Voting, Lobbying, and the Decentralization Theorem

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April 2007
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Abstract

This paper revisits the well-known fiscal "Decentralization Theorem" of Oates(1972), by relaxing the role of the assumption that governments are benevolent, while retaining the assumption of policy uniformity. If instead, decisions are made by direct majority voting, the theorem fails. Specifically, (i) centralization can welfare-dominate decentralization even if there are no externalities and regions are heterogenous; (ii) decentralization can welfare-dominate centralization even if there are positive externalities and regions are homogenous. The intuition is that the insensitivity of majority voting to preference intensity interacts with the different inefficiencies in the two fiscal regimes to give second-best results. Similar results obtain when governments are benevolent, but subject to lobbying, because now decisions are *too* sensitive to the preferences of the organized group. The conclusion is that the Decentralization Theorem is not robust to relatively minor and standard deviations away from the benchmark of purely benevolent government.

Keywords: Decentralization, majority voting, lobbying, local public goods.

JEL Classification: H41, H70, H72.

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†I would like to thank Michele Ruta for helpful comments.

1. Introduction

The fiscal decentralization theorem, formalized in Oates(1972), provides an answer to one of the fundamental problems in public finance: to which level of government should the authority to tax and provide public goods be allocated? The theorem shows that, under certain assumptions, this choice depends on the size of regional or local public good spillovers and differences in preferences for (or costs of provision of) public goods between regions. If spillovers are small, and differences across regions large, then decentralization is preferred, and if the reverse holds, centralization is preferred. This simple theory has an enduring appeal.

However, in the recent past, the assumptions of the decentralization theorem have come under increasing scrutiny. As is well-known, two key assumptions are made: firstly, that each level of government is *benevolent*; that is, whether central or sub-central government maximizes the welfare of citizens in its jurisdiction. The second assumption is that with centralization, per capita levels of public good provision are *uniform* across jurisdictions[1].

Besley and Coate(2003) and Lockwood(2002) relax *both* of these assumptions simultaneously by supposing that with centralization, local public good provision need not be uniform, and moreover, levels of public good provision are determined by bargaining between regional or district delegates to a legislature. The paper of Besley and Coate(2003) explicitly focusses on whether the decentralization theorem extends to this setting. They find that it does not, due to strategic delegation effects[2]. Specifically, they show that even with identical districts and some public good spillovers, centralization may generate less aggregate surplus than decentralization, because with centralization, voters in a district may have an incentive to vote for a delegate with a higher preference for the public good than their own in order to tilt the balance of public good provision towards their region and away from the other one.

This note asks whether it is really necessary to relax both fundamental assumptions in order to invalidate the decentralization theorem. In one direction, the answer to this

[1] Oates did not provide a very explicit justification of his assumption in his 1972 book: all he says is that "If public goods are supplied by a central government, one should expect a tendency towards uniformity in public programs across all communities." (p11). But, recently, several different explanations as to why regions might agree ex ante to uniformity at a constitutional stage have been proposed. For example, Harstad(2007) argues that it can prevent wasteful delay in bargaining in the national legislature, and Hindriks and Lockwood(2005) argue that it may constrain rent-seeking politicians.

[2] Note that they only show that the theorem fails in one "direction" i.e. in their model, with heterogenous regions and no spillovers, it is still true that decentralization is always preferred.

question is rather trivial. If uniformity is relaxed, while retaining benevolence, then centralization obviously at least weakly dominates decentralization, and strictly dominates unless there are no spillovers. This is also true, quite generally, even if only regional government can observe citizen preferences for the public goods[3]. So, the interesting question[4] is what happens when the benevolence assumption is relaxed (or changed) while retaining policy uniformity.

There are of course, a large number of ways of replacing the benevolence assumption. But, the most interesting of these, because it is so simple and widely used[5], is to assume that decisions by each level of government are made by majority voting[6]. In other words, to replace the assumption of a benevolent dictator with that of a direct democracy. In this paper, we show that generally, with this simple change, the decentralization theorem fails in both "directions". That is, examples can be found where (i) decentralization welfare-dominates centralization even with externalities and identical preferences across regions, and (ii) centralization welfare-dominates decentralization with no externalities and different preferences across regions.

The intuition is that these are *second-best* results. Either fiscal regime has one source of inefficiency, and at the same time, majority voting has a well-known inefficiency, that it does not measure intensity of preference. This inefficiency can interact with the inefficiencies in the two fiscal regimes in such a way as to overturn the Decentralization Theorem. For example, it is easy to construct examples (see Example 1 below) where the median voter has a higher preference for the public good than the average voter. This tendency towards overprovision offsets the underprovision with decentralization arising form failure to internalize positive externalities, and can make decentralization superior,

[3]If citizen preferences are linear in the private good, then from standard mechanism design results (e.g. Mas-Colell, Whinston, and Green((1995), p885), it is possible for central government to choose taxes so as induce citizens to truthfully reveal their preferences for the public good, while balancing the budget and without distorting public good supply.

