

 <b>Editors:</b> P. Bajari B. Caillaud N. Gandal	<b>Volume 26, Issue 2, March 2008</b> <span style="float: right;">ISSN 0167-7187</span>
<b>Advisory Board:</b> J. Levinsohn F. Malerba R. Porter M. Riordan M. Slade M. Waterson	<b>INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION</b>
<b>Co-Editors:</b> J.P. Choi J. Gans A. Hortacsu R.A. Jensen B. Julien D. Martimort V. Nocke A. Petrin M. Shum	Contains Special Section: Symposium on Public/Private Partnership
<b>Associate Editors:</b> V. Aguirregabiria R. Amir S. Clerides G.S. Crawford J. Dana U. Doraszelski S. Fisher-Elisson J. Fox K. Graddy G.Z. Jin F. Khalil K. Krishna J. Lerner D. Mckidams E.J. Miravete H. Paarsch M. Peitz B.J. Puffle S. Ryan M. Rysman D. Sny C. Snyder Y. Spiegel V. Stango R. Stenbacka S. Stern G. Tan J. Thisse N. Wettas R. Veugelers	<b>CONTENTS</b>
<b>Editorial Assistant:</b> A. Simantov-Damti	Introduction to the IJO Symposium on Public/Private Partnership iii
	To build or not to build: Normative and positive theories of public-private partnerships <i>D. Martimort and J. Pouyet</i> 393
	Public-private partnerships and government spending limits <i>E. Maskin and J. Tirole</i> 412
	Renegotiation of concession contracts in Latin America: Evidence from the water and transport sectors <i>J.L. Guasch, J.-J. Laffont and S. Straub</i> 421
	Exploring the effects of competition for railway markets <i>R. Lalive and A. Schmutzler</i> 443
	Price, price dispersion and number of sellers at a low entry cost shopbot <i>M. Haynes and S. Thompson</i> 459
	Two-part tariffs with quality degradation <i>S. Jensen</i> 473
	Sunk costs, entry deterrence, and financial constraints <i>S. Arping and K.M. Diaw</i> 490
	Package size and price discrimination in the paper towel market <i>A. Cohen</i> 502
	Consumer and competitor reactions: Evidence from a field experiment <i>J.M. Barron, J.R. Umbeck and G.R. Waddell</i> 517
	(Contents continued on last page of this issue)
	Available online at  <b>ScienceDirect</b> www.sciencedirect.com
26 (2) 393–624 (2008)	

This article was published in an Elsevier journal. The attached copy is furnished to the author for non-commercial research and education use, including for instruction at the author's institution, sharing with colleagues and providing to institution administration.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/copyright>



# Public–private partnerships and government spending limits <sup>☆</sup>

Eric Maskin <sup>a,b,\*</sup>, Jean Tirole <sup>c,d</sup>

<sup>a</sup> *Institute for Advanced Study, United States*

<sup>b</sup> *Princeton University, United States*

<sup>c</sup> *University of Toulouse, France*

<sup>d</sup> *MIT, United States*

Available online 2 June 2007

---

## Abstract

We consider public–private partnerships, in which a public official selects a project that is then developed and operated by a private contractor. We derive optimal public accounting rules when the official's choice among projects is biased by ideology or social ties or because of pandering to special interests. We give particular emphasis to how the rules should constrain the official's incentive to understate the costs of her pet projects.

In the basic model, we show that the optimal accounting rule takes the form of a budget cap, with a project's expected cost modified to reflect the official's distortionary incentives. If the project can be partially financed privately, then “fixed-price” contracts can serve to curb political misbehavior by “securitizing” public sector liabilities.

We also consider the possibility that development and operations are each handled by different contractors. Such “unbundling” deprives public accountants of forward information about future costs, but can prevent the official from funneling hidden future rents to contractors.

© 2007 Elsevier B.V. All rights reserved.

*JEL classification:* D73; D8; E62; H5; H6

*Keywords:* Public–private partnerships; Unbundling; Budget caps; Public accounting

---

## 1. Introduction

Public procurement accounts for a sizeable share of economic activity in most countries. Thus, how to deliver

high-quality public services at low cost to the taxpayer and user is an important problem. An interesting recent development in the effort to find solutions is the growth of *public–private partnerships* (PPPs), both in industrialized countries (e.g., the United Kingdom, as in its Private Finance Initiative launched in 1992) and in emerging economies (e.g., Latin America, Eastern Europe, and China during the 1990s). PPPs have been created for large-scale projects in transportation (rail systems, highways, subways), medical care, telecommunications, energy, water systems, and even orphan drugs.

Although the variety of risk-sharing arrangements and governance structures makes a precise characterization

---

<sup>☆</sup> A very preliminary version of this paper was presented at the conference on “Public Services and Management” (Toulouse, January 14, 2006). We are grateful for helpful comments to our discussant, Steve Tadelis, as well as to David Martimort and an anonymous referee. Jean Tirole thanks the Veolia Institute for financial support of IDEI and its members for useful discussions on public–private partnerships. Eric Maskin thanks the NSF for research support.

\* Corresponding author. Institute for Advanced Study, United States.

*E-mail address:* [maskin@ias.edu](mailto:maskin@ias.edu) (E. Maskin).

difficult, a PPP is usually defined as a *long-term development and service contract* between government and a private partner. The government typically engages its partner both to develop the project and to operate and service it. The partner may bear substantial risk and even raise private finance. Its revenue derives from some combination of government payments and user fees.

