

## Soft Budgets and Renegotiations in Public- Private Partnerships: Theory and Evidence

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# SOFT BUDGETS AND RENEGOTIATIONS IN PUBLIC-PRIVATE PARTNERSHIPS: THEORY AND EVIDENCE

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## Abstract

Public-private partnerships (PPPs) are an increasingly popular organizational form of providing public infrastructure. They can increase efficiency and improve resource allocation, yet pervasive contract renegotiations cast doubts on whether they should be preferred over public provision.

Renegotiating a PPP contract allows the present government to extract resources from future governments in exchange for current infrastructure spending by the PPP. This option is not available under public provision. We develop a model that formalizes this idea and predicts that government will use renegotiations to anticipate spending and shift payments to future administrations. Regulating renegotiation procedures so as to avoid opportunistic behavior does not avoid the use of renegotiations to anticipate government spending, changing fiscal accounting rules does.

We analyze data from Chile, Colombia and Peru, comprising 59 highway PPPs and 535 renegotiation processes, to conclude that the evidence is broadly consistent with the predictions of our model. We find that the magnitude of renegotiations is substantial: renegotiations per concession-year average 9.5% of the initial investment in Colombia, 3.6% in Peru and 1.3% in Chile. With concessions that last many decades, this suggests that the magnitude of renegotiations will end up being larger than the initial investment for many concessions, as is already the case for 11 out of the 25 concessions in Colombia. Most of the cost of renegotiations falls on future administrations and in the three countries more than 45% of renegotiations, as measured by volume, occur during the construction phase, which can be interpreted as evidence against incomplete contract models of renegotiations and in favor of our model.

**Keywords:** Build-operate-and-transfer, concessions, lowballing.

**JEL classification:** H21, L51, L91.

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“Cynics suspect that the government remains keen on PFI not because of the efficiencies it allegedly offers but because it allows ministers to perform a useful accounting trick.”

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*The Economist*, July 2, 2009.

## 1 Introduction

It has become common knowledge that governments have used PPPs to build electorally attractive projects, while avoiding budgetary restrictions on public expenditure. In this paper we show that the renegotiations of PPP contracts can also be used for the same purpose, increasing infrastructure investment without a corresponding increase in registered current public spending.

Infrastructure provision via PPPs has become an accepted mechanism for infrastructure provision in many countries. This explains the rise of PPP investment in Europe, from almost zero in 1990 to close to €30 Billion in 2006, before falling by one third in the aftermath of the financial crisis (Engel et al., 2014). When considering low and middle income countries, the numbers rise from approximately US\$20 billion in 1990 to more than US\$160 billion in 2010, with no fall after the financial crisis.<sup>2</sup> PPP investments range from highways, bridges, airports, seaports and tunnels to less conventional prisons, hospitals, schools, sanitation systems, railways, sports arenas and convention centers.

Among the advantages of PPPs is the potential for efficiency gains from packaging in one contract the final design, financing, construction and operation of a project.<sup>3</sup> However, many countries have used PPPs to reduce their measured debt while other countries believe, or act as if they believe, that PPPs provide access to additional sources of finance.<sup>4</sup> There are also political economy arguments for PPPs: for example, some countries avoid the unpopularity of privatizations by transferring state assets to a private party for only a limited time.

The problem is that a successful PPP program must avoid a series of pitfalls that are observed in many countries. In particular, governments should limit contract renegotiations, because they can overturn the efficiency gains of PPPs. This is not easy and many PPP programs are riddled with contract renegotiations.<sup>5</sup>

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<sup>2</sup>Though PPP's in these countries suffered during the previous Asian crisis.

<sup>3</sup>As in Hart (2003), Bentz et al. (2005), Bennett and Iossa (2006), and Martimort and Pouyet (2008). See Engel et al. (2014) for an alternative efficiency argument in favor of PPPs based on better incentives for maintenance.

<sup>4</sup>See Engel et al. (2013) for a critique of this argument.

<sup>5</sup>An early study is Guasch (2004) who considers over a thousand Latin American concessions previous to the year 2000. One of his findings was that over 30% of contracts are renegotiated, and in the case of roads, the fraction is 54.4%. Another finding is that renegotiations often favor the private party: in 62% of cases, tariffs were raised, and in a similar proportion the required investment was reduced. See Guasch et al. (2006a), Guasch et al. (2006b), Guasch et al. (2007) and Guasch et al. (2008) for more on renegotiations and Gómez-Ibañez and Meyer (1993) for an early reference noting

It is clear that in a long term contract it will be necessary to make adjustments in response to changes in demand, quality standards, or for other similar reasons. These adaptations of the contracts require renegotiations, so there is potential for welfare gains.<sup>6,7,8</sup> However, this reasoning does not explain why it is often the case that there are substantial renegotiations in the early stages of the project, and even during construction.<sup>9</sup> In our interpretation, there are incentives to renegotiate. One case is when there are mistakes at the planning stage that the Public Works Authority (PWA) is reluctant to admit publicly, leading to contract renegotiation in very easy terms for the firm.<sup>10</sup>

There is an additional reason for deliberate renegotiations under PPPs, that is unique to this type of infrastructure provision contracts. A characteristic of PPPs is that the project is financed by the private party in a long term contract that may continue for several administrations; by contrast, under public provision the contractual relationship between the builder and the government is short lived, ending after the project is built. Thus under PPPs the private party can offer additional investments whose costs will be paid either by future users or governments. This is an attractive option for the current government because these future costs are not registered as debt in the government's balance sheet. This paper studies the incentives to renegotiation prompted by the possibility of additional public infrastructure investment now, and which will be paid by future users or administrations. This mechanism is present both when availability payments are made by the State (the case of the PFI program in the UK) as well as when user fees are the main sources of revenues for the PPP.

