The paper develops a positive model of communication in federal legislatures to study which factors determine the incentives of local representatives to (truthfully) reveal information on local tastes. Each district, through its representative, maximizes the net gain from a local public project with spillover effects on other regions. Federally controlled public policies are funded through general taxation (cost sharing), but benefits are locally concentrated. Costs are therefore underestimated at the local level which creates an incentive for the representative toward exaggerating the local benefit in order to seek federal approval. This tendency increases in the number of districts, but may be mitigated by the fact that local delegates don’t take the externalities associated with local policies into account. The federal legislature recognizes the resulting communication bias so that meaningful transmission of information becomes difficult and, at some point, even impossible. The model can explain why federal politics are inefficient, and often characterized by overspending, universalism, and uniformity. Non-parametric estimates using data from U.S. municipalities support the predicted pattern of spending. Building on these findings, I develop a simple theory of fiscal (de-)centralization, which revisits Oates (1972) decentralization theorem in a world of incomplete information and strategic communication.

JEL Classification: D72, H77, D82

Keywords: Legislative Behavior, Fiscal Federalism, Authority, Communication, Debate

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*I wish to thank Daron Acemoglu, Philippe Aghion, Elhanan Helpman, Torsten Persson, Guido Tabellini, and especially Tim Besley and Ken Shepsle for helpful comments and discussions. I am grateful to the Canadian Institute for Advanced Research (CIAR) for financial support. Special thanks belong to Ross Hickey for invaluable research assistance. The usual disclaimer applies.

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1 Introduction

The majority of countries are organized as federations; many different tiers of government fulfil a variety of functions in revenue raising, taxation, and public expenditure. Among those, there has been a recent trend towards reallocating the fiscal powers across levels of government, particularly towards increased decentralization. Examples of countries that devolved the responsibilities of centralized governments to regional or local governments include the United States, a number of Latin American countries [Faguet (2004)], as well as Indonesia and Pakistan. Decentralization is also one of the World Bank stated policy objectives for developing counties. At the same time, the debate among member countries of the European Union has evolved around “subsidiarity” versus centralization, i.e., which functions should remain with the regions, and which can sensibly be be assumed by the European Parliament and the Council.

While popular discussions usually dismiss the idea of centralization, the promise of decentralization is seen as enhancing efficiency (through inter-governmental competition and fiscal discipline) and accountability (though enhanced local voice over service provision). The economic literature on the subject has a more balanced view, however. The traditional theory builds on Oates (1972) who recognized the obvious advantages of centralization if public policies exhibit large economies of scale or spill-over effects across jurisdictions. At the same time, Oates argued, goods provided by local governments will be better tailored to the needs and preferences of the local population. This classic view of federalism undeniably captures important factors shaping the trade off between more or less decentralized policy making. Still, a positive theory of government is missing and, while the subsequent literature approached the subject from various different angles, the perspective remained essentially normative. Understanding the consequences and determinants of federalism as

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1In the U.S., the responsibility over major welfare programs has recently been returned to the individual states Under the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) of 1996, funding for state-run welfare programs switched from open-ended match grants to fixed block grants, and simultaneously increased the discretion of states to make decisions regarding their own welfare expenditures.

2In 2002, around 30 World Bank projects had decentralization components. A total of $500 million USD was given in the form of various loans to countries like Mexico, Argentina, Brazil, India, Mexico and Pakistan. See http://www1.worldbank.org/publicsector/decentralization/.

3The said spill-over effect may also include negative fiscal externalities such as harmful intergovernmental competition for mobile resources. As Tiebout (1956) noted, though, one benefit of many competing jurisdictions may be that individuals can sort according to tastes for public spending, which obviously reinforces the advantages of decentralization.

4The implicit or explicit assumption in this literature was that governments would seek to maximize the welfare of its constituency, either because they were benevolent or because the democratic system allowed
a form of government, however, requires first understanding the working of federal political institutions and, in particular, legislatures.

This paper addresses the theory of federalism from a political economy perspective. My purpose is twofold. As a first step, I present a straightforward model of legislative behavior which incorporates some bare-bones political economy aspects, but mainly focuses on the communication as an essential element in legislative decision making. Although deceptively simple, we will see that the results provide a theoretical foundation of two frequently invoked assumptions on federal politics, namely, that the political process is characterized by universalism and that policies are uniform, i.e., do not take local circumstances into account. In a second step, I develop a simple theory of (de-)centralization and the determinants of fiscal authority.

The model I employ is designed to capture the essential elements of a country with multiple layers of government. It allows me to study which factors determine the incentives of local representatives to (truthfully) reveal locally dispersed information that concerns the consequences of public policy decisions. The economy is divided into a given number of geographical districts, which are defined by common tastes over a local public good (project) with spillover effects on other districts. Local preferences are local knowledge. Under federal fiscal authority, districts (through their representative) can communicate local preferences to the central government, which implements whichever policy it considers best given the transmitted information. The analytical framework thus conceptually formalizes the process of federal policy formation through consultation with interested parties (local officials) or, alternatively, a policy debate among local delegates in a federal legislature. Federally controlled public policies have “pork barrel” features: projects are funded through general taxation, but their benefits are locally concentrated. Costs are therefore underestimated at the local level, which incites local representatives to overstate the local benefit in order to seek federal approval. This tendency unambiguously increases in the number of districts. It also may be exaggerated or mitigated due to the fact that local delegates do not take the externalities associated with local policies into account. The federal legislature recognizes the resulting communication bias, implying that meaningful transmission of information be-

voters to perfectly control and monitor political agents.

5In other words, the central government cannot commit to (message-contingent) policies that are different from what maximizes its own objective. Communication therefore takes the form of cheap talk [Crawford and Sobel (1982)].
comes difficult or, at some point, even impossible. In the former case, the equilibrium is characterized by *universalism*: every interested district is assured a project. In the latter case, federal policies suffer from *uniformity of provision*: although it is commonly known that local preferences (generically) differ local, those fail to be taken into account when the policy decision is made. The reason lies in the strategic considerations between the federal government and local officials (between local representatives in a federal assembly, respectively), which entirely prevent the credible transmission of any information.

Based on the above findings, I compare in a subsequent step the equilibrium policy under centralization with the policies that would have been chosen under decentralized decision making. The results yield a simple theory of what determines whether jurisdiction has (respectively, should have) the authority over a policy or not. The reasoning here, although conceptually very different from Oates’ original argument, is similar in its conclusions: centralization is better at internalizing externalities but worse at accommodating the needs of the local population. Because the latter problem is more severe the larger number of districts, however, I find a congestion effect. Specifically, the new element is that centralized decision making is characterized by a particular form of dis-economies of scale, namely, in communication. As a result, decentralization is better if there are too many districts, at least if spillovers are not too pronounced.

The results of the paper provide a communication based perspective on the workings of federal legislatures and multi-level governments which is new to my knowledge. In doing so, the paper stands at the intersection of two different strands of economic literature. The first is the literature on legislative behavior and distributive “pork barrel” politics. The paper’s contribution here is to provide a theoretical foundation for universalism. This empirically relevant feature of legislative decision making is important because it generates what is sometimes referred to as “the law of 1/n”, which postulates a positive relationship between (the inefficiency of) government spending and the size of the legislature.\(^6\) Weingast et al. (1981) formally derive this law in a model which is very similar to the present framework.