In comparing PPPs to more traditional procurement (in which project development on the one hand and operations and maintenance on the other are generally arranged under *separate* contracts), the literature has generally focused on the incentives of the *private partner*. For example, one much-discussed potential advantage of PPPs is that, by “bundling” construction and operations, they induce the developer to internalize cost reductions at the operations stage that are brought about by investment at the development stage.<sup>1</sup> But, by the same token, bundling may lead to a loss in operational efficiency because the best developer might not also be the best operator.<sup>2</sup> Moreover, it may encourage choices that reduce future costs at the expense of service quality.<sup>3,4</sup>

The literature's focus on the private agent is understandable in view of the standard presumption in academic and policy work on public procurement that the government acts to maximize social welfare. Assuming governmental benevolence is a reasonable first step in the analysis of PPPs, but, of course, over-simplifies reality. Accordingly, a fair number of recent studies have departed from the benevolence assumption by supposing that the private partner or other parties may capture the procurement process by side-contracting (colluding) with the government.<sup>5</sup>

<sup>1</sup> Sometimes such internalization can be achieved without bundling if the project developer can be made fully accountable for the profits of the operator who succeeds him, as in case of second-sourcing (Iossa and Legros, 2004). However, internalization may well be imperfect, either because of developer risk aversion (Martimort and Pouyet, 2006) or because of collusion between the operator and its regulator, who can together manipulate accounts to the detriment of the developer (Laffont and Tirole, 1988; Stein, 1989).

<sup>2</sup> Laffont and Tirole (1988).

<sup>3</sup> Hart (2003), Bennett and Iossa (2004), and Martimort and Pouyet (2006). The latter allow for quality incentives as well as observable costs.

<sup>4</sup> Because of their complexity, PPPs may also be costly to negotiate; see Väilä (2005, Section 5).

<sup>5</sup> E.g., Grossman and Helpman (1994), Laffont and Martimort (1999), Laffont and Tirole (1991), and Martimort (1999). The literature includes two results on the increased scope for capture under PPP contracts: Martimort and Pouyet (2006) show that separate contracts tend to entail lower-powered incentives and therefore make capture more difficult than under bundling. Laffont and Tirole (1993, chapter 16) argue that separate contracts may be optimal despite the potential efficiency gains from bundling, because a future government (which itself may be corruptible) may undo collusion if not bound by a long-term contract signed by its predecessor.

In this paper we consider a less-explored reason for why procurement projects may not align with the public's best interest: government officials may have preferences that differ from those of a social welfare maximizer. More specifically, ideology, social or political ties, or the incentive to pander may induce an official to favor the pet projects of particular interest groups—i.e., to practice “pork-barrel” politics—even though these projects may not be justifiable from the standpoint of social welfare. We are particularly interested in how *spending caps* can mitigate the official's biases.

There is substantial evidence that politicians' project choices are influenced significantly by the desire to please constituencies and by budgetary constraints. Levin and Tadelis (2006) document that local political institutions in the U.S. have a profound impact on such choices. Less formal evidence in France suggests that efficiency considerations in the production of public goods are often secondary to the government's determination to deliver visible private benefits to particular interest groups, with costs hidden or delayed as much as possible. For that matter, the very fact that governments in many countries are made to face budgetary constraints at all would be quite mysterious if their goal were truly to maximize social welfare.

Indeed, the marked increase in PPP contracts worldwide is often attributed less to the intrinsic qualities of such contracts than to governments' attempts to evade budget constraints by taking liabilities off the balance sheet.<sup>6</sup> For this reason, some commentators worry that accounting gimmickry may become the primary motive behind PPPs, so that “governments may not take the care to properly design contracts to ensure that appropriate incentives are in place” (Mintz and Smart, 2005, page 17; see also IMF, 2005, p. 27).<sup>7</sup>

<sup>6</sup> Traditionally, many countries often record PPPs off the public sector's balance sheet. Indeed, PPP financing is often provided via “special purpose vehicles” involving banks and other financial institutions, which can be used as a private veil to hide explicit or implicit government guarantees. To combat this tendency, Eurostat (2004) requires that PPPs be recorded on the public balance sheet unless the private partner carries the construction risk and either the availability or demand risk.

<sup>7</sup> Interestingly, PPPs are sometimes actually *justified* on the grounds that they alleviate government budgets and substitute cheap private funding for discretionary finance. Engel et al. (2006) show that this argument is highly suspect, as the future user revenue lost by ceding income flows to the private sector exactly offsets the investment savings made by the government early on in the relationship. See Bassetto and Sargent (2005), Beetsma and Uhlig (1999), Blanchard and Giavazzi (2004), Calmfors (2005), Inman and Rubinfeld (1997), Koen and van den Noord (2005), and Milesi-Ferretti (2000) for further discussion of the proper control of public deficits and borrowing.

Our paper builds on Maskin and Tirole (2004, 2007) to examine PPPs as instruments in pork-barrel politics. To keep the analysis simple, we limit our focus to the constraining role of public accounting systems, and, unlike our earlier papers, ignore the restraints imposed by electoral accountability.<sup>8</sup> However, as explained in Section 3 (see footnote 16), the most straightforward way of incorporating accountability in our model changes none of our qualitative conclusions. We lay out our benchmark model in Section 2. A public official is in charge of choosing projects and a contractor of carrying them out. Each project comprises two stages, with a commonly known first-period cost and an (a priori) uncertain second-period cost (which can be high or low). In the benchmark model, the two stages are “bundled”: the same contractor is there for both periods. The public official and her contractor have the same information about the project’s second period cost: with probability  $x$ , they learn (privately) the magnitude of this cost (i.e., whether it is high or low); with probability  $1 - x$ , they, like the public, remain uninformed.