Infrastructure investment is usually popular among politicians because it helps incumbents in reelections. However, governments face budgetary constraints or spending limits, and this gives rise to schemes to have public infrastructure investment that does not appear in the fiscal accounts. In the case of the UK, the Maastricht agreements limiting public investment led to the abandonment of the Ryrie Rules imposed in the early 1980s. These rules required that PPPs be included as public investment, and thus counted against the spending limits.<sup>11</sup> Many other countries have also used PPPs to escape budgetary constraints. In this paper we show that PPP renegotiations can be used to increase spending and escape budgetary constraints, thus helping a government

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that renegotiations are common.

<sup>6</sup>There is scope for corruption in renegotiations of contracts, even when the renegotiation itself is justified.

<sup>7</sup>Note that Present-Value-of-Revenue (PVR) contracts can avoid some renegotiations or at least constrain its bounds Engel et al. (1997). By making it easy for the Public Works Authority (PWA) to buy back a PPP project at a predefined value, it can buy back a contested project and auction it again to a new bidder, with the additional investment. Even if it does not do so, the threat constrains the bounds of the bargaining set.

<sup>8</sup>The tradeoff between the gains from flexibility to adapt a project to changed conditions and the risk of opportunistic renegotiations is examined in Engel et al. (2003), Athias and Saussier (2010).

<sup>9</sup>Cantarelli et al. (2010) is a good reference on the causes of cost overruns in infrastructure projects in general.

<sup>10</sup>These mistakes may range widely, but often include intentionally or unintentionally omitted components of the project. Unintentional omissions are a result of incompetence at the PWA, but there are cases in which the omission is desired by the PWA. This occurs, for example, when the PWA omits components of the project in order to lower its cost and receive the approval from the budgetary authority.

<sup>11</sup>See Engel et al. (2014).

get reelected. We use these results to examine the political-economy use of renegotiations.

Our model starts with the observation that under traditional provision of infrastructure, a company is hired to build a project financed with fiscal funds, and is paid when the project is finished. The fiscal funds must be approved in the budgetary process and are therefore limited. An increase in spending associated to the project requires either a reassignment of budgetary funds or going through the budgetary process. Thus, it is difficult and costly to increase spending on the project

In the case of PPPs there is a difference, because the private party is paid over time and this flow of funds finances the project. Due to deficient accounting standards, changes in the future flows of resources that the firm will receive are not included in the current fiscal balance sheet. Thus, an increase in future user fees, or an extension in the life of a PPP financed by user fees does not require budgetary approval. In countries where availability payments are not included in the balance sheet, governments may increase the value of these future flows. This means that the current government can tie up resources that would have been available to future governments in exchange for current infrastructure spending by the PPP. In essence, in a renegotiation for additional works, the PPP lends to the current government in exchange for these future funds.

Our model leads to four predictions. First, under competitive bidding and renegotiation, firms will make bids that are below costs ('lowballing'). A standard interpretation is that this corresponds to cases of Winner's Curse. However, there is empirical evidence that the extent of lowballing bids is higher under weaker institutional frameworks, where renegotiations are easier, see Athias and Nuñez (2008, 2009). This is consistent with our prediction of a relation between opportunistic renegotiations and lowballing. Second, renegotiations include not only compensation for the low bid, but also additional investment. Third, renegotiations occur early in the PPP contract. Fourth, a large part of the cost of renegotiations falls onto future governments.

Our model has two policy implications. First, requiring competitive auctions for additional investments does not reduce the ability of the government to shift costs onto future administrations via renegotiations. Second, it is necessary to modify current public accounting standards in order to reduce the incentives for socially undesirable renegotiations. The PPP and all its associated obligations, including renegotiations, should be: considered current investment in the government budget; included in the government's balance sheet; and be subject to the same oversight as other budgetary items.

We present evidence from 20 highway concessions in Chile, 25 in Colombia and 14 in Peru. Renegotiations are pervasive and their fiscal cost is important. More than 80% of the concessions were renegotiated at least once. In total there were 58 renegotiations in Chile, 430 in Colombia and 47 in Peru. Renegotiations increased costs by 17% in Chile, 85% in Colombia and 14% in Peru. In each country, more than 45% of the amounts were renegotiated during construction. The average time between the award of a concession and the first renegotiation was 2.7 years in Chile, 0.9 years in Colombia and 1.4 years in Peru. In addition, there is substantial evidence that incumbent

governments shift obligations to future governments, for example, around 60% of renegotiated amounts in Chile will be paid by future administrations.

