

2009s-39

**Intertwined Federalism:  
Accountability Problems under  
Partial Decentralization**

*Marcelin Joanis*

---

**Série Scientifique**  
*Scientific Series*

---

**Montréal**  
**Septembre 2009**

© 2009 *Marcelin Joanis*. Tous droits réservés. *All rights reserved*. Reproduction partielle permise avec citation du document source, incluant la notice ©.  
*Short sections may be quoted without explicit permission, if full credit, including © notice, is given to the source.*



Centre interuniversitaire de recherche en analyse des organisations

## **CIRANO**

Le CIRANO est un organisme sans but lucratif constitué en vertu de la Loi des compagnies du Québec. Le financement de son infrastructure et de ses activités de recherche provient des cotisations de ses organisations-membres, d'une subvention d'infrastructure du Ministère du Développement économique et régional et de la Recherche, de même que des subventions et mandats obtenus par ses équipes de recherche.

*CIRANO is a private non-profit organization incorporated under the Québec Companies Act. Its infrastructure and research activities are funded through fees paid by member organizations, an infrastructure grant from the Ministère du Développement économique et régional et de la Recherche, and grants and research mandates obtained by its research teams.*

### **Les partenaires du CIRANO**

#### **Partenaire majeur**

Ministère du Développement économique, de l'Innovation et de l'Exportation

#### **Partenaires corporatifs**

Banque de développement du Canada  
Banque du Canada  
Banque Laurentienne du Canada  
Banque Nationale du Canada  
Banque Royale du Canada  
Banque Scotia  
Bell Canada  
BMO Groupe financier  
Caisse de dépôt et placement du Québec  
DMR  
Fédération des caisses Desjardins du Québec  
Gaz de France  
Gaz Métro  
Hydro-Québec  
Industrie Canada  
Investissements PSP  
Ministère des Finances du Québec  
Power Corporation du Canada  
Raymond Chabot Grant Thornton  
Rio Tinto  
State Street Global Advisors  
Transat A.T.  
Ville de Montréal

#### **Partenaires universitaires**

École Polytechnique de Montréal  
HEC Montréal  
McGill University  
Université Concordia  
Université de Montréal  
Université de Sherbrooke  
Université du Québec  
Université du Québec à Montréal  
Université Laval

Le CIRANO collabore avec de nombreux centres et chaires de recherche universitaires dont on peut consulter la liste sur son site web.

Les cahiers de la série scientifique (CS) visent à rendre accessibles des résultats de recherche effectuée au CIRANO afin de susciter échanges et commentaires. Ces cahiers sont écrits dans le style des publications scientifiques. Les idées et les opinions émises sont sous l'unique responsabilité des auteurs et ne représentent pas nécessairement les positions du CIRANO ou de ses partenaires.

*This paper presents research carried out at CIRANO and aims at encouraging discussion and comment. The observations and viewpoints expressed are the sole responsibility of the authors. They do not necessarily represent positions of CIRANO or its partners.*

ISSN 1198-8177

Partenaire financier

Développement  
économique, Innovation  
et Exportation

Québec 

# Intertwined Federalism: Accountability Problems under Partial Decentralization<sup>\*</sup>

Marcelin Joanis<sup>†</sup>

## Résumé / Abstract

La décentralisation mène typiquement à la coexistence de plusieurs niveaux de gouvernement dans un domaine donné de l'activité gouvernementale. Pour analyser les effets sur le bien-être d'une telle décentralisation partielle, cet article développe un modèle principal-agent dans lequel deux niveaux de gouvernement sont impliqués dans la fourniture d'un bien public et où les électeurs sont imparfaitement informés de la contribution de chaque gouvernement au bien public. Le modèle prédit qu'une dérogation aux cas limites de la centralisation complète et de la décentralisation complète n'est désirable que si les bénéfices associés à la complémentarité verticale dans la fourniture du bien public l'emportent sur les coûts découlant d'une imputabilité réduite. Ces derniers résultent des interactions stratégiques verticales opérant à travers le processus électoral.

**Mots clés** : décentralisation, imputabilité, responsabilité partagée, fédéralisme, interactions verticales.

*Decentralization reforms typically lead to the coexistence of multiple tiers of government in a given policy area. To analyze the welfare effects of such partial decentralization, this paper develops a political agency model in which two levels of government are involved in public good provision and voters are imperfectly informed about each government's contribution to the public good. The model predicts that a departure from the polar cases of complete centralization and complete decentralization is desirable only if the benefits of vertical complementarity in public good provision outweigh the costs of reduced accountability, which result from detrimental vertical strategic interactions operating through the electoral process.*

**Keywords:** *decentralization, accountability, shared responsibility, federalism, vertical interactions.*

**Codes JEL** : H77, D72, H11

---

<sup>\*</sup> Thanks to Michael Smart for many crucial discussions about this project, and to Robert McMillan, Martin Osborne, Albert Breton, Thierry Madiès, Bernard Dafflon, Yukihiro Nishimura, Craig Brett and workshop participants at the Canadian Public Economics Group (Toronto 2009), the European Public Choice Society (Jena 2008), the Canadian Economics Association (Halifax 2007), the Société canadienne de sciences économiques (Québec 2007) and the University of Toronto for additional comments. This paper was partly written during a short visit at HEC Lausanne (DEEP), where I benefited from many useful discussions. All remaining errors are my own. Contact address: Université de Sherbrooke, Faculté d'administration, 2500, boul. de l'Université, Sherbrooke (Québec), J1K 2R1, email: marcelin.joanis@usherbrooke.ca.

<sup>†</sup> Université de Sherbrooke, CIRANO and GRÉDI, email: [marcelin.joanis@cirano.qc.ca](mailto:marcelin.joanis@cirano.qc.ca).

“... decentralization often creates a more complex, intertwined form of governance that bears little resemblance to the forms of decentralization envisioned in textbooks on fiscal federalism or in public choice theories.”

– Rodden (2004)

## 1 Introduction

Citizens in a democracy face a key challenge in holding their political representatives accountable, a theme emphasized in the large theoretical literature on political agency problems.<sup>1</sup> Accountability is especially hard to achieve given the complex array of tasks performed by modern governments and the limited set of levers that voters can pull – typically, just one collective reelection decision per political cycle – giving rise to a potentially severe advantage in favour of politicians over voters. Decentralization of expenditure responsibilities from central to local levels of government is generally thought to mitigate this agency problem by bringing the policymaking process closer to citizens and, hence, to increase overall government accountability. The World Bank (2004), for example, has strongly advocated decentralization on the basis that it will help to solve corruption problems, especially in developing countries.

The standard intuition that decentralization should be accountability-improving is consistent with theoretical models considering complete decentralization, i.e. the full transfer of a given expenditure responsibility from a higher level of government to a lower one.<sup>2</sup> In practice, decentralization reforms tend to be partial in nature, leading to the involvement of multiple tiers of government in the provision of public goods. With benevolent governments, partial decentralization (as opposed to complete decentralization or complete centralization) is a desirable constitutional arrangement as long as there is some degree of vertical com-

---

<sup>1</sup>For a comprehensive survey of this literature, see Besley (2006).

<sup>2</sup>Oates’ (1972) seminal decentralization theorem has this flavour, although it was not originally derived in terms of a political agency problem. Theoretical treatments of decentralization in the context of agency models have been provided, amongst others, by Seabright (1996), Lockwood (2002), Besley and Coate (2003), Tommasi and Weinschelbaum (2007) and Bardhan and Mookherjee (2000, 2005, 2006a). However, these papers do not directly tackle the issues pertaining to partial decentralization and shared responsibility.

plementarity in public good provision. However, this result does not necessarily hold if governments are opportunistic.

Under partial decentralization, policy outcomes are the joint result of actions taken by politicians at different levels of government. This joint accountability in public good provision has two important consequences: First, it gives rise to informational problems which may complicate the task faced by voters in disciplining politicians via the ballot box. Second, partial decentralization introduces vertical interactions between levels of government in public good provision.

This paper sets out an analytical framework to assess the efficiency consequences of partial expenditure decentralization.<sup>3</sup> The analysis is cast in the context of a pure moral hazard political agency model, an approach initiated by Barro (1973) and Ferejohn (1986). Two levels of government are involved in the provision of a public good and voters are imperfectly informed about each government's contribution to the good.<sup>4</sup>

Under complete centralization or complete decentralization, voters can limit governments' rent-seeking by setting appropriate reelection incentives. This is not necessarily true under shared expenditure responsibility. Unless voters can observe each level of government's competence and effort towards the provision of the public good (arguably a very strong assumption), the ability of voters to hold politicians accountable is lower under partial decentralization than under either complete decentralization or complete centralization. Thus, a reform from one of these polar cases towards partial decentralization will, in general, have ambiguous consequences for voter welfare, the benefits associated with the vertical complementarity of governments being weighed against the loss of accountability following from imperfect information.<sup>5</sup>

---

<sup>3</sup>Another question is whether partial decentralization is equity-enhancing, an issue that I abstract from in this paper.

<sup>4</sup>In order to focus on vertical interactions between the two levels of government, this version of the model does not consider horizontal interactions among subnational governments. However, future work will extend the proposed framework to allow for interactions among multiple subnational governments. For related models addressing this issue, see Seabright (1996) and Besley and Coate (2003).

<sup>5</sup>In this respect, the current paper complements Seabright's (1996) earlier political agency model by exploring the consequences of partial decentralization, which was beyond the scope of that paper. See Rodden (2004) for a critical survey of the related literature.

