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Shared accountability and partial decentralization in local public good provision

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ABSTRACT

Recent decentralization reforms in developing countries have often lead to the coexistence of multiple tiers of government in given policy areas, triggering new accountability issues. This paper provides a novel theoretical treatment of the efficiency consequences of such 'partial expenditure decentralization.' It develops a political agency model in which two levels of government are involved in the provision of a local public good, with voters imperfectly informed about each government's contribution to the public good. A central result of the model is that partial 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. Through variants of the model, the interplay between decentralization and democratization is analyzed. From a positive point of view, the model predicts a relationship between electoral incentives and equilibrium decentralization.

1. Introduction

Decentralization of expenditure responsibilities from central to local levels of government is often implemented in order to increase overall government accountability, by bringing the policymaking process closer to citizens — in accordance with Oates's (1972) seminal decentralization theorem. For example, the World Bank (2003) has strongly advocated decentralization on the basis that it might help to solve corruption problems in developing countries. But empirical evidence from decentralization reforms in these countries highlights potentially sizeable accountability problems associated with the implementation of decentralization reforms.[1]

A possible culprit in explaining the disappointing results of decentralization is the incomplete nature of many decentralization reforms. Indeed, years after the implementation of decentralization reforms, central governments often remain heavily involved in the provision of the local public goods targeted by decentralization. Such 'partial expenditure decentralization' (PED) – as opposed to complete decentralization or complete centralization – may be the result of either explicit de jure shared expenditure responsibility, but more often of implicit de facto arrangements caused by delays in reform implementation, fuzzy assignment of responsibilities, political struggles, etc. PED is thus an increasingly common institution in developing countries. For example, the central and local governments may be together involved in the provision of public education by village schools while teacher management powers are retained by higher-level governments (Khemani, 2010); building a new road may involve a local agency and the central government (e.g. for the bridges); security in a region may be provided by both central and local police forces; etc.

One major issue with PED is a blurring of the electoral accountability channel, which typically works best when observable policy outcomes can straightforwardly be assigned to a given elected official. In the context of PED, 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. As pointed out by Keefer and Khemani (2005), Bardhan and Mookherjee (2006c) and Mani and Mukand (2007), such informational issues are especially problematic in developing countries, where voters tend to be less educated and where the circulation of accurate information is poorer. The accountability consequences of an increased prevalence of PED in developing countries may thus be especially acute, given poorly informed

[1] Surveying the empirical literature, Treisman (2007) notes: "Empirical studies have found almost no solid, general results about the consequences of decentralization. Decentralizing government in a particular place and time is very much a leap in the dark."

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electorates and the partial democratization contexts in which decentralization reforms are often implemented.[2]

To the best of the author's knowledge, this paper is the first to set out an analytical framework devoted to assessing the efficiency consequences of PED in a democratic context, and in particular the consequences for government accountability of imperfect information about fiscal policy *induced by decentralization*. The paper develops a political agency model in which politicians allocate government revenues between a public good valued by voters and 'rents' (valued only by themselves).[3] Two levels of government are involved in the provision of a local public good and voters, who are called upon to set reelection incentives, are imperfectly informed about each government's contribution to the good. Partial decentralization is socially optimal in the model provided that there is vertical complementarity in public good provision. However, that desirability does not necessarily hold if governments display opportunistic behavior. 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 issues which complicate the task faced by voters in disciplining politicians via the ballot box. Second, partial decentralization introduces vertical strategic interactions between levels of government in public good provision, operating through the political process.

The model yields both positive and normative implications. From a positive point of view, the model's main predictions concern the determinants of the equilibrium degree of decentralization. Under shared expenditure responsibility, the degree of decentralization is endogenous and depends on three factors: (i) the relative technological advantages of both levels of government in the production of public inputs, (ii) their relative rents from holding office, captured in the model by each level of government's access to public revenues, and (iii) the political conditions prevailing at both levels, 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. Unless voters can observe each level of government's effort towards the provision of the public good (arguably a very strong assumption), the ability of voters to hold politicians accountable is in general 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 efficiency consequences, the benefits associated with the vertical complementarity of governments having to be weighed against the loss of accountability following from imperfect information and potentially detrimental vertical interactions. Partial decentralization is especially detrimental when the features of the political environment distort the degree of decentralization towards the level of government that has the least technological advantage in providing the public good.

The paper proceeds as follows. After having surveyed the relevant literatures in the upcoming section, Section 3 moves on to set up the political agency model of PED. Section 4 derives the main theoretical results of the paper. Section 5 then explores two extensions of the model intended to capture the interplay between democratization and PED. Section 6 concludes by discussing policy implications, empirically-testable predictions and further extensions.

2. Relation to the literature

The paper belongs to two main strands of literature, at the intersection of development economics and public economics. First, from a theoretical point of view, the model developed in this paper belongs to a growing group of "second generation fiscal federalism" models (Weingast, 2009), which study fiscal federalism and decentralization in environments with opportunistic governments. Second, it builds upon insights from a quickly developing literature, both theoretical and empirical, which study the string of decentralization reforms that were implemented in developing countries in the recent past. That literature is progressively painting a comprehensive picture of the benefits and costs of decentralization.

2.1. Partial decentralization: theory and definitions

Papers in the Second Generation fiscal federalism literature are conveniently described by whether they focus on: (i) public expenditures, public revenues, or both; and (ii) horizontal interactions among governments, vertical ones, or both. So far, the main theme in the Second Generation literature has been horizontal interactions and externalities, especially when it comes to the study of expenditure decentralization.[4] While vertical interactions involving expenditures – the focus of this paper – have been little explored, a growing literature on vertical interactions on the revenue side has been sparked by Keen and Kotsogiannis (2002).[5] This paper complements the Second Generation literature 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, i.e. partial expenditure decentralization (PED).[6]

The phrase 'partial decentralization' can be traced back to Seabright (1996), where partial decentralization refers to the provision of public goods by an intermediate level of government situated between the central and local governments in the hierarchy of levels of government. More recently, Brueckner (2009) – introducing political economy considerations in a Tiebout-style model – defines "partial fiscal decentralization" as a situation where spending authority is devolved to the subnational level while financing relies on transfers from the central government. Khemani (2010) proposes a special interest politics model aimed at explaining why partial fiscal decentralization is a durable political institution, focusing on the vote-buying role of targetable intergovernmental transfers for central politicians. Devarajan et al. (2009) retain a more general definition of partial decentralization, as decentralization attempts that have not led to citizens being able to hold local governments accountable for budgetary allocations and their outcomes. In yet a different environment, in which decentralization is measured by the fraction of goods that are provided by lower-level governments, Hartfield and Padro i Miquel (2012) define partial decentralization as a situation where some goods are provided and funded at the local level, while others are provided centrally or internationally.