[4]An additional reason why this is the most interesting line of enquiry is that while there is some debate over whether the uniformity assumption is approximated in practice (see e.g. Knight(2004)), there is a certainly a consensus in economics that "benevolent dictators" do not describe real processes of political decision-making.

[5]A very partial list of papers in fiscal federalism that assume majority voting (along with policy uniformity) would include Alesina, Angeloni, and Etro(2005), Alesina and Spolaore(1997), Bolton and Roland(1997), (1998), Cremer and Palfrey(1996),(2000), Gilbert and Picard(1996), Oberholzer-Gee and Strumpf(2002).

[6]Note that because we retain the uniformity assumption, a determinate outcome with unrestricted majority voting is assured.

even with externalities and identical preferences. It is somewhat more difficult - but possible - to construct examples (see Example 2 below) where majority voting magnifies the heterogeneity across regions, thus leading to levels of public good provision under decentralization that are too heterogenous. Then, uniform provision under centralization can dominate, even with no externalities and different preferences across regions.

These results can be contrasted with those of Besley and Coate(2003). In particular, this note shows that it is *not necessary to introduce representative democracy and non-uniformity of public good provision* in order to invalidate the decentralization theorem: direct democracy is enough, even with uniformity. Moreover, the mechanism at work in our setting is completely different than in Besley and Coate. As democracy is direct, there is no strategic delegation by voters. Finally, we get invalidation of the decentralization theorem in both "directions", whereas as already remarked, in their model,with heterogenous regions and no spillovers, it is still true that decentralization is always preferred.

This paper also considers another popular way of relaxing the benevolence assumption; to assume, following Grossman and Helpman(1994), and Dixit, Grossman and Helpman(1997), that each level of government is benevolent, but also values payments from special interest groups. Again, we retain the assumption of policy uniformity. To avoid trivial results, we are careful to keep the structure of special interest groups the same in the two fiscal regimes. In this case, we also get a failure of the Decentralization Theorem in both directions. The key point is that with special interests, decision-making is too sensitive to the preferences of the organized group. This inefficiency can interact with the inefficiencies in the two fiscal regimes to produce second-best results of a similar kind to with majority voting.

Related literature, other than that already mentioned, is as follows. First, there are a number of well-known papers that, as part of their analysis, compute the outcome with some form of fiscal centralization, assuming policy uniformity to reduce the policy space down to one dimension, and then assuming majority voting (Alesina, Angeloni, and Etro(2005), Alesina and Spolaore(1997),(2003), Bolton and Roland(1996), (1997), Cremer and Palfrey(1996),(2000), Oberholzer-Gee and Strumpf(2002))). But, the main focus of these papers is typically on more positive issues (e.g. secessions, size of international unions, etc), and so none of these papers specifically deals with the normative issue addressed in this paper[7].

Second, there is a recent literature on special interest groups and fiscal decentralization (Bardhan and Mookherjee(2000), Bordignon, Colombo, and Galmarini (2003), Redoano(2003), Brou and Ruta(2006)). However, again, this literature really focusses on positive issues, such as the number of lobbies and size of lobby payments under different fiscal regimes. So, the simple point noted in this paper does not seem to have been made before.

The layout of the remainder of this paper is as follows: Section 2 presents the model, Section 3 contains examples and results, and Section 4 concludes.

2. The Model

The model is a somewhat more general version of Besley and Coate(2003), henceforth BC. The economy comprises two geographical regions $i = 1, 2$. Each is populated by a set of citizens of size unity. There are three goods in the economy, a single private good, and two public goods. Each citizen is endowed with some amount of the private good. One unit of the private good produces one unit of the public good.

Each citizen in district i is characterized by a public good parameter θ. Preferences over the private and public goods for this citizen are given by

$$(1-\sigma)v(g_i, \theta) + \sigma v(g_j, \theta) + x_i, \ \ 0 \leq \sigma \leq 0.5 \tag{2.1}$$

So, σ measures the degree of spillovers[8]. In each district, θ has support Θ_i (where Θ_i can be discrete or an interval), and has a mean $\overline{\theta}_i$ and median m_i. This generalizes BC in two respects. First, BC assume $v(g, \theta) = \theta \ln g$, whereas we only assume that that v is strictly concave in g and linear in θ. Second, unlike BC, we do *not* assume $\overline{\theta}_i = m_i$; this assumption is definitely restrictive, as we show below.

In a decentralized system, g_i is chosen by the government of region i, and public expenditures are funded by a uniform head tax on regional residents. That is, each citizen pays g_i. In a centralized system, g_1, g_2 are both determined by a national government. In this case, there is a uniform head tax on all citizens, so each citizen pays $(g_1 + g_2)/2$ i.e. cost-sharing. Moreover, as already discussed, we impose Oates' uniformity assumption

[7] But, it should be noted that the influential book of Alesina and Spoloare(2003) on the size of nations does characterize efficient outcomes (e.g. size and shape of nations), and explain why under majority voting rules, equilibrium might not be efficient. Their inefficiencies are due to the failure of majority voting to measure intensity of preferences, which is similar in spirit to the findings of this paper.