The model yields both positive and normative implications. From a positive point of view, the model has empirically testable predictions about the determinants of the degree of decentralization. Under shared expenditure responsibility, the equilibrium degree of decentralization is endogenous and depends on three factors: (i) the relative competence of each level of government, (ii) their relative rents from holding office, captured in the model by each level of government's access to the tax base, and (iii) the political conditions prevailing in both elections, i.e. the extent to which each level of government can affect its electoral fortunes by contributing to the public good. From a normative point of view, as is customary when moving from first-best to second-best analysis, otherwise welfare-improving partial decentralization (because of beneficial complementarities among levels of government) may not be desirable when voters cannot hold each level of government individually accountable for its contribution to public good provision. Partial decentralization is especially detrimental when the features of the political environment distort the degree of decentralization towards the level of government that is the least competent in providing the public good.

In a closely related contribution, Besley and Coate (2003) also adopt a political economy approach to the provision of local public goods in a federation.<sup>6</sup> Their model predicts the misallocation of public goods as a result of conflicts of interest in a centralized legislature and horizontal interactions among subnational governments. This paper complements Besley and Coate's analysis by studying the political economy of *vertical* interactions between two levels of government involved in the provision of public goods that are valued by the same constituency, shifting the focus away from decentralization *per se* and towards the way decentralization is implemented.

Examples of the kind of situation that the model intends to capture abound. Building a new road may involve the province (e.g. for the ground portions) and the federal government (e.g. for the bridges); security is provided by both provincial and federal police forces; environmental policy (such as complying with the Kyoto protocol) requires actions to be taken by both the federal and provincial governments; the provinces and local governments are together involved in the provision of public education, etc.

---

<sup>6</sup>As noted by Wilson and Janeba (2005), "the political economy approach to fiscal federalism remains relatively unexplored." Noteworthy exceptions are Panizza (1999) and Arzaghi and Henderson (2005).

The paper proceeds as follows. In Section 2, I set up a simple pure moral hazard political agency model with two levels of government. Section 3 derives the main insight of the paper in a simplified version of the model in which the inputs produced by both levels of government are perfect substitutes, the two levels of government are equally competent at providing the public good, and elections are deterministic. The model highlights that imperfect information about the intergovernmental composition of spending and vertical strategic interactions between the two levels of government preclude partial decentralization from improving upon the level of voter welfare attainable in a unitary state. Section 4 relaxes the perfect substitutes and deterministic elections assumptions, and presents the paper's core results. Section 5 analyses a series of variants and extensions: First, in Section 5.1, I attenuate politicians' objective, which are assumed to maximize their reelection probability rather than the resources that they can divert from the citizenry. Then, to capture some features of real-world elections, Section 5.2 considers a variant of the model in which voters receive systematically biased signals about the contribution of the other level of government when voting in a given election, e.g. as a result of biased media coverage. Section 5.3 then analyses the consequences of relaxing the assumption that both governments set their contribution levels simultaneously. Section 5.4 briefly considers an extension of the model in which governments supply both a shared public good and specific (non-shared) goods also valued by voters. Section 6 discusses the contribution of this paper to the long-standing debate in the literature about the consequences of decentralization for the size of the public sector. Policy implications are discussed in Section 7, and Section 8 concludes.

## **2 A Model of Shared Responsibility in Public Good Provision**

This section lays down the main building blocks of a model in which a public good valued by the voters in a given jurisdiction is jointly provided by two levels of government (labelled 'federal' and 'provincial').<sup>7</sup> I describe the environment (composed of two governments and

---

<sup>7</sup>While the labels 'federal' and 'provincial' (or its equivalent 'state') correspond best to federal countries such as Canada, the US, Germany or Australia, the applicability of the model is much more general. As

$N$  identical voters) and characterize the social optimum.

In each of two periods, two levels of government choose fiscal policy (taxes collected and spending) to maximize their expected level of rent extraction, subject to the constraint that they need to seek reelection at the end of the first period. Voters, who value public goods, can observe total taxes and can infer total rents. However, they imperfectly observe the intergovernmental composition of expenditures. Public good provision is positively related to the reelection probability of both governments such that the spending decisions of one level of government affects not only its own reelection probability but that of the other level of government as well (a positive externality arises). Each level of government's equilibrium contribution to the public good equates its own marginal benefit from reelection – with an incentive to free-ride on the other level of government's contribution – to the marginal cost of foregone rents in the first period, taking as given the strategy of the other level of government.

## 2.1 The Environment

Every period, the federal government (indexed by superscript  $f$ ) and the provincial government (indexed by superscript  $p$ ) each contribute to the provision of a public good  $g$  in a given jurisdiction (e.g. a province). Government  $j$  produces  $g^j \geq 0$  units of a publicly-provided input. Together, the federal and provincial inputs are converted into a public good  $g$  by a constant elasticity of substitution (CES) technology:<sup>8</sup>

$$g = (\theta^f (g^f)^\rho + \theta^p (g^p)^\rho)^{1/\rho}, \quad (1)$$

where  $\rho \leq 1$ .  $\theta^p$  and  $\theta^f$  are parameters that denote each level of government's competence.

---

Breton (1996) argues, it is hard to think of countries where public good provision is not undertaken by two, if not three or more, levels of government. Indeed, countries that are not organized as federations (quasi-federations such as Spain and even unitary states such as France) typically have subnational tiers of government, often with elected officials. In addition to subnational tiers of government, countries are increasingly involved in supranational institutions, some of which exhibit many features of federal countries, a prominent example being the EU.

<sup>8</sup>Nishimura (2006) also uses such an aggregation technology in a similar context.

Each government levies a lump-sum tax ( $T^j$ ) and faces a common unit cost of production ( $\tilde{\tau}$ ). Politicians in office can divert tax revenues away from public good provision and towards their own benefit. Assuming balanced budgets at each level of government, any of the jurisdiction's  $N$  individuals faces a total tax bill of

$$T = T^f + T^p = \tau(g^f + g^p) + s^f + s^p, \quad (2)$$

where  $\tau = \tilde{\tau}/N$  and  $s^j$  are the per capita rents extracted by government  $j$ .

All individuals have the following quasi-linear utility function:

$$u(g, z) = h(g) + z, \quad (3)$$

where  $z$  denotes the consumption of a private good and  $h$  is a well-behaved concave function. For tractability, let us assume a simple functional form for  $h$  :

$$h(g) = g^\alpha, \quad (4)$$

where  $0 < \alpha < 1$ . Furthermore, every period each individual is endowed with  $y$  units of the private good such that

$$z + T = y. \quad (5)$$

Without loss of generality, normalize the population of the jurisdiction to unity ( $N = 1$ ) since all individuals are identical.

## 2.2 Benevolent Governments and the Optimal Degree of Decentralization

Given the focus on the extent of decentralization on the expenditure side, for expositional purposes, it will be useful to define the 'degree of decentralization' ( $d$ ) as the share of provincial spending in total spending:

$$d \equiv \frac{g^p}{g^f + g^p} \in [0, 1]. \quad (6)$$

The case in which  $d = 1$  will be referred to as *complete decentralization*,  $d = 0$  as *complete centralization*, and  $0 < d < 1$  will correspond to instances of *partial decentralization*.

Optimality requires that politicians extract no rents while in office ( $s^{fS} = s^{pS} = 0$ ) and that the Samuelson condition be satisfied (a superscript  $S$  denotes the social optimum). In this model, the latter implies that government  $j$  contributes to the public good according to the following expression:

$$g^{jS} = \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}} (\theta^j)^{\frac{1}{1-\rho}} \left( (\theta^j)^{\frac{1}{1-\rho}} + (\theta^{-j})^{\frac{1}{1-\rho}} \right)^{\frac{\rho-\alpha}{\rho(\alpha-1)}} \quad \text{if } \rho < 1, \quad (7)$$

where  $-j$  denotes the other level of government. It follows from (7) that the optimal spending ratio (which determines the optimal degree of decentralization) is a function of the relative competence of the two levels of government:

$$\left(\frac{g^p}{g^f}\right)^S = \left(\frac{\theta^p}{\theta^f}\right)^{\frac{1}{1-\rho}}. \quad (8)$$

If the inputs produced by both levels of government do not exhibit any complementarity ( $\rho = 1$ ) – a case in which these inputs are ‘perfect substitutes’ – the socially optimal levels of  $g^f$  and  $g^p$  are given by the following conditions:

$$\begin{aligned} g^{jS} &= \left(\frac{\tau}{\alpha} \left(\frac{1}{\theta^j}\right)^\alpha\right)^{\frac{1}{\alpha-1}} && \text{if } \theta^j > \theta^{-j}, \\ g^p + g^f &= \left(\frac{\tau}{\alpha} \left(\frac{1}{\theta}\right)^\alpha\right)^{\frac{1}{\alpha-1}} && \text{if } \theta^p = \theta^f = \theta, \text{ for some } \theta, \\ g^{jS} &= 0 && \text{if } \theta^j < \theta^{-j}. \end{aligned} \quad (9)$$

The above results are summarized by the following proposition.

**Proposition 1 (Optimal Decentralization)** *The involvement of both levels of government in the provision of a public good – i.e. ‘partial decentralization’ – is optimal provided that there is some degree of complementarity between  $g^f$  and  $g^p$ . Complete centralization can be optimal only if there is no complementarity in  $g^f$  and  $g^p$  ( $\rho = 1$ ) and if the federal government is more competent than the provincial government ( $\theta^f \geq \theta^p$ ). Similarly, complete decentralization is optimal only if  $\rho = 1$  and  $\theta^f \leq \theta^p$ .*

In the special case in which both levels of government are equally competent and their competence is normalized to unity ( $\theta^p = \theta^f = 1$ ), the socially optimal levels of  $g^f$  and  $g^p$  are given by

$$\begin{aligned} g^{fS} = g^{pS} &= 2^{\frac{\rho-\alpha}{\rho(\alpha-1)}} \cdot \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}} && \text{if } \rho < 1, \\ g^{fS} + g^{pS} &= \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}} \equiv g^S && \text{if } \rho = 1. \end{aligned} \quad (10)$$

When  $g^f$  and  $g^p$  are perfect substitutes ( $\rho = 1$ ), the case which the next section focuses on, there is no *a priori* reason to favour decentralization over centralization (or vice versa) and any degree of decentralization can be socially optimal. The indeterminacy that characterizes optimal decentralization with  $\rho = 1$  disappears once imperfect substitutability is introduced in the model, with  $d = \frac{1}{2}$  being optimal when  $\rho < 1$ .