### **Relation to the literature**

Our paper is related to Maskin and Tirole (2008) who also study PPPs and government spending limits. In their model, a public official selects a project developed and operated by a private contractor. The official's choice among projects is biased by ideology or because of pandering to special interests, and spending limits help to moderate the incentives of the official to understate the cost of his pet projects. In our model, by contrast, the government uses PPP renegotiations to elude the spending limits normally imposed in the budgetary process.

Our paper is also related to the literature on the fiscal impact of PPPs; see Hemming (2006); Hemming and Staff (2008) and Irwin (2007). We add to this discussion by showing that one motivation of renegotiations in PPPs stems from them being excluded from the normal budgetary process and government balance sheet. There is still no agreement on whether and how to include PPPs in the public accounts and in the government's balance sheet; see, for example, Heald (1997), Grimsey and Lewis (2002) and Donaghue (2002). Our conclusion is that renegotiated amounts should be included as current spending in the government budget and subject to the same treatment as government investment.

We also add to the literature of renegotiations of PPPs by analyzing the ex ante electoral motivation for PPP renegotiations and their efficiency and fiscal implications. Guasch et al. (2006a,b, 2007) develop a model of government-led renegotiation with electoral concerns, but study the incentives to renegotiate of a new government in the aftermath of the election that brought it to power. Further contributions to the literature on renegotiations in PPPs include Guasch (2004), who analyzed more than 1.000 concession contracts in Latin America; Guasch et al. (2006a), who developed a theory of the determinants of renegotiations; Guasch et al. (2008) who applied the theory to an empirical study of renegotiations in transport and water in Latin America; Chong et al. (2006) and Athias and Saussier (2010), who analyzed the tradeoff between opportunism and renegotiation; Guasch and Straub (2009), who analyze the link between corruption and renegotiations; Brux (2010) who discusses efficient renegotiations as part of ongoing long-term relationships and Estache et al. (2009) who argue that incorporating social criteria when designing PPP auctions increases the probability of renegotiations .

The remainder of the paper is organized as follows. Section 2 describes the theoretical model and obtains the main results, the next section describes the implications for fiscal accounting, the fourth section describes the evidence arising from a database of renegotiations of PPPs in Chile, Colombia and Peru. The final section concludes.

## 2 A simple model of renegotiations

### 2.1 Basic set up

The model has two periods. At the end of the first period there is an election to change or keep the current administration. Social welfare depends on infrastructure services and we assume a zero discount rate so social welfare is the sum of per period utility of a representative household:

$$\mathcal{U} = u(I_1) + u(I_2), \quad (1)$$

where  $I_t$  denotes infrastructure services in period  $t$  and  $u$  is strictly increasing and strictly concave. Infrastructure lasts for a single period, the cost of a unit of infrastructure is \$1 and there are no costs of operation. The construction industry and the PPP industry are competitive.

Taxes in period  $t$  are denoted  $T_t$  and are exogenous. The intertemporal budget must be balanced:

$$T_1 + T_2 = 1 = I_1 + I_2. \quad (2)$$

Maximizing social welfare subject to the budget constraint leads to the following result.

**Result 1** *Socially optimal investment in periods 1 and 2, denoted  $I_1^s$  and  $I_2^s$ , maximizes (1) subject to (2). It follows that  $I_1^s$  is characterized by  $u'(I_1^s) = u'(1 - I_1^s)$  and  $I_1^s = I_2^s = \frac{1}{2}$ .*

Congress wants to maximize social welfare (1) and can impose a spending cap  $\bar{I}_1$ .<sup>12</sup> The government can issue debt in period 1, constrained by (2) and the spending cap imposed by Congress. The incumbent executive has a reelection concern: if  $p$  is the probability of reelection, her payoff is

$$\mathcal{G}(I_1, I_2) = u(I_1) + p(I_1)u(I_2), \quad (3)$$

where  $p$  is strictly increasing and strictly concave, and  $u > 0$ , so that  $p(I_1)u(I_2)$  is increasing in  $I_1$  for any fixed value of  $I_2$ . Note that the incumbent's preferences coincide with social welfare in period 1, but that she values period's 2 welfare only when in power.

What is the rationale for the incumbent's objective function (3)? The probability of reelection may increase with infrastructure spending because voters are irrational and prefer investments now, before the election.<sup>13</sup> An alternative interpretation comes from the political economy literature. Hillman (1982) suggests that governments choose policies by balancing the political

<sup>12</sup>The assumption that Congress' and society's interests coincide seems contrary to experience. It is based on the fact that in Congress there is an opposition party that reacts against increased (federal) spending with reelection purposes, whereas the executive has no corresponding opposition. The power of the purse is the main source of power of Congress in democratic societies, and it is active only in opposition to government. Our point is that Congress' oversight on electoral spending tends to reduce excesses, though it is probably still not optimal. In this sense, our simplification is analogous to assuming that the less risk averse party in a standard principal-agent problem is risk neutral.