[8] BC assume $v(g) = \ln g$.

i.e. $g_1 = g_2$. So with centralization there is uniformity of both the taxes and expenditures[9]
.

Following BC, and most other contributions in this area, we will rank fiscal regimes using the criterion of the sum of utilities, which, due to the quasi-linearity of preferences, is equivalent to aggregate surplus from provision of the public good i.e.

$$\sum_{i,j=1,2} [(1-\sigma)v(g_i, \overline{\theta}_i) + \sigma v(g_j, \overline{\theta}_i) - g_i], \ j \neq i \tag{2.2}$$

Note in writing this formula, we have used the fact that that the average v in region i is just $v(g, \overline{\theta}_i)$ by the linearity of $v(g, \theta)$ in θ. The efficient level of public good provision in region i thus maximizes aggregate surplus. This efficient level g_i^* therefore satisfies the Samuelson condition that the sum of expected marginal benefits across both regions equals the marginal cost of unity i.e.

$$(1-\sigma)v'(g_i^*, \overline{\theta}_i) + \sigma v'(g_i^*, \overline{\theta}_j) = 1 \tag{2.3}$$

3. Analysis

3.1. The Decentralization Theorem

We begin by briefly stating our benchmark decentralization theorem. Under decentralization, g_i^D must maximize the surplus in region i only, taking g_j as given. The outcome under decentralization therefore equates the marginal benefit of g_i in region i only to the marginal cost i.e.

$$(1-\sigma)v'(g_i^D, \overline{\theta}_i) = 1 \tag{3.1}$$

Comparing (2.3) and (3.1), it is obvious that decentralization is generally inefficient because spillovers are not internalized.

Under centralization, g_1^C, g_2^C must maximize the aggregate surplus (2.2) subject, of course, to the constraint that $g_1^C = g_2^C = g^C$. From (2.2), aggregate surplus given this constraint is $v(g^C, \overline{\theta}_1) + v(g^C, \overline{\theta}_2) - 2g^C$. This is maximized when

$$\frac{v'(g^C, \overline{\theta}_1) + v'(g^C, \overline{\theta}_2)}{2} = 1 \tag{3.2}$$

[9] This last assumption captures in a crude way the widely observed fact that centrally determined tax rates e.g. income tax rates, are the same across regions. Under the assumption of quasi-linear preferences, the assumption is not needed for the Decentralization Theorem to hold, but it is helpful when considering majority voting, as otherwise the policy space is multidimensional and there may be voting cycles.

The interpretation of (3.2) is that the average of the marginal benefit of g^C across the two regions is equal to half the marginal cost.

Comparing (2.3) and (3.2), it is apparent that centralization is generally inefficient because uniformity is imposed, unless $\overline{\theta}_1 = \overline{\theta}_2$, in which case, by inspection, conditions (3.1),(3.2) are identical. So, we can state:

Proposition 1. *Suppose that the benevolence and uniformity assumptions are satisfied.*

(i) If the average preference for the public good is the same in both regions ($\overline{\theta}_1 = \overline{\theta}_2$) and spillovers are present ($\sigma > 0$) a centralized system produces a strictly higher level of surplus than a decentralized system.

(ii) If the average preferences are different in both regions ($\overline{\theta}_1 \neq \overline{\theta}_2$), and no spillovers are present ($\sigma = 0$) a decentralized system produces a strictly higher level of surplus than a centralized system.

As is well-known, as long as the basic benevolence and uniformity assumptions are made, this result is much more general than the model i.e. it does not depend on the specific assumptions made above , e.g. the form of preferences, only two regions, and even the uniform taxation assumption.

3.2. Majority Voting and the Decentralization Theorem

We now show that if we replace the assumption of a benevolent policy-maker with decision-making via majority voting over the set of possible public good levels, while retaining the uniformity assumption, both parts of the decentralization theorem can fail.

Example 1: *Decentralization welfare-dominates centralization with externalities and identical preferences across regions.* Assume $v(g, \theta) = \theta v(g)$, with just two preference groups i.e. $\theta_i \in \{\theta_l, \theta_h\}$, $\theta_l < \theta_h$ and let $\lambda > 0.5$ be the share of type-h in region, $i = 1, 2$. Then, the median voter is a type-h in each region i.e. $m_i = \theta_h,\ i = 1, 2$.