[2] For a comprehensive discussion of the political failures (including imperfect information) associated with democratization, see Keefer and Khemani (2005). While most of their discussion does not deal with decentralization per se, they pointedly outline that voters at the local level "cannot easily determine whether service providers, *higher-level ministry officials*, or politicians are responsible for breakdowns or improvements" (my emphasis). For a pioneer treatment of the consequences of democratization, see Foster and Rosenzweig (2004), and for an empirical assessment of the allocation of central funds by elected vs. unelected agencies, see Khemani (2007).

[3] The distinction between useful and wasteful public spending makes this kind of model especially fruitful to study the consequences of decentralization in developing countries, given that an explicit objective of many decentralization reforms is a reduction in corruption. Closely related (but distinct) is the difference between targetable and nontargetable public expenditures (Keefer and Khemani, 2005).

[4] See, for example, Lockwood (2002), Besley and Coate (2003) and Hindricks and Lockwood (2009).

[5] For an early, comprehensive treatment of vertical competition between governments, see Breton (1996).

[6] Related contributions on the political economy of decentralization include Bardhan and Mookherjee (2000, 2005, 2006a) and Tommasi and Weinschelbaum (2007), though these papers do not deal with PED. A comprehensive discussion of the literature is provided by Lockwood (2006).

While these theoretical papers all address relevant aspects of partial decentralization, they do not directly tackle the issues pertaining to shared expenditure responsibility under partial decentralization.[7] This paper attempts to fill that gap, which is central to studying the institutions resulting from the current trend towards decentralization in developing countries, to which we now turn.

2.2. PED in developing countries

The empirical evidence from recent decentralization reforms in developing countries highlights potentially sizeable accountability problems associated with partial decentralization due specifically to the presence shared responsibilities (Bardhan and Mookherjee, 2006b; Khemani, 2010). Researchers have cited shared responsibilities as an important issue in explaining adverse consequences of decentralization reforms in a variety of contexts, from South America and Eastern Europe to Africa and Asia.

For example, 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, potentially associated with evidence of corruption at the state and local levels through a "strengthening of the system of spoils for regional elites." In neighboring Bolivia, Inchauste (2009) cites the "misalignment of responsibilities between the central, regional and local governments" among possible explanations for observing no "clear improvement of conditions in the poorest municipalities, or for the poorest segments of the population." He observes that "although the central government continues to be responsible for payment of wages and salaries of education and health sector employees, it has weak control over staff, or the effective wage bill," a typical case of PED. Analogous concerns have been raised in the context of Eastern Europe's economies in transition by Jakubowski and Topinska (2009), who report "evidence on the problems associated with partial decentralization, particularly for the primary and secondary education in Poland." They observe that "most crucial elements of the expenditures that make up the education function, particularly the wages and contracts for teachers, still remain in the hand of the central government," another instance of PED.

Azfar et al. (2006) also report overlapping and poorly defined jurisdictions to be a key concern in Uganda's recent decentralization experience. On the Ugandan case, Ahmad et al. (2009) note: "Uganda provides additional evidence in favor of the theory of partial decentralization. Many of the new mandates were accompanied by a rigid system of conditional grants […] However, the model undermined the generation of local autonomy in decision-making, and the system of horizontal accountability links that are at the root of strengthened performance by policy-makers in decentralized frameworks." Shared expenditure responsibilities are prevalent in Benin as well, education being described as a case of "shared competency" by Caldeira et al. (2012), together with water management and a series of so-called "delegated competencies." Similar concerns have been raised for Asian countries. For instance, in their assessment of Indonesia's Law 22 of 1999, designed to improve government accountability via decentralization, Hofman and Kaiser (2006) outline that the law is characterized by an "assignment of functions" that is "far from clear." The authors note that, following the Indonesian reform, "rent-seeking is perceived to have proliferated in many regions because many new politicians are taking turns at the trough."[8]

The remainder of the paper develops a theoretical model intended to capture the main characteristics of PED outlined by this short, non-exhaustive survey of the literature on recent decentralization reforms in developing countries.[9] In particular, the model formally analyzes how overlapping and poorly defined expenditure responsibilities between the central and local governments may lead to a worsening in government accountability observed in many of the above-cited studies, often despite decentralization reforms being aimed specifically at improving accountability.

3. A political economy model of partial expenditure decentralization

This section lays down the basic setup of a model in which a local public good valued by the voters in a given jurisdiction is jointly provided by two levels of government ('central' and 'local'). A description of the environment (composed of two governments and N identical voters)[10] is provided, and the social optimum is characterized. The main ingredients of the model are as follows: In each of two periods, politicians at the two levels of government choose how to allocate pre-determined public revenues between contributing to the public good and extracting rents, maximizing 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 the public good, can observe total government revenues and public good provision, and can therefore infer total rents. However, they cannot observe the intergovernmental composition of fiscal variables — this is the model's crucial assumption.

In some respects, the model can be seen as an extension to a hierarchy of governments of the "pure moral hazard" case in Besley and Smart's (2006, 2007) political agency model, a version of their model that focuses on the (imperfect) disciplining effect of elections.[11] Characterized by politicians facing a tradeoff between rents and the public good, their tractable two-period framework forms a natural basis for the application developed in this paper. Indeed, central government corruption (captured here by rents) is at the heart of the policy motivations given for many decentralization reforms in developing countries. The model also shares analytical similarities with the career concern model of Dewatripont et al. (1999), adapted to a development context by Mani and Mukand (2007).[12] Building on the insights of this theoretical literature, the paper develops an original model aimed at modeling the vertical strategic interactions between rent-seeking politicians operating at two different levels of government, thus introducing a fiscal federalism dimension to a family of models initially developed for other purposes.

