\alpha}$ and $\alpha_2^{\mathrm{rep}}<\bar{\alpha}$. In other words, the median voter in each country still elects a representative whose preference for public spending falls short of her own.

However, in contrast to the symmetric case, the degrees of strategic delegation need no longer be equal across countries. In general, $\alpha_1^{\mathrm{rep}}\neq\alpha_2^{\mathrm{rep}}$ unless $\lambda_1=\lambda_2$ as can be seen from (14a) and (14b). To gain further insight, consider the extreme case where $\lambda_1=0$ and $\lambda_2=1$. The local public goods of region 1 then benefit region 2 whereas region 1 does not receive such externalities. In terms of the core-periphery interpretation, region 1 is the core and region 2 the periphery. In this (special) case, Eqs. (14a) and (14b) become

$$-\left(\alpha_1^{\mathrm{rep}}-\alpha\right)\frac{(\ln[1+\beta^*])^2}{\Delta_{\beta^*}}-\frac{\varepsilon_1(\beta^*)}{2}=0, \tag{15a}$$

$$-\left(\alpha_2^{\mathrm{rep}}-\alpha\right)\frac{(\beta^*\ln[1+\beta^*])^2}{\Delta_{\beta^*}}-\frac{\varepsilon_2(\beta^*)}{2}=0, \tag{15b}$$

with $\varepsilon_1(\beta^*) = \int_{\beta^*}^1 \ln[1+\beta]\,\mathrm{d}\beta$ and $\varepsilon_2(\beta^*) = \int_{\beta^*}^1 \beta \ln[1+\beta]\,\mathrm{d}\beta$. The first term in (15a) and (15b) measures the indirect influence of α_i^{rep} on the utility of voters in region i. Since $\beta^* < 1$, this indirect influence is stronger in the spillover sending region 1 than in region 2. The direct effect of α_i^{rep} on Z^*, given by $\varepsilon_i(\beta^*)$, is also more pronounced in region 1 than in region 2. Dividing (15b) by $(\beta^*)^2$ and subtracting (15a) gives:

$$\frac{(\alpha_1^{\text{rep}} - \alpha_2^{\text{rep}})(\ln[1+\beta^*])^2}{\Delta_{\beta^*}} = -\frac{\beta^*\varepsilon_1(\beta^*) - \varepsilon_2(\beta^*)/\beta^*}{2\beta^*}. \tag{16}$$

The numerator on the RHS is strictly increasing in β^* as long as $\beta^* < 1$ and becomes zero for $\beta^* = 1$. Hence, the RHS of (16) will be positive as long as $\beta^* < 1$. This implies that $\alpha_2^{\text{rep}} < \alpha_1^{\text{rep}}$. In other words, the region that benefits from interregional spillovers elects a representative who has a lower preference for public spending than her counterpart in the region that does not receive spillovers. Strategic delegation is found to be stronger in the periphery than at the center.

Our result that peripheral countries elect representatives who have less gusto for centralization than their counterparts in core regions seems to be born out by the European experience. Anecdotal evidence includes Magaret Thatcher and the rebate she obtained for Britain as well as the more recent examples of Spain and Poland. It is of particular interest that our result does not bode well for the impending EU enlargement. New member countries are necessarily peripheral. We are thus led to expect that their representatives will have too low a preference for integration because their constituents hope to achieve a favorable cost sharing arrangement.

5. Conclusion

In this paper we have presented a positive model of policy centralization. As a first step, we have compared how each individual policy is set when the decision is taken in a decentralized way versus when it is taken centrally. As is well known, the centralized solution internalizes spillovers but incurs various costs of centralization. The tradeoff between these costs and the benefits determines the optimal degree of centralization. Our contribution in this paper is to move beyond such a normative analysis and endogenize the degree of centralization.

In our model, local representatives decide which policies are to be centralized and how to share the ensuing costs. We show that strategic delegation leads to the election of less centralist or federal-minded representatives, who are elected to obtain a more favorable cost share for their constituency. As a consequence, the resulting degree of centralization falls short of what is optimal for the average citizen. When we extend the setup to account for asymmetric spillovers, these effects persist. However, strategic delegation turns out to be more pronounced in the periphery than at the center.

Our analysis can be applied to the European Union and bears interesting implications for other regional agreements, as well. In the European context, our findings may reassure all those who are concerned about the ever expanding powers of the Brussels bureaucracy. Quite to the contrary, our model predicts that not enough decision power is devolved to the

EU Commission. In fact, it might be the centralization-skeptical politicians predicted by our model who have popularized the term subsidiarity. Equally interesting is the prediction, implied by the asymmetric extension of the model, that representatives from the periphery will be less centralist than their counterparts in core countries. Anecdotal evidence seems to support this prediction: One famous example is the rebate obtained by Margaret Thatcher.

We are well aware that such conclusions are courageous. In fact, we have intended them that way. The endogenous determination of centralization has so far attracted so little attention that we feel obliged to provoke more. There is a wide open field lying in front of us and we can only point out a few directions where further research is needed.

