

Strategic Consensus: Performance Voting
with
Electoral Uncertainty (with Applications to
Public Goods and Externalities)*

Toke S. Aidt[†] Jayasri Dutta[‡]

February 3, 2008

Abstract

The purpose of this paper is to evaluate the consequences of random voter turnout in a dynamic political agency with repeated elections, retrospective voting, and heterogeneous groups of voters. We show that all equilibrium paths (supported by subgame perfect history-independent strategies) exhibit what we call *strategic consensus* and explore this property in two public finance applications related to the choice between transfers and universal public goods and to externalities and fiscal federalism.

Keywords: Political Agency, Performance Voting, Turnout Uncertainty, Public Finance.

JEL Classifications: D72; D78; H41.

*We thank Robert Evans, Paola Profeta, Dalibor Eterovic and the participants in the CEPR workshop “Dynamic Aspects of Policy Reforms” for useful comments and suggestions. This version of the paper is preliminary and comments are very welcome.

[†]Faculty of Economics and Politics, University of Cambridge, Austin Robinson Building, Sidgwick Avenue, Cambridge CB3 9DD, Tel.: +44 1223 335231. E-mail: Toke.Aidt@econ.cam.ac.uk.

[‡]Department of Economics, University of Birmingham, Tel.: +44 0121 4146640. E-mail: J.Dutta@bham.ac.uk.

1 Introduction

The purpose of this paper is to evaluate the consequences of random voter turnout in a dynamic political agency with repeated elections, retrospective voting, and heterogeneous groups of voters. We show that all equilibrium paths (supported by subgame perfect history-independent strategies) exhibit what we call *strategic consensus* and explore this property in two public finance applications. Strategic consensus arises when politicians implement policies that satisfy the performance standards of all groups of voters on the one hand and all groups of voters lower their standards such that politicians want to satisfy them on the other. Strategic consensus insures politicians against turnout shocks and voters against partisan choices by politicians.

The paper is motivated by the empirical observation that voter turnout fluctuates substantially over time and space, and that the turnout patterns of voters with different demographic (say, men versus female, old versus young) and geographical characteristics are very different. For example, in many European democracies the standard deviation of voter turnout in parliamentary elections exceeds 5% of the average.¹ In addition, Norris (2001) presents evidence on differences in voter turnout rates for voters with different gender, age, income, education, and work status characteristics, documenting large and variable gaps in inter-group electoral participation in Western Democracies in the period 1996-99. The paper is also motivated by a gap in the theoretical literature. While there exists a substantial body of research on why rational voters may or may not participate in elections², the question of voter turnout is largely ignored in applied (theoretical) work on political economics. The canonical models – the median voters model, the probabilistic voting model as well as the agency models of elections – all assume that voters turn out to vote in each election. The evidence suggests otherwise, and we want to explore the consequences of allowing for uncertain voter turnout within one of these canonical models, namely the electoral accountability model, suggested by Ferejohn (1986) and extensively used by Persson and Tabellini (2000) and many others in subsequent work.

We study a dynamic political agency with two groups of voters who have

¹The calculation is based on a sample of 12 Western European democracies (Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom) covering the period from 1830 to 2000.

²See Dhillon and Peralta (2002) or Aidt (2000) for a discussion of the literature.

conflicting interest over public policy. The two groups of voters use elections to hold an opportunistic politician accountable for his policy choices while in office. They do so by voting retrospectively, as in Ferejohn (1986). One group is larger than the other. A critical element of the analysis is that *ex ante* – before each election – the probability that each particular group holds the majority is positive. Despite differences in groups sizes, random turnout shocks, which we assume to be correlated within a group but not between groups, introduce uncertainty from the point of view of the politician as to which of the two groups hold the majority among those who actually turn out to vote in any given election. A leading example of what we have in mind is weather conditions in different locations that induce random turnouts. Another critical element of the analysis is the specification of the *political cost function*. The political cost function shows the minimum cost (to the politician) of providing utility to voters. We study the case where the political cost function is weakly sub-additive, i.e., it is at least as costly to provide utility to the two groups separately as it is to provide the same levels jointly, as well as the case with super-additive costs which make it more expensive to generate utility to all groups of voters jointly than to the two groups separately. While (lump sum) transfers generate additive political costs, provision of universal public goods allows political costs to be strictly sub-additive. Super-additive costs arise, for example, when local public goods generate negative externalities.

The model described above is a special case of the common agency model with governance uncertainty studied by Aidt and Dutta (2004). We can, therefore, adopt the main results of that paper (Theorem 1 and Propositions 1 and 2) to characterize equilibrium paths in the political agency. In particular, it follows that all equilibrium paths (supported by subgame perfect history-independent strategies) exhibit strategic consensus; that is, politicians implement policies that satisfy the demands of all voters, and voters, in turn, set standards that politicians find optimal to satisfy. Strategic consensus insures politicians against turnout risk and voters against partisan choices. In contrast to an economy with certain electoral turnout, the interest of the minority *is* always included in the political calculus.

We study two classical public finances problems in detail. The first application focuses on the composition of public expenditures – in particular on the choice between targeted transfers and universal public goods. The nature of this choice under different electoral incentives has received sub-

stantial attention in the recent literature on positive public finance (e.g., Persson and Tabellini, 1999; Lizzeri and Persico, 1998). We demonstrate that strategic consensus implies that public goods are only provided if the Lindahl-Samuelson condition is satisfied. Moreover, the minority is protected from exploitation by the majority and, in economies with sufficiently high public sector productivity, is at least as well off as the majority. The second application is to fiscal federalism. The political economy of fiscal federalism has attracted some attention recently with contributions by among others Seabright (1996), Lockwood (2002) and Besley and Coate (2004). We consider a country with two regions of equal size, populated by citizens with identical preferences. Provision of local public goods generates positive or negative externalities and centralization exposes the federal politician to turnout uncertainty. We identify an important asymmetry between economies with positive and negative externalities. We show that decentralization Pareto dominates centralization for weak negative externalities, and that centralization is favored by at least one region in economies with positive externalities.

The rest of the paper is organized as follows. In section 2, we present the model and discuss the main assumptions. In section 3, we present the main results about strategic consensus. In section 4, we present the application to the choice between universal public goods and transfers. In section 5, we present the application to local public goods and fiscal federalism. In section 6, we summarize and discuss a number of extensions.

2 The Model

We consider an infinite horizon model of repeated elections and performance voting, familiar from Ferejohn (1986), Persson et al. (1997) and Coate and Morris (1999) among others. We extend the standard formulation of the model by introducing voter heterogeneity and uncertainty in turnouts at elections. Society consists of two groups of voters, $i = 1, 2$; politicians are indicated by index 0. A group is defined as a subset of voters who are affected in the same way by public policy. Group affiliation may be determined by observable characteristics such as location, age, gender, race, or religion. Per-period utility, u_{it} , is discounted with the common discount factor $\beta \in (0, 1)$

and lifetime welfare is given by

$$V_{0i} = \sum_{t=0}^{\infty} \beta^t u_{it}; \quad i \in \{0, 1, 2\}.$$

There are n_1 voters in group 1 and n_2 voters in group 2. The size of the total (voter) population is $n = n_1 + n_2$. Whenever $n_1 > n_2$ we refer to group 1 as the majority and group 2 as the minority, although either group may in actual fact hold the majority among those who turn out to vote (see below).

Each period, the politician collects taxes up to a maximum of T , spends some of this on providing amenities to his electorate, and keeps the rest for himself.³ Denoting the cost of providing utilities to the two groups of voters c_t , we can write the politician's per-period payoff as

$$u_{0t} = T - c_t$$

if in office, and $u_{0t} = 0$ otherwise. Politicians apply the same discount factor as voters.

The cost of providing utility to voters is determined by the *political cost function* – $C(x_{1t}, x_{2t})$ – which shows the minimum cost to the politician of providing utility levels $u_{1t} \geq x_{1t}$ and $u_{2t} \geq x_{2t}$ to voters in the two groups at time t . Likewise, we can define $C_i(x_{it})$ as the minimum cost of providing utility levels $u_{it} \geq x_{it}$ to group i , $i = 1, 2$. We begin by specifying the political cost function directly, but shall derive it from more fundamental considerations in the two applications to follow. We shall explore the following general properties of the political cost function.

Assumption 1 *The political cost function is differentiable and weakly increasing in each argument. Moreover, $\lim_{x_i \rightarrow \infty} C(x_1, x_2) = \infty$ and $C(0, 0)$.*⁴

This assumption says that it is costly for the politician to generate utility for each group of voters. This is clearly the case whenever more tax resources have to be devoted to the task. However, as we shall see below, when

³This formulation of the conflict of interest between voters and politicians is due to Persson et al. (1997) and used extensively in Persson and Tabellini (2000). It should be understood as a metaphor for the more general phenomenon that politicians can divert their efforts towards activities that are not in the interests of their electorate.