So, equilibrium public good supply under decentralization in each region must be the most preferred supply of the type-h : that is, $g_1^D = g_2^D = g^D$ must solve (3.1), except that $\overline{\theta}_i$ is replaced by θ_h :

$$(1 - \sigma)\theta_h v'(g^D) = 1 \tag{3.3}$$

Also, as the median voter is high-preference in the whole economy, equilibrium public good supply with centralization must be the most preferred supply of the type-h citizen, taking into account the uniformity constraint $g_1 = g_2$, which forces the median voter to internalize the spillover. That is, g^C must solve (3.2), where $\overline{\theta}_1, \overline{\theta}_2$ are replaced by θ_h;

$$\theta_h v'(g^C) = 1 \tag{3.4}$$

Finally, from (2.3), efficient supply is

$$\overline{\theta}v'(g^*) = 1,\ \overline{\theta} = \lambda\theta_h + (1-\lambda)\theta_l \tag{3.5}$$

Now assume that $(1-\sigma)\theta_h = \overline{\theta}$, an assumption that is always feasible as $\theta_h > \theta_l$. Then $g^D = g^* < g^C$: in this case, decentralization must generate higher aggregate surplus than centralization. □

The intuition is that majority voting biases the outcome in the direction of too high a level of the public good: this offsets the bias in the direction of too low a level of the public good with decentralization, making it more efficient.

To get an example where the opposite can occur, i.e. where centralization welfare-dominates decentralization with no externalities and different preferences across regions is considerably more work. The following example is constructed so that the median voter in each region is an "extremist." Thus, under decentralization, public good provision is too heterogenous across regions. Of course, under centralization, public good provision is too uniform across regions. But under some conditions, excessive heterogeneity can be worse than excessive uniformity.

Example 2: *Centralization welfare-dominates decentralization with no externalities and different preferences across regions.* Assume $\theta \in \{1-\delta, 1, 1+\delta\}$, $1 > \delta > 0$. Call these preferences low, medium, high (L, M, H) respectively. In region 1, the shares of population with L, M, H are $\frac{1+\varepsilon}{2}$, $\frac{1-\varepsilon}{2}$, 0 respectively, where $\varepsilon < 1$. In region 2, the shares of population with L, M, H are 0, $\frac{1-\varepsilon}{2}$, $\frac{1+\varepsilon}{2}$. Moreover, the utility functions are

$$\begin{aligned} v(g,\theta) &= g(1+\theta) - \frac{g^2}{2},\ \theta = 1-\delta, 1+\delta \\ v(g,\theta) &= g(1+\theta) - \frac{g^4}{4},\ \ \theta = 1 \end{aligned} \tag{3.6}$$

Note that M agents care more about deviations from their ideal point, 1, than do L or H agents. Note that in this class of examples, heterogeneity is parametrized in two different ways, by δ and ε. The higher δ, the more dispersed are the ideal points of the agents. The higher ε, the more "extremists" i.e. L,H types there are, relative to moderates.

The equilibrium supplies with decentralization are easy to find. In region 1, the L-type is the median voter, so his most preferred level of public good provision is chosen i.e. the maximizer of $v(g_1, 1-\delta) - g_1$, implying from (3.6), $g_1^D = 1-\delta$. In region 2, the H-type is the median voter, so his most preferred level of public good provision is chosen, which in the same way, can be calculated at $g_2^D = 1+\delta$.

With centralization, as $\varepsilon < 1$, overall, the M type is the median voter[10], so his most preferred level of public good provision $g_1 = g_2 = g$ is chosen. This maximizes $v(g,1) - g$, i.e. $g^C = 1$.

We now need to show that g^C, g^C yields higher aggregate surplus than g_1^D, g_2^D. Surpluses in regions 1 and 2 are $S_1(g_1),\ S_2(g_2)$ where

$$S_1(g) = \frac{1+\varepsilon}{2}[(1-\delta)g - \frac{g^2}{2}] + \frac{1-\varepsilon}{2}[g - \frac{g^4}{4}] \tag{3.7}$$

$$S_2(g) = \frac{1+\varepsilon}{2}[(1+\delta)g - \frac{g^2}{2}] + \frac{1-\varepsilon}{2}[g - \frac{g^4}{4}] \tag{3.8}$$

So, we need to show that $S_1(1)+S_2(1) > S_1(1-\delta)+S_2(1+\delta)$. Because of symmetry of the model, $S_1(1) = S_2(1),\ S_1(1-\delta) = S_2(1+\delta)$, so it is sufficient to show $S_1(1) > S_1(1-\delta)$.

Note that there are two opposing forces determining the relative size of $S_1(1) - S_1(1-\delta)$. First, L-agents are in a majority, and they get what they want with decentralization. Opposing this is the fact that M-agents dislike deviations from their ideal point, 1, more than do L-agents. This latter intensity of preference is not taken into account by majority voting, but for a wide range of parameter values, dominates the first effect, implying that centralization dominates i.e. $S_1(1) > S_1(1-\delta)$.