## 2.3 Introducing Politics: Opportunistic Politicians and Strategic Voters

Unless governments are assumed to be benevolent social planners, their behaviour depends on the incentives provided by the political process. This paper considers a two-period model, with separate elections taking place at the provincial and federal levels between the two periods. The model builds upon Besley and Smart's (2006, 2007) political agency model (the pure moral hazard case), extending it to a hierarchy of governments. In this model, elections can act as an imperfect disciplinary device, the basic intuition being given in the next section in the context of a unitary state.<sup>9</sup>

**Politicians** Each government maximizes expected discounted rents (per capita) over the two periods, given by

$$S^j = s_1^j + P^j \beta s_2^j, \quad (11)$$

where subscripts indicate periods,  $\beta \in [0, 1]$  is a discount factor and  $P^j$  is incumbent  $j$ 's perception of his reelection probability.

**Voters and elections** Voters face a simple binary reelection decision in the elections held at the two levels of government at the end of period 1. Unless mentioned otherwise, the two elections are assumed to take place simultaneously. Furthermore, following Besley and Smart (2006), voters are taken to be able to announce and commit to a reelection rule before the elections take place.

---

<sup>9</sup>For more details, see Besley and Smart (2006).

**Information** The information available to voters at election time is crucial to the ability of elections to act as disciplinary devices. Two sources of imperfect information will be crucial to the analysis that follows:

1. Voters imperfectly observe the contribution of each level of government to the shared public good. However, voters observe the aggregate level of the public good. In other words, voters observe  $g$  but not  $g^f$  and  $g^p$ .
2. The analysis is conducted under two different sets of assumptions as to how uncertain voters and incumbents are about the upcoming elections. In Section 3, elections are ‘deterministic’ in the following sense: the outcome is fully determined by the strategies played by the agents. In Section 4, uncertainty about the election outcome is introduced and resolved only after incumbents have taken all relevant decisions and just before the voters cast their ballots. From the point of view of incumbents, elections are ‘probabilistic’ in this case.

The next section derives the main insight of the paper under the assumption that elections are deterministic.

### **3 Shared Responsibility Federalism with Perfect Substitutes and Deterministic Elections**

The purpose of this section is to compare two constitutional arrangements: a unitary state, and a federal state with shared expenditure responsibility. To this end, I analyse a simplified version of the model which assumes that the inputs provided by the two levels of government are perfect substitutes ( $\rho = 1$ ), that the two levels of government are equally competent in providing the public good ( $\theta^p = \theta^f = 1$ ), and that elections are deterministic. In this simplified model, the key mechanism by which shared responsibility affects electoral accountability is evident: Shared responsibility creates a coordination problem between the two levels of government, with positive provision of the public good by one government generating a positive externality for the other one through increased reelection probabilities.

### 3.1 Unitary State

Let us first analyse the case in which only one level of government provides the public good (unitary state, labeled  $US$ ). This case corresponds to the pure moral hazard case in Besley and Smart (2006).

Although any politician will always extract maximum rents in the final period of the game ( $s_2 = y$ ), politicians' ability to extract rents can be limited in period 1 by the need to win reelection. In period 1, the incumbent can always set  $s_1 = y$  and be defeated for sure, which leads to the following indifference condition:

$$\hat{s}_1(\sigma) + \sigma\beta y = y, \quad (12)$$

where  $P = \sigma$  is the representative voter's reelection rule, i.e. the probability that she reelects the incumbent, and  $\hat{s}_1(\sigma)$  is the incumbent's optimal choice of  $s_1$ .

With only one government involved in public good provision, voters observe perfectly the government's fiscal policy, i.e. both  $g_1$  and  $T_1$  are observed. Since we have assumed a balanced budget and provided that  $\tau$  is common knowledge, voters can exactly infer the government's level of rent extraction:  $s_1 = T_1 - \tau g_1$ . The voters' reelection rule can therefore be conditioned upon  $s_1$ . The indifference condition (12) implies that  $\frac{\partial \hat{s}_1(\sigma)}{\partial \sigma} \leq 0$ , leading voters to adopt the (pure) equilibrium strategy  $\sigma = 1$  (i.e. reelect the incumbent for sure) if observed rents are no higher than  $(1 - \beta)y$ . This level of rent extraction leaves the government indifferent between being reelected and stealing everything today (and being defeated for sure). Therefore, the subgame perfect equilibrium outcome of this game is:  $s_1 = (1 - \beta)y$  and  $s_2 = y$ . This result is summarized in the following proposition:

**Proposition 2 (Unitary state)** *There exists a subgame perfect equilibrium of the game with a unitary state in which the incumbent is always reelected and the amount of rents extracted in period 1 is limited to  $(1 - \beta)y$ . The level of public good provision in period 1 is given by  $g^{US} = \arg \max_g \{u(g, \beta y - \tau g)\} \leq g^S$ .*

**Proof.** Besley and Smart (2006). ■

Hence, in a unitary state, elections have been shown to act as a disciplinary device. The remainder of this section will show how this result is affected by the introduction of a second level of government: the answer depends critically on the information available to voters.

## 3.2 Shared Responsibility Federalism

I now turn to the analysis of a hierarchy of two governments. I consider an institutional context in which the constitution does not attribute specific responsibility for the provision of  $g$ , i.e. there is shared responsibility. However, to avoid complications, it is assumed that neither government can tax more than half of the shared tax base:<sup>10</sup>

$$T^j \leq y/2. \quad (13)$$

### 3.2.1 Perfect Information

I first assume that voters have perfect information (labeled  $PI$ ) about the fiscal policy conducted by each level of government. Given the above revenue constraint, both governments extract rents  $s_2^j = y/2$  in period 2. In the first period, indifference conditions analogous to condition (12) hold for both incumbents:

$$\hat{s}_1^j(\sigma^j) + \sigma^j \beta y/2 = y/2, \quad (14)$$

where  $\sigma^j$  is the reelection rule that the representative voter applies to government  $j$ . It is straightforward to see, in line with the unitary state case, that the following proposition holds:

**Proposition 3 (Decentralization with perfect information)** *With shared responsibility and perfect information, the subgame perfect equilibrium outcome is, for each government, rent extraction  $s_1^{jPI} = (1 - \beta)y/2$  and  $s_2^{jPI} = y/2$ . The electorate's (pure) strategies on the equilibrium path in both elections are  $\sigma^j = 1$ . Any degree of decentralization can be an equilibrium outcome, with  $g^{fPI} + g^{pPI} = g^{US}$  and  $s_1^{jPI} + \tau g^{jPI} \leq y/2$ .*

**Proof.** See Appendix. ■

The ability of elections to act as a disciplinary device in this environment is the same in a unitary state and in a decentralized state if voters have perfect information about the

---

<sup>10</sup>None of the results in this section rely on the assumption that the tax base be split in equal shares. This restriction makes the outcome of the second period certain from the point of view of incumbent politicians, conditional upon reelection, by ruling out vertical interactions between the two levels of government in the second period. One could alternatively assume any tax sharing constraint.

intergovernmental composition of fiscal policy. This is a strong assumption: voters know perfectly each level of government's contribution to public good provision and tax tally. The remainder of the paper analyses the consequences for government accountability of imperfect information about fiscal policy *induced by decentralization*.

### 3.2.2 No Information about the Composition of Spending

Assume now that voters observe only total taxes  $T_t$  and total public good provision  $g_t$ . Voters can therefore infer total rents  $s_t$  but, in general, not their composition. This precludes the electorate from using a reelection rule based directly on the behaviour of individual governments. Given their observation of aggregate fiscal policy, voters can either adopt a 'symmetric reelection rule' (reelect or fire both governments according to some criterion) or an 'asymmetric reelection rule' (always reelect or fire one government, and reelect or fire the other according to some criterion).<sup>11</sup>

I first consider possible pure-strategy equilibria involving symmetric reelection rules of the form:

$$\sigma = \begin{cases} 1 & \text{if } s_1 \leq \bar{s}_1 \\ 0 & \text{if } s_1 > \bar{s}_1 \end{cases}, \quad (15)$$

where  $\sigma$  is a reelection probability that applies to both governments and  $\bar{s}_1 < y$  is a given level of rents. In the presence of such a cut-off rule based on aggregate rents, governments face a coordination problem. They need to coordinate to be reelected and share  $\bar{s}_1$ ; otherwise, they are both defeated for sure. Recall that for any government to accept rents less than  $y/2$  in period 1, it must be the case that the government is at least indifferent between being reelected and being defeated, that is,  $s_1^j \geq (1 - \beta)y/2$ .

Given  $\sigma$ , the two governments play the following period-1 coordination game, in which they can either coordinate (C) to share rents  $\bar{s}_1$  or defect (D) :

	C	D	
C	$(\frac{\bar{s}_1}{2} + \beta\frac{y}{2}, \frac{\bar{s}_1}{2} + \beta\frac{y}{2})$	$(\frac{\bar{s}_1}{2}, \frac{y}{2})$	(16)
D	$(\frac{y}{2}, \frac{\bar{s}_1}{2})$	$(\frac{y}{2}, \frac{y}{2})$	

---

<sup>11</sup>The analysis is restricted to pure strategy equilibria.

Note that this payoff matrix assumes that if they coordinate, the governments divide  $\bar{s}_1$  equally, an assumption compatible with the two governments having equal bargaining power. It is straightforward to show that both (C,C) and (D,D) are Nash equilibria.