⁴In addition, we need the technical assumption that for all x_1 there exists a x'_2 such that $C(x_1, x'_2) = C_1(x_1)$ and likewise that for all x_2 , there exists a x'_1 such that $C(x'_1, x_2) = C_2(x_2)$.

the politician can generate utilities by providing universal public goods, the cost function may not be strictly increasing in both arguments. The next assumptions play a key role in the analysis.

Assumption 2 *The political cost function is sub-additive*

$$(\mathbf{C}^+) \quad C(x_{1t}, x_{2t}) \leq C_1(x_{1t}) + C_2(x_{2t}).$$

Alternatively,

Assumption 3 *The political cost function is super-additive*

$$(\mathbf{C}^-) \quad C(x_{1t}, x_{2t}) > C_1(x_{1t}) + C_2(x_{2t}).$$

A sub-additive political cost function makes it cheaper to provide utility to all voters jointly than to provide the same utility levels to the two groups separately. Sub-additivity arises from the fundamental role of public goods. Imagine that a politician wants to provide utility to one group of voters only. He can do this by making transfers to this group. If he wants to provide utility to both groups, it may be cheaper to provide universal public goods. The fact that public goods can be used to provide utility to everybody at the same time allows the cost function to be sub-additive. A politician with access to (lump sum) taxes and subsidies only would, in contrast, face an additive political cost function. A super-additive cost function makes it more expensive to please all groups of voters jointly than to please the two groups separately. Super-additivity arises in the presence of negative externalities associated with, for example, provision of local public goods or with envy effects.

The politician, elected at t , cannot make binding promises on the level and pattern of public spending before he enters office. Since his own payoff decreases with c_t , he would, in the absence of further incentives, choose $c_t = 0$ and provide no amenities to the electorate. Voters know this, and threaten to vote retrospectively against a politician who does not provide them with a minimum level of utility. At the beginning of each period, voters in each group announce a performance standard, denoted x_{1t} and x_{2t} , and vote in favor of reelection of the incumbent politician if, and only if the policy implementation observed at the end of the period generates at least that level of utility, i.e., if, and only if $u_{it} \geq x_{it}$.

Importantly, neither group can guarantee to turn out in full force at elections. Suppose a politician delivers on the performance standard set by group 1, who, say, holds the majority ex ante, by incurring the cost $C_1(x_{1t})$, but fails to deliver on the standard set by group 2 ($u_{2t} < x_{2t}$). On the day of the election, \tilde{n}_{it} voters from group i actually show up to vote, and the politician can lose his bid for reelection if $\tilde{n}_{2t} > \tilde{n}_{1t}$. The central assumption of our analysis is that electoral turnout is uncertain, and that voters can commit to vote according to the announced performance standards *if they show up to vote*, but cannot commit to a particular turnout rate. This is captured by the next assumption.

Assumption 4 *Electoral turnout, $\tilde{n}_t = (\tilde{n}_{1t}, \tilde{n}_{2t})$, is random. The ex-ante probability that the turnout of group 1 is greater than that of group 2, $P(\tilde{n}_{1t} \geq \tilde{n}_{2t})$, is equal to p and constant over time. We assume that $p \in (0, 1)$.*

Here, we specify the parameter p directly. It can be derived from more basic considerations, however. For example, suppose $\tilde{n}_{it} = \theta_{it}n_i$ and θ_{1t} and θ_{2t} are independent draws from the uniform distribution with support on the unit interval. The probability p can then be derived as $p = \frac{2n_1 - n_2}{2n_1}$. Other distributions of turnout shocks θ_i map into alternative specifications of p . In this analysis, it is important that $0 < p < 1$, so that neither group can guarantee reelection. This is more likely to be the case when turnout shocks are correlated within groups, as in the case where differences in weather conditions affect the turnout of voters in different geographical locations or foul weather keeps certain types of voters, such as the poor, at home (Roemer, 1998), and when differences in group sizes are not too large.

The game between the incumbent politician and the two groups of voters unfolds over time as follows. At the beginning of each period, voters in each group announce the (utility) standard that the politician needs to satisfy to get their votes in the next election. The standards are chosen by the two groups non-cooperatively and at the same time. The politician observes the standards and determines whether to comply, and if so, how many standards to meet. We denote the set of actions available to the politician by $A = \{(00), (10), (01), (11)\}$ with elements $a_t = (00)$ (meet neither standard); $a_t = (10)$ (meet group 1's standard only); $a_t = (01)$ (meet group 2's standard only); and $a_t = (11)$ (meet both standards). At the end of the period, a new election is held and voters randomly turn up to vote. Those who turn up vote according to the announced performance standard. The politician either

wins or loses. In the latter case, he is replaced by an identical challenger; in the former case, he gets (at least) another term in office. After the election, the game continues to the next period where a similar sequence of events takes place. We restrict attention to history-independent subgame perfect Nash equilibria of this game.⁵ In addition, we assume that the politician if indifferent between two or more actions (which are then preferred to the remaining ones) chooses the action that maximizes reelection chances. Below, when we refer to equilibrium this is what we have in mind.

3 Equilibrium Paths

We apply Theorem 1 from Aidt and Dutta (2004) to characterize the set of equilibria. The Theorem says that all equilibrium paths of the political game described above have a property called *strategic consensus*: the politician prefers to meet all performance standards at all times, all groups of voters vote for the incumbent, and the incumbent is reelected with certainty, irrespective of turnout shocks. While this outcome, perhaps, is to be expected when the cost function is sub-additive and it is cheaper for the politician to satisfy the standards jointly than separately, it is surprising that the same result obtains with super-additive costs. In this case, the fact that it is *more* expensive to satisfy the standards jointly than separately suggests that “partisan” outcomes would be more likely. This intuition is, however, wrong. Whenever the politician is willing to implement a “partisan” outcome, the disfavored group has an incentive to lower its standard to induce the politician to make a “partisan” choice in its favor. This logic continues until the standards are such that the politician is just willing to implement a policy that satisfies both groups. The result is strategic consensus.

Although all equilibrium paths display strategic consensus, the distribution of payoffs depends critically on the properties of the political cost function. Let $X = \{x_{1t}, x_{2t}\}_{t=0}^{\infty}$ be a sequence of *equilibrium* performance standards. In an economy with sub-additive costs, the following characteri-

⁵Formally, the model describes a dynamic common agency game with absorbing states and perfect information. The two groups of voters are principals, and the elected politician their common agent. Uncertainty in rewards arises from uncertainty about which of the two principals will have the “casting vote”, or final say, in the only reward available: reelection. There is no aggregate uncertainty, as one of the principals will have the casting vote for sure.

zation result holds.⁶

Proposition 1 (Sub-additive Costs) *If the political cost function satisfies assumption 1 and 2, then X must satisfy*

$$(\mathbf{SC}_1^+) \quad C(x_{1t}, x_{2t}) = \beta T;$$

$$(\mathbf{SC}_2^+) \quad C_1(x_{1t}) \geq \beta p T;$$

$$(\mathbf{SC}_3^+) \quad C_2(x_{2t}) \geq \beta(1-p)T.$$

Moreover, (\mathbf{SC}_2^+) and (\mathbf{SC}_3^+) hold with equality for an additive political cost function. Along all equilibrium paths, the politician receives payoffs $(1-\beta)T$ per period.

The proposition explores the fact that the politician must, at equilibrium, be indifferent between satisfying both and satisfying none of the standards. The politician *always* gets per period payoff $(1-\beta)T$, while the remaining share of tax revenues, βT , is devoted to the task of generating utilities to the voters. Importantly, this distribution of resources is unaffected by turnout uncertainty. Thus, strategic consensus provides the politician with “full insurance” against random voter turnout and voters with insurance against “partisan” choices by the politician. When the political cost function is additive, the allocation of utility between the two groups of voters is uniquely determined by p . In contrast, economies with *strictly* sub-additive costs exhibit multiple equilibria in performance standards at each t , and any equilibrium allocation what arises with sub-additive costs (weakly) Pareto dominates the utility allocation with additive costs.

In an economy with super-additive costs, the utility allocation is very different, as shown by the second characterization result.

Proposition 2 (Super-additive Costs) *If the political cost function satisfies assumption 1 and 3, then X must satisfy*

$$(\mathbf{SC}_1^-) \quad C(x_1, x_2)(1+\theta) - C_1(x_1) = \theta T$$

$$(\mathbf{SC}_2^-) \quad C(x_1, x_2)(1+\eta) - C_2(x_2) = \eta T$$

where $\theta = \frac{(1-p)\beta}{1-\beta}$ and $\eta = \frac{p\beta}{1-\beta}$. The politician receives payoffs $T - C(x_1, x_2) > (1-\beta)T$ every period. Moreover, if $\frac{\partial C}{\partial x_1 \partial x_2} > 0$, the solution to (\mathbf{SC}_1^-) and (\mathbf{SC}_2^-) is unique.