\(^6\)There have been several earlier papers that explain the norm of universalism. Those either rely on a simple expected value comparison between the rewards to legislators of the coalition of the whole as against the uncertainties associated with minimal winning coalitions. As noted by Niou and Ordeshook (1985), however, such a comparison fails to model directly the decision processes within a legislature and, thus, fails to explain why it is in no member’s self-interest to defect from such a norm. Further, the corresponding explanations for universalism can accommodate inefficiency in legislation–pork barrel–only with additional and ad hoc assumptions or with appeals to secondary group norms. Niou and Ordeshook offer an alternative model based on constituency motivations that establishes universalism as an optimal individual choice and which accommodates inefficient legislation directly, but does not relate to the Law of 1/n.
but which assumes universalism from the outset and does not consider the possibility of
delegates in the federal assembly communicating privately held information. The issue of
communication in legislatures has received surprisingly little attention in the literature.
Austen-Smith (1990) analyzes the informational role of debate in federal legislatures in a
series of examples with majority voting over fixed or endogenous agendas. The author shows
that communication allows legislators who would otherwise reveal their information through
proposals to share this information prior to the agenda-setting stage. Gilligan and Krehbiel
committees can communicate information through policy proposals (submitting bills) to an
uninformed floor. The objective of these papers is to understand how different rules for
adding amendments affect equilibrium informational efficiency.7

Second, the paper contributes to the literature on fiscal federalism. In particular, one
key element in the standard theory of fiscal federalism [Oates (1972)] is that a central
government will provide a single, uniform level of public output in all jurisdictions, a pre-
 assumption that has lately come under criticism [see Seabright (1996), Lockwood (2002) and
Besley and Coate (2003)].8 In the present framework, federal policies are often indiscrimi-
nate toward local taste in equilibrium and thus endogenously uniform. As a consequence, I
am able to provide an information-based foundation of the traditional argument. The model
yields a version of Oates’s celebrated decentralization theorem that is derived entirely from
an explicit model of government behavior: policy uniformity is not assumed from the outset,
but is a direct consequence of the impossibility to credibly communicate information about
local tastes to higher levels of government in equilibrium. Although previous contributions
to the literature on fiscal federalism have looked at informational asymmetries between a
central government and regional governments,9 I am aware of no similar results. To my

7See also Austen-Smith (1993) who looks at single versus sequential referrals in this context. For a survey
of work legislative organization under asymmetric information, see Bendor et al. (2001). In an abstract model
outside the political economy context, Dessein (2002) studies communication versus delegation in a model
which is similar to ours, but only has two actors, a principal and an agent. The latter has private information
that is relevant to decision, which the principal can either take herself (after communicating with the agent),
or delegate.

8Empirically, it is not difficult to document cases where a central government provides public goods in
a discriminatory manner across regions, although a tendency towards ‘equal treatment’ arguably remains.
On the theoretical side, it is unclear why a central government does not differentiate between districts.

9See in particular, Kilbanoff and Poitevin (1996) and Kilbanoff and Morduch (1995). There is also
a growing literature on political accountability, which started with Seabright (1996) and is surveyed in
Lockwood (2005). These models study the effect of decentralized versus centralized fiscal authority on the
agency relationship between voters and their representatives, rather than the agency relationship between a
central government and its local counterparts.
knowledge, the only other paper that explicitly addresses policy uniformity is by Harstad (2006) and quite different in focus. The author considers a model where two politically autonomous regions negotiate an agreement over local public goods with spillovers under asymmetric information. Although policy uniformity is not an equilibrium phenomenon as in the present framework, Harstad shows a mutual commitment to policy harmonization (uniform policies) may be advantageous in inter-regional negotiations because is reduces delay in bargaining.

2 A Simple Framework

Consider an economy divided into \( n \) constituencies or districts indexed by \( i \in \{1, \ldots, n\} \). Each district is composed of a continuum of homogenous households with exogenous income \( y \) and mass unity. For expositional purposes, it is convenient to think of these districts as being geographically distinct and I will often refer to them as regions. However, it is equally possible to interpret them as broadly defined constituencies, which are separated along observable demographic or economic (rather than geographic) lines and share a common objective with regard to the policy under consideration. There are \( n + 1 \) goods in the economy, one private consumption good \( x \) and \( n \) public projects \( g_i \), one for each district. If the latter are geographic entities (regions, states, municipalities), the assumption is that policies are targeted to a particular locality and, as such, have the natural interpretation of projects in infrastructure, recreation, urban renewal, environment, or police and fire protection. Otherwise, the projects can be thought of as entitlement programs targeted to the respective constituency (the retired or the poor, say). Within each district, a household gains a private benefit \( \theta_i > 0 \) from the locally realized public project. The cost of realizing project \( g_i \) is \( c_i < y \). In addition, there are spillovers from projects in other districts \( j \neq i \), denoted by \( \gamma_{ij} \). All costs and benefits are measured in terms of the private consumption commodity. The utility of a household in region \( i \) from the consumption vector \((g_1, \ldots, g_n, x)\) is thus equal to

\[
u_i = \theta_i g_i + \sum_{j \neq i} \gamma_{ij} g_j + x.
\]

For the main part of the analysis, I will assume that the parameter measuring the private benefit \( \theta_i \) from their own project \( g_i \) is private information of the individuals belonging to
the respective constituency. People outside the constituency, including a central authority, only know that the \(\theta_i\)’s are independently distributed according to some smooth distribution function \(F(\theta_i)\) over the support \(\Theta_i = [0, \bar{\theta}_i]\). All other variables and parameters of the economy are common knowledge. Public spending on projects is financed by a local income tax \(t_i \in \mathbb{R}\), which is assumed to be non-distortionary for simplicity.

Since people within a district are identical, we can represent each district by a single agent \(i = \{1, \ldots, n\}\) who acts on behalf of all citizens. This agent’s payoff from a policy vector \(\{(g_i, t_i)\}_{i=1,\ldots,n}\) is \(u_i = \theta_i g_i + \sum_{j \neq i} \gamma_{ji} g_j + y - t_i\) which also captures the aggregate surplus generated in district \(i\). If the authority over project \(g_i\) lies with the local district (decentralization), the agent is simply an elected policy maker who directly determines local policy. Each district is financially responsible for its own (and only its own) project, i.e., \(t_i = c_i g_i\).

The policy-maker chooses \(g_i\) to maximize

\[
   u_i^D = \theta_i g_i + \sum_{j \neq i} \gamma_{ji} g_j + y - c_i g_i, \tag{1}
\]

taking the public good supply in all other districts \(j \neq i\) as given. If the decision over project \(g_i\) lies with a central authority (centralization), the district representative may be a regional delegate to the federal assembly, an appointed local public official, or a lobbyist who advances the constituency’s interests in the central government. Total federal expenditures \(\sum_i c_i g_i\) are still funded by local taxation \(t_i, i = 1, \ldots, n\) but since funds are often shared at the federal level, the link between a district’s tax bill and the implementation of its project will generally not be perfect, i.e., local tax revenues may be raised independently from local project realization. To fix ideas, I will assume that there is some arbitrary but exogenous sharing rule \(t_i = \sum_{j=1}^{n} s_{ij} c_j g_j\), where \(s_{ij}(\cdot)\) with \(\sum_{i=1}^{n} s_{ij} = 1\) denotes district \(i\)’s share in the funding of project \(g_j\). The central authority’s objective is to choose policies \((g_1, \ldots, g_n)\) to maximize total surplus

\[
   u^C = \sum_i u_i = \sum_i \left[ \theta_i g_i + \sigma_i g_i + y - \sum_{j=1}^{n} s_{ij} c_j g_j \right], \tag{2}
\]

where \(\sigma_i \equiv \sum_j \gamma_{ij}\) measure the aggregate spillover of the public project associated with district \(i\). There are two interpretations to this benevolent objective function. The first is that the central government is a policy maker whose constituency consists of the entire

\[1\text{I will moreover assume that } \theta_i \text{ is ‘soft’ information, i.e., agents cannot certify or ‘prove’ the value of } \theta_i \text{ to others, even if they would like to.} \]
economy: while local policy makers only cares about his or her own (regional) district, the
center cares about the welfare of all citizens. There is an alternative and perhaps more
compelling interpretation, however. Suppose all districts choose one agent as a delegate to
send to the national legislature. Since the federal legislature is an enduring institution in
which delegates interact repeatedly through communicating, bargaining, and voting over a
fairly long period of time, one can expect regional representatives to overcome inefficiencies
caued by majoritarian decision rules (minimum winning coalitions) and negotiate their way
to the Pareto frontier. This is what Besley and Coate (2003) have called a ‘cooperative’
legislature. In this view, the above objective represents a utilitarian bargaining solution,
that is, legislators agree to a policy vector that maximizes their joint surplus subject to
the federal budget constraint.\footnote{Some would argue that creating a forum for communication to debate policies and negotiate mutually
beneficial agreements is one of the main purposes of a national assembly. Evidence backs this view: in the
US house, for instance, minimum winning coalitions are the exception rather than the rule. In the EU,
the number of representatives is relatively small, which makes it likely that they will exploit the benefits of
cooperation. Also, many decisions require unanimity, which may force legislators to cooperate.}
As we will see shortly, they are nevertheless constrained
by the fact that although communicating per se is costless, credible communication is not
always feasible, i.e., informational asymmetries may well persist. Before analyzing this case,
however, is it instructive to illustrate Oates (1972)’s classic arguments in favor or against
decentralization within the above framework of locally dispersed private information, taking
the informational disadvantage of the central (federal) government as given.