If voters have no information about the composition of spending (an assumption labeled *NI*), decentralization raises the possibility of multiple equilibria. With symmetric reelection rules, both ‘non-coordinated’ and ‘coordinated’ equilibria can arise. In non-coordinated equilibria, both governments extract maximum rents in period 1 and are defeated for sure, regardless of the cutoff level for aggregate rents set by the voters. However, a coordinated equilibrium can also arise, in which  $s_1^j = \bar{s}_1^j = (1 - \beta)y/2$  and both incumbents are reelected for sure.

Other equilibria involve asymmetric firing rules of the following form: always fire or reelect one of the governments ( $j$ ) and reelect the other one ( $-j$ ) if  $s_1 \leq y/2 + (1 - \beta)y/2$ . In such asymmetric equilibria, voters forego  $y/2$  in period 1 to hold government  $-j$ ’s level of rent extraction to its minimum compatible with its incentive constraint, that is  $s_1^{-j} = (1 - \beta)y/2$ . In terms of aggregate rent-seeking, the asymmetric equilibria lie in between the coordinated and non-coordinated symmetric equilibria, with  $s_1 = (2 - \beta)y/2$ . Note that it is only in the coordinated symmetric equilibrium that decentralization does not reduce voter welfare, a result formalized by Proposition 4.<sup>12</sup>

**Proposition 4 (Decentralization with no information)** *Any equilibrium of the political agency model with two governments and no information about the composition of spending involves equal or higher rent-seeking than in a unitary state. Any degree of decentralization can be observed in equilibrium.*

---

<sup>12</sup>One might wonder how robust the non-coordinated symmetric equilibrium is. Intuitively, couldn’t the voters increase  $\bar{s}_1$  above  $(1 - \beta)y$  and induce both governments to coordinate? Indeed, it can be shown that the non-coordinated equilibrium fails to pass Carlsson and van Damme’s (1993) risk-dominance criterion. The idea is to introduce an arbitrarily small degree of uncertainty by allowing a small proportion of politicians to deviate from Nash equilibrium strategies. Applying iterated strict dominance to this new game yields a unique equilibrium in which the two levels of government coordinate to share rents in period 1 and jointly earn reelection. Note that taking into consideration this result would allow us to write Proposition 4 with strict inequality, both the asymmetric and the risk-dominant symmetric equilibria of the political agency model with two governments involving strictly higher rent-seeking than in a unitary state.

**Proof.** See Appendix. ■

An interesting parallel can be drawn between the analysis of this section and the seminal analysis of Brennan and Buchanan (1980). While Brennan and Buchanan’s main argument – based on a competitive markets analogy – is favourable to decentralization or to a federal constitution, they also briefly allude to the possibility of collusion between governments in a federal system. The coordinated equilibrium in the present analysis is reminiscent of this conjecture, with an important difference: Here, ‘collusion’ between the two levels of government (to earn reelection) is actually beneficial to the voters. That being said, to the extent that shared expenditure responsibility is associated with an imperfect ability by the voters to observe each government’s contribution to the shared public good, moving towards shared expenditure responsibility is never welfare-improving in the simple environment assumed in this section.

Recall that this stark result is derived under three strong assumptions: First, the inputs produced by the two levels of government are perfect substitutes; second, the two levels of government are equally competent at providing the public good; and third, elections are deterministic in the sense that voters can commit to a strict reelection rule, about which there is no uncertainty from the incumbents’ point of view. These assumptions are relaxed in the next section. Assuming probabilistic elections will smooth the problem and avoid the multiplicity of equilibria that arises in the special case studied in this section. Furthermore, relaxing the perfect substitutes and the equal competence assumptions will have important consequences on the equilibrium degree of decentralization.

## 4 Imperfect Substitutes and Probabilistic Elections

This section introduces uncertainty in electoral conditions. In the spirit of probabilistic voting models, such as those developed by Persson and Tabellini (2000) or more recently by Alesina and Tabellini (2007, 2008), election results are typically uncertain from the point of view of politicians (at least to some extent) since a series of shocks may affect the electorate’s decision beyond fiscal policy (e.g. other issues arising during the campaign, characteristics of challengers, partisan loyalty). As before, voters base their reelection decisions on observed

aggregate fiscal policy variables. However, it is now assumed that, just before an election, they receive information about other factors affecting their willingness to reelect the incumbent. This information is specific to a given level of government, introducing heterogeneity in the electoral conditions between the elections taking place at the two levels of government. The information becomes available to voters only after both levels of government have taken period-one fiscal policy decisions.<sup>13</sup>

The timing of the game is as follows:

1. Incumbents set period-1 fiscal policy (determining the contribution to the shared public good and the level of rents);
2. Voters observe the realization of two random variables which summarize the electoral conditions specific to each election;
3. The federal and provincial elections take place; and
4. If reelected, the incumbents set period-2 fiscal policy. Otherwise, voters achieve the utility level associated with challengers (similar in all respects to incumbents).

The main consequence of introducing uncertainty about electoral conditions is that voters cannot commit *ex ante* to such a stark reelection cut-off as in equation (15). The best that voters can do is now to announce that they will reelect each incumbent if their period-1 utility level exceeds some random threshold value, the distribution of which is assumed to be common knowledge. The cut-off utility level relevant to the provincial election is denoted  $\bar{u}$  and is a random variable distributed according to  $F$ , a c.d.f. Hence, voters reelect the provincial government if

$$u(g, T) \geq \bar{u}. \tag{17}$$

Symmetrically, they reelect the federal government if their utility exceeds the realization of a random variable  $\bar{v}$ , distributed according to  $G$ , a c.d.f.

---

<sup>13</sup>One interpretation for this is that information about the quality of the challengers becomes available just before the election.

From the point of view of incumbents, reelection is now probabilistic. Electoral results depend on aggregate public good provision and on the realization of the stochastic reservation utility levels. The probability that the provincial incumbent is reelected is

$$P^p = \Pr [u(g, T) \geq \bar{u}] = F [u(g, T)]. \quad (18)$$

For simplicity, let us assume that  $\bar{u}$  is uniformly distributed on the interval  $[0, u^*]$ , implying that

$$P^p = \frac{1}{u^*} u(g, T). \quad (19)$$

Note that the reelection probability is decreasing in  $u^*$ , the upper bound on the random cut-off utility level. Hence, the election is riskier from the incumbent's point of view the higher is this upper bound.

For simplicity, let us make a few additional assumptions about taxes. Since taxes are lump-sum in this model, we can assume that individuals and governments take total taxes collected ( $T^p$  and  $T^f$ ) as given. Let us further assume that  $T^p$  and  $T^f$  are fixed at some pre-determined levels that are sufficient for each level of government to provide some arbitrary maximum level of the public good ( $\bar{g}$ ). In sum, we assume the following series of inequalities for each government  $j$ :

$$\tau \bar{g} \leq T^j \leq y. \quad (20)$$

We can now consider the provincial incumbent's problem in period 1:

$$\max_{g^p} T^p - \tau g^p + \beta T^p \frac{1}{u^*} ((\theta^f (g^f)^\rho + \theta^p (g^p)^\rho)^{\alpha/\rho} - T^p - T^f), \quad (21)$$

which is obtained by substituting the government's budget constraint ( $\tau g^p + s^p = T^p$ ) and equation (19) in equation (11).<sup>14</sup> The federal government solves a symmetric problem, with  $\bar{v} \sim U [0, v^*]$ . The two levels of government are assumed to behave non-cooperatively in setting their contribution to the public good, taking the contribution level of the other government as given. Since elections are simultaneous, the equilibrium contribution levels in period 1 will be those observed in a Nash equilibrium.

---

<sup>14</sup>Time subscripts are dropped from now on since the period-2 problem is trivial, with maximum rents being taken by each government. All decision variables relate to period 1.

As in the previous section, the main exercise performed here is to compare two constitutional institutions: a constitution attributing the provision of the public good to one level of government and a federal state with shared expenditure responsibility. Whenever one of the two levels of government is more competent than the other, the specific-responsibility constitution attributes public good provision to the most competent. In the spirit of Oates' decentralization theorem, let us restrict the analysis to cases where  $\theta^f < \theta^p$ , that is the level of government closest to citizens has an advantage in production. Let us first consider the case in which the constitution attributes a specific responsibility to one of the levels of government.

#### 4.1 Specific Responsibility

If the constitution attributes the provision of the public good to the province only, the incumbent will provide the following level of its specific input:

$$g^p = \left[ \frac{\tau}{\alpha} \left( \frac{1}{\theta^p} \right)^{\frac{\alpha}{\rho}} \frac{u^*}{\beta T^p} \right]^{\frac{1}{\alpha-1}}. \quad (22)$$

Note that  $g^p$  is increasing in the discounted value of period-2 rents ( $\beta T^p$ ) and in the competence parameter ( $\theta^p$ ), but that it is decreasing in the tax rate ( $\tau$ ) and in the upper bound on the voters' random utility cutoff ( $u^*$ ). Note also that  $g^p$  is different from its socially optimal level, given by equation (7), in part because the 'forced' complete decentralization in this scenario foregoes the benefits of complementarity between  $g^p$  and  $g^f$ .

#### 4.2 Shared Responsibility and Endogenous Decentralization

How does the outcome under a constitution attributing public good provision to the most competent level of government compare to the outcome under shared responsibility? Under shared responsibility, the degree of decentralization is endogenous and is the outcome of vertical interactions between the two levels of government that are shaped by the degree of substitutability between the public inputs.<sup>15</sup>

---

<sup>15</sup>Whereas high complementarity mitigates the ability of each government to merely free-ride on the other's contribution, complementarity is also associated with a more indirect effect of aggregate spending on

### 4.2.1 Perfect Substitutes Revisited

Before turning to the general case in which the inputs produced by the two governments display at least some degree of complementarity, I first revisit the perfect substitutes case ( $\rho = 1$ ) of the previous section to highlight the role played by the probabilistic nature of elections.