We now turn to a formal description of the environment.

3.1. The environment

Every period, the central government (indexed by superscript c) and the local government (indexed by superscript l) each contribute to the provision of a public good g in a given local jurisdiction.[13] Government j produces $g^j \geq 0$ units of a publicly-provided input.[14] Together, the

[7] An exception is the excellent discussion of the "politics of partial decentralization" by Devarajan et al. (2009), who provide the best motivation to date for a theoretical research agenda on the accountability consequences of partial decentralization in a political economy context. However, their paper does not feature a formal theoretical model of PED.

[8] Chavis (2009) studies the role that local competition might play in mitigating this problem.

[9] For excellent surveys of decentralization in developing countries, see Bardhan (2006), Bardhan and Mookherjee (2006b) and Ahmad and Brosio (2009).

[10] The consequences of relaxing the latter assumption of a homogeneous electorate will be explored in Section 5.1.

[11] Kessing (2010) studies federalism and accountability – but not partial decentralization and shared accountability – under a similar assumption. A different issue is the selection effect of elections, that a political agency model with adverse selection would tackle. See Hindrick and Lockwood (2009) for a recent treatment of selection issues in a federal context.

[12] A key difference with the latter is their focus on a single agent performing a series of tasks while our focus is on two agents involved in a single task.

[13] In order to focus on vertical interactions between the two levels of government, the model does not consider horizontal interactions among subnational governments. This amounts to assuming no spillovers across jurisdictions in local public good provision. Horizontal considerations are the focus of Brueckner (2009) and Hindricks and Lockwood (2009) in recent, related contributions.

[14] Note that g^c can be interpreted, at least to some extent, as a transfer from the center to the local government. See Gadenne (2013) for a discussion of the informational issues that may be associated with the tax vs. transfers mix in local government financing.

central and local inputs are converted into a public good g by a constant elasticity of substitution (CES) technology[15]:

$$g = \left(\theta^c (g^c)^\rho + \theta^l \left(g^l\right)^\rho\right)^{1/\rho}, \tag{1}$$

where $\rho \leq 1$. θ^l and θ^c are technological parameters that introduce heterogeneity across levels of government — they allow the model to capture cases in which one level of government has an advantage in production over the other.[16] Each government faces a common unit cost of production ($\widetilde{\tau}$).

All individuals value the public good according to the following simple linear utility function:

$$u(g) = g. \tag{2}$$

Without loss of generality, let us normalize the population of the jurisdiction to unity ($N = 1$).

Given our focus on the extent of decentralization on the expenditure side, let us define the 'degree of decentralization' (d) as the share of local spending in total spending:

$$d \equiv \frac{g^l}{g^c + g^l} \in [0, 1]. \tag{3}$$

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* (i.e. PED).

3.2. Optimal decentralization

Before turning to the behavior of opportunistic politicians, it will be useful, for further reference, to characterize the optimal degree of expenditure decentralization in this environment.

First, optimality requires that politicians extract no rents while in office and, consequently, that public good provision be maximized (a superscript S denotes the social optimum) such that:

$$g^{cS} + g^{lS} = \frac{T}{\tau}, \tag{4}$$

where T is the aggregate public revenues expressed in per capita terms and $\tau = \widetilde{\tau}/N$. Second, the public inputs must be provided in proportions that are consistent with the government-specific technological parameters, determining the optimal degree of decentralization. As long as these public inputs are not 'perfect substitutes' (i.e. as long as $\rho < 1$), the optimal spending ratio is given by

$$\left(\frac{g^l}{g^c}\right)^S = \left(\frac{\theta^l}{\theta^c}\right)^{\frac{1}{1-\rho}}, \tag{5}$$

or, stated in terms of the above-defined degree of decentralization,

$$d^S = \frac{\left(\frac{\theta^c}{\theta^l}\right)^{\frac{1}{\rho-1}}}{1 + \left(\frac{\theta^c}{\theta^l}\right)^{\frac{1}{\rho-1}}}. \tag{6}$$

Hence, at the social optimum, each government produces:

$$\begin{aligned} g^{lS} &= d^S \cdot \frac{T}{\tau}, \\ g^{cS} &= \left(1 - d^S\right)\frac{T}{\tau}. \end{aligned} \tag{7}$$

If the inputs produced by both levels of government do not exhibit any complementarity (i.e. if $\rho = 1$) – a case in which these inputs are perfect substitutes – the socially optimal levels of g^c and g^l are given by the following conditions:

$$\begin{array}{ll} g^{jS} = \dfrac{T}{\tau} & \text{if } \theta^j > \theta^{-j}, \\ \text{any}\left(g^{lS}, g^{cS}\right) \text{s.t. } g^{lS} + g^{cS} = \dfrac{T}{\tau} & \text{if } \theta^l = \theta^c = \theta, \text{for some } \theta, \\ g^{jS} = 0 & \text{if } \theta^j < \theta^{-j}. \end{array} \tag{8}$$

Stated in terms of degree of decentralization, these conditions imply the following:

$$\begin{array}{ll} d^s = 1 & \text{if } \theta^c > \theta^l, \\ \text{any } d^S & \text{if } \theta^l = \theta^c, \\ d^S = 0 & \text{if } \theta^c < \theta^l. \end{array} \tag{9}$$

The above results on optimal decentralization 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. PED – is optimal provided that there is some degree of complementarity between g^c and g^l. Complete centralization can be optimal only if there is no complementarity in g^c and g^l ($\rho = 1$) and if the central government has a technological advantage over the local government ($\theta^c \geq \theta^l$). Similarly, complete decentralization is optimal only if $\rho = 1$ and $\theta^c \leq \theta^l$.

In this model, PED is thus generally a desirable policy arrangement in the absence of political distortions, which we now introduce.