<sup>13</sup>Cadot et al. (2006) present a model of pork-barrel infrastructure spending where future voters are not represented in the current election

benefits of support from industry (through campaign contributions) against the dissatisfaction of consumers from inefficient investments. Higher industry profits are exchanged in return for political contributions, which raises the probability of reelection, but also increases the welfare loss and, therefore, the dissatisfaction of voters. Thus, governments trade off the benefits from campaign contributions against voter dissatisfaction that reduces their election possibilities. In our model, it is straightforward to see that in a neighborhood of  $I_1^s = \frac{1}{2}$  the welfare loss to consumers from increasing investment in period 1 will be second order while the benefit for the incumbent of increased political support is first order; it follows that  $I_1$  will be larger than  $I_1^s$  in equilibrium.

### 2.1.1 Conventional provision vs. public-private partnerships

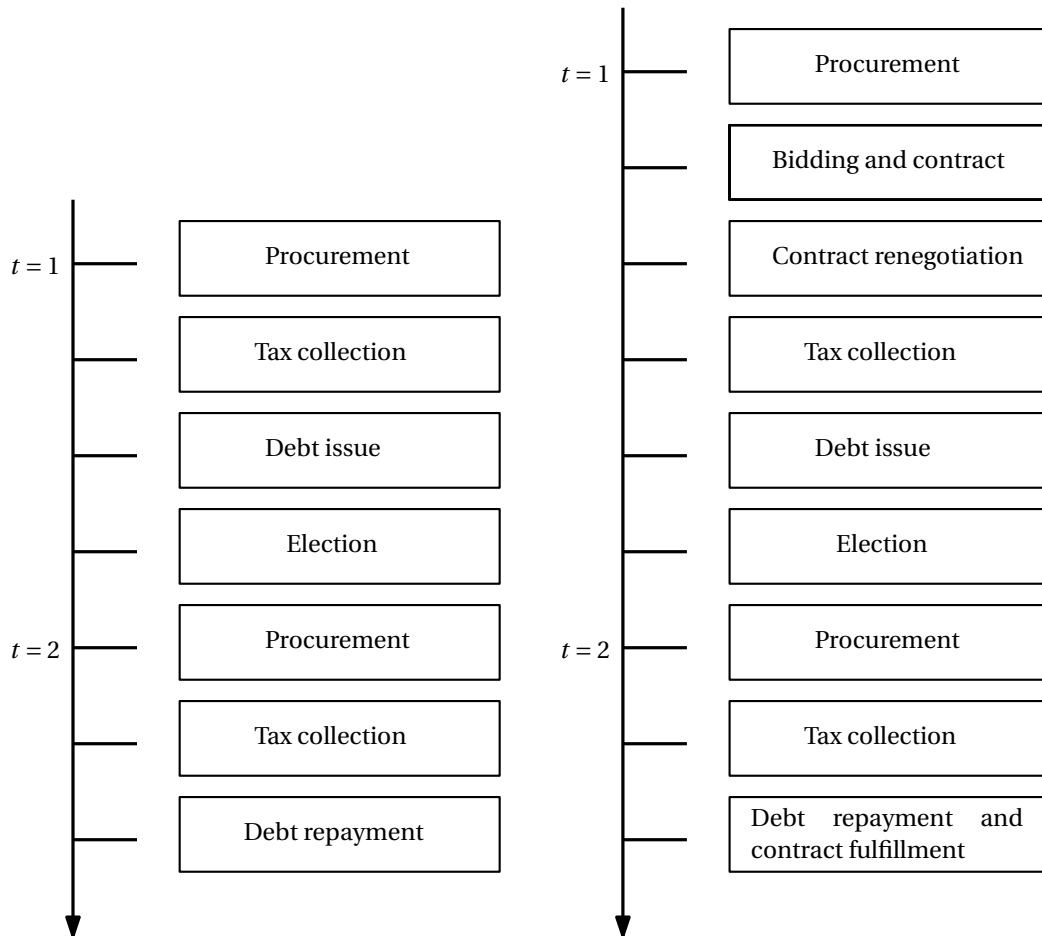


Figure 1: Timing of the two cases. Traditional procurement (left), PPP (right).

The model considers two alternative ways of procuring infrastructure: conventional provision and public-private partnerships. In both cases Congress grants an authorization to the government to spend at most  $\bar{I}_1 = I_1^s = \frac{1}{2}$  in period 1 (see Figure 1 for a time-line). This constraint can



be interpreted in two ways. In the first interpretation, the services of infrastructure provided in period 1 cannot exceed  $I_1 = \frac{1}{2}$ , this is the “services limit” interpretation. In the second interpretation, actual expenditures on infrastructure in period 1 cannot exceed  $\frac{1}{2}$ , this is the “expenditure limit” interpretation. Both interpretations are not equivalent when the infrastructure contracted in period 1 is partly paid for in period 2, as will be the case under PPPs. Nevertheless the insights and results we derive below hold, with minor modifications, for both cases.