2.1 Benchmark Cases and Oates’ Decentralization Theorem

I. Centralization with Full Information

As a first benchmark, suppose fiscal authority lies with a central government (federal as-
sembly) that has under full information, i.e., knows the realized vector of local benefits
$\theta = (\theta_1, \ldots, \theta_n)$. Clearly, a central authority that maximizes the unweighted sum of social
utilities will choose a Pareto optimal allocation of public projects. Using (2), the efficient
policy is

$$g^*_i(\theta_i) = \begin{cases} 1 & \text{if } \theta_i + \sigma_i \geq c_i \\ 0 & \text{otherwise} \end{cases}$$

Note that the efficient project choices do not depend on how projects are financed; in
particular, any sharing rule with $\sum_i c_i g_i = \sum_i t_i$ is feasible and equally efficient.\footnote{Of course, if taxation were distortionary and the deadweight loss from raising public funds increasing in
$t_i$, this would no longer be true and there would be an optimal allocation of cost to minimize distortions. As}
eliminate trivial cases, I will assume in the remainder that \( \sigma_i \neq 0 \) and \( \sigma_i \in [c_i - \bar{\theta}_i, c_i] \) for all projects \( g_i, i = 1, \ldots, n \). The latter assumption simply states that the (known) externalities of a project are never sufficiently negative so as not to make its realization worthwhile, and that they are never so large as to always yield a positive net benefit, regardless of \( \theta_i \).

II. Decentralization.

Consider next a decentralized system in which policy makers in each district choose their own project independently. From (1), the corresponding Bayesian Nash equilibrium is characterized by

\[
g^D_i(\theta_i) = \begin{cases} 
1 & \text{if } \theta_i \geq c_i \\
0 & \text{otherwise.}
\end{cases} 
\]

for each district \( i = 1, \ldots, n \).

Each district’s government only takes the benefit received by its own citizens into account. As a result of this lack of coordination, the policy decisions are Pareto suboptimal: \( q^D_i \neq q^*_i \) under our assumption that the project generates externalities \( \sigma_i \neq 0 \). There is under-provision of public projects if the externality is positive \( \sigma_i > 0 \) and over-provision if the externality is negative, \( \sigma_i < 0 \). Moreover, the size of the distortion, measured by the expected difference between optimal and actual expected surplus,

\[
\Delta^D = \left| \int_{c_i}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i) \right| > 0
\]

is increasing in the degree of spillovers \( |\sigma_i| \). In comparison to the previous subsection, therefore, the outcome to under centralization with full information strictly dominates in terms of (expected) social surplus. This is not surprising since the central government maximizes that surplus, whereas district policy makers only pursue the good of their own regions. An example, suppose that raising \( t_i \) in public funds requires a total tax of \( \psi(\psi(t_i)) \geq t_i \) with \( \psi' \geq 1 \) and \( \psi'' \geq 0 \). Then the Pareto optimal solution would have projects are ordered in terms of their overall social benefit - cost ratio \( (\theta_i + \sigma_i)/c_i \). Projects \( g_i, i \in I^* \), with the highest net benefits are realized, whereas projects from regions \( i \notin I^* \) do not receive federal approval and funding. Moreover, total spending is allocated across regions so as to minimize the distortions created through taxation. Formally,

\[
\psi_i'(t_i) = \lambda, \quad i = 1, \ldots, n, \quad \text{with } \sum_{i \in I^*} c g_i = \sum_{i \in I^*} t_i
\]

\[
\theta_i + \sigma_i \geq \lambda c_i \quad \forall \ i \in I^*.
\]

\( ^{13} \)The presumption that politically autonomous jurisdictions do not coordinate their policies is standard in the literature and appears natural in many circumstances. If inter-jurisdictional contracts are enforceable, however, it is also conceivable that regions engage in Coasian bargaining. So far, only a few papers have studied this possibility of Pareto improving contractual arrangements under decentralization. See Lülfesmann (2002) and Kessler et al. (2006) for models with efficient bargaining, and Harstad (2006) for an analysis of bargaining under asymmetric information.
constituencies, and ignore any spillovers that their policy decisions may have. On a more general note, one could also explain the finding as follows: because the central authority has the same instruments and the same information available than the district policy makers, it could always replicate the allocation that prevails under decentralization. If the central authority chooses not to do so, it must be because total surplus is higher otherwise. This simple reasoning shows that, if information is perfect, a central government can never do worse by allocating power at the central level, and must do strictly better whenever there are spillovers involved. Hence, centralization is always preferred.

That the above argument is not universally applicable, however, was already noted by Oates (1972) who emphasized that there are many reasons for why a federal government does not – or cannot – replicate regional policy decisions. Oates himself gave as one prominent reason the danger of policy uniformity under centralization. The central government, he argued, often does not discriminate among regions. That is, federal policies are applied uniformly without reference to the individual circumstances that prevail in a particular district. Thus, decentralized authority gives districts the opportunity to better tailor their local policy to local tastes, thereby establishing a ‘government closer to the people’. The problem with this argument is that it rests on the presumption of a uniform level of public spending under centralization. But why should a central government not differentiate between districts?

One answer to this question lies in informational asymmetries [see Oates (1999) and Oates (2005)]. Local governments, being closer to their constituencies, possess knowledge of local preferences, cost functions, and other relevant circumstances that is not available to a central authority. Clearly, if the center lacks the relevant knowledge about, say, regional preferences, it cannot possibly take those into account. The following section studies the idea in the present framework.

III. Centralization with Incomplete Information

Suppose the federal government does not know the realization of the vector of district-specific preference parameters \( \theta = (\theta_1, \ldots, \theta_n) \). Given its prior beliefs \( \mu \) over states \( \theta \in \Theta \), federal policies will then satisfy

\[
(g_1, \ldots, g_n) \in \text{arg max } E_\mu \left( \sum_i \left[ \theta_i g_i + \sigma_i g_i - \sum_j s_{ij} c_j g_j \right] \right)
\]
Under incomplete information, we thus have for $i = 1, \ldots, n$ and for all $\theta_i \in \Theta_i$,

$$g_i^{UC}(\theta_i) = 1 \Leftrightarrow E_{\mu}[\theta_i] + \sigma_i \geq c_i,$$

where the subscript $UC$ stands for an *uninformed centralized* decision. We can thus conclude that the lack of information central government does in fact yield non-discriminatory policies $g_i$, at least up to observable differences. In particular, if $\sigma_i = \sigma$ and $c_i = c$, then either $g_i = 1$ or $g_i = 0$ for all $i$: if all districts ‘look alike’ from the center’s perspective, then public spending is uniform. Moreover, the fact that federal policy is insensitive towards local preferences under incomplete information implies that decentralized policy making may be preferable. Indeed, decentralization will obviously be strictly better if spillovers are very small, $|\sigma_i| \to 0$. For very large spillovers, in contrast, the inefficiency due to the lack of coordination under decentralization dominates and centralization is the desirable mode of governance. The above arguments can be synthesized in

**Oate’s Decentralization Theorem (Information Based).** Centralizing policy $g_i$ maximizes the expected social surplus whenever the central government has complete information, or, if it is perfectly informed, whenever interregional the spillovers of the policy are sufficiently important. Decentralizing $g_i$ maximizes the expected social surplus whenever the central government has incomplete information and interregional externalities are sufficiently small.