There is a continuum of interest groups, and the public official “favors” a fraction of them in the sense that she prefers a project she knows is high-cost and that benefits a favored group to one that benefits some unfavored group and whose cost is not yet known. This preference give rise to the central inefficiency of the model: the official has the incentive to “pass off” high-cost projects she favors as projects with still unknown costs.

In Section 3, we study PPPs when contractors are “cashless,” i.e., they can bear no risk in their costs. This set up is particularly simple, as we can focus without loss of generality on just *fixed-price* contracts (which can be used for projects with known costs) and *cost-plus* contracts (appropriate for projects with unknown costs).<sup>9</sup> The public official can pass off a favored high-cost project as one with unknown cost by awarding the contractor a cost-plus contract. That is, cost-plus contracts are vulnerable to *adverse selection*: the official will use them not only for the projects for which they were designed (those with unknown costs), but also for her inefficient pet projects.<sup>10</sup> We show that the public

official can be induced to behave more in line with social welfare if subjected to a spending limit and a public accounting system. Moreover, the public accounting system can be chosen to be “linear,” and we derive its optimal form. The accounting costs will, in general, differ from true costs to reflect the adverse selection problem described above.

The optimal accounting system induces a public spending rule that takes one of two forms. Either it is “tight,” so that only favored projects of uncertain cost and projects known to be low-cost are undertaken. Or else it is “lax,” in which case all projects are undertaken except those that are high cost and do not benefit a favored group. *Ceteris paribus*, lax spending limits will pertain when the fraction of interest groups that are favored is small and the probability  $x$  that the public official learns the second period cost is low.

In Section 4, we allow contractors to be privately financed, a possibility that can raise welfare. Private finance allows cost-plus PPP arrangements to be replaced by more efficient fixed-price contracts; hence, the theory predicts that private finance will be associated with a higher use of fixed-price contracts. Intuitively, private finance shifts risk to the private sector and attenuates (indeed—in our simple model—altogether *eliminates*) the adverse selection problem. It thereby enables the “securitization” of public sector liabilities.

In Sections 5 and 6, we compare PPPs with the more conventional arrangement in which development and operations are “unbundled,” i.e., there is a separate contractor for each. We show that PPPs offer the potential advantage that projects’ true costs can be assessed earlier, making it hard for the official to push through her favorite project. However, PPPs also introduce the countervailing danger that contractors may be able to mask high costs by accepting low initial payments in exchange for high rents later on. Specifically, if the contractor obtains second-period rents that are not observable to accountants at stage 1, then the contractor will be willing to undertake high-cost projects at an initially low-cost rate, providing extra scope for the public official to sidestep the financial constraints in period 1.

Section 7 concludes by suggesting a few avenues for further work.

## 2. Model

There are two periods,  $t = 1, 2$  (but no discounting) and a large number of interest groups (technically, a continuum) indexed by  $i \in [0, 1]$  in the country or municipality. At date 1, the public official decides, for each  $i$ ,

<sup>8</sup> Two other papers that examine public spending and electoral accountability are Canes-Wrone et al. (2001) and Dewatripont and Seabright (2005).

<sup>9</sup> In our model, in which contractors do not exert effort toward cost reduction, cost-plus contracts do as well as fixed-price contracts for projects with known costs. However, introducing costly effort would make fixed-price contracts strictly dominant.

<sup>10</sup> Clearly, this logic extends well beyond the context of this particular model. For example, it would also hold in a Laffont and Tirole (1986) procurement model, generating a menu of incentive schemes with different cost-sharing coefficients.

whether or not to invest in a project that benefits that interest group. Each project  $i$  costs  $I_1$  (which is deterministic) at date 1 and  $I_2^i$  (which *ex ante* is stochastic) at date 2. Because of  $I_2^i$ 's randomness, the total cost  $C_i = I_1 + I_2^i$  can assume either of two values:  $C_i = C_L$  with probability  $\rho$  and  $C_i = C_H$  with probability  $1 - \rho$ .

Costs are independently distributed across interest groups and are borne equally by everyone (i.e., by all the interest groups). By contrast, the benefit  $B$  from project  $i$  accrues only to interest group  $i$ .<sup>11</sup> Thus if  $y_i$  denotes the decision about project  $i$ —where  $y_i = 1$  denotes “invest in  $i$ ” and  $y_i = 0$  “do not invest”—the welfare of interest group  $i$  is

$$y_i B - E[y_i C_i],$$

where “ $E$ ” denotes the expectation operator. For each project  $i$ , there is probability  $x$  that the public official and the contractor (but not the public at large) learn the value of  $C_i$  in advance (because the project is pre-evaluated). In that event (which is independent across projects), we will speak of a “ $C_L$ -project” or a “ $C_H$ -project.” With probability  $1 - x$ , the official does *not* learn  $C_i$ 's value. We will then refer to a “ $\bar{C}$ -project,” where

$$\bar{C} = \rho C_L + (1 - \rho) C_H,$$

i.e.,  $\bar{C}$  is the prior mean. We assume that

$$C_H > B > \bar{C}, \tag{1}$$

and so if the official maximized social welfare—i.e., the expected sum of the interest groups' welfare—she would undertake the  $C_L$ - and  $\bar{C}$ - but not the  $C_H$ -projects.

For each project  $i$ , there is a corresponding contractor,<sup>12</sup> who has the same information as the official. In line with our focus on PPPs, we shall suppose for now that contractor  $i$  incurs both the costs  $I_1$  and  $I_2^i$  (below in Section 5, we will contrast this model with the “unbundled” case in which there are separate contractors for development and for service/operations). In return, it

receives payment  $t(C_i)$  as a function of its cost, as specified in the procurement contract.