The first-order condition for the problem in (21) yields the following reaction function:

$$g^{p*}(g^f) = \frac{1}{\theta^p} \left( \frac{\tau}{\alpha} \frac{u^*}{\beta T^p} \right)^{\frac{1}{\alpha-1}} - \frac{\theta^f}{\theta^p} g^f. \quad (23)$$

The federal government's problem is symmetric and yields the following reaction function:

$$g^{f*}(g^p) = \frac{1}{\theta^f} \left( \frac{\tau}{\alpha} \frac{v^*}{\beta T^f} \right)^{\frac{1}{\alpha-1}} - \frac{\theta^p}{\theta^f} g^p. \quad (24)$$

Note that since these reaction functions are parallel, the outcome of the game with perfect substitutes will involve either complete centralization or complete decentralization unless the intercepts coincide. Which government provides the good is determined, in equilibrium, by the relative values of the ratios  $\frac{u^*}{T^p}$  and  $\frac{v^*}{T^f}$ . Specifically,

$$\begin{aligned} g^f &= \frac{1}{\theta^f} \left( \frac{\tau}{\alpha} \frac{v^*}{\beta T^f} \right)^{\frac{1}{\alpha-1}} \text{ and } g^p = 0 && \text{if } \frac{v^*}{T^f} < \frac{u^*}{T^p}, \\ \text{Any } (g^f, g^p) \text{ s.t. } g &= \left( \frac{\tau}{\alpha} \frac{\pi}{\beta} \right)^{\frac{1}{\alpha-1}} && \text{if } \frac{v^*}{T^f} = \frac{u^*}{T^p} = \pi, \\ g^p &= \frac{1}{\theta^p} \left( \frac{\tau}{\alpha} \frac{u^*}{\beta T^p} \right)^{\frac{1}{\alpha-1}} \text{ and } g^f = 0 && \text{if } \frac{v^*}{T^f} > \frac{u^*}{T^p}. \end{aligned} \quad (25)$$

This result is summarized in the following proposition.

**Proposition 5 (Endogenous decentralization with perfect substitutes)** *When the inputs produced by the two levels of government are perfect substitutes ( $\rho = 1$ ), the equilibrium degree of decentralization (complete decentralization by assumption) corresponds to the optimal degree of decentralization only if  $\frac{T^p}{T^f} > \frac{u^*}{v^*}$ , i.e. if the provincial-federal revenue ratio exceeds the provincial-federal ratio of the voters' reservation utility levels. While any degree of decentralization can be observed if  $\frac{T^p}{T^f} = \frac{u^*}{v^*}$ , complete centralization arises in equilibrium if  $\frac{T^p}{T^f} < \frac{u^*}{v^*}$ .*

---

reelection probabilities.

Note that assuming that both levels of government are equally competent at providing the shared public good would not fundamentally alter this result since the relative competence of the two levels of government does not play the crucial role in the determination of which government produces the public good.

#### 4.2.2 Imperfect Substitutes

This subsection analyses the full-blown model, with  $\rho < 1$ . In this case, the reaction functions are given by:

$$\frac{\beta T^p}{u^*} (\theta^f (g^f)^\rho + \theta^p (g^p)^\rho)^{\frac{\alpha}{\rho} - 1} (g^p)^{\rho-1} \theta^p = \frac{\tau}{\alpha}, \quad (26)$$

$$\frac{\beta T^f}{v^*} (\theta^f (g^f)^\rho + \theta^p (g^p)^\rho)^{\frac{\alpha}{\rho} - 1} (g^f)^{\rho-1} \theta^f = \frac{\tau}{\alpha}. \quad (27)$$

Solving (26) for an interior solution yields the Nash equilibrium spending ratio:

$$\frac{g^p}{g^f} = \left( \frac{\theta^p T^p v^*}{\theta^f T^f u^*} \right)^{\frac{1}{1-\rho}}, \quad (28)$$

which in general is different from the optimal spending ratio given by equation (8), unless  $T^p v^* = T^f u^*$ . Notice that equation (28) implies a linear relationship between the logarithm of the spending ratio and the three ratios on the right-hand side. The following equation provides a useful decomposition of the equilibrium spending ratio:

$$\underbrace{\ln \left( \frac{g^p}{g^f} \right)}_{\text{spending ratio}} = \underbrace{\frac{1}{1-\rho} \ln \left( \frac{\theta^p}{\theta^f} \right)}_{\text{relative competencies}} + \underbrace{\frac{1}{1-\rho} \ln \left( \frac{T^p}{T^f} \right)}_{\text{revenue ratio}} + \underbrace{\frac{1}{1-\rho} \ln \left( \frac{v^*}{u^*} \right)}_{\text{relative reelection uncertainties}} \quad (29)$$

**Proposition 6 (Endogenous decentralization with imperfect substitutes)** *When the inputs produced by the two levels of government are imperfect substitutes ( $\rho < 1$ ), the equilibrium degree of decentralization corresponds to the optimal degree of decentralization (which exceeds  $\frac{1}{2}$  by assumption) only if  $\frac{T^p}{T^f} = \frac{u^*}{v^*}$ , i.e. if the provincial-federal revenue ratio is equal to the provincial-federal ratio of the voters' reservation utility levels. Otherwise, the equilibrium spending ratio differs from the optimal ratio and is determined by the product of three ratios: the relative competencies  $\left(\frac{\theta^p}{\theta^f}\right)$ , the revenue ratio  $\left(\frac{T^p}{T^f}\right)$ , and the relative reelection uncertainties  $\left(\frac{v^*}{u^*}\right)$ .*

Together, the results derived in this subsection and the previous one show how a decentralization reform that leads to *de facto* shared expenditure responsibilities may not be socially optimal despite the existence of complementarities amongst levels of government. The key reasons for why this is the case in this model are (i) voters' inability to hold each level of government individually liable for its actions, and (ii) vertical interactions amongst levels of government, which take into account factors other than relative competencies.

So far, the analysis has relied on the assumption that voters receive no information about each government's contribution to the shared public good (other than the aggregate level of  $g$ ) and that politicians' objective is to divert resources from the public good. The next section explores variants of the model in which voters receive some information about each government's contribution to the public good and in which politicians are vote maximizers rather than rent maximizers, with the main insights of the analysis remaining essentially intact. The assumption of simultaneous elections is also relaxed.

## 5 Extensions and Variants

In this section, I alter some features of the model to show that this framework can be used to study a wide variety of policy-relevant situations. First, I restrict the ability of politicians to extract rents from tax revenues; instead, politicians will be assumed to value holding office *per se*. Second, voters will now be assumed to receive some (imperfect) information about each level of government's contribution to the shared public good. Finally, I consider briefly the consequences of sequential rather than simultaneous elections, and of assuming that the private goods  $s^p$  and  $s^f$  valued by politicians in the original model are also valued by voters.

### 5.1 Tamed Leviathans: Shared Responsibility with Ego Rents

The results of sections 3 and 4 have been derived under the arguably strong assumption that politicians behave in the manner of Brennan and Buchanan's (1980) Leviathan, their only objective being to divert public resources for their own benefit. This is a strong assumption. Let us now assume that politicians are not able to steal resources from the public. Instead, they are assumed to value holding office *per se*, from which they obtain what may be referred

to as ‘ego rents.’ Normalizing those ego rents to unity, an incumbent’s problem now reduces to maximizing its reelection probability by choosing a period-1 contribution level to the shared public good. Hence, the provincial incumbent’s optimization problem becomes:

$$\max_{g^p} \frac{1}{u^*} (g^\alpha - \tau g). \quad (30)$$

Despite the great simplicity of this model, the application that follows shows that it is nevertheless a useful framework for discussing some of the consequences of shared-responsibility federalism.

## 5.2 Media Bias and Imperfect Information

Building on the simplified model of Section 5.1, I now relax the assumption that the composition of spending is completely unobservable to voters. A key insight of the model developed in this paper involves the nature of reelection rules under shared responsibility: If policy outcomes are the joint result of actions undertaken by two levels of government, voters take into account the actions of the other level of government when deciding whether or not to reelect an incumbent. For example, it is not the level of spending by the provincial government *per se* that matters but the joint policy outcome. Hence, in an extreme case, the provincial government will be reelected for spending zero on the public good if the federal government is already providing alone the optimal level of the good. I now assume that voters benefit from imperfect information about the other government’s level of spending when voting in a given election.

### 5.2.1 A Model with Imperfect Information

When voting in a provincial election, voters are now able to observe the province’s contribution to  $g$  perfectly and to form an assessment of the federal contribution, given by  $\tilde{g}^f = \vartheta g^f$ .  $\vartheta$  can be thought of as the realization of a random variable that is known by both levels of government before making their contribution decisions. This is meant to capture the idea of biased media coverage in electoral campaigns, with the focus being on the actions of the level of government holding an election and those of the other level of government being kept in the background.