The specifics of expenditure oversight vary from country to country. In some countries infrastructure projects must pass a social cost-benefit evaluation. In other countries, PPP projects must pass a value-for-money test which compares costs with conventional provision.<sup>14</sup> In these cases the “services limit” interpretation for the spending cap is appropriate. Yet in other countries the public works authority faces spending limits imposed and enforced by the finance authority and the “expenditure limit” interpretation applies.

Following Maskin and Tirole (2008) we assume that PPPs make hidden intertemporal transfers possible. That is, because PPPs bundle finance with construction and operation, the government can make a credible promise to repay in the future for infrastructure that firms build in the present. Furthermore, these promises do not enter budgetary discussion until the period they are disbursed. By contrast, there is no mechanism available to backload payments under conventional provision.

Governments can backload payments under PPPs in a variety of ways other than the one considered in our model. For example, the government can extend the duration of the concession contract, raise future user fees, offer additional revenue guarantees, promise an increase in future subsidies, or lower the quality standards required of the firm. In all these cases the incumbent transfers resources from future administrations and users to the concessionaire, and circumvents budgetary controls.

**Conventional provision** As mentioned above, Congress allows the government an expenditure of at most  $I_1^s = \frac{1}{2}$ , a limit that cannot be exceeded, because there are no mechanisms to transfer resources intertemporally without congressional approval. There is procurement to an amount  $I_1 = \frac{1}{2}$  from construction companies (here competition ensures that investment is comparable). If  $\frac{1}{2} > T_1$ , the government issues debt of an amount  $D = \frac{1}{2} - T_1$ . This means that  $I_2 = T_2 - D$ , since the intertemporal budget constraint always holds. Since period 2 spending in the optimal case is  $I_2 = \frac{1}{2}$ , we have that  $T_2 = \frac{1}{2} + D$ . This means that in this case there is no mechanism to shift spending between periods, and the government cannot achieve its desired spending pattern. Note also that an alternative way for Congress to control spending is by putting a limit of  $\frac{1}{2} - T_1$  on the issuance of public debt in period 1.

**Public-private partnerships** In this case, the private firm does not only build the infrastructure project, but it also operates and finances the project. The firm makes a bid for a payment of  $B$  (over

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<sup>14</sup>There is anecdotal evidence that PPP units understate costs to meet the test.

the two periods) in order to build infrastructure to the amount  $\frac{1}{2}$ , which is all that Congress allows. Given the expenditure limits enforced by Congress,  $B \leq \frac{1}{2}$ .

Assume now that the contract is renegotiated before period 2, in order to increase infrastructure investment by the amount  $W$ , in exchange for an additional amount  $R$  to be paid in period 2 to the private firm. The new contract specifies  $W$  in additional investment (to  $\frac{1}{2} + W$ ) in exchange for increased payments, to be paid in the second period. Total payment is  $B + R$ . Thus, the agreement involves an intertemporal obligation that has not been approved by Congress and that can be used to exceed the expenditure limits.<sup>15</sup> We show later how to determine the values of  $B$ ,  $R$  and  $W$  in equilibrium.

## 2.2 Soft budgets and renegotiations

We now show that an incumbent can exploit PPPs to anticipate spending. First we show that an unconstrained incumbent would like to spend more than what Congress allows under conventional provision. Next we show that the incumbent can use renegotiations to attain her optimum.

### 2.2.1 The unconstrained government

Assume a government constrained only by (2). Then the incumbent sets  $I_1$  to satisfy the necessary FOC

$$\frac{d\mathcal{G}(I_1, 1 - I_1)}{dI_1} = u'(I_1^*) - p(I_1^*)u'(1 - I_1^*) + p'(I_1^*)u(1 - I_1^*) = 0, \quad (4)$$

with SOC

$$\frac{d^2\mathcal{G}}{dI_1^2} = u''(I_1^*) + p(I_1^*)u''(1 - I_1^*) - 2p'(I_1^*)u'(1 - I_1^*) + p''(I_1^*)u(1 - I_1^*) < 0,$$

since  $u$  and  $p$  are concave and increasing, and  $u > 0$ .

We now show that  $I_1^* > \frac{1}{2}$ . To begin, assume that  $p' = p'' = 0$ , that is, there is a fixed probability of reelection  $p \in [0, 1]$ . Denote the corresponding optimal investment in infrastructure during period 1 by  $I_1^p$ . The FOC simplifies to

$$u'(I_1^p) - pu'(1 - I_1^p) = 0.$$

Result 1 corresponds to the case where  $p = 1$ . Implicit differentiation of the FOC shows that

$$\frac{dI_1^p}{dp} = \frac{u'(1 - I_1^p)}{u''(I_1^p) + pu''(1 - I_1^p)} < 0.$$

Hence,  $I_1^p > I_1^s = \frac{1}{2}$  for  $p < 1$ . This result is well known (Alesina and Tabellini, 1990): the

<sup>15</sup>It is possible to control these underhand fiscal loans, but they require an overhaul of the fiscal accounts system, so that these hidden obligations are revealed.

incumbent tends to anticipate spending because future infrastructure spending is discounted by more than the social discount factor.