We are interested in two alternative possibilities: (i) the case where the contractor has no cash and must receive  $t(C_i) \geq C_i$  for any realized  $C_i$ ; and (ii) that where the contractor has “financial muscle,” so that it can commit to more general incentive contracts (this latter case includes the possibility that a contractor is initially cashless but can borrow from financial intermediaries).

We will start with case (i), which implies that because the official wishes *ceteris paribus* to minimize her payments, she will offer the contractor either a “cost-plus” contract, specifying  $t(C_L) = C_L$  and  $t(C_H) = C_H$  or a “fixed-price” contract, where  $t \equiv C_L$  or  $t \equiv C_H$ . Note that a fixed price contract with  $t \equiv C_L$  is feasible only if the official and contractor know that  $C_i = C_L$ ; otherwise the contractor cannot be sure of covering its costs.

The public official “favors” a fraction  $f \in (0, 1)$  of the interest groups and weights their welfare by  $\alpha_f > 1$ . The remaining fraction  $1 - f$  consists of “unfavored” groups, with welfare weight  $\alpha_u < 1$ . Without loss of generality, we assume that  $E[\alpha_i] = f\alpha_f + (1 - f)\alpha_u = 1$ , where  $\alpha_i \in \{\alpha_f, \alpha_u\}$  is the welfare weight on interest group  $i$ . The official wishes to maximize the expected sum of weighted welfare across interest groups:

$$E[(\alpha_i B - C_i)y_i]. \tag{2}$$

To introduce (i) a potential conflict between the official's actions and social welfare maximization and (ii) a tendency for the official to overspend, we assume that

$$\alpha_f B - C_H > \alpha_u B - \bar{C} > 0, \tag{3}$$

which implies, from Eq. (1), that the official will wish to replace a  $\bar{C}$ -project benefiting an unfavored group with a  $C_H$ -project benefiting a favored group.

We focus on how spending caps and accounting rules can be designed to best constrain the official's deviation from the social optimum.<sup>13</sup> A *linear accounting system*

<sup>11</sup> The exact timing of this accrual is not crucial; for concreteness, assume that it occurs at date 2 (but is anticipated by the interest group at date 1).

<sup>12</sup> We assume that the contractor is a private firm, i.e., independent of the government. It would be worthwhile extending the model to accommodate the trade-offs between having private and public contractors: in particular, public firms might face less severe cash constraints than their private counterparts (see below), but could give the official an additional way to channel benefits to specific interest groups.

<sup>13</sup> We suppose that the accounting system can be specified *a priori*, e.g., by a constitution. But clearly it would also be of interest to examine the self-serving choices of accounting rules by politicians. As noted by Mintz and Smart (2005, p. 2): “In practice, governments have often initiated capital accounts to provide an opportunity to escape the impact of the fiscal rule. Alternatively, they have pushed debt finance off their own books to quasi-public agencies not consolidated in the budget or to the private sector under public-private partnership arrangements.” An example of this last stratagem is Ispa, the Italian off-budget agency created to form PPPs and raise capital by issuing state-guaranteed bonds, so as to finance new infrastructure while complying with the European Stability and Growth Pact.

consists of a *spending limit*  $G$  on public expenditure and *accounting costs*  $\hat{C}_L$ ,  $\hat{C}_H$  and  $\hat{C}$ , corresponding to low fixed-price, high fixed-price, and cost-plus contracts respectively, with  $\hat{C}_L \leq \hat{C} \leq \hat{C}_H$ . The official is then constrained to choose a set of contracts that satisfies

$$n_L \hat{C}_L + n_H \hat{C}_H + n \hat{C} \leq G, \quad (4)$$

where  $n_L$ ,  $n_H$ , and  $n$  are the proportions of all potential projects corresponding to low fixed-price, high fixed-price, and cost-plus contracts, respectively. We will show in Section 3 that, we can impose this linear structure without loss of generality.<sup>14</sup> Note that we are implicitly assuming in Eq. (4) that all contracts are *publicly observable*, so that, in particular, the official cannot report a high fixed-price or cost-plus contract as a low fixed-price contract.<sup>15</sup>

The reader may wonder why it is not optimal to set the accounting costs equal to the actual (expected) costs. The answer can be traced to the adverse-selection problem: the official has the incentive to hide some projects she knows to have high costs behind cost-plus contracts. The accounting system must recognize this tendency and attempt to “penalize” it; hence, the divergence between accounting and actual costs.

Following the political economy literature (see footnote 7), we suppose that the public official can be enjoined *ex ante* from exceeding her spending limit (say, by a court order), but that she cannot be punished or rewarded *ex post* (i.e., after costs are realized) for any date 1 pronouncement she makes about costs. This assumption rules out schemes in which she is induced to reveal what she knows about costs at date 1 for fear of punishment *ex post* if her cost forecast deviates from realized costs. Because of the law of large numbers, such schemes could, in fact, generate the full social optimum in our continuous model with independent costs (implying that there is no aggregate uncertainty), since *perfect* forecasts would be possible. However, in a somewhat more elaborate model that includes aggregate cost uncertainty and sufficient risk aversion on the part of the official, these schemes would no longer be significantly useful.

<sup>14</sup> Because investment is the only item on our simplified government balance sheet, we can avoid the debate on the relative merits of cash accounting (which charges government investment expenses to a single budget) and accrual accounting (with the concomitant Pigou–Keynes’ golden rule policy that capital—but not current—expenditures are financed through public borrowing). Our “spending cap” can equivalently be interpreted as a limit on borrowing to finance public investment.