Generally, centralization dominates when there is not "too much" heterogeneity in the sense that either ε or δ is small enough, which is quite intuitive. Specifically, there are three cases. If $\varepsilon > \frac{1}{2}$, then for fixed ε, there must be a $0 < \delta_0 < 1$ such that centralization dominates iff $\delta < \delta_0$. If $\varepsilon < \frac{1}{5}$, then for fixed ε, there must be a $0 < \delta_0 < 1$ such that centralization dominates iff $\delta > \delta_0$. Finally, if $\frac{1}{2} \geq \varepsilon \geq \frac{1}{5}$, there may be an interval of values of δ for which centralization dominates. Detailed proofs of these claims are in the Appendix. $\square$

So, we have seen that the Decentralization Theorem may fail in both "directions" when utility-maximization is replaced by majority voting. But, careful inspection of both examples reveals that in each case, preferences within a region are asymmetrically distributed, so that $\overline{\theta}_i \neq m_i$. One might guess that with a symmetric distribution of preferences within each region, Proposition 1 might continue to hold even with majority voting, and this is indeed the case.

To see this, just note that with either fiscal regime, the outcome under majority voting is the same as that with utility maximization. Moreover, this argument can be generalized somewhat, as the Decentralization Theorem states (i) that when $\overline{\theta}_1 = \overline{\theta}_2$, $\sigma >$

[10] Note that as the aggregate distribution of preference types is symmetric (i.e. $\frac{1+\varepsilon}{2}$ are L, $1-\varepsilon$ are M, $\frac{1+\varepsilon}{2}$ are H), the median voter must be an $M-$type as long as there are any $M-$types at all i.e. $\varepsilon < 1$.

0, centralization is *strictly* preferred, and (ii) when $\overline{\theta}_1 \neq \overline{\theta}_2,\ \sigma = 0$, the reverse is true. So, by continuity, the theorem must continue to hold under direct democracy when the median and mean preference parameters $m_i,\ \overline{\theta}_i$ are sufficiently close. Formally:

Proposition 2. *Suppose that the benevolence assumption is replaced by decision making by majority voting. Then, there is an* $\varepsilon > 0$ *such that the Decentralization Theorem continues to hold if* $\left|\overline{\theta}_i - m_i\right| < \varepsilon,\ i = 1, 2.$

At this point, more comparison with BC's results might be helpful. First, our model in this section is one of direct, rather than representative, democracy: the latter is assumed in BC. Moreover, BC assume $\overline{\theta}_i = m_i,\ i = 1, 2$. So, the overall conclusion is that if preference distributions are asymmetric, the Decentralization Theorem can fail even with direct democracy, due to "second-best" effects, but if preference distributions are symmetric, the Decentralization Theorem can only fail with representative democracy, due to "strategic delegation" effects.

3.3. Special Interests and the Decentralization Theorem

We now modify the assumption of a benevolent policy-maker in a different way. We continue to assume that the policy-maker maximizes the sum of utilities of the citizens in his jurisdiction, but we now assume that some of the citizens in each jurisdiction are organized into a special interest group (SIG). We model the influence of the SIG using the well-known common agency model of lobbying (Grossman and Helpman(1994), Dixit, Grossman and Helpman(1997)).

In this case, the appropriate welfare criterion is more problematic: should the welfare of the policy-maker be included in any way when evaluating regimes? Previously, the use of total surplus as a criterion implies that only the welfare of citizens matters, and so for consistency, we also assume that here. This means that the welfare of the SIG must be calculated net of any contributions made in equilibrium. This assumption is also made in other papers studying the welfare effects of lobbying e.g. Brou and Ruta(2006).

The key point is that with special interests, the preferences of the organized group are overrepresented. This inefficiency can interact with the inefficiencies in the two fiscal regimes in such a way as to overturn the Decentralization Theorem, again, a kind-of second-best result. As before, we show that the Decentralization Theorem fails in both directions by presenting two examples.

Example 3: *Decentralization welfare-dominates centralization with externalities and identical preferences across regions.* Assume $v(g, \theta) = \theta v(g)$, and just two preference groups i.e. $\theta_i \in \{\theta_l, \theta_h\}$, $\theta_l < \theta_h$. Both regions have a share $\lambda > 0.5$ of type-h agents. In each region, group h is organized as a SIG and group l is not i.e. there are two SIGs, one in each region. Efficient supply of the public good is the same in both regions, and is given by

$$(\lambda\theta_h + (1-\lambda)\theta_l)\, v'(g^*) = 1 \tag{3.9}$$

Equilibrium supply under decentralization is as follows. First, define the surplus to group m in region i;

$$S_{i,m}(g_i, g_j) \equiv \theta_m[(1-\sigma)v(g_i) + \sigma v(g_j)] - g_i,\ i = 1,2,\ m = h, l \tag{3.10}$$