⁶We state proposition 1 and 2 without proof. For proofs see Aidt and Dutta (2004; theorem 1 and propositions 1 and 2).

In this case, the politician must, at equilibrium, be indifferent between satisfying both standards and satisfying just one of them. The politician receives $T - C(x_1, x_2)$ each period. This is more than he receives along *any* equilibrium path with sub-additive costs, but the payoff is no longer independent of turnout shocks. Intuitively, super-additive costs make it costly for the politician to implement consensus outcomes. This enables him to extract more rents: the two groups of voters have, *ceteris paribus*, to lower their standards to prevent “partisan” outcomes.

We can now consider two public finance applications of these general results. This allows us to characterize the standards that are, in fact, set at equilibrium and the policy choices that support them. The first application studies the choice between universal public goods and targeted (monetary) transfers. The second application studies the costs and benefits of centralization of provision of local public goods in a federation.

4 Universal Public Goods and Transfers

The composition of public expenditures – in particular the choice between targeted (monetary) transfers and universal public goods – under different electoral incentives has received substantial attention in the recent literature on positive public finance (e.g., Persson and Tabellini, 2000; Lizzeri and Persico, 2001). In this section, we show that turnout uncertainty has interesting and surprising implications for this political choice and for the welfare of minority groups in a democracy.

4.1 The Analysis

Suppose the politician can please voters by providing a universal public good, g_t , or targeted, lump sum transfers, $\tau_{it} \geq 0$, $i = 1, 2$, or a combination of the two.⁷ The public good is produced by a linear technology

$$g_t = Ak_t,$$

where k_t is the input needed to produce the public good and $A > 0$ is a productivity parameter. The input is bought at a fixed price, normalized to

⁷We do not allow transfers to be targeted specifically to individual voters, but only to groups of voters in different geographical locations, age-groups, professions, etc.

1 each period. The public budget constraint requires that

$$n_1\tau_{1t} + n_2\tau_{2t} + k_t \leq T$$

for each t . We assume that $n_1 > n_2$ and that all voters value the universal public good in the same way, and that utility is linear in public and private goods:

$$u_{it} = g_t + \tau_{it}; \quad i = 1, 2.$$

A social planner would provide the public good if, and only if the Lindahl-Samuelson condition holds:

$$An - 1 \geq 0.$$

The politician, on the other hand, can choose the level and composition of public spending as he likes, but needs to take into account that if more is spent on targeted transfers, less is available for public goods and political rents. His per-period utility is $u_{0t} = T - c_t$.

We begin the analysis by characterizing the political cost function. Suppose voters in the two groups announce the standards $\{x_{1t}, x_{2t}\}$ at time t . The minimum cost required to satisfy these standards is

$$C(x_{1t}, x_{2t}) = \min_{k_t \geq 0; \tau_{1t} \geq 0; \tau_{2t} \geq 0} k_t + n_1\tau_{1t} + n_2\tau_{2t}$$

subject to $Ak_t + \tau_{1t} \geq x_{1t}$, $Ak_t + \tau_{2t} \geq x_{2t}$, and the public budget constraint. Similarly, the minimum cost required to satisfy one standard is:

$$C_i(x_{it}) = \min_{k_t \geq 0, \tau_{it} \geq 0} k_t + n_i\tau_{it}$$

subject to $Ak_t + \tau_{it} \geq x_{it}$ and the public budget constraint. Transfers must be provided to all voters in the relevant group, implying that the cost of targeted redistribution is sensitive to group sizes. In contrast, public goods allow the politician to satisfy the demands simultaneously irrespective of group sizes.

The details of the derivation of the political cost function is relegated to the Appendix. What is important for what follows is that the cost function is sub-additive. This implies that the equilibrium allocations and policy implementations can be deduced from proposition 1. More specifically, the cost-efficient method of meeting the performance standards depends on A , the productivity level in the public sector, relative to the size of the two groups, as follows:

1. Let $A < \frac{1}{n}$. The political cost function is:

$$C(x_{1t}, x_{2t}) = n_1 x_{1t} + n_2 x_{2t};$$

$$C_1(x_{1t}) = n_1 x_{1t};$$

$$C_2(x_{2t}) = n_2 x_{2t}.$$

Here, A is sufficiently low that the Lindahl-Samuelson condition is violated. For the politician, this implies that transfers are the cheapest way to buy voter approval, so that, $k_t = g_t = 0$. Importantly, this makes the political cost function additive, and it follows from proposition 1 that the equilibrium allocation is unique and given by $u_{1t} = \tau_{1t} = \frac{p\beta T}{n_1}$, $u_{2t} = \tau_{2t} = \frac{(1-p)\beta T}{n_2}$ and $u_{0t} = (1 - \beta)T$ for all t .

2. Let $\frac{1}{n} \leq A < \frac{1}{n_1}$. The political cost function is

$$C(x_{1t}, x_{2t}) = \frac{\min[x_{1t}, x_{2t}]}{A} + n_1(x_{1t} - \min[x_{1t}, x_{2t}]) + n_2(x_{2t} - \min[x_{1t}, x_{2t}]);$$

$$C_1(x_{1t}) = n_1 x_{1t};$$

$$C_2(x_{2t}) = n_2 x_{2t}.$$

Here, politicians provide public goods only if they wish to satisfy both standards. This makes the political cost function (strictly) sub-additive. Proposition 1 then predicts that there exist many possible equilibrium paths, but along all of these the politician wants to satisfy the standard of the least demanding group by public goods and then “top-up” the utility of the other with transfers. This implies that some public goods are always provided and that at most one group receives transfers.

3. Let $\frac{1}{n_1} \leq A < \frac{1}{n_2}$. The political cost function is

$$C(x_{1t}, x_{2t}) = \frac{x_{1t}}{A} + n_2 \max(x_{2t} - x_{1t}, 0);$$

$$C_1(x_{1t}) = \frac{x_{1t}}{A};$$

$$C_2(x_{2t}) = n_2 x_{2t}.$$

Here, the political costs are minimized by satisfying group 1 – the majority – with public goods, and meeting further demands from the

minority with transfers. This makes the political cost function (strictly) sub-additive and provision levels and the size of the transfer vary across equilibria. The direction of the transfer, if any, is, however, uniquely determined: it goes towards the minority.

4. Let $A \geq \frac{1}{n_2}$. The political cost function is

$$C(x_{1t}, x_{2t}) = \frac{\max[x_{1t}, x_{2t}]}{A};$$

$$C_1(x_{1t}) = \frac{x_{1t}}{A};$$

$$C_2(x_{2t}) = \frac{x_{2t}}{A}.$$

Here, the productivity of the public sector is high enough that all demands are met by public goods rather than transfers. Although the cost function is (strictly) sub-additive, all equilibrium paths generate the same utility allocation, namely $g_t = u_{1t} = u_{2t} = A\beta T$ and $u_{0t} = (1 - \beta)T$ for all t .⁸ A politician who wants to meet the standard of one group will automatically provide (some) utility to the other. An implication, then, is that the utility allocation is independent of p .

A number of interesting results about the composition of public spending flows directly from this analysis. The results are valid for any $p \in (0, 1)$ and so do not depend on the precise distribution of the turnout shocks.

Proposition 3 (Public goods) *Along any equilibrium path, public goods are provided ($g_t > 0$) if, and only if*

$$A > \frac{1}{n}.$$

For $A \in [\frac{1}{n}, \frac{1}{n_2})$, the provision level varies across equilibria. For $A \geq \frac{1}{n_2}$, $g_t = A\beta T$ for all t .

Proof. The first statement follows directly from the political cost function $C(x_{1t}, x_{2t})$. The second follows from the fact that $A \in [\frac{1}{n}, \frac{1}{n_2})$ implies strict sub-additivity of the cost function, and that g_t depends on $x_{2t} - x_{1t}$ which varies across equilibria. For $A \geq \frac{1}{n_2}$, all demands are met by public goods, as discussed in case 4 above ■

⁸This outcome can be supported by many different performance standards.

Proposition 4 (Transfers) *Along any equilibrium path, transfers are used only if*

$$0 < A < \frac{1}{n_2}.$$

Further, only the minority gets transfers if $A \in (\frac{1}{n_1}, \frac{1}{n_2})$.