<sup>15</sup> To avoid the possibility that an official can arrange a low fixed-price contract for a  $C_H$ -project by telling the contractor that she will pay it more later, we suppose that any such informal arrangement is unenforceable.

### 3. Optimal accounting systems with cashless contractors

Supposing that the contractor is cashless, we now derive the linear accounting system that is optimal in the sense of inducing the official to choose the set of contracts closest to the social optimum. We also show that this scheme is optimal in the broader class of *all* feasible accounting schemes.

A benevolent official would not have to be constrained and would spend  $x\rho C_L + (1-x)\bar{C} = G$ . Faced with budget cap  $G$ , a non-benevolent official will replace some medium-cost (i.e., uncertain) projects with high-cost projects for her favored groups. We now show that it is not optimal to use real-cost accounting and the naive cap  $G$  computed above.

We note first that, since Eq. (1) implies  $C_H$ -projects are not socially desirable, we might as well take  $\hat{C}_H = \infty$ , so that the official will never undertake a  $C_H$ -project under a fixed-price contract. Instead, any such project will be carried out on a cost-plus basis. Of course,  $\bar{C}$ -projects must also be performed through cost-plus contracts. So, in effect, the official is disguising high-cost projects as  $\bar{C}$ -projects (the contractor obviously will not object to this gimmick since it fares equally well under cost-plus and high fixed-price contracts, and public accountants cannot prevent the gimmick since they cannot distinguish *ex ante* between  $C_H$ - and  $\bar{C}$ -projects).

The official solves

$$\begin{aligned} \max_{\{y\}} & \{x\rho[fy^{Lf}(\alpha_f B - C_L) + (1-f)y^{Lu}(\alpha_u B - C_L)] \\ & + x(1-\rho)[fy^{Hf}(\alpha_f B - C_H) + (1-f)y^{Hu}(\alpha_u B - C_H)] \\ & + (1-x)[f\bar{y}^f(\alpha_f B - \bar{C}) + (1-f)\bar{y}^u(\alpha_u B - \bar{C})]\} \end{aligned} \quad (5)$$

subject to

$$\begin{aligned} x\rho[fy^{Lf} + (1-f)y^{Lu}]\hat{C}_L + x(1-\rho)[fy^{Hf} + (1-f)y^{Hu}]\hat{C} \\ + (1-x)[f\bar{y}^f + (1-f)\bar{y}^u]\hat{C} \leq G, \end{aligned} \quad (6)$$

where  $y^{Lf}$  is the proportion of favored  $C_L$ -projects that are undertaken, and  $y^{Lu}$ ,  $y^{Hf}$ ,  $y^{Hu}$ ,  $\bar{y}^f$ , and  $\bar{y}^u$  are the corresponding proportions for unfavored  $C_L$ -projects, favored  $C_H$ -projects, unfavored  $C_H$ -projects, favored  $\bar{C}$ -projects, and unfavored  $\bar{C}$ -projects, respectively and  $y = (y^{Lf}, y^{Lu}, y^{Hf}, y^{Hu}, \bar{y}^f, \bar{y}^u)$ . In view of Eqs. (4) and (6) we note that

$$n_L = x\rho(fy^{Lf} + (1-f)y^{Lu}),$$

$$n_H = x(1-\rho)(fy^{Hf} + (1-f)y^{Hu}),$$

$$n = (1-x)(f\bar{y}^f + (1-f)\bar{y}^u).$$

Letting  $\mu$  denote the shadow price of the budget constraint, we can characterize the solution by:

$$y^{Lk} = 1 \Leftrightarrow \alpha_k B \geq C_L + \mu \hat{C}_L \quad (7)$$

$$y^{Hk} = 1 \Leftrightarrow \alpha_k B \geq C_H + \mu \hat{C} \quad (8)$$

$$\bar{y}^k = 1 \Leftrightarrow \alpha_k B \geq \bar{C} + \mu \hat{C}, \quad (9)$$

where  $k=f, u$ .

Note that, given  $\hat{C}_L$  and  $\hat{C}$ , the choice of a spending cap  $G$  is equivalent to specifying a value of  $\mu$ . Moreover, there is one dimension of freedom in how parameters are scaled, so that the accounting costs  $\hat{C}_L$  and  $\hat{C}$  and the shadow price  $\mu$  can be scaled up or down without changing the solution. Thus, because from Eq. (3),  $\alpha_u B - C_L > 0$  we can assume, without loss of generality, that  $\hat{C}_L = C_L$ .

Because  $B - C_L > 0$ , it is socially desirable that  $C_L$ -projects always be chosen by the official. Furthermore, this desideratum is attainable by the optimal accounting system since, no matter what value is chosen for  $\hat{C}$ ,  $\mu \hat{C}_L$  can be taken small enough so that the inequality in Eq. (7) holds for  $k=f, u$ .

From Eq. (3), we have

$$\alpha_f B - \bar{C} > \alpha_f B - C_H > \alpha_u B - \bar{C} > \alpha_u B - C_H.$$

That is, omitting low-cost projects, the official's ranking in order of decreasing preference is: (A) favored  $\bar{C}$ -projects, (B) favored  $C_H$ -projects, (C) unfavored  $\bar{C}$ -projects and (D) unfavored  $C_H$ -projects.<sup>16</sup> Note that because there is no way for an accounting system (whether linear or not) to distinguish between  $\bar{C}$ - and  $C_H$ -projects, *any* such system simply induces a *cut-off* point: all projects above that point in the official's ranking will be implemented and those below will not. Observe, furthermore, that a cut-off between (B) and (C) makes no sense: if favored  $C_H$ -projects (whose contribution to social welfare is negative) are accepted, then unfavored  $\bar{C}$ -projects (with a positive net contribution) should be included also. Similarly, a cut-off that either excludes or includes all projects cannot be optimal.