While alluding to the lack of information on the part of the central government to generate policy uniformity is appealing at first glance, it remains unsatisfactory on second thought. If the federal government does not know regional preferences, and if this is what prevents it from adapting policies that are better suited for the local constituencies, why does it not ask local public officials? More generally, what prevents regions from communicating their preferences to the federal government? Indeed, is communication not what a federal assembly *with regional delegates* is all about? Naturally, if one – reasonably – allows for communication, why not go even one step further and let the federal government design a mechanism to elicit the private information of the districts? The answer to this question is lack of commitment. By its very nature, all rights reside with the central authority in a centralized regime. Importantly, this includes the right to ‘reneg’ on promises made and to ‘change one’s mind’ if necessary.\(^{14}\) In other words, it is conceivably very difficult for the

\(^{14}\)This will naturally be the case after an election: future governments do not have to honor the promises...
central government to commit itself to anything else but its preferred course of action. I will assume that under centralization it is unable to make such a commitment.\footnote{If agents can commit to monetary transfers and to public good levels ex ante, the revelation principle applies and organizational structure becomes irrelevant. By the same token, I also do not consider the possibility of regions ‘cooperating’ under decentralization. Consistent with the non-commitment ability of the central government (federal assembly) the analysis also implicitly assumes that a local policymaker cannot commit to any policy that does not maximize the respective objective function. An alternative justification for this assumption is that districts need a central government, which has an intrinsic interest (through its objective function) to improve upon the decentralized outcome, and has the legal means to impose local policies that do not maximize local surplus to to enforce binding agreements. In either case, what matters for the analysis is that communication and, hence, policy coordination is better if authority rests with the center than if districts are granted autonomy, which seems to be a reasonable proposition.}

2.2 Centralization with Communication

Let us reconsider the case where authority over spending and taxation rests with the federal government, i.e., the central authority can mandate a policy vector \( (g_1, \ldots, g_n) \), financed by local taxation \( (t_1, \ldots, t_n) \). In contrast to the previous analysis, though, the federal government now recognizes that it does not possess all information relevant to its policy decision. Specifically, I will allow information to flow between the central government and the districts (local officials) in the sense that the latter can communicate their local benefit \( \theta_i \) to the former. In doing so, however, they have to take into account the fact that the center will – upon having received the information communicated by the districts and possibly updated its prior on \( \theta \) – implement its most preferred policy. There are two interpretations of this communication consistent with the two views of a central authority laid out above. First, if the central authority is a federal government that is distinct from the local representatives, one could imagine the center consulting regional representatives and officials on the project before making a decision. Alternatively, the central authority may simply be a federal assembly, which itself is composed of regional delegates. In this interpretation, the information transmission stage can be seen as formalizing delegates communicating with each other – a policy debate. The constraint they operate under, however, is that, at the end of the day, the assembly will pass a bill that maximizes joint surplus.

made by previous governments. Recently, the lesson that it is impossible to bind future governments was learned the hard way by Canadian working parents. In 2004, the Liberal government of then Prime Minister Paul Martin announced their Canadian Child Care Plan, which was meant to improve childcare on a nationwide basis. It subsequently passed a budget designating $5 billion over five years to create 250,000 child-care spaces by 2009. However, after having defeated the Liberals in the January 2006 election, the Conservatives under Stephen Harper quickly moved to cancel the plan entirely, and with it the promised federal funds that had been earmarked for this purpose [see http://www.cbc.ca/news/background/daycare/]. Another justification of the no-commitment assumption would simply be an ‘incomplete contracting’ scenario, where the public projects are too complex to be described ex ante and thus cannot be contracted upon.
Formally, communication and policy selection under centralization can be described by the following three stage game. In the first stage, nature chooses for the vector of local benefits $\theta$, and each district representative learns the $\theta_i \in \Theta_i$ for its local project $g_i$. The second stage is a communication stage where the central government consults local officials on, alternatively, the delegates in the federal assembly engage in a political debate. At a very general level, this communication can be formalized by the exchange of messages $m_i$. Upon observing $m_i$, the central authority forms new beliefs $\mu_i(m_i, \cdot)$ over $\theta_i \in \Theta_i$. Given $\mu = (\mu_1, \ldots, \mu_n)$ the central authority then implements a policy vector $(g_1, \ldots, g_n)$ that maximizes expected social surplus. Note that because the federal government always chooses its most preferred policy, conditional on beliefs $\mu$, the only thing communication may achieve is to change $\mu$. Any communication is therefore ‘cheap talk’ and could in principle be quite complicated (the exchange of messages could be conditional and repeated). Under our assumptions that a) private information is not correlated across districts and b) as far as a single district representative is concerned the decision on her own local project is independent of what happens in other districts, however, it is easy to see that the cheap talk game for each district can be analyzed separately. Moreover, there is no loss of generality restricting attention to a single message $m_i$ that is transmitted from the local representative to the central authority, who then decides upon $g_i$ given its updated beliefs $\mu_i(m_i)$. Cheap talk games with a single sender have been studied extensively in Crawford and Sobel (1982), who consider a generic version of the game where a better-informed sender can send arbitrary messages to a receiver who eventually makes an irreversible decision that affects the well-being of both. Crawford and Sobel show that the Bayesian Nash equilibria of the game will be characterized by a partition of the parameter space into connected sets (intervals). In each of these equilibria, the sender optimally and truthfully announces to which interval the realized state of nature belongs given the receiver’s decision rule, and the receiver maximizes her expected utility, given her updated beliefs based on the correct but coarse information about the state of nature she received from the sender.
2.2.1 Equilibrium Communication

As is easily seen, there always exists an equilibrium where no information is transmitted.\(^{16}\) Given the sender’s message is unrelated to his private information, the receiver rationally does not update her beliefs and picks the optimal action based on her prior. Conversely, since the receiver ‘ignores’ the message sent, any message is consistent with an equilibrium. Of course, there may be other equilibria with finer partitions in which informative communication is feasible. Since there is one decision taken for every message sent (which corresponds to an interval in the parameter space), the number of actions taken in equilibrium is limited by the number of elements of the partition. The converse is also true, however: if there are two messages (partition elements) that trigger identical actions, then we can combine them into a single message (partition element) without loss of generality. Since there are at most two decisions in the present model, the finest partition has two elements with \(g_i = 0\) if \(\theta_i\) belongs to one interval and \(g_i = 1\) if \(\theta_i\) belongs to the other interval. Also, because preferences satisfy single crossing, the latter must clearly contain higher values of \(\theta_i\); otherwise, it would be optimal for local representatives with extreme values of \(\theta_i\) to lie.