3.3. Introducing politics

Like Besley and Smart (2006, 2007), we consider a two-period environment, with separate elections taking place at the local and central levels between the two periods. Every period, each government receives a pre-determined amount of public revenues (T^j per capita) such that $T = T^l + T^c$, and is thus constrained by this amount.[17] Politicians in office can divert public revenues away from public good provision and towards their own benefit. Assuming balanced budgets at each level of government, the following conditions must hold in any period:

$$T^l = \tau g^l + s^l, \text{ and} \tag{10}$$

$$T^c = \tau g^c + s^c, \tag{11}$$

where s^j are the per capita rents extracted by government j.

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

$$S^j = s_1^j + P^j \beta s_2^j, \tag{12}$$

[15] Nishimura (2006) also uses such an aggregation technology in a similar context. Public goods in this model can be seen as fitting Mani and Mukand's (2007) notion of complex public goods, which may be especially prone to exhibit low visibility and thus to complicate voters' assessment of government performance.

[16] For example, Oates's hypothesis that the level of government closest to citizens has an advantage in production can be captured by assuming $\theta^c < \theta^l$. We retain that assumption in the next section.

[17] The restriction that tax revenues are pre-determined will make 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. It is adopted here to facilitate tractability, but also to allow for a discussion of optimal revenue-sharing arrangements (see Section 4.2.3).

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 face a simple binary reelection decision in the elections held at the two levels of government at the end of period 1. The two elections are assumed to take place simultaneously,[18] and we assume probabilistic voting.[19] In probabilistic voting models, such as those developed by Persson and Tabellini (2000) and by Alesina and Tabellini (2007, 2008), election results are typically uncertain from the point of view of politicians since random shocks may affect the electorate's decision beyond fiscal policy (e.g. other issues arising during the campaign, characteristics of challengers, partisan loyalty). Uncertainty about the election outcome is resolved only after incumbents have made all relevant decisions and just before the voters cast their ballots. From the point of view of incumbents, elections are thus 'probabilistic.'

The timing of the political game is as follows:

1. Incumbents set their contribution to the shared public good;
2. Voters observe the quantity of the local public good and the realization of two random variables which summarize the electoral conditions specific to each election;
3. The central and local elections take place; and
4. If reelected, the politicians take maximum rents in the second period.

The information available to voters at election time is crucial to the ability of elections to act as disciplinary devices. Here, voters do not observe the contribution of each level of government to the shared public good.[20] However, voters observe the aggregate level of the public good. In other words, voters observe g but not g^c and g^l. Hence, they condition their reelection decisions on observed aggregate local public good provision. 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 made period-one fiscal policy decisions.[21]

Accordingly, voters reelect each incumbent if their period-1 utility level exceeds some random benchmark, the distribution of which is assumed to be common knowledge. The benchmark relevant to the local election is denoted $\overline{u}$ and is a random variable distributed according to F, a concave c.d.f. Hence, voters reelect the local government if

$$g \geq \overline{u}. \tag{13}$$

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

Electoral results depend on aggregate public good provision and on the realization of the random benchmark. The probability that the local incumbent is reelected is

$$P^l = Pr[g \geq \overline{u}] = F[g]. \tag{14}$$

And at the central level, we have:

$$P^c = Pr[g \geq \overline{v}] = G[g]. \tag{15}$$

Although any politician will always extract maximum rents in the final period of the game ($s_2^j = T^j$), politicians' ability to extract rents can be limited in period 1 by their desire to win reelection. Given the above set of assumptions, the local incumbent's problem in period 1 is given by:

$$\max_{g^l} \quad T^l - \tau g^l + \beta T^l F\left[\left(\theta^c (g^c)^\rho + \theta^l \left(g^l\right)^\rho\right)^{1/\rho}\right], \tag{16}$$

which is obtained by substituting the government's budget constraint ($\tau g^l + s^l = T^l$) and Eq. (14) in Eq. (12).[22] The central government solves a symmetric problem, with $\overline{v} \sim G$.[23]

We solve the political model in the next section, which presents the paper's main results on the accountability consequences of PED.

4. Endogenous partial expenditure decentralization

We solve the model for two institutions: (i) an institutional arrangement attributing the provision of the public good to one level of government ('specific responsibility'), and (ii) a hierarchy of two governments with shared expenditure responsibility, i.e. PED. In the spirit of Oates's decentralization theorem, let us restrict the analysis in this section to cases where $\theta^c < \theta^l$, that is the level of government closest to citizens has an advantage in production.[24]

Since elections typically act only as an imperfect disciplining device in this kind of environment (Besley and Smart, 2006), the main focus of this section will be on the second-best issue of the degree of expenditure decentralization — i.e. how a (generally) suboptimal overall effort is shared by the two levels of government. At the end of this section, we assess whether a specific revenue sharing arrangement could implement the first-best.

Before turning to the paper's main results pertaining to PED, let us first consider the case in which one of the levels of government is being assigned the specific responsibility for public good provision.

4.1. Specific responsibility

If the provision of the public good is assigned to the level of government with an advantage in production, i.e. the local government, together with the full access to the revenue base, the incumbent will provide the following level of its specific input:

$$g^l = F'^{-1}\left[\frac{\tau}{\beta T (\theta^l)^{1/\rho}}\right] \frac{1}{(\theta^l)^{1/\rho}}. \tag{17}$$

This solution is valid for both the perfect ($\rho = 1$) and imperfect substitute ($\rho < 1$) cases. Note that g^l is increasing in the discounted value of period-2 rents (βT) and in θ^l, but that it is decreasing in the unit cost of the public good (τ).

We now compare voter welfare under specific responsibility with the social optimum, distinguishing between perfect and imperfect substitutes. Under specific responsibility with imperfect substitutes, the level of the public good (and the resulting voter welfare) is lower than its socially optimal level, implied by Eqs. (4) and (5), because the 'forced' complete decentralization in this scenario foregoes the benefits of complementarity between g^l and g^c, and because the local government exhibits rent-seeking behavior. With perfect substitutes, only the latter distortion matters. In this case, for voter welfare with specific responsibility to correspond to the social optimum implied by Eq. (9), it

[18] It is relatively straightforward to relax that assumption, with key results unaltered.

[19] Section 5.2 explores the consequences of relaxing this assumption.