Proof. The first statement follows from the political cost function $C(x_{1t}, x_{2t})$. The second statement follows from the fact that $A \in (\frac{1}{n_1}, \frac{1}{n_2})$ implies that $\tau_1 = 0$ minimizes costs for any attainable x_{1t} and x_{2t} ■

Proposition 3 demonstrates that the politician only provides public goods if the Lindahl-Samuelson condition is satisfied. In this sense, strategic consensus implies efficient provision of public goods. It is clear, however, that the politician supplies less public goods than the social planner, who spends all tax revenues on the purpose ($g_t^* = AT$ for $A \geq \frac{1}{n}$). Under-provision arises, as in Persson et al. (1997), because voters must allow their politicians to divert some funds, which could otherwise have been spent on public goods (or transfers), in order to discipline them not to expropriate everything. More surprisingly, for $A \in [\frac{1}{n}, \frac{1}{n_1}]$, all attainable equilibrium paths *over-provide* public goods relative to the wishes of the majority who for this ranges of productivity levels prefers transfers to public goods. This happens because the politician finds it cheaper to satisfy the demands of one of the groups with public goods.

A comparison of propositions 3 and 4 shows how the politician makes use of the two policy instruments in economies with different productivity levels and group sizes. Begin by considering an economy with low public sector productivity ($A < \frac{1}{n}$). In this economy, politicians prefer to use targeted transfers to get reelected. This makes the political cost function additive and voters in each group receive actuarially fair insurance against partisan choices. An implication, then, is that the majority is unable to (fully) expropriate the wealth of the minority. Turnout uncertainty plays a critical role in generating this outcome. To see this, suppose, as in Ferejohn (1986), that voters always turn out to vote. Since reelection requires the support of the majority only, the wealth of the minority is expropriated completely by the politician who redistributes some to the majority and keeps the rest for himself.⁹ Turnout uncertainty protects the minority against this because

⁹If there are more than two groups outcomes are even worse. The politician will be looking for a minimum winning coalition. Competition to get included in this coalition

there is a chance that it is, in fact, the minority that holds the majority among those who show up to vote.

Contrast this with an economy with high public sector productivity ($A \geq \frac{1}{n_2}$). In this economy, the politician prefers to satisfy all demands from voters by public goods and the political cost function becomes (strictly) sub-additive. An immediate implication is that all voters are treated equally and turnout uncertainty is no longer necessary to protect the minority from expropriation. To see why, return to the situation where turnout is certain and the politician can win the election by pleasing the majority group only. Since the cheapest way to do so is to provide public goods, everybody – including voters in the minority group – get the same benefits, even when the politician attempts to implement a “partisan” outcome.¹⁰

Only in an economy with an intermediate productivity level ($A \in (\frac{1}{n}, \frac{1}{n_2})$), the politician prefers to use a combination of public goods and transfers (to at most one group) to please voters. While for $A \in (\frac{1}{n}, \frac{1}{n_1})$ the direction of the transfer depends on the particular equilibrium path attained, only the minority receives transfers when $A \in [\frac{1}{n_1}, \frac{1}{n_2})$. This observation has a somewhat surprising implication.

Proposition 5 (Minority welfare) *Along any equilibrium path, the minority is at least as well off as the majority if*

$$A \geq \frac{1}{n_1}.$$

Proof. To establish this, we note that $\frac{1}{n_2} > A \geq \frac{1}{n_1}$ implies

$$C(x_{1t}, x_{2t}) = \frac{x_{1t}}{A} + n_2 \max(x_{2t} - x_{1t}, 0) = \beta T.$$

Hence, $g_t = x_{1t}$, $\tau_{1t} = 0$ and $\tau_{2t} \geq 0$. This implies that

$$u_{2t} \geq g_t = u_{1t} = x_{1t}.$$

If $A \geq \frac{1}{n_2}$, we have $g_t = \max(x_{1t}, x_{2t})$, and $\tau_{1t} = \tau_{2t} = 0$ all t implying that $u_{1t} = u_{2t}$ ■

provides a strong incentive for groups to offer their votes at a discount and sparks a process of underbidding leading to the result that none of the groups get any transfers at equilibrium.

¹⁰Persson and Tabellini (2000, chapter 9) makes a similar point. See also Aidt and Magris (2002, section 5).

The result derives from the fact that it is often too expensive for politicians to satisfy the demands of the majority with transfers: the group is simply too large. Conversely, it is too expensive to satisfy additional demands by the minority with (more) public goods when $A < \frac{1}{n_2}$. Hence, for $\frac{1}{n_2} > A \geq \frac{1}{n_1}$, the politician provides public goods to please the majority. The minority, of course, also benefits from this, and, in addition, in some, but not all equilibria, gets a transfer.¹¹

4.2 Discussion

It is useful to relate our findings regarding the political choice between universal public goods and targeted transfers in economies with turnout uncertainty to related work on the topic.

- Common agency models have attracted considerable attention in the recent literature on political economics with seminal contributions by Bernheim and Whinston (1986) and Dixit et al. (1997). In these papers, the principals (often thought of as lobby groups) can offer monetary incentives to politicians. In our model, the stage game is a common agency but one in which the principals (groups of voters) only have one very crude control instrument at their disposal – reelection – and, more importantly, turnout uncertainty prevents this instrument from being applied with certainty. This later makes a significant difference for outcomes. To see why, consider the public finance example analyzed by Dixit et al. (1997) and suppose that politicians care only about monetary rewards received in exchange for policy favours from two competing lobby groups. Assume, furthermore, that the only policy instrument available is targeted (lump sum) transfers. Under these circumstances, Dixit et al. (1997) demonstrate that lobby groups cannot control the politician at all. The reason is that the politician can

¹¹In the analysis, we assumed that public goods can be produced with constant returns to scale. This assumption allows us to illustrate the main implications of turnout uncertainty for the composition of public spending in a simple and transparent way. The case with decreasing returns is more complex but yields very similar results. In particular, in a “large” economy, where large refers to the tax raising capacity of the economy (T), the socially optimal level of the public good is provided along all equilibria paths with strategic consensus, yet redistribution via targeted transfers (in many cases going to both groups) takes place because political costs are additive on the margin.

threaten to disregard one group and please the other. When transfers can be made lump sum, the two groups effectively become perfect substitutes in the eyes of the politician as a source of monetary rewards, and the logic of Bertrand competition renders each of them powerless. In our model, the two groups of voters avoid Bertrand competition because they are not perfect substitutes from the point of view of the politician: the consent of both is needed to secure the reelection reward with certainty. As a consequence, voters retain some control power even when political costs are additive.

- Our model has some interesting similarities with the probabilistic voting model, in particular as applied to redistributive politics by Lindbeck and Weibull (1987) and Dixit and Londregan (1996). These papers study the incentives of competing political parties to target monetary transfers to specific groups of voters in order to “buy” votes. A key result is that transfers are targeted at swing voters, i.e., groups of voters whose voting probabilities are particularly sensitive to additional benefits. In our model, competition is between groups of voters, rather than between political parties. The equilibrium payoff of a group is increasing with its likelihood of casting the decisive vote in the election, much in the spirit of probabilistic voting where groups of voters are rewarded according to how sensitive their vote decisions are at the margin.
- Our model is also related to the work of Lizzeri and Persico (2001). They study a situation in which two political parties can use either a universal public good or targeted transfers to attract votes. As in our model, the public good is supplied for sure when public sector productivity is sufficiently high. For intermediate productivity levels, the candidates follow a mixed strategy and sometimes supply the public good and sometimes target transfers to specific segments of the voter population. As opposite to our model, targeted transfers – when offered – always go towards a majority of voters and the excluded minority receives nothing: two-party competition does not provide insurance against partisan choices.
- Turnout uncertainty limits redistribution and the minority is never exposed to 100 per cent taxation. The standard political economy expla-

nations for why the majority (typically the poor with income below the average) does not expropriate the wealth of the minority (typically the rich with income above the average) are based either on the notion that taxation is distortionary making it too costly for the median voter to demand complete equalization of after-tax income or on the notion that the rich can organize pressure groups and protect themselves that way against high taxes (Becker, 1983). As an alternative to this, Roemer (1995) demonstrates that two-party competition can limit redistribution if the policy space has two dimensions and voters care sufficiently about a non-economic issue such as religion or race. The idea is intuitive: the party representing the poor, which in the absence of the non-economic issue would propose a tax rate of one, can enhance the welfare of its constituency by attracting votes from among those rich who care sufficiently about its position on the non-economic issue by proposing a more lenient tax policy. Finally, Corneo and Gruner (2000) provide a sociological explanation. They argue that social status is positively correlated with income, and appeal to the idea that fear of losing social status as a result of less income inequality might induce middle class voters to block redistributive policies that expropriate the wealth of the rich. Our model demonstrates that turnout uncertainty can provide a simple answer to the puzzle of why redistribution is limited in a democracy that can complement these explanations.