<sup>16</sup> If we added a reelection motive to the official's objectives by supposing that a (random) fraction of the interest groups would vote for her provided that she invested in their projects, then this ranking would remain the *same*, and so none of our conclusions would be altered. If, however, there were differences across groups in the visibility of public spending or in the elasticity of voting response to such spending, then electoral accountability could make a difference.

We conclude that the only two cut-offs that can potentially be optimal are those (i) between (A) and (B), and (ii) between (C) and (D). The former corresponds to a “tight” spending limit — in which only favored  $\bar{C}$ -projects are undertaken — and can be achieved through a linear accounting system by choosing  $\mu$  and  $\hat{C}$  so that

$$\alpha_f B = \bar{C} + \mu \hat{C}. \quad (10)$$

The latter corresponds to a “loose” spending limit—in which only unfavored  $C_H$ -projects are not undertaken—and can be attained by taking  $\mu$  and  $\hat{C}$  so that

$$\alpha_u B = \bar{C} + \mu \hat{C}. \quad (11)$$

Notice that if we take  $\hat{C}_L = C_L$  (which is justifiable, as argued above) then at the optimum

$$\alpha_u B - C_L - \mu C_L \geq 0,$$

so that

$$\frac{\alpha_u B - C_L}{C_L} \geq \mu. \quad (12)$$

Hence, if the tight limit is optimal, Eqs. (10) and (12) imply that

$$\alpha_f B \leq \bar{C} + \frac{\alpha_u B - C_L}{C_L} \hat{C}.$$

This means that if  $\alpha_f C_L < \alpha_u \bar{C}$ , we may choose  $\hat{C}$  either bigger or smaller than  $\bar{C}$  and still satisfy all the conditions for optimality. From Eqs. (11) and (12), the same is true *a fortiori* if the loose limit is optimal.

The loose limit is optimal if and only if favored  $C_H$ -projects and unfavored  $\bar{C}$ -projects are *together* socially desirable on net, i.e., if

$$x(1 - \rho)f(B - C_H) + (1 - x)(1 - f)(B - \bar{C}) > 0. \quad (13)$$

Summarizing, we have:

**Proposition 1.** *Given the official's preferences and a cashless contractor, second-best social welfare can be maximized using a linear public accounting system with spending limit  $G$  in which (i)  $C_L$ -projects are always undertaken; (ii) the accounting cost of a  $C_L$ -project is set equal to its true cost  $C_L$ ; (iii) if  $\alpha_f C_L < \alpha_u \bar{C}$ , the accounting cost of a  $\bar{C}$ -project is set either above or below its true cost  $\bar{C}$ ; (iv) the optimal budget constraint is loose (i.e., admits all  $\bar{C}$ -projects and favored  $C_H$ -*

projects) rather than tight (i.e., admits only favored  $\bar{C}$ -projects) if and only if Eq. (13) holds.

**Remark.** From Eq. (13), a loose budget constraint is optimal provided that the probability of *ex ante* knowledge about costs is small enough ( $x$  is low) or the proportion of favored groups is small enough ( $f$  is low).

#### 4. Private finance

We now introduce intermediated finance in a highly stylized fashion. Assume that, at cost  $m \geq 0$ , a financial intermediary, not just the public official, can pre-evaluate a project together with the project's contractor, and thereby learn the date-2 cost *ex ante* with probability  $x$  (the case  $m=0$  corresponds to the framework of Section 3). Backed by such a private financier, a contractor has financial muscle and so can accept a fixed-price contract even for  $\bar{C}$ -projects.

Let us assume that  $m$  is sufficiently low so that pre-evaluation is socially worthwhile, i.e., the expected benefit of weeding out a favored  $C_H$ -project outweighs the cost:

$$m < x(1 - \rho)f(C_H - B).^{17}$$

We suppose that the intermediary captures enough of this surplus so that pre-evaluation is also privately worthwhile. With pre-evaluation, all contracts will be of the fixed-price variety, and social welfare becomes:

$$\rho x(B - C_L) + (1 - x)(B - \bar{C}) - m.$$

Four points follow:

- (a) There is no social benefit from privately financing  $C_L$ -projects (But, of course, they are not known to be  $C_L$  projects until they are monitored).
- (b) The benefit of intermediated finance exhibited here differs from those typically emphasized in the corporate finance literature.<sup>18</sup> In our framework, the contractor faces no internal incentive problem, and so intermediated finance does not—unlike in standard models—serve to reduce production costs. Instead, its role is to constrain the public official by certifying a project's cost to public accountants (or to the courts). As noted in the introduction, it enables the securitization of

public sector liabilities and thereby provides a clearer picture of public sector performance.

- (c) Private finance is associated with a higher frequency of fixed-price contracts.
- (d) We cannot conclude that private finance leads to greater public investment. But, of course, it does enhance public investment if the optimal policy in the model of Section 3 is a *tight* spending limit.