Throughout this section, I assume that both governments are equally competent ( $\theta^f = \theta^p = 1$ ), and I initially assume that  $g^f$  and  $g^p$  are perfect substitutes. Voters reelect the incumbent provincial government if their utility exceeds the stochastic cut-off  $\bar{u}$  :

$$(g^p + \tilde{g}^f)^\alpha - T^p - T^f \geq \bar{u}. \quad (31)$$

Similarly in a federal election, they observe the provincial government's contribution with noise:  $\tilde{g}^p = \xi g^p$ . Voters reelect the federal incumbent if

$$(\tilde{g}^p + g^f)^\alpha - T^p - T^f \geq \bar{v}. \quad (32)$$

I now consider the provincial government's problem, whose objective is to maximize its reelection probability, subject to its budget constraint:

$$\max_{g^p} \frac{1}{u^*} (((g^p + \vartheta g^f))^\alpha - \tau g^p - T^f). \quad (33)$$

The first-order condition for this problem gives the following reaction function:

$$g^{p*}(g^f) = \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}} - \vartheta g^f. \quad (34)$$

The federal government's problem is symmetric and yields the following reaction function:

$$g^{f*}(g^p) = \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}} - \xi g^p. \quad (35)$$

Under the assumption that the vertical interactions between the two governments follow Nash behaviour, the equilibrium contributions to the shared public good are given by:

$$(g^f, g^p) = \left( \frac{(1-\xi) \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}}}{1-\xi\vartheta}, \frac{(1-\vartheta) \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}}}{1-\xi\vartheta} \right), \quad (36)$$

as long as it is not the case that  $\xi = \frac{1}{\vartheta}$ . Equation (36) implies that aggregate public spending in such a Nash equilibrium is:

$$g = g^f + g^p = \frac{(2-\xi-\vartheta) \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}}}{1-\xi\vartheta}, \quad (37)$$

which in general is different from the social optimum, given by equation (10). In the special case in which the voters perfectly observe each government's contribution to the shared public good, i.e.  $\xi = \vartheta = 1$ , the Nash equilibrium allocation corresponds to the social optimum:

$$(g^f, g^p) \in \left\{ (g^f, g^p) : g^f + g^p = \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}} ; g^f, g^p \geq 0 \right\}. \quad (38)$$

These results are summarized in the following proposition.

**Proposition 7 (Inefficiency with imperfect information)** *As long as there is some degree of imperfect information on the part of the voters with respect to the level of spending by the other level of government when voting in a given election, the Nash equilibrium outcome is inefficient. If voters perfectly observe each government's contribution to the shared public good, the Nash equilibrium aggregate level of all public goods is efficient.*

### 5.2.2 A Special Case: Underestimating the Contribution of the Other Government

I now consider a special case of the previous analysis: When voting in a federal election, voters take full account of federal spending on the shared public good but they may systematically underestimate the contribution of the provincial government, while the opposite holds in a provincial election. This amounts to setting  $\vartheta, \xi \in [0, 1]$ . Taking the federal election as an example, at one extreme if  $\xi = 0$  voters completely ignore the provincial public good; at the other extreme, if  $\xi = 1$  voters fully acknowledge the provincial public good.

I turn first to the implications of such an informational environment in the perfect substitutes case.

**Perfect Substitutes** With  $\vartheta, \xi \in [0, 1]$ , equation (37) implies that  $g > g^S$ . In words, there is overspending in equilibrium, a result formalized in the following proposition.

**Proposition 8 (Overspending with perfect substitutes)** *If voters underestimate the contribution of the other level of government when voting in a given election, the Nash equilibrium aggregate level of public spending is inefficiently high in the perfect substitutes case.*

If voters completely ignore spending by the other level of government, i.e.  $\xi, \vartheta = 0$ , overspending is maximized and exceeds the social optimum by a factor of 2. At the other end of the spectrum, if voters can fully account for spending by the two governments when voting, i.e.  $\xi, \vartheta = 1$ , the set of Nash equilibria corresponds to the social optimum.

**Imperfect Substitutes** I now analyse the more general model in which the public goods can be imperfect substitutes and even perfect complements, while keeping the simplifying

assumption that  $\vartheta, \xi \in [0, 1]$ . The following analysis shows that the degree of substitutability among goods produced at both levels of government plays a crucial role in shaping the outcome of vertical fiscal interactions.

The first-order conditions of the federal and the provincial governments' problems with respect to the shared good are now, respectively:

$$((g^f)^\rho + (\xi g^p)^\rho)(g^f)^{\frac{\rho(\rho-1)}{\alpha-\rho}} = \left(\frac{\tau}{\alpha}\right)^{\frac{\rho}{\alpha-\rho}}, \quad (39)$$

$$((\vartheta g^f)^\rho + (g^p)^\rho)(g^p)^{\frac{\rho(\rho-1)}{\alpha-\rho}} = \left(\frac{\tau}{\alpha}\right)^{\frac{\rho}{\alpha-\rho}}. \quad (40)$$

For simplicity, I restrict the analysis to the case in which  $\xi = \vartheta \neq 1$ , focusing attention on the set of symmetric Nash equilibria (i.e.  $g^f = g^p = g^j$ ). In such an equilibrium, both first-order conditions collapse to (with superscripts omitted)

$$(\vartheta^\rho g^{j\rho} + g^{j\rho})g^{j\frac{\rho(\rho-1)}{\alpha-\rho}} = \left(\frac{\tau}{\alpha}\right)^{\frac{\rho}{\alpha-\rho}}, \quad (41)$$

which is solved by

$$g^f = g^p = \left(\frac{1}{1 + \vartheta^\rho}\right)^{\frac{\alpha-\rho}{\rho(\alpha-1)}} \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}}. \quad (42)$$

To determine whether such a Nash equilibrium is efficient, i.e. that  $g^N = g^S$ , recall from equation (10) that, with CES utility, optimality requires that  $g^{fS} = g^{pS} = 2^{\frac{\rho-\alpha}{\rho(\alpha-1)}} \cdot \left(\frac{\tau}{\alpha}\right)^{\frac{1}{\alpha-1}}$ . The answer depends crucially on the parameter  $\rho$ . Indeed, efficiency requires:

$$\frac{1}{1 + \vartheta^\rho} = \frac{1}{2}, \quad (43)$$

which is solved only if  $\rho = 0$ . This corresponds to the Cobb-Douglas case. Otherwise, we have:

$$g > g^S \Leftrightarrow \rho \in (0, 1], \quad (44)$$

$$g < g^S \Leftrightarrow \rho \in (-\infty, 0). \quad (45)$$

The results of this subsection are summarized in the following three propositions.

**Proposition 9** *If voters underestimate the contribution of the other level of government when voting in a given election, three types of symmetric Nash equilibria can arise:*

- (i) *Overspending equilibrium:* spending is inefficiently high if  $\rho \in (0, 1]$ ;
- (ii) *Efficient equilibrium:* spending is efficient if  $\rho = 0$ ; and
- (iii) *Underspending equilibrium:* spending is inefficiently low if  $\rho \in (-\infty, 0)$ .

In the special case in which  $\rho \rightarrow -\infty$ , i.e. Leontief preferences, both governments provide public goods that are perfect complements. The only pure strategy Nash equilibrium in such a case is zero provision by both governments. A sufficient degree of substitutability between the public inputs provided at each level of government is thus required for the over-provision result to obtain.

### 5.3 The Federal Government as a Stackleberg Leader

I assume again that  $\rho = 1$ , i.e. the public inputs are perfect substitutes, and follow the informational assumptions of the above ‘special case.’ However, I now relax the assumption that both governments move simultaneously. Instead, the federal government decides its level of public good provision before the provincial government, i.e. the federal government is modelled as a ‘Stackleberg leader.’ This gives the federal government a first-mover advantage.

In a subgame perfect equilibrium, the federal government supplies a higher quantity of the public good than the provincial government does:

$$g^f = \frac{1}{1 - \xi\vartheta} \left\{ \left[ \frac{\tau(1 - \vartheta)}{\alpha(1 - \xi\vartheta)} \right]^{\frac{1}{\alpha-1}} - \xi \left( \frac{\tau}{\alpha} \right)^{\frac{1}{\alpha-1}} \right\}, \quad (46)$$

$$g^p = \left( \frac{\tau}{\alpha} \right)^{\frac{1}{\alpha-1}} - \frac{\vartheta}{1 - \xi\vartheta} \left\{ \left[ \frac{\tau(1 - \vartheta)}{\alpha(1 - \xi\vartheta)} \right]^{\frac{1}{\alpha-1}} - \xi \left( \frac{\tau}{\alpha} \right)^{\frac{1}{\alpha-1}} \right\}. \quad (47)$$

Total spending in the SPE is given by

$$g = g^f + g^p = \left( \frac{\tau}{\alpha} \right)^{\frac{1}{\alpha-1}} + \frac{1 - \vartheta}{1 - \xi\vartheta} \left\{ \left[ \frac{\tau(1 - \vartheta)}{\alpha(1 - \xi\vartheta)} \right]^{\frac{1}{\alpha-1}} - \xi \left( \frac{\tau}{\alpha} \right)^{\frac{1}{\alpha-1}} \right\} \geq g^S. \quad (48)$$

These results translate into the following proposition.

**Proposition 10 (Overspending with a Stackleberg leader)** *If voters underestimate the contribution of the other level of government when voting in a given election, the subgame perfect equilibrium aggregate level of public spending is inefficiently high in the perfect substitutes case. The government moving first supplies a higher share of aggregate spending.*

## 5.4 Introducing Specific Responsibilities

I have assumed so far that governments provide only one public good, namely the shared public good. In reality, governments typically provide some public goods under specific responsibility and others under shared responsibility. It is straightforward to extend the model of the present section to allow for the simultaneous provision of both a shared public good and tier-specific public goods. To do so, one might assume that  $s^p$  and  $s^f$  are now specific public goods that are valued by voters rather than resources merely stolen from the citizenry. In such a model, each level of government provides a specific public good in addition to its contribution to the shared public good. Voter utility is now:

$$u(g, s^p, s^f, z) = g^\alpha + p(s^p) + f(s^f) + z, \quad (49)$$

where  $p$  and  $f$  are increasing and concave functions. Without any alteration to the budget constraints of governments and individuals, the socially optimal contributions to the shared public good are given by equation (10) above, and the socially optimal levels of the specific public goods are given by  $p'(s^{pS}) = f'(s^{fS}) = 1$ . In future work, it will be interesting to extend the analysis along those lines.

The next section offers a brief discussion of the contribution of this paper to the ongoing debate in the literature about the relationship between decentralization and government size.