We define  $p^{\text{eq}}$  as the fixed probability such that the incumbent would optimally choose to spend  $I_1^*$ , that is

$$u'(I_1^*) \equiv p^{\text{eq}}u'(1 - I_1^*).$$

Now from the FOC (4) we have

$$u'(I_1^*) = p(I_1^*)u'(1 - I_1^*) - p'(I_1^*)u(1 - I_1^*).$$

It follows that

$$p^{\text{eq}} = p(I_1^*) - p'(I_1^*) \frac{u(1 - I_1^*)}{u'(1 - I_1^*)} < p(I_1^*).$$

Defining  $I_1^{p^*}$  as optimal government expenditure for a government with constant  $p$  equal to  $p(I_1^*)$  and recalling that  $I_1^s = \frac{1}{2}$  denotes socially optimal government expenditure we then have  $I_1^* > I_1^{p^*} > I_1^s = \frac{1}{2}$ .

Thus, there are two reasons why the current government wants to anticipate spending. First, the coalition may not be in office in the future:  $p < 1$  acts as a discount rate that discounts future utility more than is socially desirable. Second, more spending today increases the probability of reelection. Hence, the government's expenditure not only depends on its probability of being re-elected,  $p(I_1^*)$ , but also on how responsive this probability is to changes in expenditures. A more responsive probability leads to higher expenditures, even when the actual probability of being re-elected remains unchanged.

### 2.2.2 Implementing the incumbent's optimum via renegotiation

We show that using renegotiations, the government is able to achieve its desired allocation of infrastructure investment. There are two things to consider here. First, the bargaining power of each party. Second, the degree of lowballing of the winning bidder. This subsection builds up to Result 2, where we show that, independently of the bargaining power of the parties, the government can always obtain its chosen allocation.

The intuition for this is that as the firm obtains more bargaining power, the competition to be the firm that builds the infrastructure project becomes more intense (in the expectation of profitable renegotiation), increasing the extent of lowballing. In turn, lowballing implies that there are period 1 ex post free funds that the government can use, apart from any reallocation due to the possibility of the PPP firm "lending" resources to the government to increase first period investment.

We assume that the government, following the spending cap set by congress, auctions a PPP contract with period 1 investment  $I_1 = \frac{1}{2}$  and obtains a bid  $B$  for the contract. Nevertheless,

renegotiation leads to additional spending  $W$  in period 1 and an additional payment  $R$  in period 2. Hence total investment in period 1 is  $\frac{1}{2} + W$  and second period investment is  $1 - (B + R)$ . The utility of the incumbent then is:

$$u(\frac{1}{2} + W) + p(\frac{1}{2} + W)u(1 - (B + R)).$$

At the renegotiation the concessionaire obtains rent  $R - W$  where the markup depends on its bargaining power. We assume that all firms have identical bargaining power. Then, an increase in the rent, due to reduced bargaining power by the incumbent, increases lowballing, because of competition among firms. Denote the extent of lowballing by  $L = \frac{1}{2} - B$ . By competition, we have that total spending commitments by government for period 1 investment,  $B + R$ , must equal total infrastructure provided that period,  $\frac{1}{2} + W$ :

$$B + R = \frac{1}{2} + W, \tag{5}$$

or equivalently

$$R = L + W. \tag{6}$$

Note that the effect is that in equilibrium with competition for the PPP, bidders lowball in period 1 by the extent they will gain in the renegotiation process in period 2.

The important point is that the transfer implicit in the lowballing is a free transfer to the incumbent, which can use it to increase its spending in the first period, without it being at stake in the renegotiation process. Under the assumptions of efficient bargaining and competition, this is sufficient to achieve the desired first period investment by the incumbent.

We show next that even when the concessionaire has all the bargaining power, the incumbent can achieve its desired spending.

**Private party has all the bargaining power** Since in this case the government does not obtain any additional utility by renegotiation (because it is all appropriated by the firm), renegotiations keeps its pre-renegotiation utility constant. However, this utility includes the resources saved by lowballing, which means that there are free second period resources. The incumbent's utility of no renegotiation is  $u(\frac{1}{2}) + p(\frac{1}{2})u(\frac{1}{2} + L)$ , where the additional second period resources are due to the fact that the first period expenditure cost is less than  $\frac{1}{2}$ . Thus the problem for the winning bidder –after being awarded the contract by lowballing  $L$ – is to maximize its profits by renegotiation, under this constraint:

$$\begin{aligned} \max_{\{W,R\}} R - W & \tag{7} \\ \text{s.t. } u(\frac{1}{2} + W) + p(\frac{1}{2} + W)u(\frac{1}{2} + L - R) &= u(\frac{1}{2}) + p(\frac{1}{2})u(\frac{1}{2} + L). \end{aligned}$$

We take the first order conditions of this problem and then impose the no rents constraint (5) to obtain

$$u'(\frac{1}{2} + W) - p(\frac{1}{2} + W)u'(\frac{1}{2} - W) + p'(\frac{1}{2} + W)u(\frac{1}{2} - W) = 0$$

which is identical to (4)! Thus, even when the firm has all the bargaining power, the incumbent can use renegotiations to achieve its desired allocation of expenditure.