**Lemma 1.** Communication is limited under centralization. In particular, for each district \(i\), there are at most two types of Bayesian Nash equilibria (up to labeling differences):

(a) Communication is completely uninformative. In this equilibrium, the local representative sends a message \(m_i(\theta_i) = m_i(\theta'_i) \forall \theta_i, \theta'_i \in \Theta_i\) and the centralized policy consequently satisfies

\[
q^C_i(\theta_i) = q^{UC}_i(\theta_i) \quad \forall \theta_i \in \Theta_i
\]

(b) Communication is informative but incomplete. The corresponding equilibrium is characterized by a cut-off value \(\tilde{\theta}_i \in (0, \bar{\theta}_i)\) such that

\[
m_i(\theta_i) = \begin{cases} 
1 & \text{if } \theta_i \in [\tilde{\theta}_i, \bar{\theta}_i] \\
0 & \text{otherwise,}
\end{cases} \quad \text{and} \quad g^C_i(\theta_i) = m_i(\theta_i) \quad \forall \theta_i \in \Theta_i
\]

**Proof.** The proof follows directly from Crawford and Sobel (1982) and the above discussion. \(\square\)

\(^{16}\)In this case, the interval to which the sender truthfully announces that the realized state belongs to simply encompasses the entire parameter space
The equilibrium in (b), which I refer to as the *informative communication* equilibrium in the remainder, is illustrated in Figure 1.

\[
\begin{align*}
\text{Figure 1: Informative Communication} \\
0 & \quad \tilde{\theta}_i & \quad \tilde{\theta}_i \\
0 \quad g_i = 0 & \quad \tilde{\theta}_i & \quad g_i = 1 \\
0 \quad m_i = 0 & \quad m_i = 1 \\
0 & \quad \tilde{\theta}_i & \quad \tilde{\theta}_i \\
0 & \quad g_i = 0 & \quad g_i = 1 \\
0 & \quad m_i = 0 & \quad m_i = 1 \\
0 & \quad \tilde{\theta}_i & \quad \tilde{\theta}_i
\end{align*}
\]

Since \(g_i(\theta_i) = m_i(\theta_i)\), communication in this type of equilibrium has a simple structure. The local representatives makes a ‘recommendation’ as to whether or not their policy project should be realized, and the federal government follows the recommendation. In equilibrium, all proposals are thus rubber-stamped.

**Corollary.** If informative communication takes place between the federal government and all representatives \(i = 1, \ldots, n\), the equilibrium policy vector is characterized by universalism, i.e., each interested district is assured a project (regardless of whether the project is socially desirable or not).

Lemma 1 shows that whenever the informative communication equilibrium exists, it is not unique. So why should we focus on this equilibrium, i.e., is it a natural candidate for equilibrium selection? The answer is given in

**Lemma 2.** The equilibrium with informative communication Pareto dominates the equilibrium where no information is transmitted.

Proof. See Appendix.

In what follows, I will assume that players coordinate on the Pareto superior equilibrium, provided it exists. It remains to analyze when this is the case. To this end, recall that the policy vector that is eventually implemented must be the optimal choice for the central government, given its beliefs \(\mu\). If communication is as characterized in Lemma 1, we thus
must have
\[ E_{\theta_i \geq \tilde{\theta}_i} \{ \theta_i + \sigma_i - c_i \} \geq 0 \quad \Rightarrow \quad g_i(m_i = 1) = 1 \]
\[ E_{\theta_i \leq \tilde{\theta}_i} \{ \theta_i + \sigma_i - c_i \} \geq 0 \quad \Rightarrow \quad g_i(m_i = 0) = 0 \]

Next, consider the representative of the district. Since talk is ‘cheap’ (sending messages costless), for the communication strategy to be optimal, it must be the case that the individual prefers \( q_i = 0 \) to \( q_i = 1 \) whenever \( \theta_i \leq \tilde{\theta}_i \) and \( q_i = 1 \) to \( q_i = 0 \) otherwise. Since \( \theta_i \) is distributed with full support over the interval \( \Theta_i \), a representative with preference parameter \( \tilde{\theta}_i \) must be indifferent between both outcomes.

\[ E_{m_{j \neq i}, u_i(1, \tilde{\theta}_i)} = E_{m_{j \neq i}, u_i(0, \tilde{\theta}_i)} \quad \iff \quad \tilde{\theta}_i - s_i c_i + E_{m_j} \left\{ \sum_{j \neq i} (\gamma_{ij} - s_{ij} c_j) q_j(m_j) \right\} = E_{m_j} \left\{ \sum_{j \neq i} (\gamma_{ij} - s_{ij} c_j) q_j(m_j) \right\} \]
\[ \iff \tilde{\theta}_i = s_i c_i \quad (4) \]

Hence,

**Lemma 3.** The equilibrium with informative communication exists if and only if
\[ E\{ \theta_i + \sigma_i - c_i \mid \theta_i \geq s_i c_i \} \geq 0 \quad (5) \quad \text{and} \quad E\{ \theta_i + \sigma_i - c_i \mid \theta_i \leq s_i c_i \} \leq 0 \quad (6) \]
hold.

In summary, we can characterize the information that is transmitted through a political debate and the subsequent course of action under centralization as follows. First, communication is imperfect in general, which implies that centralized decisions are never efficient, as would be the case under perfect information. Second, whenever informative communication is feasible, the central authority in effect rubber-stamps local proposals or, put differently, the central legislature operates with universalistic criteria: every interested district is assured a project. However, the federal government still can – and generally will – discriminate among districts: in equilibrium, given the communicated information, the decision rule \( q_i(m_i) \) depends on the realization of the local benefit \( \theta_i \). Third, whether or not meaningful communication is in fact feasible depends on the \( \sigma_i \) as well as on \( s_i \). The following subsection looks at these dependencies in more detail.

---

17In other words, although ‘formal’ authority rests with the central government, the fact that districts command superior information means that ‘real’ authority still lies with the local representatives. The distinction between formal and real authority has been studied in Aghion and Tirole (1997), albeit in a quite different framework.
2.2.2 How much Information flows? Local Bias Effect and Common Pool Effect

Lemma 3 has shown that the incentives to truthfully share information (respectively, the credibility of the shared information) and by extension the centralized equilibrium policy decision, is determined by two exogenous variables: the extent of the spill-overs and the rule governing cost-sharing.

To develop some understanding of the mechanisms underlying (credible) information sharing, consider $s_i = 1$, i.e., the district ‘pays the piper’ even though the federal government ‘calls the tune’. Informative communication then requires $\tilde{\theta} = c_i$, i.e., the district proposes to implement its local project under centralization whenever it would have implemented the project itself under decentralization. Were the federal authority always to follow the local recommendation, the outcome under both governance structures would be identical. If spillovers are significant, however, the federal government will sometimes optimally ‘override’ the district and then no informative communication can take place.

To see this, suppose first spill-overs are negative. Then, the federal government may want to scrap the project even though the local representative is in favor. Because federal approval is gained less often than is desired by his constituency, the local representative’s incentives to truthfully communicate $\tilde{\theta}$ are diminished. In particular, the desire to counteract the federal reluctance to realize the project by overstating local benefits $\tilde{\theta}$ may becomes sufficiently strong as to render any meaningful communication infeasible. Formally, this happens for (in absolute terms) large values of $\sigma_i$ that do not satisfy condition (5). Similarly, if spill-overs are positive the federal government will want to realize the project more often than is desired by the local population. Again, informative communication will become infeasible because at some point because the incentive of the local representative to counteract federal activism by understating local benefits $\theta_i$ is too pronounced: condition (6) is violated for sufficiently large (positive) values of $\sigma_i$. The federal government then rationally ignores the local representative’s information and realizes the project against the expressed will of the local population.

Because the motive to overstate (respectively, understate) the local value of the project primarily depends on the discrepancy between the private value and the social value of the policy, we may call this effect the local bias effect. Also note that due to the simple structure of the model, the local bias effect operates only through a threshold value of $\sigma_i$ above
(respectively, below) which the informative equilibrium ceases to exist. It has no influence on the equilibrium policy as long as information is transmitted.