5 Local Public Goods and Fiscal Federalism

Should there be a centralized system of public finance in which spending decisions are made by a central government and financed from general revenues or should there be a decentralized system in which choices are made by local governments and financed by local taxes? In his seminal work on economic federalism, Oates (1972) answered this question by highlighting a trade off between internalization of externalities and the capacity of the state to cater for regional differences in taste. His Decentralization Theorem, then, states that decentralization is desirable if externalities are weak and regional differences in taste are large.¹² Although, such economic trade offs are important, the design of the fiscal state has equally important political implications,

¹²This result is, as pointed out by Besley and Coate (2004), driven by the somewhat artificial assumption that central government cannot differentiate between regions. See

simply because political inefficiencies may be larger at the central than at the local level. This has been explored in a growing literature on the political economy of fiscal federalism (e.g., Seabright, 1996; Edwards and Keen, 1996; Lockwood, 2001; and Besley and Coate, 2004). Below we add to this literature by exploring how turnout uncertainty can become an additional cost of centralization. We relate our findings in more detail to the existing literature in the discussion that follows the analysis.

5.1 The Analysis

We consider a country with two regions, $i = 1, 2$. The two regions are of equal size with respect to population (normalize to 1 in each region), but may differ with regard to tax potential and electoral turnout patterns.¹³ Individuals in each region derive utility from local public goods g_{it} and private goods y_{it} . Consumption of local public goods in one region generates externalities for individuals in the other region. To capture this, we write the utility function of an individual in region i as

$$u_{it} = y_{it} + g_{it} - \gamma g_{-it}$$

where $\gamma \in (-1, 1)$ captures the strength of the externality and $\gamma > 0$ corresponds to a negative and $\gamma < 0$ to a positive externality. Public goods are produced by the following technology

$$g_{it} = \alpha k_{it}^\alpha$$

where k_{it} is an input required to produce the public good, bought at a constant price of one. For simplicity, we assume that $\alpha = \frac{1}{2}$. The maximum revenue that can be raised in region i is T_i each period, and so the maximum revenue that can be raised in the country is $T = T_1 + T_2$. We use the convention that politicians raise the maximum revenue each period, spent some of it on providing local public goods, some on transfers $s_{it} > 0$ to individuals, and keep the rest as rents.

We compare two institutional arrangements: Regionalism [R] and Federalism [F]. Regionalism means that each region elects its own politician

Inman Rubinfeld (1997) for a survey of the literature.

¹³We make the assumption $n_1 = n_2$ to isolate the novel features of this application, but stress that differences in group sizes continues to play a role in the choice between (local) public goods and transfers.

who can finance local public goods (and transfers) out of local tax revenues. Importantly, we assume that regional politicians can guarantee reelection if they satisfy the performance standard set by voters in their region: there is no turnout uncertainty within a region. Federalism means that a single elected politician is in charge of the whole country and can use general tax revenues to provide public goods and transfers to the two regions. In contrast to the two regional politicians, the politician in charge of the federation has an incentive to internalize externalities. However, he is exposed to turnout uncertainty and needs the consent of voters in both regions to get reelected for sure. We denote the ex ante probability that voters in region i holds the majority among those who turn out to vote by p_i with $p_1 = 1 - p_2$.¹⁴ In short, centralization is beneficial because it allows for internalization of externalities, but it comes at the (potential) cost of deluding electoral accountability.

Begin by imagining that all public finance decisions are made by benevolent planners. When fiscal decisions are decentralized to the regional level, two regional planners decide independently and simultaneously how much local public good to provide to their region. They do so by maximizing regional aggregate public goods surplus taken the spending decision in the other region as given:

$$s_{it}^D(k_{it}; k_{-it}) = \frac{1}{\alpha}(k_{it}^\alpha - \gamma k_{-it}^\alpha) - k_{it}, \quad i = 1, 2.$$

In a federation, on the other hand, decisions are made by one benevolent planner who maximizes aggregate public goods surplus for the whole country, i.e., $s_t^F(k_{1t}, k_{2t}) = \sum s_{it}^D(\cdot)$. It is easy to verify that federalism under these ideal circumstances Pareto denominates regionalism for all $\gamma \neq 0$.¹⁵ This provides a clear-cut benchmark against which we can measure political outcomes.

To characterize political allocations, we need to derive the political cost functions. While politicians always want to provide local public goods¹⁶, transfers are only used if the demands of voters are sufficiently high. In the following, we restrict attention to the situation in which both federal and regional politicians provide local public goods *and* transfers in equilibrium.¹⁷

¹⁴This slight change in notation allows us to state many of the results in a more compact manner.

¹⁵For $\gamma = 0$, the institutional arrangement makes no difference.

¹⁶This is implied by the production technology.

¹⁷The details for the derivation of the costs functions are in the Appendix [to be added].

Under regionalism, the two regional politicians face a separate performance standard and make decisions about public spending without (direct) regard for the welfare of voters in the other region: each politician takes the spending decisions by the other politician as given. Consider the politician in region i who in period t faces the performance standard x_{it} . The minimum cost of satisfying this standard for a given input to the production of local public goods in the other region is

$$C(x_{it}; k_{-i}) = \min_{k_{it} \geq 0, s_{it} \geq 0} k_{it} + s_{it}$$

subject to $x_{it} \leq s_{it} + 2k_{it}^{\frac{1}{2}} - 2\gamma k_{-it}^{\frac{1}{2}}$ and the regional budget constraint. For $\min\{x_{1t}, x_{2t}\} > 2(1 - \gamma)$, it follows that $k_{it} = 1$ and $s_{it} = x_{it} - 2(1 - \gamma)$, and the political cost functions are

$$C_i^R(x_{it}) = x_{it} - 1 + 2\gamma \quad \text{for } i = 1, 2.$$

We notice that the externality is not internalized: both regions spend on local public goods up to the point where private marginal benefits are equal to the marginal cost. The transfer must therefore compensate local voters for the impact of spending on local public goods in the other region – if the politician want to secure reelection. In each region, voters set the performance standard in period t taking the standard of the other region as given. At equilibrium, the standards are set to make each regional politician indifferent between satisfying the standard and getting reelected (for sure) and not satisfying it, in case of which he is replaced but keeps all local tax revenues T_i for himself. This yields the following stationary equilibrium allocation

$$x_{it}^R = \beta T_i + 1 - 2\gamma \quad \text{for } i = 1, 2. \tag{1}$$

Thus, the politician keeps a share $(1 - \beta)T_i$ of regional tax revenues each period, and uses the rest to provide local public goods and transfers to voters.

A sufficient condition that guarantees that politicians, at equilibrium, provide local public goods and transfers in all regimes is $\min\{T_1, T_2\} > \frac{1}{\beta}$; for $\gamma < 0$

$$T > \max_i \left[\frac{1}{\beta p_i} \right] (1 + \gamma^2 + 4\gamma);$$

and for $\gamma \geq 0$

$$T > \max_i \left[\frac{(1 + 2\gamma(1 - \beta p_i)(1 - \gamma))}{\beta p_i} \right].$$

A negative externality reduces voter welfare, while a positive externality enhances their well-being, as one would expect.

Under federalism, decision making power rests with a single elected politician who faces performance standards $\{x_{1t}, x_{2t}\}$ set by voters in the two regions each period. For $\min\{x_{1t}, x_{2t}\} > 2(1 - \gamma)^2$, the politician minimizes the cost of satisfying the two standards jointly by spending $k_{1t} = k_{2t} = (1 - \gamma)^2$ on local public goods and by providing transfers $s_{it} = x_{it} - 2(1 - \gamma)^2$ to voters in each of the two regions. The political cost function is therefore given by

$$C^F(x_{1t}, x_{2t}) = x_{1t} + x_{2t} - 2(1 - \gamma)^2. \quad (2)$$

If the politician decides to satisfy the standard of one of the regions, say, region 1, only, then it is clear that $s_{2t} = 0$. However, if local public goods generate a positive externality, it is cost effective to provide some local public goods to region 2: not because the politician cares about the welfare of voters in that region, but because it is, up to a point, cheaper to provide utility to voters in region 1 this way than to give them transfers. If, on the other hand, local public goods generate negative externalities, then $k_{2t} = 0$ minimizes costs. With this in mind, we can, for $\min\{x_{1t}, x_{2t}\} > 2$, write the political cost functions as follows

$$C_i^F(x_{it}) = x_{it} - 1 \quad \text{for } \gamma \geq 0 \quad \text{for } i = 1, 2; \quad (3)$$

$$C_i^F(x_{it}) = x_{it} - (1 + \gamma^2) \quad \text{for } \gamma < 0 \quad \text{for } i = 1, 2. \quad (4)$$

We notice that the political cost function is sub-additive for $\gamma < 0$, super-additive for $\gamma > 0$ and additive for $\gamma = 0$. Below we apply propositions 1 and 2 to characterize stationary equilibrium allocations.

Our main goal is to compare [F] and [R] under different assumptions about the magnitude of the externality. To set the stage, we begin by considering the case in which there is no externality. In this case, political costs are additive and the total rent $((1 - \beta)T)$ captured by the federal politician corresponds precisely to the sum of those captured by the two regional politicians $((1 - \beta)T_1 + (1 - \beta)T_2)$. An implication, then, is that the only effect of centralization is to allow redistribution between the two regions: with additive costs centralization is a zero-sum game and if one region gains it must be at the expense of the other.