The policy-maker in i is benevolent but also takes contributions C_i from the special interest group[11] in i, which he weights at γ, and so maximizes $\lambda S_{i,h} + (1-\lambda)S_{i,l} + \gamma C_i$ overall, taking g_j as given (we suppress the dependence of $S_{i,m}$ on g_i, g_j except when necessary. The equilibrium[12] contribution of this group can be calculated, and it is well-known that given the equilibrium contribution, the policy-maker then maximizes surplus in region i, $\lambda S_{i,h} + (1-\lambda)S_{i,l}$, plus γ times the surplus of the SIG, $\lambda S_{i,h}$, which gives an overall maximand of

$$\lambda(1+\gamma)S_{i,h} + (1-\lambda)S_{i,l} \tag{3.11}$$

It can easily be calculated from (3.10) and (3.11) that the g_i that maximizes (3.11), taking g_j as given, solves

$$\frac{(1-\sigma)(\lambda(1+\gamma)\theta_h + (1-\lambda)\theta_l)}{\lambda(1+\gamma)+1-\lambda} v'(g^D) = 1 \tag{3.12}$$

So, in equilibrium, $g_1^D = g_2^D = g^D$.

Finally, the equilibrium contribution fully compensates the policy-maker for the deviation from g^* in (2.3). In the case of one SIG, it is well-known that this contribution (denoted C_D) is the money equivalent of the loss in welfare for the policy-maker from setting g^D instead of g^*. Note for future reference that if $\gamma \to \infty$, so that the policy-maker puts a very high weight on money payments, then $C_D \to 0$.

Equilibrium with centralization is as follows. The structure of the SIGs is the same as with decentralization i.e. the h-types are organized separately in each region. But now, each makes an independent contribution C_1, C_2 to the national policy-maker. This policy-maker is benevolent i.e. maximizes surplus in both regions, $\sum_{i=1,2} \lambda S_{i,h} + (1-\lambda)S_{i,l}$, but

[11] So, we assume that a SIG in one region cannot lobby the policy-maker in another region. For a model where such "cross-regional lobbying" can occur, see Bordignon, Colombo, and Galmarini (2003).

[12] Here and what follows, by "equilibrium" we mean the (unique) equilibrium in truthful or compensating contributions (Dixit, Grossman and Helpman(1997)).

also weights total contributions $C_1 + C_2$ at γ. The equilibrium contribution of each group can be calculated, and it is well-known that given the equilibrium contribution, surplus plus γ times the surplus of the sum of the two SIGs, $\lambda S_{1,h} + \lambda S_{2,h}$ which gives an overall maximand of

$$\sum_{i=1,2} \lambda(1+\gamma)S_{i,h} + (1-\lambda)S_{i,l} \tag{3.13}$$

This is maximized subject to $g_1 = g_2 = g$. It can easily be calculated from (3.10) and (3.13) that the solution g^C to this problem solves

$$\frac{\lambda(1+\gamma)\theta_h + (1-\lambda)\theta_l}{\lambda(1+\gamma) + 1 - \lambda} v'(g^C) = 1 \tag{3.14}$$

Note that (3.14) is independent of σ, as $S_{i,m} = \theta_m v(g) - g$, when $g_1 = g_2 = g$ is imposed. Note from (3.9)-(3.14), that $g^C > g^*$; that is, with centralization, there is over-supply, due to the influence of the SIGs.

Now, assume that $(1-\sigma)\theta_h = \overline{\theta}$: then, for $\gamma \to \infty$, $g^D \simeq g^* < g^C$, and as just argued, $C_D \to 0$. So, as SIG contributions under centralization are non-negative, decentralization welfare-dominates for γ high enough. $\square$

Note that the intuition behind the example is very similar to Example 1. Lobbying biases the outcome in the direction of too high a level of the public good: this offsets the bias in the direction of too low a level of the public good with decentralization, making decentralization more efficient than centralization.

Example 4: *Centralization welfare-dominates decentralization with no externalities and different preferences across regions.* This is like Example 3, except: $\sigma = 0$, $\lambda_1 > \lambda_2 = 0.5$, and the $h-$types are only organized in a SIG in region 2. Efficient supply of the public good is given by

$$(\lambda_i\theta_h + (1-\lambda_i)\theta_l)\, v'(g_i^*) = 1,\ i = 1, 2 \tag{3.15}$$

Following the argument of Example 3, and recalling that $\lambda_2 = 0.5,\ \sigma = 0$, equilibrium supply under decentralization is

$$(\lambda_1\theta_h + (1-\lambda_1)\theta_l)\, v'(g_1^D) = 1,\ \frac{(1+\gamma)\theta_h + \theta_l}{2+\gamma} v'(g_2^D) = 1 \tag{3.16}$$

Supply is efficient in region 1 i.e. $g_1^D = g_1^*$, as no SIG is organized there. Also, assume that $\frac{1+\gamma}{2+\gamma} = \lambda_1$, i.e. the lobby power of $h-$types in region 2 just offsets their reduced numbers relative to region 1. Then from (3.9,3.16), $g_1^D = g_2^D = g^D = g_1^*$.