In practice, of course, a project that is decided upon at the federal is almost certain to be funded at the federal level as well. In what follows, I will therefore focus on the empirically more relevant case where cost are shared under federal authority. For example, irrespective of any (observable or unobservable) differences in the tax bases across districts, cost sharing takes place whenever the federal budget is at least partly financed by a uniform tax instrument such as a federal income tax or a federal consumption tax. In the simplest case of a central budget financed by a uniform tax on identical tax bases, for instance, we would have $s_i = 1/n$ or $t_i = \frac{1}{n}c_i$. More generally, I will assume

**Assumption 1.** Costs are shared on the federal level, and the district tax shares decline in the number of districts. For all districts $i = 1, \ldots, n$, we have

$$0 < s_i(n) < 1 \quad \text{and} \quad s_i(n) > s_i(n+1) \in (0, 1)$$

Public projects thus have “pork barrel” features: they largely benefit a single district at a cost to all others.\(^{18}\) Recall from the previous sections that how funds are raised and costs shared under federal authority had no impact on federal policies in the benchmark cases of perfect information and imperfect information without communication, respectively. Once we allow for communication between the federal government and local officials (among local delegates in a federal assembly) this is no longer true: in conjunction with the lack of information on the part of the federal government, cost sharing now creates a common pool problem. Project cost are not entirely borne by the local population, which leads local representative to underestimate the cost of the project ceteris paribus. This in turn creates an incentive to overstate the local benefits vis-a-vis the federal authority, which makes the transmission of credible information becomes more difficult.\(^{19}\)

To illustrate how this common pool effect and the local bias effect work together, suppose first $\sigma_i < (1-s_i)c_i$. The informative communication equilibrium (assuming it exists) is then

\[^{18}\text{These type of projects capture the important elements of many real-life policies, and are commonly assumed in the literature on legislative politics [see, e.g., in Ferejohn (1986) and Weingast et al. (1981), and Grossman and Helpman (2005).]}\]

\[^{19}\text{In a more general formulation with variable project size, this effect holds whenever locally earmarked expenditures grow more rapidly with project scale than local taxes.}\]
characterized by over-provision since the project is realized whenever $\theta_i \geq s_ic_i$ but should only be realized for values $\theta_i \geq c_i - \sigma_i > s_ic_i$. Adding additional districts (projects) implies $s'_i < s_i$ and clearly makes matters only worse: an already over-provided public project is prone to be even more over-provided as the cost share of the constituency declines and the incentive to overstate its value increases further. Hence, the combination of imperfect communication of privately held information and a common pool problem endogenously generates dis-economies of (organizational) scale: the more districts there are, the more difficult it becomes to truthfully communicate a projects’ true benefits in the political process, and the more distorted the resulting policy decision will be. The consequences are best seen in the limit case where $s_i \to 0$. From (4), if informative communication is feasible at all, we must have $q^{IC}_i(\theta_i) = 1$ almost always under federal authority. Intuitively, since the local district’s share of the cost is almost nil, it has a strong incentive to overstate local benefits in order to persuade the federal government to realize the project. But we know that the latter always approves whenever it listens to the former, which is necessarily the case if communication is meaningful. For values $\sigma_i > (1 - s_i)c_i$, on the other hand, the local bias effect is sufficiently strong so that the informative communication equilibrium is characterized by under-provision: the project is realized for values $\theta_i \geq s_ic_i > c_i - \sigma_i$. The local-bias effect and the common-pool effect then work in opposite directions, and which effect dominates will depend on the extent of the local bias ($\sigma_i$) and on the degree of cost sharing (the number of districts $n$). In particular, additional districts now have the benefit of counteracting the under-provision problem: more information will flow and the decision will be more efficient as we increase the number of districts from $n$ to $n+1$ (ignoring the integer problem). Eventually, though, the common pool problem will dominate, at least if $n \to \infty$ implies $s_i \to \infty$. In such a situation, there obviously is an optimal organizational size $n^*$ that balances the common pool effect with the local bias effect and thus minimizes the loss of information under centralization. To summarize:

**Theorem 1.** How informative the communication between central and a local government on the local policy is depends on the extent of the policy’s spillovers and on how costs are shared at the federal level. If $\sigma_i = (1 - s_i)c_i > 0$ communication is perfect and the federal policy decision is socially optimal.

For parameter values $\sigma_i < (1 - s_i)c_i$, the federal policy decision is characterized by over-provision and this tendency will grow with the number of districts. For values $\sigma_i > (1 - s_i)c_i$,
the federal policy decision is characterized by under-provision. This tendency is mitigated as the number of districts increases to some optimal $n^*$ which minimizes the loss of information.

2.3 Assigning Fiscal Authority

The previous section has identified two distorting effects on the information flow between a federal government and local representatives, the local-bias effect and the common-pool effect. In this section I study how the effects together translate into the overall efficiency of policies chosen on a federal level, and then compare the outcome under centralization with that under decentralization. Note that the comparison is not trivial: as we saw earlier, for instance, communication under central authority improves as the local bias shrinks. Thus we’d expect centralization to do well for small (absolute) values of $\sigma_i$. At the same time, though, the disadvantage of decentralized authority also disappears for small values of $\sigma_i$. Which effect dominates is thus not a priori clear.

To start, it is useful to distinguish between policies with negative spillovers (a positive local bias) and policies with positive spillovers (a negative local bias). Policies in the first category, which yield a net benefit to one locality but hurt others on average, include public investment with the potential for environment damage such as water dams or power plants, or infrastructure that intensifies intra-jurisdictional competition (e.g., to attract mobile capital). Policies in the second category, which on average have a positive spillover onto other districts, include public projects that improve health care, foster education, or protect the environment.

Thus, suppose first the project has a positive local bias, i.e., spillovers are negative. In this situation, the local-bias effect is such that the local representative will want to overstate the project’s benefits even if the district is financially fully responsible, $s_i = 1$. Irrespective of how much costs are shared on the federal level, the two effects thus work in the same direction, namely, to generate a bias toward over-provision. We find

**Theorem 2** (Negative Spillovers). Suppose $\sigma_i < 0$. Then, local authority over policy $g_i$ is socially preferred if $\sigma_i \geq -E\{\theta_i - c_i | \theta_i \geq c_i\}$ and federal authority over $g_i$ is optimal otherwise.

Moreover, whenever federal authority is socially preferable, the policy decision will be taken under ignorance and is characterized by under-provision.
**Corollary.** Decisions over policies that are under federal authority and have negative spillovers will not distinguish between ex ante indistinguishable districts (all such policies will be uniform).

**Proof.** For $\sigma_i < 0$, the project is over-provided under decentralization. Theorem 1 tells us it is also over-provided under centralization if the informative communication equilibrium exists. But because the project is undertaken even more often in the latter, local authority is strictly preferred. Formally,

$$\Delta^C = \int_{c_i}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i) > \int_{c_i}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i) = \Delta^D.$$  

Next, note that delegation is also socially preferred whenever $\sigma$ is sufficiently small such that the federal authority would always realize the project without additional information, i.e., if the informative communication equilibrium does not exist because (6) is violated. Hence, if centralization is ever optimal, it must be the case that a) the federal authority acts under ignorance (no information flows) and b) (5) is violated, which implies $g_i \equiv 0$. The expected surplus lost under centralization is then

$$\Delta^C = \int_{c_i}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i) > 0. \quad (7)$$

The expected loss in surplus under decentralization is

$$\Delta^D = -\int_{c_i}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i) > 0. \quad (8)$$

Comparing (7) with (8), we see that decentralization is preferred if

$$\int_{c_i}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i) \geq -\int_{c_i}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i)$$

$$\Leftrightarrow \int_{c_i}^{c_i - \sigma_i} (\theta_i + c_i) \, dF(\theta_i) \geq 0$$

$$\Leftrightarrow \int_{c_i}^{c_i - \sigma_i} (\theta_i - c_i) \, dF(\theta_i) \leq -\sigma_i [1 - F(c_i)]$$

$$\Leftrightarrow -E \{\theta_i - c_i | \theta_i \geq c_i\} \leq \sigma_i.$$
Finally, note that for \( \sigma_i < -E\{\theta_i - c_i | \theta_i \geq c_i\} \), condition (5) is indeed violated, i.e., the informative communication equilibrium under centralization does not exist. For those values of \( \sigma_i \) we then must have \( g_i^C(\theta_i) \equiv 0 \) for all \( \theta_i \in \Theta_i \), which proves the second part of the theorem.