Note that in this setting we get cost overruns, because the firm makes an offer that is below costs, but this is not inadvertent, but endogenous to the model. The renegotiated amount  $R$  to be paid in the second period includes an amount to compensate the firm for its lowballing in its period 1 winning bid  $B$ .

**Government has all the bargaining power** In the case in which the incumbent has all the negotiating power, there is no lowballing, since firms know that they will not be able to raise their profits through renegotiation. In that case, renegotiation takes place, but the cost of the additional works  $W$  is equal to period 2 repayment  $R$  and we have a straightforward case of government attaining its preferred allocation of infrastructure investment by maximization of its utility.

One way of giving all bargaining power to the government is by a Congressional mandate that all additional works in renegotiation should be awarded by the concessionaire to the winner of an open auction for these additional works. In this case, there are no profits to the concessionaire even though it pays for the works in the first period (and is receives the compensation in the second period). There will be no lowballing, but the ability of the concessionaire to “lend” to the incumbent means that the incumbent is able to attain its desired allocation of investment.

**General case** When considering the general case, where both the government and the firm have bargaining power during the renegotiation, the intuition is similar to what we discussed in the case where the firm has all the bargaining power. The firm lowballs in the expectation of recovering the first period deficit with the renegotiation rents. The proof of the result is complicated by the fact that the firm and government measure their utility in different units, and we present it in the appendix. Here we state the result.

**Result 2** *Assuming a competitive auction for  $I_1 = \frac{1}{2}$  and efficient bargaining during the renegotiation that follows, in equilibrium the incumbent uses the renegotiation to implement her optimum, regardless of the distribution of bargaining power. The firm lowballs in the initial auction by  $L$  that solves*

$$u(I_1^*) + p(I_1^*)u(1 - I_1^*) = u(\frac{1}{2}) + p(\frac{1}{2})u(\frac{1}{2} + \frac{L}{\alpha}), \quad (8)$$

where  $\alpha \in [0, 1]$  denotes the firm’s share of surplus. It follows that  $L$  is increasing in  $\alpha$  with  $L(0) = 0$ . As long as the firm has some bargaining power ( $\alpha > 0$ ), additional spending contracted during the renegotiation is used both to pay for the new infrastructure and to compensate lowballing in the auction.

**Proof** See Appendix A. ■

### 2.2.3 Discussion

It follows from Result 2 that the division of the ex post surplus, and therefore, the ex post rent made by the concessionaire depends on his bargaining power,  $\alpha$ . Nevertheless, our assumption of ex ante competition in the auction implies that the concessionaire will not earn rents overall, as any ex post rent compensates for ex ante lowballing.

This has an interesting implication: suppose Congress makes it a law that additional works must be awarded by competitive auction, thus ensuring a competitive price  $W$  for these additional works. This procedure does not prevent spending anticipation: its only effect is to prevent lowballing in the initial auction. By imposing no rents during the renegotiation, Congress shifts all bargaining power to the government during the renegotiation. Nevertheless, as shown above, the government can still attain its preferred spending pattern, since the additional expenditure on infrastructure is paid for in period 2 and therefore is not subject to the spending constraint imposed by Congress in period 1.

Second, note that with PPP contracts the initial bid for the project is  $B = \frac{1}{2} - L$ , at a net loss of  $L$  for the firm, while the amount paid by the government in the renegotiation equals  $L + W$ , for infrastructure that is worth  $W$ . Thus, if  $\alpha > 0$ , the results of the renegotiation includes additional compensation for the works originally contracted as well as for additional works not contemplated in the original contract. In other words, “cost overruns,” which are often cited in practice as the reason for renegotiating, are brought about endogenously, by initial lowballing.

Third, lowballing implies  $B < \frac{1}{2}$  whenever  $\alpha > 0$ . Hence, the government is left with a first period surplus that can be used to pay for the results of renegotiation. Thus, some of the additional compensation of the concessionaire is paid from the current budget.

Fourth, observe that renegotiations are an effective means of anticipating spending only if a significant part of the amounts renegotiated are not paid by the current administration. This is the main prediction of the model.<sup>16</sup> The future administration has  $\frac{1}{2} - W$  to spend in period 2 instead of the socially optimal  $\frac{1}{2}$ .

We note that we have assumed that the value of the infrastructure auctioned originally equals the spending limit imposed by Congress:  $I_1 = \frac{1}{2}$ . This is one of many possible auctions that lead, after renegotiation, to the incumbent’s optimal infrastructure level  $I_1^*$ . For example, when the spending cap is interpreted as a limit on expenditures, it is feasible to have  $I_1 > \frac{1}{2}$ , coupled to a winning bid  $B$  that does not exceed the spending cap  $\frac{1}{2}$ .<sup>17</sup>

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<sup>16</sup>As we have mentioned before, there is a difference between this result and having additional first period spending by selling bonds or borrowing in the market: in the case of PPPs, the lender is the firm and there is no oversight of the additional spending.