Equilibrium with centralization is as follows. The policy-maker is benevolent but also takes contributions C_2 from the special interest group in region 2 only, which he weights at γ. So, following the argument of Example 3, and recalling that $\lambda_2 = 0.5,\ \sigma = 0,\ g^C$ must maximize

$$\lambda_1 S_{1,h} + (1-\lambda_1)S_{1,l} + 0.5(1+\gamma)S_{2,h} + 0.5S_{2,l}.$$

where $S_{i,m}$ is defined in (3.10). The first-order condition is

$$\frac{(\lambda_1 + 0.5(1+\gamma))\theta_h + (1-\lambda_1+0.5)\theta_l)}{2+0.5\gamma}v'(g^C) = 1 \tag{3.17}$$

So, by comparing (3.16), (3.17), and using the fact that $\frac{1+\gamma}{2+\gamma} = \lambda_1$, we see that $g_2^* < g^C < g^D = g_1^*$. That is, expenditure is uniform under both fiscal regimes, but with centralization, the outcome is strictly between the optimal levels in the two regions.

We can now show that welfare i.e. aggregate surplus, minus contributions by SIGs, is higher with centralization. First, note from (2.3), and using the special features of Example 4, that aggregate surplus from an arbitrary uniform level of provision g is:

$$S(g,g) = ((\lambda_1 + 0.5)\theta_h + (1-\lambda_1+0.5)\theta_l)v(g) - 2g \tag{3.18}$$

This is strictly concave in g, and by inspection of (3.17),(3.18), has a maximum at $\hat{g},\ \hat{g} < g^C$. We already know that $g^C < g^D$. So, it follows immediately that $\hat{g} < g^C < g^D$, and thus, as $S(g,g)$ is strictly concave, $S(g^C,g^C) > S(g^D,g^D)$ for all γ.

To complete the argument, it is sufficient to show that SIG contributions are lower with centralization. To calculate the equilibrium contributions, we need the following additional notation. Total surplus in i can be written $S_i(g_i,g_j) \equiv \lambda_i S_{i,h}(g_i,g_j) + (1-\lambda_i)S_{i,l}(g_i,g_j)$. Note that as $\sigma = 0$, $S_i(g_i,g_j)$ is independent of g_j, so we write $S_i(g_i,g_j) \equiv S_i(g_i)$.

Now note that there is only one SIG under both decentralization and centralization. So, under decentralization, the SIG must fully compensate the policy-maker for the loss he suffers from choosing g^D rather than the first-best g_2^*. This loss is $S_2(g_2^*) - S_2(g^D)$. Converting this into a money value by dividing by γ, we see that the aggregate contribution of the SIG is

$$C_D = \frac{1}{\gamma}[S_2(g_2^*) - S_2(g^D)] \tag{3.19}$$

In the same way, under centralization, the SIG must fully compensate the policy-maker for the loss he suffers from choosing g^C rather than the constrained-optimal $\hat{g}$ i.e. the aggregate contribution of the SIG is

$$C_C = \frac{1}{\gamma}[S_1(\hat{g}) + S_2(\hat{g}) - S_1(g^C) - S_2(g^C)] \tag{3.20}$$

bearing in mind that now, the policy-maker cares about surplus in both regions.

We need to show that $C_C \leq C_D$. Comparison of the two is not obvious and so we resort to numerical simulation. Assume $v(g) = 2\sqrt{g}$ and let $\theta_h = 2, \theta_l = 1$. Then $g_2^*, g^D, \hat{g}, g^C$ can all easily be explicitly calculated, and thus C_C, C_D can also be explicitly calculated by substituting the values of $g_2^*, g^D, \hat{g}, g^C$ back into formulae (3.19), (3.20). Then, as the following table shows, for a wide range of values of γ, $C_C < C_D$ as required.

Table 1: SIG Contributions under Different Fiscal Regimes

γ	0.1	0.5	1	10	100
$\gamma \times C_D$	0.00057	0.010	0.028	0.174	0.240
$\gamma \times C_C$	0.00028	0.005	0.014	0.087	0.120

In particular, it turns out that in this example, C_D is double C_C. $\square$

One question which then arises is whether there is a simple condition (similar to that in Proposition 2) such that the Decentralization Theorem holds, even with lobbying. If we are willing to ignore the cost of SIG contributions (possibly because the payoff of the policy-maker is included in the calculation of social surplus), is relatively easy to state such conditions. For simplicity, continue to assume two preference groups only, and suppose that both preference groups in each region are organized into separate SIGs. Then, taking into account contributions, the policy-maker in i under decentralization maximizes just $1 + \gamma$ of total surplus in region i, and thus he will behave just like a benevolent policy-maker. A similar argument applies under centralization. So, in this case, the *levels of public good provision* are exactly the same as those chosen by a benevolent dictator, and so *if SIG contributions are ignored*, the Decentralization theorem still holds.

But ignoring SIG contributions is inconsistent with the rest of the analysis. Moreover, calculating SIG contributions and then doing the relevant welfare comparisons is likely to be very complex, as under decentralization, there are two SIGs, and under centralization, four. There is no reason to think that contributions will be the same under both fiscal regimes, even under the special conditions of the Decentralization Theorem i.e. when there are no spillovers, or when average willingness to pay for the public good is the same in both districts. This is certainly a topic for future work.