The following result derives the optimal assignment of fiscal authority in the case where the project has a negative local bias, i.e., spillovers are positive.

**Theorem 3 (Positive Spillovers).** Suppose \( \sigma_i > 0 \). Then local authority over \( g_i \) is socially preferred if \( \sigma_i \leq -E\{\theta_i - c_i | s_i c_i \leq \theta_i \leq c_i\} \) and federal authority is preferred otherwise.

Moreover, the federal policy decision is taken under ignorance for all values \( \sigma_i > -E\{\theta_i - c_i | 0 \leq \theta_i \leq s_i c_i\} \). In this case, the federal policy decisions are characterized by over-provision.

**Corollary.** With cost sharing at the federal level, decisions over policies that are under federal authority and have positive spillovers will not distinguish between ex ante indistinguishable districts if either \( n \) is large and spillovers are pronounced.

**Proof.** Consider first parameter values \( 0 < \sigma_i \leq (1 - s_i)c_i \). For those values, (6) holds trivially. Hence, if the informative communication equilibrium does not exist in this range, (5) must be violated and we must have \( g_i(\theta_i) \equiv 0 \) i.e., the project would never be undertaken under federal authority. But then decentralization is always preferred because it at least ensures that \( g_i = 1 \) in some states of the world. If the informative communication equilibrium exists in this range, we know from Theorem 1 that the project is undertaken too often. The expected surplus lost is

\[
\Delta^C = - \int_{s_i c_i}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i) > 0. \tag{9}
\]

Conversely, the project is undertaken not often enough under decentralization. The corresponding expected loss in surplus is

\[
\Delta^D = \int_{c_i - \sigma_i}^{c_i} (\theta_i + \sigma_i - c_i) \, dF(\theta_i) > 0. \tag{10}
\]
Comparing (9) with (10), decentralization is preferred if
\[
- \int_{s_i c_i}^{c_i} (\theta_i + \sigma_i - c_i) dF(\theta_i) \geq \int_{c_i - \sigma_i}^{c_i} (\theta_i + \sigma_i - c_i) dF(\theta_i)
\]
\[\Leftrightarrow \quad - \int_{s_i c_i}^{c_i} (\theta_i + \sigma_i - c_i) dF(\theta_i) \leq 0 \]
\[\Leftrightarrow \quad - \int_{s_i c_i}^{c_i} (\theta_i - c_i) dF(\theta_i) \geq \sigma_i [F(c_i) - F(s_i c_i)]
\]
\[\Leftrightarrow \quad -E \{\theta_i - c_i| s_i c_i \leq \theta_i \leq c_i\} \geq \sigma_i.
\]
Finally, note that for \(\sigma_i > -E \{\theta_i - c_i| s_i c_i \leq \theta_i \leq c_i\}\), both conditions (5) and (6) hold, i.e., the informative communication equilibrium under centralization indeed exists (and the outcome is preferred to that under decentralization).

Next, consider parameter values \((1 - s_i)c_i < \sigma_i \leq c_i\). If the informative communication equilibrium exists in this range, Theorem 1 tells us it will be characterized by under-provision. Because the project is undertaken even less often under local authority, federal authority is strictly optimal. Formally,
\[
\Delta C = \int_{c_i - \sigma_i}^{s_i c_i} (\theta_i + \sigma_i - c_i) dF(\theta_i) < \int_{c_i - \sigma_i}^{c_i} (\theta_i + \sigma_i - c_i) dF(\theta_i) = \Delta D.
\]
If the informative communication equilibrium does not exist for \(\sigma_i > (1 - s_i)c_i\), we must have (6) violated,
\[
\int_{0}^{s_i c_i} (\theta_i + \sigma_i - c_i) dF(\theta_i) > 0 \Leftrightarrow \sigma_i F(s_i c_i) > - \int_{0}^{s_i c_i} (\theta_i - c_i) dF(\theta_i),
\]
or \(\sigma_i > -E \{\theta_i - c_i| 0 \leq \theta_i \leq s_i c_i\}\). Federal authority is still better since
\[
\Delta C = - \int_{0}^{c_i - \sigma_i} (\theta_i + \sigma_i - c_i) dF(\theta_i) < \int_{c_i - \sigma_i}^{c_i} (\theta_i + \sigma_i - c_i) dF(\theta_i) = \Delta D.
\]
for those values of \(\sigma_i\). Federal policy decisions will then be taken under ignorance and will be characterized by excessive provision. Finally, note that \(\sigma_i > -E \{\theta_i - c_i| 0 \leq \theta_i \leq s_i c_i\}\) will hold if either \(\sigma\) is large or the cost share parameter \(s_i\) is small (the number of districts \(n\) sufficiently large).
3 Discussion and Empirical Evidence

To summarize, the model presented in the previous section yields the following conclusions. First, communication between the federal government and its local counterparts necessarily remains incomplete. The resulting inefficiency of federal spending decisions is determined by the interplay between the local bias effect and the common pool effect, which in turn depend on the extent of local spillovers $\sigma_i$ and the number of districts (projects) $n$. In particular, centralized political decision making results in overspending in policy domains with negative or small external effects, whereas too low spending persists in policy domains with large external effects. Second, whenever meaningful communication is feasible, federal spending decisions will be characterized by a form of universalism: each interested district is assured a project. Third, if meaningful communication is not feasible, federal policy decisions are insensitive to local preferences: federal politics are uniform, that is, all districts are treated alike and either all projects are funded or none, possibly against the expressed will of the local population. In either case, the central government’s information about the local consequences of its policies is incomplete. Similar – but not identical – to Oates (1972)’s original argument, I thus identify a trade-off between a loss of coordination under decentralization and a loss of information under centralization, where the latter become more severe the larger the number of districts. A final set of results relates to this trade-off: from society’s point of view, local policy decisions are preferable whenever the associated externalities are small, and whenever preference heterogeneity or the number of districts is large.

3.1 Empirical Evidence

There is some support for the implication of the model in the data. For instance, political scientists have long observed and documented an increased tendency for universalistic behavior in the U.S. congress and Senate [Collie (1988), Alvarez and Saving (1997)].\footnote{See also Cox and Tutt (1984).} In those instances where universalism applies, the model furthermore predicts a version of “Law of 1/n,” as formalized in Weingast et al. (1981), which posits that fiscal inefficiency in the form of excessive spending increases with the number of legislative districts.\footnote{There have been numerous theoretical contribution who build on the common pool effect of distributive policies [see, e.g., Chari et al. (1997)].}
Gilligan and Matsusaka (2001) test the relationship between legislature size and spending using American State data, and find that large legislatures spent more, as implied by the "Law of 1/n". There is also supporting evidence for the hypothesis that legislators respond to common pool incentives: the probability of supporting (larger) projects is increasing in own-district benefits and decreasing in the own district cost burden [see DelRossi and Inman (1999), who using spending decisions of the US Congress following the passage of the Water Resources Development Act of 1986, and Knight (2004) who uses 1998 Congressional votes over transportation project funding], Bradbury and Crain (2001) examine the Law of 1/n in bicameral and unicameral legislative structures using a cross-section of democratic countries. The results support the positive relationship between legislative size and spending across countries, but the effect is greater in unicameral legislatures than in bicameral legislatures.