[20] Mani and Mukand (2007) retain a similar assumption in a career concern model of a single government allocating resources to a vector of public goods with different characteristics.

[21] One interpretation for this is that information about the identity of the challengers becomes available just before the election.

[22] Time subscripts are dropped from now on since the period-2 problem is trivial, with maximum rents being taken by each politician. All decision variables relate to period 1.

[23] The possibility that F and G differ may be interpreted as capturing, albeit in reduced form and among other government-specific factors, the fact that the marginal electoral benefit of spending on the local public good for the central incumbent is affected by the electoral conditions prevailing in other local jurisdictions.

[24] This assumption has received empirical support, for example by Bardhan and Mookherjee (2005).

must be that $\beta T\theta^l F'[g^S] \geq \tau$. The following proposition formalizes these results.

Proposition 2 (Specific responsibility) Imposing complete decentralization when $\theta^c < \theta^l$ does not generate the socially optimal level of public good provision, except when public inputs are perfect substitutes and the marginal benefit of spending at the socially optimal level is at least equal to the marginal cost.

Despite the generally imperfect ability of elections to act as a disciplinary device in this kind of framework, it is thus possible to identify circumstances where a politician facing a high marginal benefit of spending on the public good will reach the socially optimal effort in period 1 to ensure reelection.

4.2. 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. The spending decisions of one level of government affect not only its own reelection probability but that of the other level of government as well, generating a positive externality for the other levels of government. Given our assumption of simultaneous elections and the trivial nature of the period-2 problems (each politician takes maximum rents), solving the model involves calculating the Nash equilibria of the electoral game being played between the two periods. The two levels of government are thus assumed to behave non-cooperatively in setting their contribution to the public good, taking the contribution of the other government as given. Each level of government's equilibrium contribution to the public good thus 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.

Before turning to the more general case of imperfect substitutes, we first solve the model when public inputs at both levels of government are perfect substitutes.

4.2.1. Perfect substitutes

With perfect substitutes, the first-order condition for the problem in (16) yields the following reaction function:

$$g^{l*}(g^c) = \frac{1}{\theta^l} F'^{-1}\left[\frac{\tau}{\beta T^l \theta^l}\right] - \frac{\theta^c}{\theta^l} g^c. \tag{18}$$

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

$$g^{c*}\left(g^l\right) = \frac{1}{\theta^c} G'^{-1}\left[\frac{\tau}{\beta T^c \theta^c}\right] - \frac{\theta^l}{\theta^c} g^l. \tag{19}$$

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 electoral conditions prevailing at both levels of government. Specifically,

$$\begin{aligned}
&g^c = \frac{1}{\theta^c} G'^{-1}\left[\frac{\tau}{\beta T^c \theta^c}\right] \text{and } g^l = 0 && \text{if } \frac{1}{\theta^c} G'^{-1}\left[\frac{\tau}{\beta T^c \theta^c}\right] > \frac{1}{\theta^l} F'^{-1}\left[\frac{\tau}{\beta T^l \theta^l}\right],\\
&\text{Any}\left(g^c, g^l\right) \text{s.t.} g^l + g^c = \pi && \text{if } \frac{1}{\theta^c} G'^{-1}\left[\frac{\tau}{\beta T^c \theta^c}\right] = \frac{1}{\theta^l} F'^{-1}\left[\frac{\tau}{\beta T^l \theta^l}\right] = \pi,\\
&g^l = \frac{1}{\theta^l} F'^{-1}\left[\frac{\tau}{\beta T^l \theta^l}\right] \text{and } g^c = 0 && \text{if } \frac{1}{\theta^c} G'^{-1}\left[\frac{\tau}{\beta T^c \theta^c}\right] < \frac{1}{\theta^l} F'^{-1}\left[\frac{\tau}{\beta T^l \theta^l}\right].
\end{aligned} \tag{20}$$

This result is summarized in the following proposition.[25]

Proposition 3 (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 corresponds to the optimal degree of decentralization (complete decentralization by assumption) only if $\frac{1}{\theta^c} G'^{-1}\left[\frac{\tau}{\beta T^c \theta^c}\right] < \frac{1}{\theta^l} F'^{-1}\left[\frac{\tau}{\beta T^l \theta^l}\right]$. While any degree of decentralization can be observed if $\frac{1}{\theta^c} G'^{-1}\left[\frac{\tau}{\beta T^c \theta^c}\right] = \frac{1}{\theta^l} F'^{-1}\left[\frac{\tau}{\beta T^l \theta^l}\right]$, complete centralization arises in equilibrium if $\frac{1}{\theta^c} G'^{-1}\left[\frac{\tau}{\beta T^c \theta^c}\right] > \frac{1}{\theta^l} F'^{-1}\left[\frac{\tau}{\beta T^l \theta^l}\right]$.

It is interesting to note that, in a situation where complete decentralization is optimal given the local government's advantage in production, a sufficiently strong incentive to spend on the public good by the central government – governed by G and T^c – can produce an equilibrium with complete centralization.

4.2.2. Imperfect substitutes

With $\rho < 1$, the reaction functions are given by:

$$g^l = \left(\frac{\beta T^l \theta^l}{\tau} F'[g]\right)^{\frac{1}{1-\rho}} g^{\rho}, \tag{21}$$

$$g^c = \left(\frac{\beta T^c \theta^c}{\tau} G'[g]\right)^{\frac{1}{1-\rho}} g^{\rho}. \tag{22}$$

Solving (21) and (22) for an interior solution yields the Nash equilibrium (N) spending ratio:

$$\frac{g^{lN}}{g^{cN}} = \left(\frac{\theta^l}{\theta^c} \frac{T^l}{T^c} \frac{F'\left[g^N\right]}{G'\left[g^N\right]}\right)^{\frac{1}{1-\rho}}, \tag{23}$$

which in general is different from the optimal spending ratio given by Eq. (5), unless $T^l F'[g^N] = T^c G'[g^N]$. Eq. (23) provides a useful decomposition of the equilibrium spending ratio, summarized by the following proposition:

Proposition 4 (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 the assumption that $\theta^c < \theta^l$) only if $\frac{T^l}{T^c} = \frac{G'[g^N]}{F'[g^N]}$, i.e. if the local–central revenue ratio is equal to the central–local ratio of the marginal electoral benefits at g^N Otherwise, the equilibrium spending ratio differs from the optimal ratio and is determined by the product of three ratios: the relative technological advantages in production $\left(\frac{\theta^l}{\theta^c}\right)$, the revenue ratio $\left(\frac{T^l}{T^c}\right)$, and the relative marginal electoral benefits $\left(\frac{F'[g^N]}{G'[g^N]}\right)$.