To summarize, we have:

**Proposition 2.** *Through pre-evaluation, private financiers certify the cost of a project and potentially raise welfare by preventing  $C_H$ -projects from being undertaken. Private finance induces a higher incidence of fixed-price contracts.*

#### 5. Unbundling

We have assumed so far that the public official enters into long-term (two-period) contracts with contractors and have labeled such arrangements “public–private partnerships.” To assess the value of PPPs, let us contrast them with arrangements in which development and operations are “unbundled.” In the unbundled scenario, each project has *two* contractors: one at date 1, and one at date 2. Because date 1 costs always equal  $I_1$ , any date-1 contract involves payment  $t_1 = I_1$  to the date-1 contractor. Thus, the spending constraint becomes

$$y\hat{C} < G,$$

where  $y$  is the proportion of all potential projects that are undertaken and  $\hat{C}$  is the accounting cost (which now must be the *same* for all projects regardless of the actual total cost). If, as before,  $\mu$  denotes the shadow price of the budget constraint, the official will undertake group  $i$ 's project if and only if

$$\alpha_i B \geq C_i + \mu \hat{C} \text{ with } C_i \in \{C_L, \bar{C}, C_H\} \text{ and } \alpha_i \in \{\alpha_f, \alpha_u\}. \tag{14}$$

Comparing Eqs. (7)–(9) with Eq. (14), we obtain

**Proposition 3.** *Unbundling prevents early public assessment of projects' costs and therefore (weakly) reduces social welfare.*

The cost of unbundling in our model differs from the costs emphasized in the literature. Here it stems from a misalignment between the official's and the public's interests, and from the concomitant need to keep the

<sup>17</sup> This formula assumes that the “loose” limit above is optimal in the absence of private finance.

<sup>18</sup> Summarized, for instance, in chapter 9 of Tirole (2006).

official under the control of an informative accounting system. By contrast, the literature has focused on gaming by the contractor, which may derive, for example, from the “moral hazard in teams” situation created by unbundling.

## 6. Time shifting and hidden rents

The import of Proposition 3 is that, compared to unbundled contracts, PPPs can increase the transparency of public accounts. However, with this benefit comes a potential countervailing danger, namely, that bundling may make hidden intertemporal transfers possible. Specifically, suppose that a PPP contract is designed so that the contractor gets a date-2 rent that is *invisible* to public accountants at date 1. The contractor will then be willing to settle for a contractual payment *smaller* than its total cost, since it knows that it will recoup the shortfall through the subsequent rent. Notice that there is no mechanism to backload payments in this way under unbundled contracts and so there, in contrast with PPPs, the date-1 contractor would be unwilling to agree to a payment below the investment cost.

“Invisible” rents can result from deliberate omission of contractual specifications, i.e., from “strategically incomplete” contracts. For example, the contract may “neglect” to specify certain obligations on the part of the contractor that will make renegotiation later on necessary to ensure acceptable service. Such renegotiation can then create hold-up rents for the contractor. Alternatively, the contract may assign the contractor control rights whose impact is not reflected in the public accounts. According to Engel et al. (2003, page 6), a case in point was a major public highway construction project in Argentina in the 1990s: the location of the toll booths was left unspecified, allowing the contractor to place them strategically and thereby raise motorists’ costs well above the anticipated level.

Assume that  $x=1$ , so that fixed-price contracts are always feasible. Let us formalize strategic incompleteness in a simple-minded reduced form: incompleteness (which is not publicly observable) creates a date-2 rent  $r=C_H-C_L$  for the contractor, but reduces the public benefit from  $B$  to  $B_L$ . Such incompleteness allows the contractor to break even on a  $C_H$ -project when paid only  $C_L$ . The public official can then exploit the incompleteness to undertake  $C_H$ -projects for her favored groups in place of  $C_L$ -projects for unfavored groups, provided that:

$$\alpha_f B_L > \alpha_u B.$$

Note that such an undesirable substitution is not feasible with unbundled contracts because there the date-1 contractor cannot obtain a date-2 rent.

An implication of this analysis is that PPP contracts need to be carefully reviewed by independent authorities that can expose hidden rent backloading. Of course, introducing such an authority is typically expensive, so that PPPs can be expected to entail higher transaction costs than their unbundled counterparts.<sup>19</sup>

**Proposition 4.** *PPP contracts may allow hidden backloading of contractor profits through strategic incompleteness of contracts.*

## 7. Further research

Our analysis in this paper is only a first step and leaves open many questions. Here are a few issues for further exploration:

- (1) We have left electoral accountability out of our model in order to focus on accounting systems. But obviously in practice public investment is often strongly motivated by the credit that politicians can take for it. As we have noted, the most straightforward model of accountability would not change our conclusions at all. But more elaborate departures (e.g., those described in footnote 16) would be worthwhile exploring.
- (2) Our analysis has focused on “greenfield” projects, and neglects the official’s incentives to invest in such projects rather than maintain existing ones. Such a trade-off will depend both on the nature of the accounting system and on the public credit an official can derive from each activity. We might conjecture that politicians would be biased against maintenance projects, especially if those projects were initiated by others, since performance evaluation would then be subject to a “moral hazard in teams” problem.
- (3) We have focused on taxpayer-financed projects. Although this may be a reasonable approximation for environmental and cultural projects (e.g., parks or museums) or education, many PPPs in practice are largely user-financed (“self-liquidating”). In fact, the mix of financing by taxpayers and users is ordinarily a policy-choice variable: the allocation of the costs for highways, airports,

<sup>19</sup> Unbundling may save on transaction costs in another way: when the uncertainty about date 2 costs resolves, it may be possible to draft simpler (and therefore cheaper) contracts at date 2.

bridges or water-treatment facilities between taxpayers and users is subject to considerable discretion. Of course, this allocation will depend on the same considerations as already mentioned: public sector accounting and public officials' electoral concerns. Strict accounting rules are likely to favor self-liquidating investments. Yet, just as public accountants may be fooled by a public official, so may the beneficiaries of public projects. The Argentinean highway toll booths provide a good example.