Proposition 6 (No externality $\gamma = 0$) *Regime [F] and [R] cannot be Pareto*

ranked. Region i prefers [F] to [R] if, and only if

$$p_i > \frac{T_i}{T} \quad \text{for } i = 1, 2.$$

Proof. Using proposition 1, we can derive the equilibrium utility allocation in regime [F] as follows

$$x_{it}^F = \beta p_i T + 1 \quad \text{for } i = 1, 2.$$

The utility differences between regime [F] and [R] is

$$x_{it}^F - x_{it}^R = \beta(p_i T_{-i} - p_{-i} T_i) \equiv \widehat{\Delta}_i \quad \text{for } i = 1, 2. \quad (5)$$

where x_{it}^R is defined by equation (1). The proposition follows immediately from the fact that $\widehat{\Delta}_1 = -\widehat{\Delta}_2$ ■

Region i receives $1 + p_i \beta T$ from the federal government and $1 + T_i \beta$ net of rents from the regional government. Intuitively, therefore, whether a region gains or loses from centralization depends on p_i – the probability that each region holds the majority in the federal election – relative to the share of federal revenues provided by that region. An implication, then, is that poor regions are, *ceteris paribus*, more likely to favor centralization than rich regions.

The situation is more complex when local public goods generate a negative externality ($\gamma > 0$) and political costs become super-additive. In this case, centralization is associated with three effects. The first effect is the *redistribution effect* described above: centralization pools revenues from the two regions and thus allows redistribution to take place. The second effect is the *internalization effect*: centralization induces the politician to internalize the externality in order to minimize the cost of getting reelected. This benefits all voters. The third effect is the *rent effect*. The rent effect arises because political costs are super-additive. Recall from proposition 2 that the politician's share of total revenues, at equilibrium, is *larger* than $(1 - \beta)T$. This implies that less is available in total to generate amenities to voters in the federation than in the two regions separately. This harms all voters. In the next proposition, we isolate the externality and rent effect from the redistribution effect by assuming that $p_1 = \frac{1}{2}$ and that $T_1 = T_2$.¹⁸

¹⁸We use Pareto efficiency as our welfare criterion instead of aggregate public goods surplus (used e.g., by Besley and Coate, 2004). We do so because the Pareto criterion

Proposition 7 (Negative Externalities $\gamma > 0$) Assume that $p_1 = \frac{1}{2}$ and $T_1 = T_2$. Then

1. [F] is Pareto superior to [R] for $\gamma \in (0, \frac{2(1-\beta)}{2-\beta})$.
2. [R] is Pareto superior to [F] for $\gamma \in (\frac{2(1-\beta)}{2-\beta}, 1)$.

Proof. Using proposition 2 and equations (2) and (3), we can derive the (unique) stationary utility allocation as follows:

$$x_{it}^F = p_i\beta T + 1 + 2\gamma(1 - \beta p_i)(\gamma - 2) \quad \text{for } i = 1, 2.$$

The utility differences between regime [F] and [R] are

$$\Delta_{it} = x_{it}^F - x_{it}^D = \widehat{\Delta}_i + 2\gamma^2(1 - \beta p_i) - 2\gamma(1 - 2\beta p_i) \quad \text{for } i = 1, 2,$$

where $\widehat{\Delta}_i$ is defined in equation (5). For $p_1 = \frac{1}{2}$ and $T_1 = T_2$, we have that

$$\Delta_1 = \Delta_2 = \gamma(\gamma(2 - \beta) - 2(1 - \beta))$$

which is negative for $\gamma \in (0, \frac{2(1-\beta)}{2-\beta})$ and positive for $\gamma \in (\frac{2(1-\beta)}{2-\beta}, 1)$ ■

The proposition shows that centralization is efficient only with strong negative externalities. This is in contrast to the social planner's solution which showed that centralization is a Pareto improvement for all $\gamma > 0$. The result, however, echoes the classical finding by Oates (1972), although the logic is entirely different. While Oates focused on the trade off between internalizing externalities and catering for differences in preferences for public goods in different regions, the trade off behind proposition 7 has nothing to do with heterogenous taste: it is driven by the rent effect. Centralization implies a transfer of resources from voters in the two regions to the federal politician and for weak externalities, both regions are worse off in a federation. However, for $\gamma > \frac{2(1-\beta)}{2-\beta}$, the externality effect is sufficiently strong to dominate the rent effect, and federalism Pareto dominates regionalism.

Proposition 7 ignores the redistribution effect which, as we noted above, is driven by turnout uncertainty as captured by p_i and differences in tax

has a clear-cut positive implication: if one institutional arrangement Pareto dominates another, all voters would support a change in the institutional arrangement if the decision to change was put to a vote in e.g. a referendum (see Cr mer and Palfrey (1996) for a positive theory of centralization of political decisions). It also avoids mixing up positive and normative analysis. Notice, however, in making Pareto statements, we do not count the welfare of the politicians.

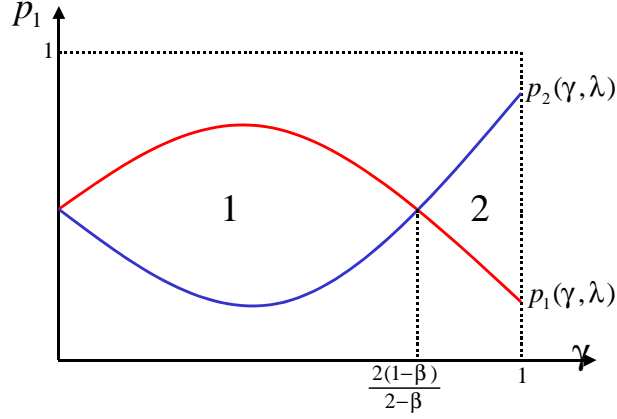


Figure 1: Welfare analysis with super-additive political costs.

resources in the two regions. We can define the values of p_1 , expressed as functions of γ and λ , at which the two regions are indifferent between the two regimes as:

$$p_1(\gamma, \lambda) = \frac{\beta\lambda T_2 + 2\gamma(1 - \gamma)}{\beta(T_2(1 + \lambda) + 2\gamma(2 - \gamma))};$$

$$p_2(\gamma, \lambda) = \frac{\beta\lambda T_2 + 2\gamma^2(1 - \beta) - 2\gamma(1 - 2\beta)}{\beta(T_2(1 + \lambda) + 2\gamma(2 - \gamma))};$$

where $\lambda = \frac{T_1}{T_2}$. Region 1 prefers [F] to [R] if, and only if $p_1 > p_1(\gamma, \lambda)$ and region 2 prefers [F] to [R] if, and only if $p_1 < p_2(\gamma, \lambda)$. The functions, $p_1(\gamma, \lambda)$ and $p_2(\gamma, \lambda)$, are drawn in Figure 1 in (γ, p) space for a given value of λ . We can identify two main areas: in area 1 [R] is Pareto superior to [F], while in area 2, [F] Pareto dominates [R]. Outside these areas, the distribution effect is sufficiently strong to make one of the regions better off at the expense of the other. An increase in λ (which makes region 1 richer) shifts $p_1(\gamma, \lambda)$ and $p_2(\gamma, \lambda)$ up making it less likely that region 1 and more likely that region 2 benefits from federalism.

The situation in which local public goods generate positive externalities is very different. In this case, political costs are sub-additive and proposition 1 shows that the political agency has multiple equilibria. Along all equilib-

rium paths, the aggregate utility of the two regions is, however, uniquely determined by

$$x_{1t} + x_{2t} = \beta T + 2(1 - \gamma)^2$$

with the lower bounds given by $x_i \geq \beta p_i T + (1 + \gamma^2)$ for $i = 1, 2$. The federal politician collects the rent $(1 - \beta)T$ each period. This is the same as the total rent collected by the two regional politicians: there is no rent effect with sub-additive costs. In the absence, then, of significant redistribution effects, one might, therefore, expect that centralization is always a Pareto improvement. The next proposition shows that this is not the case. To state the result, we define the share, denoted θ , of total utility that goes to region 1 as $\theta = \frac{x_{1t}}{\beta T + 2(1 - \gamma)^2}$. This allows us to index equilibrium allocations by θ .