4.2.3. Optimal revenue sharing and voter welfare

Can these equilibria yield the socially optimal degree of decentralization and, even, the optimal level of the public good? With respect to the degree of decentralization, the answer lies with the ability of the revenue-sharing rule to be based on the relative electoral incentives of

[25] Note that assuming that no level of government has a technological advantage in providing the shared public good would not fundamentally alter this result since θ^c and θ^l do not play a crucial role in the determination of which government produces the public good.

the two levels of government.[26] Exploiting the fact that $T = T^l + T^c$ yields the following proposition for the imperfect substitute case.

Proposition 5 (Optimal revenue sharing with imperfect substitutes) When the inputs produced by the two levels of government are imperfect substitutes ($\rho < 1$), a revenue-sharing arrangement such that the revenue share of the local government is $\frac{G'[g^N]/F'[g^N]}{1+G'[g^N]/F'[g^N]}$ yields the optimal decentralization ratio.

In the perfect substitutes case, it is also possible to induce the optimal degree of decentralization (here, $d = 1$ since $\theta^c < \theta^l$) by attributing the full revenue base to the local government. This amounts to forcing the specific responsibility case discussed at the beginning of this section.

Proposition 6 (Optimal revenue sharing with perfect substitutes) When the inputs produced by the two levels of government are perfect substitutes ($\rho = 1$), a revenue-sharing arrangement attributing the full revenue base to the government with a technological advantage in public good provision yields the optimal decentralization ratio.

These optimal revenue-sharing arrangements implement the optimal degree of decentralization. But will they maximize social welfare? With perfect substitutes, we have shown above that specific responsibilities will yield the social optimum if the local government's marginal benefit of spending at the socially optimal level is at least equal to the marginal cost (see Proposition 2). With imperfect substitutes, as discussed before, such a solution will not yield the social optimum. While it is possible to get the right decentralization ratio through the right revenue-sharing arrangement (Proposition 5), the vertical interactions among levels of government (leading to free-riding) will preclude the Nash equilibrium allocation from reaching the socially optimal level for the public good.

4.2.4. Summary of results

Together, the results derived in this section show how a decentralization reform that leads to shared expenditure responsibilities may not be socially optimal despite the existence of complementarities among 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 among levels of government, which take into account factors other than relative competencies. Specifically, the model shows:

1. In a shared responsibility equilibrium, electoral incentives distort the degree of decentralization away from its optimal ratio.
2. In the presence of vertical complementarity, forced specific responsibility will, in general, not be desirable. An appropriate revenue-sharing arrangement – taking into account the relative marginal electoral benefits of spending – can lead the equilibrium (partial) decentralization ratio to coincide with the optimal ratio, while not yielding the first-best level of the public good.
3. In the absence of vertical complementarity, forced specific responsibility may generate the first-best level of the public good if the appropriate reelection incentives are in place.

The next section explores two variants of the model that are related to the interplay between PED and a country's degree of democratization.

5. Variants: partial decentralization and democratization

Unlike in developed countries, decentralization reforms implemented in developing countries are often bundled up with interventions aimed at promoting democratization at the local level. So far, the analysis has highlighted the key role played by electoral incentives while, however, positing a homogeneous electorate entirely incapable of distinguishing the individual contributions of local and central politicians. Furthermore, the model has assumed probabilistic voting, an electoral environment in which voters cannot commit to a sharp reelection rule based on the rents extracted by politicians. Both of these assumptions (homogeneity of the electorate and probabilistic voting) result in an environment whereby opportunistic politicians are in a particularly favorable position to extract rents at the expense of citizens.

This section explores two channels through which the democratization and the availability of information might sharpen the electorate's ability to discipline politicians. In a first extension of the model, the homogeneity assumption is relaxed with the introduction of a group of better-informed voters that are able to directly assess each politician's contribution to the public good. In a second variant of the model, deterministic elections replace the probabilistic elections in a simplified version of the model, thus allowing the electorate to commit to sharp reelection rules.

5.1. Voter heterogeneity

In the same environment as in Section 4.2.2, consider now that a share λ of the electorate is informed about the intergovernmental composition of spending on the public good, i.e. they observe g^c, g^l and g. Accordingly, when facing reelection, politicians at each level of government now have a probability λ of facing a 'better-informed' pivotal voter and a probability $(1-\lambda)$ of facing an 'uninformed' pivotal voter. The key difference between the two types of voters is that the uninformed voter conditions his reelection rules on the aggregate level of the public good (g) while the better-informed voter conditions hers on the level of public input produced by each politician (g^l or g^c).[27] In line with the homogeneous electorate version of the model, an uninformed pivotal voter reelects the local government with probability $F[g]$ and reelects the central government with probability $G[g]$. We assume that a better-informed voter reelects the local government with probability $\Phi[g^l;g^c,g]$, and the central government with probability $\Gamma[g^c;g^l,g]$, with Φ and Γ concave in their first argument.[28]

The local incumbent's problem becomes:

$$\max_{g^l} \; T^l - \tau g^l + \beta T^l\left[(1-\lambda)F[g] + \lambda\Phi\left[g^l\right]\right]. \tag{24}$$

The central incumbent faces a symmetric problem. Solving for an interior solution yields the Nash equilibrium (N) spending ratio

$$\frac{g^{lN}}{g^{cN}} = \left(\frac{\theta^l}{\theta^c}\frac{T^l}{T^c}\frac{F'\left[g^N\right]}{G'\left[g^N\right]}\left[\frac{\tau-\beta T^c\lambda\Gamma'\left[g^{cN}\right]}{\tau-\beta T^l\lambda\Phi'\left[g^{lN}\right]}\right]\right)^{\frac{1}{1-\rho}}. \tag{25}$$

This equilibrium solution is easily compared to Eq. (23). The heterogeneity in the electorate adds a third distortion term to the decentralization ratio, in addition to the ratio of the revenue bases and the ratio

[26] The revenues to which each level of government has access have been shown, above, to play an important role in determining the equilibrium degree of decentralization. It is important to note that this would also be the case with benevolent governments constrained by a given revenue-sharing arrangement. Benevolent local and central governments would both spend on the public good up to T^l or T^c, respectively. The resulting degree of decentralization would then be $d = \frac{T^l}{T^c}$.