Following Baqir (2002), I present a test for this presumption in an OLS regression using data on U.S. municipalities from the U.S. 1980 Census of Population, the 1982/87 U.S. Census of Government and the International City/County Management Association (ICMA, various yearbooks 1980–1986). The basic estimated equation is

$$C_{exp} = \alpha + \beta_1 C_{size} + \beta_2 \text{Pop} + \beta_3 \text{Own} + \beta_4 \text{Ethn} + \beta_5 \text{Edu} + \epsilon.$$  

The dependent variable is $C_{exp}$, which denotes the log of municipal spending per capita. The main explanatory variable of interest is $C_{size}$, the number of councillors in the municipality’s legislative body. Other independent variables are log population size ($\text{Pop}$), the percentage of owner occupied housing ($\text{Own}$), an index of heterogeneity/racial fragmentation ($\text{Ethn}$) and the percentage of the population with a college degree ($\text{Edu}$). Based on the standard model of redistributive policies and government size, the regression should also include the ratio of median to mean income (will be added once available).
OLS regression for ln(government spending per capita)

<table>
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<tr>
<td>Csize</td>
<td>.0428***</td>
<td>.0421***</td>
<td>.0393***</td>
<td>.036***</td>
<td>.016***</td>
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<tr>
<td></td>
<td>(.006)</td>
<td>(.006)</td>
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<tr>
<td>Pop</td>
<td>.096***</td>
<td>−.614*</td>
<td>−1.178***</td>
<td>−1.72***</td>
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<tr>
<td></td>
<td>(.0218)</td>
<td>(.369)</td>
<td>(.365)</td>
<td>(.433)</td>
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<tr>
<td>Own</td>
<td>−.0061***</td>
<td>−.0062***</td>
<td>−.009***</td>
<td>−.008***</td>
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<tr>
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<td>(.0014)</td>
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<td>(.0014)</td>
<td>(.0016)</td>
<td>(.0013)</td>
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<tr>
<td>Ethn</td>
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<td>−.164*</td>
<td>−.169*</td>
<td>−.118</td>
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<tr>
<td></td>
<td>(.108)</td>
<td>(.107)</td>
<td>(.104)</td>
<td>(.12)</td>
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</tr>
<tr>
<td>Edu</td>
<td>.004**</td>
<td>.004**</td>
<td>.005**</td>
<td>.006***</td>
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</tr>
<tr>
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<td>(.001)</td>
<td>(.002)</td>
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</tr>
<tr>
<td>Pop2</td>
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<td>.055***</td>
<td>.079***</td>
<td>.053***</td>
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</tr>
<tr>
<td></td>
<td>(.017)</td>
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<td>(.02)</td>
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<tr>
<td>Den</td>
<td>−.127***</td>
<td>−.147***</td>
<td>−.094***</td>
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<td></td>
<td>(.015)</td>
<td>(.016)</td>
<td>(.014)</td>
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<td>Ward</td>
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<td>.055</td>
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<td></td>
<td></td>
<td>.084*</td>
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<td></td>
<td></td>
<td>(.055)</td>
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<td></td>
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<td>(.046)</td>
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<tr>
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<td>12.61***</td>
<td>15.5***</td>
<td>12.1***</td>
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<td>no</td>
<td>no</td>
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<tr>
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<td>.10</td>
<td>.15</td>
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<td>.47</td>
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To this basic regression, I successively add the following additional control variables: the square of the log population size (Pop2), the density (Den), the electoral system (a dummy which equals 1 if the system is a Ward system and zero if councillors are elected at large), and state fixed effects. The main results are gather in Table 1.

### 3.2 Robustness, Extensions, and Relationship to the Literature

Centralization results in political failure in the present model despite the fact that the legislature’s decision making is efficient, i.e., the legislature acts ‘cooperatively’ [see Weingast et al. (1981)]. An alternative and noncooperative approach to the behavior of legislatures is to assume that central decisions are taken by majority rule. This view is adopted in Lockwood (2002), who studies a model of legislative bargaining in which decisions require minimum winning coalition to form. Besley and Coate (2003) consider both cooperative and non-cooperative (majority rule) legislatures. If legislators act non-cooperatively and decisions are taken by majority rule, centralized policies will be tilted towards those regions that

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22By incorporating political economy considerations and focusing on the (distributional) conflict of among regions, these papers thus look at federalism from an angle that is quite different from Oates (1972)’s original insight. In contrast, the model in the present paper pays tribute to the need to explicitly account for the incentive of political actors (although it admittedly does so in a fairly rudimentary way) but is much closer in spirit to Oate’s.
are part of the ruling majority, and consistently disadvantage the minority regions. In the present framework, this effect would add another dimension of conflict, which likely renders a meaningful communication with jurisdictions outside the minimum winning coalition impossible. Otherwise, however, the flavor of the result would be preserved. In particular, as long as the cost of local public goods are still financed through a central budget, information transmission for those jurisdictions that belong to the minimum winning coalition should still be governed by the interplay of common pool effect and local bias effect.

The results in the present paper also shed light on the question whether centralization increase the size of government. In Besley and Coate (2003), regions seek to attract a larger share of central spending by delegating bargaining to representatives with high values for the local public good. In Persson and Tabellini (1994), local policy makers use contributions to persuade a central legislator to allocate public spending towards their regions, in the non-cooperative equilibrium, the central legislator supplies to many public goods. In all these studies, centralization for political decision making results in an over-provision of public goods. In the present paper, this is not true, but rather depends on the local bias effect. In particular, while centralization increases spending in policy domains where project have negative or positive but small spillovers, centralization may actually decrease public spending in policy domains with significant positive spill-overs. This finding is consistent with casual evidence in the European Union. The EU’s common agricultural policy where spill-overs are absent or even negative, is arguably characterized by overspending. In other areas with significant spillovers such as the environment, in contrast, spending is remarkably low.

Finally, in order to keep the analysis concise and tractable, I have made specific assumptions concerning the nature of the public projects and the privately held information. In particular, the informational asymmetry only related to a projects idiosyncratic benefits, not to its cost or its spillovers. Moreover, project costs and benefits were additive separable across districts, implying that the efficient local project choice could be made independently of what happened in other districts. Some of these assumptions could easily be altered. For instance, models where districts are better informed about their cost of raising public funds, or about the spillover effect of other projects (rather than about their own project benefit) could be analyzed in an analogous fashion, with similar conclusions.\(^{23}\) It would also be

\(^{23}\)Technically, what is important is that the variable capturing the privately held information continues to be one-dimensional.
fairly straightforward to study a situation where the realizations of local benefits are corre-
lated, say, because of some common shock to the economy. How much information a local
representative can credibly transmit in equilibrium would then hinge on what others have
already said. My conjecture is that this effect could make sequential communication desirable;
depending on the nature of the correlation, the order of speech would matter and there
may well be an optimal sequence of speakers in the assembly that maximizes informational
efficiency. To go one step further, one could consider a scenario where project decisions are
interrelated, e.g., because there the federal budget is fixed. The communicated information
of others then directly affects the social desirability of each project. Again, the incentives of
local delegates to truthfully convey their information would depend on the communication
strategies of other delegates in equilibrium. An analysis of these cases is beyond the scope
of the present paper but constitutes a fruitful avenue of future research.

Appendix

Proof of Lemma 2. Note that the equilibrium without information transmission, either \( q_i \equiv 1 \) or \( q_i \equiv 0 \), irrespective of \( \theta_i \). Now consider an informative equilibrium and a local delegate
with information \( \theta_i \in [0, \tilde{\theta}_i) \) who sends a message \( m_i = 0 \) that triggers \( q_i = 0 \) in equilibrium.
Since this agent can alternatively sent a message \( m_i = 1 \) which would prompt the central
authority to set \( q_i = 1 \), he or she must weakly prefer the former, and strictly so whenever
\( \theta_i < \tilde{\theta}_i \). The converse is true for delegates with information \( \theta_i \in [\tilde{\theta}_i, \bar{\theta}_i] \). The local districts
are therefore better off. By a similar revealed preference argument, the central authority
is also strictly better off. Since information is being transmitted, it changes the decision
\( q_i(\theta_i) \) for some states of the world, which must be strictly better than sticking with the
(uninformed) decision that prevails without the information.

References


Because of the interdependency in communication strategies, this case is much more difficult to analyze.
In a series of examples with three delegates who have received private signals about the desirability of a
common project, Austen-Smith (1990) shows that there are two opposing effect: on the one hand, delegates
have an incentive to share information insofar as their preferences are correlated. On the other hand,
information may be withheld due to diversity in ideal points.