One direction is to take a closer look at the actors who set policies, both at the center and locally. We have modeled them as well-meaning executives but clearly they have their own stakes in the centralization decision, and will take action to influence it. Most notable in this respect is the interest of the central bureaucracy in further centralization. To account for such effects, we need to develop a dynamic version of our model.

Another interesting dimension that merits attention is the institutional design aspect of our analysis. We have considered an institutional setting where representatives are elected to bargain on policy centralization. Our goal in doing so has been to model the European status quo. However, the rules are still malleable, especially in Europe. Our framework should be compared to alternative rules of decision-making that might give rise to a different degree of centralization.

Finally, our treatment of policies has necessarily been stylized, especially on the cost side. The cost of centralization was meant to proxy for a wide range of possible issues, be it informational asymmetries or locational differences. A more explicit treatment of different costs might provide further insights. This also applies to the benefits or spillovers produced by different types of public goods. Greater detail on this dimension would yield more concrete predictions which policies are most likely to be centralized.

Acknowledgments

We are grateful to the editor and two anonymous referees for very helpful suggestions. We also thank seminar participants at Konstanz, Illinois, Kiel, Kassel, Cergy-Pontoise, as well as at the GWIW, NOITS, IIPF, VfS, and RIEF 2004 conferences for valuable comments and discussions. The usual caveat applies: all errors are ours.

Appendix A. Single crossing property

As shown by Gans and Smart [15], a sufficient condition for invoking the median voter result is that the voters' objective function satisfies the single crossing property. Recall the voters' objective function in our case:

$$V_i\left(\beta^*\left(\alpha^{\text{rep}}\right), Z^*\left(\beta^*\left(\alpha^{\text{rep}}\right); \alpha^{\text{rep}}\right); \alpha\right) = y \pm Z^* + \int_0^1 b_i\left(g_i^d(\beta); \alpha\right) \mathrm{d}\beta + \int_{\beta^*}^1 s(\beta; \alpha)\, \mathrm{d}\beta.$$

We want to check whether this function satisfies single crossing. Gans and Smart [15] use the following definition, which we restate using our notation:

$\forall \alpha_i^{\text{rep}'} > \alpha_i^{\text{rep}}$ and $\forall \alpha_i' > \alpha_i$:

$$\alpha_i^{\text{rep}'} \succcurlyeq_{\alpha_i} \alpha_i^{\text{rep}} \quad \Rightarrow \quad \alpha_i^{\text{rep}'} \succcurlyeq_{\alpha_i'} \alpha_i^{\text{rep}} \quad \text{and} \quad \alpha_i^{\text{rep}'} \succ_{\alpha_i} \alpha_i^{\text{rep}} \quad \Rightarrow \quad \alpha_i^{\text{rep}'} \succ_{\alpha_i'} \alpha_i^{\text{rep}}.$$

This definition is clearly satisfied in our application if

$$V_i\big(\alpha_i^{\text{rep}'}; \alpha_i\big) \geqslant V_i\big(\alpha_i^{\text{rep}}; \alpha_i\big) \quad \Rightarrow \quad V_i\big(\alpha_i^{\text{rep}'}; \alpha_i'\big) > V_i\big(\alpha_i^{\text{rep}}; \alpha_i'\big),$$

where we have suppressed all but the relevant arguments. Now suppose the first inequality holds. Plugging in for Z, b, and s it can be written as:

$$0.5\int_{\beta^{*\prime}}^{\beta^*} \alpha_{-i}^{\text{rep}} B\,\mathrm{d}\beta - 0.5\int_{\beta^{*\prime}}^{1} \alpha_i^{\text{rep}'} B\,\mathrm{d}\beta + 0.5\int_{\beta^*}^{1} \alpha_i^{\text{rep}} B\,\mathrm{d}\beta + \int_{\beta^{*\prime}}^{\beta^*} (\alpha B - \bar{\alpha}\beta - f)\,\mathrm{d}\beta \geqslant 0,$$

where $B \equiv [1+\beta]\ln[1+\beta]$. Similarly, the second inequality can be written as:

$$0.5\int_{\beta^{*\prime}}^{\beta^*} \alpha_{-i}^{\text{rep}} B\,\mathrm{d}\beta - 0.5\int_{\beta^{*\prime}}^{1} \alpha_i^{\text{rep}'} B\,\mathrm{d}\beta + 0.5\int_{\beta^*}^{1} \alpha_i^{\text{rep}} B\,\mathrm{d}\beta + \int_{\beta^{*\prime}}^{\beta^*} (\alpha' B - \bar{\alpha}\beta - f)\,\mathrm{d}\beta > 0.$$

The fact that α and α' appear only in the last term of these inequalities makes it easy to see that the former implies the latter for $\alpha' > \alpha$. This establishes that the voters' objective function satisfies the single crossing property, which is sufficient to apply the median voter result.

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