Proposition 8 (Positive externalities $\gamma < 0$) *Assume that $p_1 = \frac{1}{2}$ and $T_1 = T_2$. Then there exists a $\bar{\theta} \in (0, \frac{1}{2})$ such that for $\theta \in [\bar{\theta}, 1 - \bar{\theta}]$ regime [F] Pareto dominates regime [R].*

Proof. Using proposition 1, we can calculate the “best” and the “worst” equilibrium allocation for each region under regime [F]:

$$\begin{aligned} x_{it}^{\max} &= 1 - 4\gamma + \gamma^2 + p_i \beta T \\ x_{it}^{\min} &= \beta p_i T + (1 + \gamma^2) \end{aligned}$$

for $i = 1, 2$. Region i is better off under [R] than under [F] in the “worst” equilibrium if

$$x_{it}^{\min} - x_{it}^D = \hat{\Delta}_i + \gamma^2 + 2\gamma < 0,$$

and is better off under [F] than under [R] in the “best” equilibrium if

$$x_{it}^{\max} - x_{it}^D = \hat{\Delta}_i + \gamma^2 - 2\gamma > 0,$$

where $\hat{\Delta}_i$ is defined in equation (5). For $p_1 = \frac{1}{2}$ and $T_1 = T_2$, we see that $x_{it}^{\min} - x_{it}^D < 0$ and $x_{it}^{\max} - x_{it}^D > 0$ for $i = 1, 2$. Thus, at least one region prefers [F] to [R]. Along any equilibrium path

$$x_{1t} + x_{2t} = \beta T + 2(1 - \gamma)^2.$$

Define the share of total utility obtained by region i by θ_i . Region i is then indifferent between the two regimes for

$$\theta_i = \frac{\beta T_i + 1 - 2\gamma}{\beta T + 2(1 - \gamma)^2} \equiv \bar{\theta}_i.$$

Note that for $T_1 = T_2$, $0 < \bar{\theta}_1 < 1 - \bar{\theta}_2 < 1$ and that $\bar{\theta}_1 = \bar{\theta}_2 < \frac{1}{2}$. Since $\sum_i \theta_i = 1$, we conclude that for $\theta_1 \in (\bar{\theta}_1, 1 - \bar{\theta}_2)$ both regions prefer [F] to [R]. Substitution of $\theta_1 = \theta$ and $\bar{\theta}_1 = \bar{\theta}$ yields the proposition ■

Corollary 1 *There exist equilibrium allocations for which centralization is not a Pareto improvement.*

The proposition shows that federalism Pareto dominates regionalism in some, but not all, equilibria. In the absence of the rent and redistribution effect, this is somewhat surprising. Why is it not better for all voters to allow internalization of the external benefits? The reason is that the selection of equilibria, in fact, re-opens the door to redistribution, but now redistribution is driven by the selection of equilibria, rather than by differences in p_i and T_i as such. For example, in the “worst” equilibrium under [F], the external benefit captured by region 1 is γ^2 which is less than what it “receives” under [R], namely -2γ . The point is that in this equilibrium most of the benefits from having the positive externality internalized are captured by region 2 and region 1 is better off with the “external” benefits bestowed on it by region 2 under regionalism. This – and the proposition more generally – is illustrated in Figure 2. The Figure shows the utility allocations attainable in political equilibrium under the assumptions of the proposition. The segment in bold on the utility frontier $A - B$ contains the equilibrium allocations that Pareto dominate regionalism (represented by point R).

5.2 Discussion

[Incomplete] Our analysis has some interesting links to the existing literature on the political economy of federalism.

- Seabright (1996) argues that political accountability is reduced when public spending decisions are centralized. He measures this effect as the reduced probability that the welfare of a given region can determine the re-election of the government. In our model, this notion is made precise. The political clout of a region is determined by p_i : the probability that voters of that region holds the majority among those who turn out to vote in the federation. Importantly, whether the reduction, implied by centralization, in the probability that a given region can determine

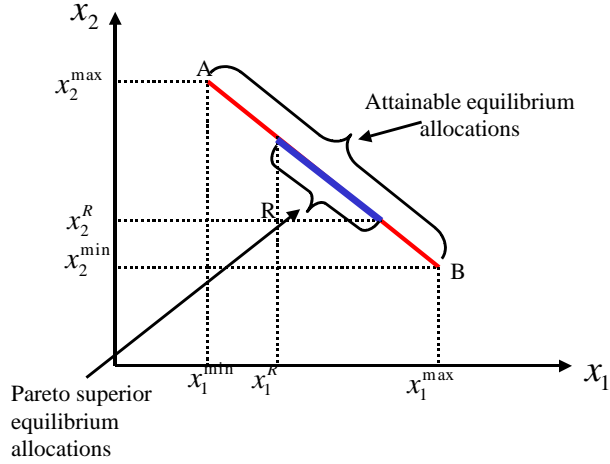


Figure 2: Utility allocations with sub-additive political costs.

the re-election of the government leads to a loss of political accountability depends on the nature of political cost function. In particular, we identify an interesting asymmetry between economies with positive and negative externalities. In economies with positive externalities, political accountability, as measured by the amount of rent seeking allowed at equilibrium, is not affected by centralization. In contrast, in economies with negative externalities, voters are forced to accept more rent seeking in the federation than under regional government.

- Besley and Coate (2004) identify two important political effects of centralization. These are related to different legislative procedures at the federal level. First, centralization induces uncertainty as to whether or not the representative from a particular region will be include in the minimum winning coalition that determines policy. Second, when policy making at the federal level is determined by bargaining between representatives from different regions, regional voters may have an incentive to delegate strategically and elect a politician that cares a lot about public spending. In both cases, a trade off between the political distortion (uncertainty or strategic delegation) and the benefits of internalizing (positive) externalities determines whether or not centralization is beneficial, and Besley and Coate find that centralization is,

typically, beneficial if the externality is strong enough. In our model, we also focus on the uncertainty that arises when decisions are centralized, but we stress turnout uncertainty rather than uncertainty about being included in the minimum winning coalition. It is interesting to notice that decentralization, in our model, can only Pareto dominate centralization in the presence of a negative externality – a case that Besley and Coate (2004) do not consider.¹⁹

- Lockwood (2002) shows that centralization leads to inefficient outcomes when regional representatives vote over agendas that contain sets of region-specific projects. The problem is that the political choice is not tailored sufficiently to within-region benefits. Thus, centralization entails a classical trade off between catering for regional differences and internalizing externalities. Importantly, however, the political distortions imply that weaker externalities and heterogeneity between regions need not increase the efficiency gain from decentralizations. In our model, there is no regional differences with regard to the benefits of public goods. Nonetheless, we find an interesting asymmetry between positive and negative externalities which provides a complementary example of how politics can change the classical trade offs in surprising ways.

6 Conclusion

This paper explores the consequences of turnout uncertainty in a political agency model with repeated elections, retrospective voting, and heterogeneous voters. All political equilibria exhibit *strategic consensus*. Strategic consensus arises when politicians implement policies that satisfy the performance standards of all groups of voters and all groups of voters lower their standards such that politicians want to satisfy them. Strategic consensus insures the politician against turnout shocks and voters against partisan choices by the politician. We develop two public finance applications. In the first application, we study the choice between universal public goods and targeted monetary transfers. The application demonstrates how turnout uncertainty

¹⁹Besley and Coate (2004) make welfare comparisons based on aggregate public goods surplus. In our model, it is possible to identify cases where aggregate public goods surplus is maximized under decentralization even with positive externalities.

protects the interests of the minority and highlights the role of public goods in serving the same purpose. In the second application, we study the costs and benefits of centralization of public spending on local public goods in a federation. We show that centralization may not be desirable because of the political distortions created by turnout uncertainty and identify an important asymmetry between positive and negative externalities.

The analysis can be extended in many directions. There are some examples:

- Our model has only two groups. With additive costs, it appears that strategic consensus arises also for the case with three (or more) groups, but more work on this extension is warranted.
- In the application to fiscal federalism, we ignore a potentially important benefit of regionalism, namely that it allows for yardstick competition. As shown by Besley and Case (1995) voters can make comparisons between jurisdictions and use information about what is happening in other jurisdictions to overcome political agency problems. This forces incumbents into (yardstick) competition in which they care about what other incumbents are doing. This benefit is, of course, lost if fiscal decisions are centralized. It would be interesting in future research to extent our model to include the possibility of yardstick competition.
- We study two public finance problems. Strategic consensus can, however, find applications in many other fields, including corporate governance and labor economics. It would be of interest to explore some of these in future research.

References

- [1] Aidt, T.S. 2000, Economic voting and information. *Electoral Studies* 19, 349-262.
- [2] Aidt, T.S. and F. Magris, 2002, Capital Taxation and Electoral Accountability. 2006. *European Journal of Political Economy* 22, 277-91.
- [3] Aidt, T.S. and J. Dutta, 2004, Strategic consensus. *Journal of Mathematical Economics* 40, 227-245.