## 6 Relation to the Literature on Decentralization and Government Size

The relationship between the ‘federal’ structure of the government sector and the total size of the government sector has fueled considerable debate in the literature. Indeed, among the prime candidates to explain the rapid growth of the government sector in the second half of the XX<sup>th</sup> century was the simultaneous growth in the decentralization of government activities (Oates, 1972).<sup>16</sup> This positive association between the extent of decentralization and the size of the public sector is the opposite of Brennan and Buchanan’s (1980) conjecture

---

<sup>16</sup>Oates’ hypothesis (borrowed from John Wallis) is that decentralization brought government policy-making closer to citizens, who were then more inclined to demand publicly-provided goods (Oates, 1985).

that federalization should apply downward pressure on the size of the government sector. As a matter of fact, the Brennan and Buchanan view has received only limited empirical support (Oates, 1985 and 1989; Nelson, 1986).<sup>17</sup> Using Canadian data, Grossman and West (1994) observe an increase in both provincial and federal own-purpose expenditures (as a share of GNP) as a result of increased decentralization over the 1958-1987 period.<sup>18</sup> Recent international evidence (Jin and Zou, 2002) also documents a positive relationship between expenditure decentralization and aggregate government size.

The Brennan and Buchanan view has received its most convincing echo in the tax competition literature, associated with the well-known ‘race to the bottom’ outcome (see, e.g., Wilson, 1986). That literature has three main limitations when it comes to explaining the relationship between government size and federalization: (i) it typically treats public good provision as the residual by-product of a tax-setting game; (ii) by focusing on the implications of horizontal factor mobility, it is usually framed in a Tibout-style environment with minimal treatment of political economy considerations; and (iii) it highlights horizontal fiscal interactions, abstracting from the vertical structure of government.<sup>19</sup>

This paper shifts the attention towards vertical fiscal interactions in the provision of public goods and away from the usual horizontal tax competition.<sup>20</sup> While the full transfer of spending responsibility from the federal government to the provinces may not lead to bigger government, the growing involvement of both levels of government in a given field of activity may trigger vertical inter-governmental competition and lead to bigger government. The

---

<sup>17</sup>Studies that found some support for the Brennan and Buchanan view include Marlow (1988) and Zax (1989).

<sup>18</sup>Grossman and West (1994) suggest that their result provides support for a conjecture, also attributed to Brennan and Buchanan (1980), that governments may collude to extract rents from voters (rather than compete). The present paper shows that one need not resort to a collusion story to rationalize a positive relationship between decentralization and government size. The Canadian experience, characterized by incessant conflict between the federal government and the provinces, seems *a priori* more likely to fit the predictions of an intergovernmental competition model than of a collusion model.

<sup>19</sup>An emerging view of fiscal interactions within federations has emphasized vertical *tax* externalities between central and subnational governments, predicting that total taxes may in fact be too high in equilibrium (Keen and Kotsogiannis, 2002). This alternative view has received recent empirical support (Brühlhart and Jametti, 2006).

<sup>20</sup>Breton (1996) also highlights the need to consider vertical fiscal interactions.

simple model developed in Section 5.2 predicts aggregate overspending in a federation where the federal government and the province provide public goods that display a sufficiently high degree of substitutability. Although this prediction has been derived under a rather specific assumption about the nature of the information problem faced by voters, namely systematic underestimation of the other government’s spending when voting in a given election, it conveniently lends itself to empirical investigation.

## 7 Policy Relevance

Partial decentralization of expenditure responsibilities is an increasingly pervasive institution in both developed and developing countries. From a policy perspective, the current analysis stresses that decentralization *per se* might not generally lead to the oft-trumpeted improvements in accountability. With partial decentralization, the usual accountability benefits of decentralization – which include the potential for yardstick competition across local governments highlighted by Besley and Case (1995) – have to be weighed against the informational problems associated with the involvement of more than one level of government in policymaking. Hence, how decentralization is implemented matters crucially: for example, the full transfer of spending responsibilities from the center to local governments may reduce rent-seeking, but the growing involvement of multiple levels of government in a given field of activity is likely to worsen pre-existing corruption problems and even create new rent-seeking opportunities.

Evidence from recent decentralization reforms in developing countries, typically characterized by partial decentralization, highlights potentially sizeable accountability problems. In his assessment of Brazil’s 1988 decentralization reform, Baiocchi (2006) identifies “overlapping responsibilities in most areas” as an obstacle to the reform’s implementation, together with evidence of corruption at the state and local levels through a “strengthening of the system of spoils for regional elites.” Similarly, Indonesia’s Law 22 of 1999 – designed to improve government accountability via decentralization – is characterized by an “assignment of functions” that is “far from clear” (Hofman and Kaiser, 2006). The authors note that, following the Indonesian reform, “rent-seeking is perceived to have proliferated in many re-

gions because many new politicians are taking turns at the trough.” Azfar *et al.* (2006) also report overlapping and poorly defined jurisdictions to be a key concern in Uganda’s recent decentralization experience.<sup>21</sup>

As pointed out by Bardhan and Mookherjee (2006c), these issues are especially relevant in developing countries, where voters tend to be less educated and the circulation of accurate information is poorer. Yet they are also of primary importance in many developed countries (such as the U.S., Canada and the EU) where ongoing debates about the assignment of responsibilities among levels of government are taking place.<sup>22</sup>

From a normative perspective, the first-best could be restored in this paper’s model by precluding either government from providing the shared public good – at least when the actions of both levels of government can be thought of as substitutes. Hence, the analysis has stark policy implications for the allocation of spending responsibilities across levels of government. In particular, it suggests that an optimal constitution would allocate separate and clear spending responsibilities to each level of government, and avoid a blurry allocation of shared powers. However, shared responsibilities exist today in many federations.<sup>23</sup> Furthermore, in some federations there exists a so-called ‘federal spending power,’ such that areas of exclusive provincial responsibility are *de facto* characterized by shared responsibility. In this spirit, the model highlights the need for constitutional reform in federations to take into account the reality of the political process. In particular, shared responsibility in areas that are politically sensitive (e.g. infrastructure investment) may be especially conducive to inefficient public spending.

---

<sup>21</sup>For an excellent recent survey of decentralization in developing countries, see Bardhan and Mookherjee (2006b).

<sup>22</sup>In Canada, the growing involvement of the federal government in areas of provincial jurisdiction (through so-called ‘federal spending power’) gives rise to a heated debate, especially in the autonomy-seeking province of Québec. For example, Québec’s Commission on Fiscal Imbalance (2002) notes that “in the administration of health care, a field of particular public concern, Canadians find it very difficult to clearly identify the roles and responsibilities of each order of government. They seem to overestimate the financial contribution of the federal government and, more generally, do not seem to know exactly who is responsible for what.”

<sup>23</sup>One example is the area of regional development in Canada, in which both the federal and provincial governments are active players.

## 8 Conclusion

‘Federalization’ has occurred in many regions of the World since the eighteenth century, including North America (the United States of America in 1776 and Canada in 1867) and other large-scale federations (e.g. Australia and Russia). In the aftermath of the Second World War, the creation of the United Nations and what is now the European Union led the way for a new wave of political integration. The recent increase in the membership of the European Union is a clear illustration that independent countries are often willing to forgo part of their national sovereignty to take part in a larger political entity. While political integration is in vogue, so is decentralization (see Stegarescu (2006) for an interesting assessment of these related phenomena). These two trends have a common consequence: the creation or reinforcement of a hierarchy of governments. A fundamental question is whether these additional levels of government improve the efficiency of public good provision.

Depending upon the specific constitutional rules, both levels of government in a federation (or a decentralized ‘unitary’ state) are more or less involved in similar sectors of activity. In such a context – typical in real-world federations – making coherent collective choices is a complex undertaking for voters, who need to garner information about the contribution of each level of government to the aggregate policy outcomes that they observe. To capture such informational complexity, this paper has considered a political agency model in which the presence of a hierarchy of governments involved in the provision of a public good is a source of ‘fiscal illusion’ on the spending side (with respect to the intergovernmental composition of government spending).<sup>24</sup> In the model, the provision of public goods by both levels of government in a federation is the margin along which political competition occurs. In a given subnational jurisdiction, the central and the subnational governments compete for the support of the same voters (though in separate elections) by each providing public goods. Under some realistic conditions – chiefly, imperfectly informed voters and substitutable cen-

---

<sup>24</sup>The literature on fiscal illusion has typically dealt with the tax side of fiscal policy (see Oates (1988) for an early survey). However, as argued by Musgrave (1981), “[...] fiscal illusion is not limited to the tax side only. It is no less plausible to maintain that the benefits of public expenditures are undervalued. [...] Their benefits are more remote [than private goods], and taken for granted much like sunshine, and hence may not be given an adequate evaluation.”

tral and subnational public goods – the model predicts inefficient provision of shared public goods in equilibrium.

The analysis calls upon further theoretical refinements. This paper has focused on two key aspects of partial decentralization, namely the vertical interactions between levels of government and the informational demands on voters associated with areas of shared responsibility. The inefficiencies that this approach has shed light on obviously need to be weighed against other potential advantages of decentralization that previous research has identified. Future work could therefore extend the simple model presented here to incorporate, for example, the accountability benefits associated with horizontal yardstick competition advanced by Besley and Case (1995). A more general version of the model would include multiple subnational jurisdictions, as in Besley and Coate's (2003) model.