[27] The voters that are able to condition their reelection decisions on the public input produced by each level of government are referred to as 'better-informed' as, crucially, they remain ignorant of how revenues are shared and of the technology that transforms the inputs into the public good g. An interesting extension would be to allow the better-informed voters to know the intergovernmental composition of revenues. See Gadenne (2013) for a model in which the composition of tax revenues is known to voters while intergovernmental transfers are imperfectly observed.

[28] For technical reasons, let us also assume that $\tau > \beta T^c\lambda\Gamma'[g^c]$ and $\tau > \beta T^l\lambda\Phi'[g^l]$, where Γ' and Φ' denote the derivative with respect to the first argument.

of the relative marginal electoral benefits in the uninformed population. Notice that, as expected, this third distortion term cancels out when $\lambda = 0$, i.e. when all voters are uninformed. With $\lambda > 0$, the decentralization ratio responds to the relative marginal electoral benefits in the better-informed population. These marginal benefits are given more weight as the share of better-informed voters increases. The last ratio can be interpreted as measuring spending's expected net marginal cost in the better-informed population. The following proposition extends Proposition 4 to a heterogeneously informed electorate.

Proposition 7 (Endogenous decentralization with heterogeneous electorate) When the inputs produced by the two levels of government are imperfect substitutes ($\rho < 1$) and a share λ of the electorate is informed about the intergovernmental composition of public expenditures, the equilibrium degree of decentralization corresponds to the optimal degree of decentralization (which exceeds $\frac{1}{2}$ by the assumption that $\theta^c < \theta^l$) only if $\frac{T^l}{T^c} = \frac{G'[g^N]\tau - \beta T^l \lambda \Phi'[g^{lN}]}{F'[g^N]\tau - \beta T^l \lambda \Phi'[g^{lN}]}$. Otherwise, the equilibrium spending ratio differs from the optimal ratio and is determined by the product of four ratios: the relative technological advantages in production $\left(\frac{\theta^l}{\theta^c}\right)$, the revenue ratio $\left(\frac{T^l}{T^c}\right)$, the relative marginal electoral benefits in the uninformed population, and the ratio of the expected net marginal costs in the better-informed population.

The presence of a fraction of better-informed voters thus raises the key issue of the ability of politicians to target the informed population for electoral purposes, which can differ for the central (captured by Γ') and local governments (captured by Φ').[29] One level of government's ability to target electorally-decisive better-informed voters will tweak the decentralization ratio towards that level of government, further outlining the influence of political distortions on the equilibrium degree of decentralization.

5.2. Deterministic elections

Another way in which the availability of information in the electorate might affect the analysis is through the extent to which voters can commit to stricter reelection rules than those that are implicit under probabilistic voting.[30] In what follows, we explore the accountability consequences of PED under 'deterministic elections,' in the sense that voters are now able to commit to strict reelection rules about which there is no uncertainty from the incumbents' point of view.

To study this issue, a simplified version of the model is analyzed, assuming that the inputs provided by the two levels of government are perfect substitutes ($\rho = 1$), and that the two levels of government are equally competent in providing the public good ($\theta^l = \theta^c = 1$). In this special case of the model, the social optimum is given by $g^{cS} + g^{lS} = \frac{T}{\tau}$, thus there is no a priori reason to favor decentralization over centralization (or vice versa) and any degree of decentralization can be socially optimal. The key mechanism by which shared responsibility affects electoral accountability is especially evident in this simplified environment: 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. For simplicity and without much loss in generality, let us assume in this section that $T^c = T^l = T/2$.

Voters can now commit ex ante to reelection rules based on observed aggregate fiscal policy, about which there is no uncertainty from the point of view of incumbents. Consider possible pure-strategy equilibria involving symmetric reelection rules of the form[31]:

$$\sigma = \begin{cases} 1 & \text{if } s \le \bar{s} \\ 0 & \text{if } s > \bar{s} \end{cases} \tag{26}$$

where σ is a reelection probability that applies to both governments and $\bar{s} < T$ is an endogenous level of rents that will be determined in equilibrium. In the presence of such a cut-off rule based on aggregate rents, governments face a coordination problem.[32] They need to coordinate to be reelected and share $\bar{s}$; otherwise, they are both defeated for sure. For any government to accept rents less than $T/2$ in period 1, it must be the case that the government is at least indifferent between being reelected and being defeated, that is, $s^j \ge (1 - \beta)T/2$.

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

	C	D
C	$\left(\frac{\bar{s}}{2} + \beta\frac{T}{2}, \frac{\bar{s}}{2} + \beta\frac{T}{2}\right)$	$\left(\frac{\bar{s}}{2}, \frac{T}{2}\right)$
D	$\left(\frac{T}{2}, \frac{\bar{s}}{2}\right)$	$\left(\frac{T}{2}, \frac{T}{2}\right)$

(27)

Note that this payoff matrix assumes that if they coordinate, the governments divide $\bar{s}$ equally, an assumption mirroring the fact that the two governments split public revenues equally.[33] It is straightforward to show that both (C,C) and (D,D) are Nash equilibria of the stage game. Both 'non-coordinated' and 'coordinated' outcomes can therefore arise. In non-coordinated outcomes, 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. A coordinated outcome can also arise, in which $s^j = \bar{s}^j = (1-\beta)T/2$ and both incumbents are reelected for sure. [34]

If voters have no information about the composition of spending, PED thus raises the possibility of multiple equilibria: the non-coordinated equilibrium reduces voter welfare compared to either complete centralization or decentralization, whereas voter welfare is equivalent to these polar cases in the coordinated equilibrium, a result formalized by Proposition 8.