- [4] Besley, Timothy and Case, Anne, 1995, Incumbent Behavior: Vote-Seeking, Tax-Setting, and Yardstick Competition. *American Economic Review* 85(1), 25-45.
- [5] Besley, T. and Coate, S., 2004, Centralized versus decentralized provision of local public goods: a political economy approach. Forthcoming in *Journal of Public Economics*.
- [6] Bernheim, B.D. and M. Whinston, 1986, Menu Auctions, Resource Allocation and Economic Influence. *Quarterly Journal of Economics* 101, 1-31.
- [7] Becker, Gary S., 1983, A theory of competition among pressure groups for political influence. *Quarterly Journal of Economics* 98(3), 371-400.
- [8] Coate, S., and S. Morris, 1999, Policy persistence, *American Economic Review* 89, 1327-1336.
- [9] Corneo, Giacomo and Gruner, Hans Peter, 2000, Social limits to redistribution, *American Economic Review* 90, 1491-1507.
- [10] Crémer, Jacques and Palfrey, Thomas R., 1996, In or out?: Centralization by majority vote. *European Economic Review* 40(1), 43-60.
- [11] Dhillon, A. and S. Peralta, 2002, Economic theories of voter turnout. *Economic Journal* 112, F332-F352.
- [12] Dixit, A, G. Grossman, E. Helpman, 1997, Common agency and coordination: general theory and application to government policy making, *Journal of Political Economy* 105, 752-769.
- [13] Dixit, A. and Londregan, J., 1996, The determinants of success of special interests in redistributive politics. *Journal of Politics* 58, 1132-55.
- [14] Edwards, Jeremy and Keen, Michael, 1996, Tax competition and Leviathan, *European Economic Review* 40(1), 113-134.
- [15] Ferejohn, J., 1986, Incumbent performance and electoral control, *Public Choice* 50(1-3), 5-25.
- [16] IDEA (International Institute for Democracy and Electoral Assistance). http://www.idea.int/voter_turnout.
- [17] Inman, R. P and Rubinfeld, D. L., 1997, The political economy of federalism, in D. Mueller: *Perspectives on Public Choice: a Handbook*. Cambridge: Cambridge University Press.

- [18] Lindbeck, A. and J. Weibull, 1987, Balanced budget redistribution as the outcome of political competition, *Public Choice* 52, 272-97.
- [19] Lizzeri, Alessandro and Nicola Persico, 2001, The provision of public goods under alternative electoral incentives, *American Economic Review* 9, 225-39.
- [20] Lockwood B., 2001, Distributive Politics and the Costs of Centralization. *The Review of Economic Studies* 69(2), 313-337.
- [21] Norris, P., 2001, Women's Power at the Ballot Box, in IDEA (International Institute for Democracy and Electoral Assistance) Voter Turnout – a global survey. http://www.idea.int/voter_turnout.
- [22] Oates, W.E., 1972, *Fiscal federalism*. Harcourt Brace, New York.
- [23] Persson, T., G. Roland and G. Tabellini, 1997, Separation of powers and political accountability, *Quarterly Journal of Economics* 112, 1163-1202.
- [24] Persson, T., G. Roland and G. Tabellini, 2000, *Political Economics: Explaining Economic Policy*. The MIT Press: Cambridge, Mass.
- [25] Roemer, John E., 1998, Why the poor do not expropriate the rich: an old argument in new garb, *Journal of Public Economics* 70, 399-424.
- [26] Seabright, P. 1996, Accountability and decentralization: an incomplete contacts model. *European Economic Review* 40(1), 61-90.

Appendix

The political cost functions in section 4 To simplify notation, we omit all time subscripts. Write the cost to the politician if k is invested in the public good, τ_1 is transferred to Group 1 and τ_2 is transferred to Group 2 as

$$c(k, \tau_1, \tau_2) = k + n_1\tau_1 + n_2\tau_2.$$

Let $x = \{x_1, x_2\}$ be the utility standards announced by voters. The least cost of satisfying both standards is the solution to the following problem:

$$C(x_1, x_2) = \min_{k \geq 0; \tau_1 \geq 0; \tau_2 \geq 0} c(k, \tau_1, \tau_2)$$

subject to $Ak + \tau_1 \geq x_1$, $Ak + \tau_1 \geq x_2$ and the public budget constraint. Similarly, we can define the least cost of providing utility levels satisfying

one of the standards only as

$$C_i(x_i) = \min_{k \geq 0, \tau_i \geq 0} c(k, \tau_i, 0)$$

subject to $Ak + \tau_i \geq x_i$ and the public budget constraint. It is clear that feasibility requires that $C(x_1, x_2) \leq T$ and $C_i(x_i) \leq T$. The solutions to these problems depend on the size of A relative to n_1 , n_2 and n . Consider first the derivation of $C(x_1, x_2)$. Logically there are five ways in which the politician can provide utility to the two groups. The case with $g > 0$, $t_1 > 0$ and $t_2 > 0$ can, however, be ruled out immediately because of the linear production technology. If the politician wants to target transfers to both groups, it must be cheaper to do so than providing any public goods at all. If, on the other hand, the politician wants to provide public goods, it must be cheaper to satisfy the demands of at least one group completely with public goods. This leaves us with four cases to consider:

1. $g = 0$, $\tau_1 > 0$ and $\tau_2 > 0$ with costs $C(1) = n_1x_1 + n_2x_2$.
2. $g > 0$, $\tau_1 = 0$ and $\tau_2 \geq 0$ with costs $C(2) = \frac{x_1}{A} + n_2(x_2 - x_1)$ for $x_2 \geq x_1$.
3. $g > 0$, $\tau_1 \geq 0$ and $\tau_2 = 0$ with costs $C(3) = \frac{x_2}{A} + n_1(x_1 - x_2)$ for $x_1 \geq x_2$.
4. $g > 0$, $\tau_1 = 0$ and $\tau_2 = 0$ with costs $C(4) = \frac{\max\{x_1, x_2\}}{A}$.

Note that $C(2) = C(3) = C(4)$ if $x_1 = x_2$. Suppose that $x_1 \geq x_2$. Then, we get

$$(A1) \quad C(1) \leq (<) C(3) \Leftrightarrow A \leq (<) \frac{1}{n},$$

$$(A2) \quad C(3) \leq (<) C(4) \Leftrightarrow A \leq (<) \frac{1}{n_1}.$$

Suppose that $x_2 \geq x_1$. Then, we get

$$(A3) \quad C(1) \leq (<) C(2) \Leftrightarrow A \leq (<) \frac{1}{n},$$

$$(A4) \quad C(2) \leq (<) C(4) \Leftrightarrow A \leq (<) \frac{1}{n_2}.$$

Note that $\frac{1}{n} < \frac{1}{n_1} < \frac{1}{n_2}$. We can now derive the cost function for the 4 cases stated in the text.

1. Let $A < \frac{1}{n}$. It follows from (A1) – (A4) that

$$C(1) < C(3) < C(4) \quad \text{for } x_1 \geq x_2,$$

$$C(1) < C(2) < C(4) \quad \text{for } x_2 > x_1.$$

Hence,

$$C(x_1, x_2) = n_1x_1 + n_2x_2.$$

2. Let $A \in [\frac{1}{n}, \frac{1}{n_1})$. It follows from (A1) – (A4) that

$$C(3) \leq C(1) \text{ and } C(3) < C(4) \quad \text{for } x_1 \geq x_2,$$

$$C(2) \leq C(1) \text{ and } C(2) < C(4) \quad \text{for } x_2 > x_1.$$

Hence, defining $x^{\min} = \min\{x_1, x_2\}$, we can write

$$C(x_1, x_2) = \frac{x^{\min}}{A} + n_2(x_2 - x^{\min}) + n_1(x_1 - x^{\min}).$$

3. Let $A \in [\frac{1}{n_1}, \frac{1}{n_2})$. It follows from (A1) – (A4) that

$$C(4) \leq C(3) < C(1) \quad \text{for } x_1 \geq x_2,$$

$$C(2) < C(1) \text{ and } C(2) < C(4) \quad \text{for } x_2 > x_1.$$

Hence, we get

$$C(x_1, x_2) = \frac{x_1}{A} + n_2(\max\{x_2 - x_1, 0\}).$$

4. Let $A \geq \frac{1}{n_2}$. It follows from (A1) – (A4) that

$$C(4) < C(3) < C(1) \quad \text{for } x_1 \geq x_2,$$

$$C(4) \leq C(2) < C(1) \quad \text{for } x_2 > x_1.$$

Hence, we get

$$C(x_1, x_2) = \frac{\max\{x_1, x_2\}}{A}.$$

To derive $C(x_i)$, we note that the relevant cases are

1. $g = 0$ and $\tau_i > 0$ with costs $C(1) = n_i x_i$.

2. $g > 0$ and $\tau_t = 0$ with costs $C(2) = \frac{x_i}{A}$.

It follows that $C(x_i) = n_i x_i$ for $A < \frac{1}{n_i}$ and that $C(x_i) = \frac{x_i}{A}$ for $A \geq \frac{1}{n_i}$.

The political cost functions in section 5 To be added.