## References

- [1] Alesina, Alberto and Guido Tabellini (2007). “Bureaucrats or Politicians? Part I: A Single Policy Task,” *American Economic Review*, 97, 169-179.
- [2] Alesina, Alberto and Guido Tabellini (2008). “Bureaucrats or Politicians? Part II: Multiple Policy Tasks,” *Journal of Public Economics*, 92, no. 3-4, 426-447.
- [3] Arzaghi, Mohammad and J. Vernon Henderson (2005). “Why Countries are Fiscally Decentralizing?” *Journal of Public Economics*, 89, 1157-1189.
- [4] Azfar, Omar, Jeffrey Livingston and Patrick Meagher (2006). “Decentralization in Uganda,” in Bardhan and Mookherjee (2006b).
- [5] Baiocchi, Gianpaolo (2006). “Inequality and Innovation: Decentralization as an Opportunity Structure in Brazil,” in Bardhan and Mookherjee (2006b).
- [6] Bardhan, Pranab and Dilip Mookherjee (2006a). “Decentralisation and Accountability in Infrastructure Delivery in Developing Countries,” *Economic Journal*, 116 (January), 101-127.
- [7] Bardhan, Pranab and Dilip Mookherjee (2006b), eds. *Decentralization and Local Governance in Developing Countries*, Cambridge: MIT Press.
- [8] Bardhan, Pranab and Dilip Mookherjee (2006c). “The Rise of Local Governments: An Overview,” in Bardhan and Mookherjee (2006b).
- [9] Bardhan, Pranab and Dilip Mookherjee (2005). “Decentralizing Antipoverty Program Delivery in Developing Countries,” *Journal of Public Economics*, 89, 675-704.
- [10] Bardhan, Pranab and Dilip Mookherjee (2000). “Capture and Governance at Local and National Levels,” *American Economic Review*, 90(2), 135-139.
- [11] Barro, Robert (1973). “The Control of Politicians: An Economic Model,” *Public Choice*, 14, 19-42.

- [12] Besley, Timothy (2006). *Principled Agents? The Political Economy of Good Government*, Oxford: Oxford University Press.
- [13] Besley, Timothy and Anne Case (1995). "Incumbent Behavior: Vote-Seeking, Tax-Setting, and Yardstick Competition," *American Economic Review*, 85(1), 25-45.
- [14] Besley, Timothy and Stephen Coate (2003). "Centralized versus Decentralized Provision of Local Public Goods: A Political Economy Approach," *Journal of Public Economics*, 87, 2611-2637.
- [15] Besley, Timothy and Michael Smart (2006). "Political Agency and Public Finance," in Besley (2006).
- [16] Besley, Timothy and Michael Smart (2007). "Fiscal Restraint and Voter Welfare," *Journal of Public Economics*, 91, 755-773.
- [17] Brennan, Geoffrey and James M. Buchanan (1980). *The Power to Tax: Analytical Foundations of a Fiscal Constitution*, Cambridge: Cambridge University Press.
- [18] Breton, Albert (1996). *Competitive Governments: An Economic Theory of Politics and Public Finance*, Cambridge: Cambridge University Press.
- [19] Brülhart, Marius and Mario Jametti (2006). "Vertical versus Horizontal Tax Externalities: An Empirical Test," *Journal of Public Economics*, 90, 2027-2062.
- [20] Carlsson, Hans and Eric van Damme (1993). "Global Games and Equilibrium Selection," *Econometrica*, 61(5), 989-1018.
- [21] Commission on Fiscal Imbalance (2002). *A New Division of Canada's Financial Resources*, Report, Government of Québec.
- [22] Ferejohn, John (1986). "Incumbent Performance and Electoral Control," *Public Choice*, 50, 5-25.
- [23] Grossman, Philip J. and Edwin G. West (1994). "Federalism and the Growth of Government Revisited," *Public Choice*, 79, 33-46.

- [24] Hofman, Bert and Kai Kaiser (2006). “Decentralization, Democratic Transition, and Local Governance in Indonesia,” in Bardhan and Mookherjee (2006b).
- [25] Jin, Jing and Heng-fu Zou (2002). “How Does Fiscal Decentralization Affect Aggregate, National, and Subnational Government Size?” *Journal of Urban Economics*, 52, 270-293.
- [26] Keen, Michael J. and Christos Kotsogiannis (2002). “Does Federalism Lead to Excessively High Taxes?” *American Economic Review*, 92, 363-370.
- [27] Lockwood, Ben (2002). “Distributive Politics and the Costs of Centralization,” *Review of Economic Studies*, 69(2), 313-337.
- [28] Marlow, Michael L. (1988). “Fiscal Decentralization and Government Size,” *Public Choice*, 56, 159-169.
- [29] Musgrave, Richard A. (1981). “Leviathan Cometh – Or Does He?” in *Tax and Expenditure Limitations*, H. Ladd and T. Tideman (eds), Washington: The Urban Institute Press.
- [30] Nelson, Michael A. (1986). “An Empirical Analysis of State and Local Tax Structure in the Context of the Leviathan Model of Government,” *Public Choice*, 49, 283-94.
- [31] Nishimura, Yukihiro (2006). “Human Fallibility, Complementarity, and Fiscal Decentralization,” *Journal of Public Economic Theory*, 8(3), 487-501.
- [32] Oates, Wallace E. (1972). *Fiscal Federalism*, New York: Harcourt Brace.
- [33] Oates, Wallace E. (1985). “Searching for Leviathan: An Empirical Study,” *American Economic Review*, 75, 748-757.
- [34] Oates, Wallace E. (1988). “On the Nature and Measurement of Fiscal Illusion: A Survey,” in *Taxation and Fiscal Federalism: Essays in Honour of Russell Mathews*, G. Brennan *et al.* (eds), Sydney: Australian National University Press, 65-82.
- [35] Oates, Wallace E. (1989). “Searching for Leviathan: A Reply and Some Further Reflections,” *American Economic Review*, 79, 578-583.

- [36] Panizza, Ugo (1999). "On the Determinants of Fiscal Centralization: Theory and Evidence," *Journal of Public Economics*, 74, 97-139.
- [37] Persson, Torsten and Guido Tabellini (2000). *Political Economics: Explaining Economic Policy*, Cambridge: MIT Press.
- [38] Rodden, Jonathan (2004). "Comparative Federalism and Decentralization: On Meaning and Measurement," *Comparative Politics*, July 2004.
- [39] Seabright, Paul (1996). "Accountability and Decentralisation in Government: An Incomplete Contracts Model," *European Economic Review*, 40, 61-89.
- [40] Stegarescu, Dan (2006). *Decentralised Government in an Integrating World : Quantitative Studies for OECD Countries*, ZEW Economic Studies, 34.
- [41] Tommasi, Mariano and Federico Weinschelbaum (2007). "Centralization vs. Decentralization: A Principal-Agent Analysis," *Journal of Public Economic Theory*, 9(2), 369-389.
- [42] Wilson, John D. (1986). "A Theory of Interregional Tax Competition," *Journal of Urban Economics*, 19, 296-315.
- [43] Wilson, John D. and Eckhard Janeba (2005). "Decentralization and International Tax Competition," *Journal of Public Economics*, 89, 1211-1229.
- [44] World Bank (2004). *World Development Report*, Washington DC: World Bank and Oxford University Press.
- [45] Zax, Jeffrey S. (1989). "Is there a Leviathan in your Neighborhood?" *American Economic Review*, 79, 560-567.

# A Appendix

## A.1 Proof of Proposition 3

**Proof.** Each level of government being taken independently, the proof is exactly the same as for Proposition 2, with maximum rents being  $y/2$  for each government instead of  $y$ . The level of public good provided by each level of government is the outcome of vertical interactions between the two levels of government, with government  $j$ 's reaction function being given by  $g^j = \arg \max_{g^j} \{u(g^j + g^{-j}, \beta y - \tau(g^j + g^{-j}))\}$  subject to  $s_1^j + \tau g^j \leq y/2$ . ■

## A.2 Proof of Proposition 4

**Proof.** Consider first symmetric voting strategies on the part of the voters. Given the environment, voters are restricted to a binary reelection decision. Since voter utility is monotonically decreasing in  $s_1$ , it can be shown that the voters' best response function has the cut-off form given in (15). Taking as given an arbitrary cutoff  $\bar{s}_1$  and the assumption that the two governments have equal bargaining power, the stage game played by the two levels of government has two Nash equilibria, as long as  $\bar{s}_1 \geq (1 - \beta)y$ : one in which each government plays  $s_1^j = \frac{\bar{s}_1}{2}$  (a 'coordinated' equilibrium) and one in which each government plays  $s_1^j = \frac{y}{2}$  (a 'non-coordinated' equilibrium). If  $\bar{s}_1 < (1 - \beta)y$ , however, the stage game has a unique, non-coordinated equilibrium. Given these outcomes of the vertical interactions between the two incumbent governments, the rational choice of  $\bar{s}_1$  by the electorate is  $\bar{s}_1 = (1 - \beta)y$ . The two symmetric subgame perfect equilibria of the game can therefore be characterized by (i)  $\bar{s}_1 = (1 - \beta)y$ ,  $s_1^p = s_1^f = \frac{\bar{s}_1}{2}$  and  $s_2^p = s_2^f = \frac{y}{2}$ , and (ii)  $\bar{s}_1 = (1 - \beta)y$ ,  $s_1^p = s_1^f = \frac{y}{2}$  and  $s_2^p = s_2^f = \frac{y}{2}$ . In these two equilibria, any level of decentralization can be an equilibrium outcome.

Consider now asymmetric voting strategies. In an asymmetric reelection strategy, one of the governments (denote it by  $j$ ) is always defeated or always reelected. In both of these cases, that government extracts maximum rents in both periods. Knowing this and the aggregate levels of public good provision and taxes, the electorate can infer the amount of rent-seeking by the second government (denote it by  $-j$ ). Following the logic of the unitary state case, voters set their threshold amount of rents to keep government  $-j$  indifferent

between being defeated and being reelected. In this case, only one of the two governments will provide the public good in equilibrium, leading to complete centralization if  $j = f$  or complete decentralization if  $j = p$ . ■