4. Conclusions

This paper has revisited the fiscal Decentralization Theorem, by relaxing the role of the assumption that governments are benevolent, while retaining the assumption of policy uniformity. We find that if instead, decisions are made by direct majority voting, (i) centralization can welfare-dominate decentralization even if there are no externalities and regions are heterogenous; (ii) decentralization can welfare-dominate centralization even if there are positive externalities and regions are homogenous. The intuition is that the insensitivity of majority voting to preference intensity interacts with the different inefficiencies in the two fiscal regimes. Thus, strategic delegation effects are not necessary to invalidate the theorem. But, these counter-examples do depend on asymmetric preference distributions within regions: when the mean and median willingness to pay is the same within every region, the decentralization theorem generalizes to majority voting. Similar counter-examples can be found when a benevolent policy-maker is lobbied by a special interest group. In that case, however, no obvious conditions can be found under which the Decentralization Theorem continues to hold.

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Appendix: Further Analysis of Example 2. From (3.7), (3.8), we see that

$$\begin{aligned} S_1(1) &= \frac{1+\varepsilon}{2}[\frac{1}{2}-\delta]+\frac{1-\varepsilon}{2}\frac{3}{4} \\ S_1(1-\delta) &= \frac{1+\varepsilon}{2}\frac{(1-\delta)^2}{2}+\frac{1-\varepsilon}{2}[1-\delta-\frac{(1-\delta)^4}{4}] \end{aligned}$$

So, after some rearrangement, we see that $S_1(1) > S_1(1-\delta)$ is equivalent to

$$g(\varepsilon,\delta) \equiv \frac{1}{4}+\varepsilon\left(\frac{3}{4}-2\delta\right) > (1+\varepsilon)\frac{(1-\delta)^2}{2}-(1-\varepsilon)\frac{(1-\delta)^4}{4} \equiv f(\varepsilon,\delta)$$

Note that

$$g(\varepsilon,0)=f(\varepsilon,0)=\frac{1}{4}+\frac{3}{4}\varepsilon,\ g(\varepsilon,1)=\frac{1}{4}-\frac{5}{4}\varepsilon,\ f(\varepsilon,1)=0$$

Finally, the derivative of f w.r.t. δ is

$$f_\delta(\delta,\varepsilon)=(1-\delta)((1-\varepsilon)(1-\delta)^2-(1+\varepsilon))$$

So, for all $0<\varepsilon<1$, $(1-\varepsilon)(1-\delta)^2<(1+\varepsilon)$, so the unique root of $f_\delta(\delta,\varepsilon)=0$ is at $\delta=1$. Finally,

$$f_{\delta\delta}(\delta,\varepsilon)=(1+\varepsilon)-3(1-\varepsilon)(1-\delta)^2$$

so that if $\varepsilon>\frac{1}{2}$, $f_{\delta\delta}(\delta,\varepsilon)>0$ for all $\delta\in[0,1]$. Otherwise, if $\varepsilon<\frac{1}{2}$;

$$f_{\delta\delta}(\delta,\varepsilon)\left\{\begin{array}{c} >0 \\ <0 \end{array}\right\} \Longleftrightarrow \left\{\begin{array}{c} \delta>1-\phi \\ \delta<1-\phi \end{array}\right\} \tag{.1}$$

where $\phi=\left(\frac{1+\varepsilon}{3-3\varepsilon}\right)<1$. We now have enough information to identify three different cases.

1. $\varepsilon>\frac{1}{2}$. Fix ε. In this case, f is everywhere strictly convex on $\delta\in[0,1]$, and has a minimum at $\delta=1$. Moreover, $f=g$ at $\delta=0$, and at $\delta=1$, $f=0$, $g<\frac{1}{4}-\frac{5}{4}\frac{1}{2}<0$. So, f must initially lie below g, and cut g from below at a unique $0<\delta_0<1$. So, $g>f$ iff $\delta<\delta_0$.

2. $\varepsilon<\frac{1}{5}$. Fix ε. In this case, $f=g$ at $\delta=0$, and at $\delta=1$, $f=0$, $g>\frac{1}{4}-\frac{5}{4}\frac{1}{5}=0$. Moreover, from (.1), as δ increases from 0, f is initially strictly convex and then strictly concave. So, So, f must initially lie above g, and cut g from above at a unique $0<\delta_0<1$.there must be a $0<\delta_0<1$ such that $g>f$ iff $\delta>\delta_0$.

3. $\frac{1}{2}\geq\varepsilon\geq\frac{1}{5}$. Fix ε. In this case, by similar arguments, either there is an interval (δ_0,δ_1), $0<\delta_0<\delta_1<1$, such that $g>f$ iff $\delta\in(\delta_0,\delta_1)$, or $g\leq f$ for all $\delta\in[0,1]$. □