- (4) Spending caps can be justified by negative externalities beyond the one considered in this paper (the effect of public spending on future taxpayers). For example, public spending may also constrain future *governments*. Furthermore, future difficulties in repaying public debt can spill over to other states, regions or countries.
- (5) Politicians' incentives to shift liabilities to the future suggest a complementary role for independent agencies. Such agencies (e.g., the World Bank, the General Accounting Office, or the Insitut de Gestion Déléguee in France) can provide *ex ante* advice on best-contracting and best-accounting practices and can analyze performance *ex post* to create public pressure for good overall governance.<sup>20</sup>
- (6) Public accounting is more complicated than the process of simply labeling projects as "high-cost" or "low-cost." For example, governments often try to shift liabilities (e.g., unfunded pensions and future bank bailouts) off the public sector's balance sheet *altogether*. Despite the extensive discussions on fiscal constitutions throughout the world and a voluminous policy literature on constitutional design, there is essentially no analytic analysis of this important issue.

## References

- Bassetto, M., Sargent, T., 2005. Politics and Efficiency of Separating Capital and Ordinary Government Budgets. Federal Reserve Bank of Chicago WP, vol. 07.
- Beetsma, R., Uhlig, H., 1999. An analysis of the stability and growth pact. *The Economic Journal* 109, 546–571.
- Bennett, J., Iossa, E., 2004. Building and Managing Facilities for Public Services. Brunel University and CMPO (University of Bristol) Working Paper.
- Blanchard, O., Giavazzi, 2004. Improving the SGP Through a Proper Accounting of Public Investment. CEPR Discussion Paper N1 4220.
- Calmfors, L., 2005. What remains of the stability pact and what next? report. Swedish Institute for European Policy Studies, vol. 8. <http://www.iies.su.se/~lcalmfor>.
- Canes-Wrone, B., Herron, M., Shotts, K., 2001. Leadership and pandering: a theory of executive policymaking. *American Journal of Political Science* 45, 532–550.
- Dewatripont, M., Seabright, P., 2005. A theory of wasteful public spending projects, ECARES/IDEI, mimeo.
- Engel, E., Fisher, R., Galetovic, A., 2003. Soft Budgets and Highway Franchising, mimeo, Yale University and University of Chile.
- Engel, E., Fisher, R., Galetovic, A., 2006. The Basic Public Finance of Public–Private Partnerships, mimeo.
- Eurostat, 2004. New Decision of Eurostat on Deficit and Debt: Treatment of Public–Private Partnerships. February 11.
- Grossman, G., Helpman, E., 1994. Protection for sale. *American Economic Review* 84, 833–850.
- Hart, O., 2003. Incomplete contracts and public ownership: remarks and an application to public–private partnerships. *The Economic Journal* 113, 69–76.
- IMF, 2005. Government Guarantees and Fiscal Risk, document prepared by the Fiscal Affairs Department. April 1.
- Inman, R., Rubinfeld, D., 1997. Rethinking federalism. *Journal of Economic Perspectives* 11 (4), 43–64.
- Iossa, E., Legros, P., 2004. Auditing and property rights. *Rand Journal of Economics* 35, 356–372.
- Koen, V., van den Noord, P., 2005. Fiscal Gimmickry in Europe: One-off Measures and Creative Accounting. OECD Economic Department Working Papers, vol. 417.
- Laffont, J.J., Martimort, D., 1999. Separation of regulators against collusive behavior. *Rand Journal of Economics* 30, 232–262.
- Laffont, J.J., Tirole, J., 1986. Using cost observation to regulate firms. *Journal of Political Economy* 94, 614–641.
- Laffont, J.J., Tirole, J., 1988. Repeated auctions of incentive contracts, investment and bidding parity, with an application to takeovers. *Rand Journal of Economics* 19, 515–537.
- Laffont, J.J., Tirole, J., 1991. The politics of government decision making: a theory of regulatory capture. *Quarterly Journal of Economics* 106, 1089–1127.
- Laffont, J.J., Tirole, J., 1993. *A Theory of Incentives in Procurement and Regulation*. MIT Press, Cambridge.
- Levin, J., Tadelis, S., 2006. Contracting for Government Services: Theory and Evidence from the U.S. Cities, mimeo.
- Martimort, D., 1999. The life cycle of regulatory agencies: dynamic capture and transaction costs. *Review of Economic Studies* 66, 929–948.
- Martimort, D., Pouyet, J., 2006. Build It or Not: Normative and Positive Theories of Public–Private Partnerships, mimeo, IDEI Toulouse and Ecole Polytechnique.
- Maskin, E., Tirole, J., 2004. The politician and the judge: accountability in government. *American Economic Review* 94, 1034–1054.
- Maskin, E., Tirole, J., 2007. Pandering and Pork-Barrel Politics, mimeo, IAS Princeton, and IDEI Toulouse.
- Milesi-Ferretti, G.M., 2000. Good, Bad or Ugly? On the Effects of Fiscal Rules with Creative Accounting. IMF Working Paper WP/00/172.
- Mintz, J., Smart, M., 2005. Incentives for Public Investment under Fiscal Rules, mimeo, University of Toronto.
- Stein, J., 1989. Efficient capital markets, inefficient firms: a model of myopic corporate behavior. *Quarterly Journal of Economics* 104, 655–669.
- Tirole, J., 2006. *The Theory of Corporate Finance*. Princeton University Press.
- Välilä, T., 2005. How expensive are cost savings? On the economics of public–private partnerships. *European Investment Bank Papers* 10 (1), 94–119.

<sup>20</sup> In the same way that the Congressional Budget Office in the United States estimates the future budgetary impact of legislation, agencies can help warn public accountants and users about the likely impact of PPPs.