Proposition 8 (Endogenous decentralization with deterministic elections) Any equilibrium of the model with deterministic elections and perfect substitutes involves equal or higher rent-seeking than under specific responsibility. In a coordinated equilibrium, there is partial decentralization while no contribution to the public good is made in a non-coordinated equilibrium.

[29] This is closely related to Mani and Mukand's (2007) treatment of the role of visibility in distorting the allocation of public goods.

[30] As Keefer and Khemani (2005) put it, "only when a large enough part of the electorate is exposed to the same information is there a threat of coordinated voter action in response to underperforming incumbent governments." For more on this topic, see Ferejohn and Kuklinski's (1990) book.

[31] The analysis is restricted to pure strategy equilibria.

[32] Given that voters cannot observe the intergovernmental composition of fiscal variables by assumption, we rule out 'asymmetric' reelection rules in which voters would always reelect or fire one government, and reelect or fire the other according to some criterion.

[33] The main result in this section, Proposition 8 below, does not depend on the assumption that revenues be split in equal shares. One could alternatively assume other revenue-sharing constraints (with the corresponding rent-splitting rules).

[34] An interesting parallel can be drawn here with the seminal analysis of Brennan and Buchanan (1980). While Brennan and Buchanan's main argument – based on a competitive market analogy – is favorable to decentralization, 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.

Proof. See Appendix A. ■

This last result confirms that our main results remain essentially unaffected when voters are assumed to me more sophisticated, being able to commit to strict reelection rules.[35] To the extent that PED is associated with an imperfect ability by the voters to observe each government's contribution to the shared public good, PED is welfare-dominated by specific responsibility (albeit in a weak sense involving multiple equilibria) in the simple environment assumed in this section. Assuming probabilistic elections in the previous sections has smoothed the problem and avoided the multiplicity of equilibria that arises in the special case studied in this section, in addition to allowing a tractable treatment of heterogeneous electoral environments at the local and central levels.

6. Discussion and concluding remarks

Both political integration and decentralization are *en vogue* (Stegarescu, 2006). They 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 local public good provision, especially in developing countries where decentralization reforms have proliferated in recent years. Depending upon the specifics of these reforms, the different levels of government in a decentralized state remain more or less involved in similar sectors of activity, with the central government often retaining an important role.

To the best of the author's knowledge, this paper is the first to consider a political agency model in which the presence of a hierarchy of governments involved in the provision of a public good creates an information problem on the spending side (with respect to the intergovernmental composition of government spending). In the model, the provision of a local public good by both levels of government is the margin along which political competition occurs. In a given jurisdiction, a central government and a local government compete for the support of the same voters (though in separate elections) by each contributing to the good. The paper has focused on two key aspects of partial decentralization, namely the vertical interactions between levels of government and the informational demands on voters in areas of shared responsibility.

From a policy perspective, the model highlights the need for decentralization reforms to take into account the reality of the political process. With PED, the usual efficiency benefits of decentralization have to be weighed against the potential informational problems and political games associated with the involvement of more than one level of government in policymaking. If the duties of each level of government are well defined and are of common knowledge to every relevant player – including to the voters – partial decentralization will not foster accountability problems. It is when these duties are not well-defined, or when they specifically assign a given spending responsibility to more than one level of government, that accountability issues are likely to arise. Hence, how decentralization is implemented matters crucially. For example, shared responsibility in areas that are politically sensitive (e.g. infrastructure investment) or for public goods that are the most visible (Mani and Mukand, 2007) may be especially conducive to inefficient outcomes. Furthermore, a partial decentralization reform should pay special attention to the information available to voters about the respective role of each level of government, an issue likely to be especially prominent in developing countries.

The analysis calls upon further theoretical refinements. 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 model to incorporate, for example, intergovernmental transfers and the accountability benefits associated with horizontal yardstick competition.[36]

Future research should also explore empirical applications of the model, notably by introducing electoral variables in empirical analyses of the determinants of decentralization. Indeed, notice that Eq. (23) implies an empirically implementable relationship between the spending ratio and the three ratios on the right-hand side. In closely related work, Jametti and Joanis (2012) provide a first empirical implementation of a similar equation, with initial empirical results confirming that political distortions deserve to be adequately factored in when assessing the determinants of fiscal decentralization in developing countries. However, future work should devise strategies to overcome important identification issues and the lack of adequate data for individual countries, in order to assess how the within-country degree of (partial) expenditure decentralization is affected by the electoral incentives of both local and central incumbents. This paper supplies a theoretical framework to guide such data collection initiatives and empirical tests.

Appendix A. Proof of Proposition 8

Proof. Given the environment, voters are restricted to a binary reelection decision. Since voter utility is monotonically decreasing in s, it can be shown that the voters' best response function has the cut-off form given in (27). Taking as given an arbitrary cutoff $\bar{s}$ and the assumption that the two governments share rents equally when they coordinate, the game played by the two levels of government has two Nash equilibria, as long as $\bar{s} \geq (1-\beta)T$: one in which each government plays $s^j = \frac{\bar{s}}{2}$ (a 'coordinated' equilibrium) and one in which each government plays $s^j = \frac{T}{2}$ (a 'non-coordinated' equilibrium). If $\bar{s} < (1-\beta)T$, however, the game has a unique, non-coordinated equilibrium. Given these outcomes of the vertical interactions between the two incumbent governments, the rational choice of $\bar{s}$ by the electorate is $\bar{s} = (1-\beta)T$. The two equilibria of the (period-1) game can therefore be characterized by (i) $\bar{s} = (1-\beta)T$ and $s^l = s^c = \frac{\bar{s}_1}{2}$, and (ii) $\bar{s} = (1-\beta)T$ and $s^l = s^c = \frac{T}{2}$. ■

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[35] As we have assumed in this section that public inputs are perfectly substitutable, this result is most directly comparable with Proposition 2 above, with $\theta^l = \theta^c = 1$ following the equal competence assumption also introduced in this section.

[36] On this issue, see Besley and Case (1995) and Belleflamme and Hindriks (2005).

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