<sup>17</sup>Result 2 applies to the case where  $I_1 < \frac{1}{2}$  as well. In this case, the firm lowballs by including additional works (above  $\frac{1}{2}$ ) initially, but charges less than  $\frac{1}{2}$  for it. Defining  $L(I_1)$  in a manner analogous to what we did for  $I_1 = \frac{1}{2}$ , we have that as long as  $I_1 - L(I_1) \leq \frac{1}{2}$  the spending limit for period 1 won’t be exceeded and the renegotiation achieves

Summing up, the model developed in this section has various testable implications. First, anticipating future renegotiations, firms lowball in their bids for a PPP. Second, governments include additional works during the renegotiation process. Third, renegotiation can occur early on, even before construction is completed. Fourth, a significant part of the cost of renegotiation is passed onto future administrations (or users, in the case of user fee revenue).

### 3 Accounting for PPPs

Spending anticipation is not inherent to PPPs. Indeed, conventional provision and PPPs share the same information structure, and have insignificant differences as far as delegation is concerned—both delegate infrastructure procurement in a government agency which reports directly to the executive, rather than to an independent supervisory body. The difference is due to defective accounting standards, which interact with two specific aspects of PPPs.

The first characteristic is that PPPs bundle finance, construction and operation into one contract, which allows the incumbent to renegotiate all dimensions of the contract with the concessionaire simultaneously. The second characteristic is that PPP laws and regulations impose constraints mainly (in many countries only) on the original PPP contract. As we already mentioned, some countries may require that PPPs pass a social cost-benefit analysis; others require PPPs to pass a value-for-money test. These requirements are intended to limit spending by the government (i.e., they set  $I_1$  to the optimal social value  $I_1^s$ ), yet in practice the incumbent can renegotiate the original contract in order to increase spending to  $I_1^* > I_1^s$ , as described in our model.

This problem of socially undesirable spending anticipation has a straightforward solution that can be implemented within existing budgetary practices: the government should count any infrastructure procured via PPPs as current investment.

To see why this solves the problem, we return to our model. Under the proposed solution,  $B+R$  will be registered as government infrastructure spending in period 1, and the government's net borrowing will appear to be  $B+R-T_1$ . Thus a cap on total spending  $B+R$ , or on net borrowing equal to  $I_1^s - T_1$  would lead to  $B+R \leq I_1^s$ . In other words, the reformulated cap forces the government to cut other investments if it wishes to renegotiate.<sup>18</sup>

The above digression is closely related to the issue of fiscal accounting of PPPs. Should the assets held by a PPP be classified as owned by the concessionaire or the government?

The solution Eurostat (2004, 2010, 2014) found was to base the decision primarily on the risks that the private party has to bear. This approach seems to have been a compromise between the forces pushing for the exclusion of PPPs altogether and those that found that it was an unsound

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the incumbent's optimum. The resulting function  $L(I_1)$  is decreasing in  $I_1$ . Thus, independent of how we interpret the spending cap imposed by Congress, the incumbent uses renegotiations to circumvent the spending caps and achieve her optimum.

<sup>18</sup>Engel et al. (2013) show that optimal budgetary accounting of PPPs requires that they appear as a deficit item upfront, independent of whether the source of payments is the public budget or revenues generated by the project.

fiscal policy, as events would show in the aftermath of the world financial crisis of 2008. In the latest version of these guidelines (Eurostat, 2014), the decision on whether to classify a particular PPP project as belonging on or off balance sheet is based on the answer to 84 yes-no questions divided into 11 sections. For example, question 70 asks “does the (private) partner bear the construction risk and at least one of either the availability or the demand risks?”. If the answer is ‘no’, the asset is classified on the government’s balance sheet. If the answer is ‘yes’, additional conditions must be met for the asset to be kept off the government’s balance sheet. In particular, there should be no mechanism, such as a government guarantee or early termination provisions, that transfers the risks back to government.

Eurostat guidelines do little to avoid the use of PPPs to anticipate spending via renegotiations, as their main focus is on risk sharing, not on their budgetary implications. Donaghue (2002, p. 9) shows that the conventional approach has been to classify assets as owned by the concessionaire during the term of the concession. Nonetheless there are some noteworthy exceptions. In the 1980s the so called ‘Ryrie Rules’ applied in the UK, requiring that private finance of public infrastructure could only be used if public expenditure was reduced by the same amount. Another exception is the auditor-general of New South Wales in Australia, who determined that the asset and liabilities of privately financed bulk-water treatment plants belonged to the public sector’s balance sheet.<sup>19</sup>

A related important advance towards a sounder policy is the gradual incorporation of contingent obligations associated to PPPs into the fiscal accounts. Recently, Eurostat has established a separate set of accounts for contingent liabilities.<sup>20</sup> Some Latin American countries (Chile, Colombia) have gone beyond this by applying standard financial tools to put a value on these liabilities.

## 4 Evidence from the Chile, Colombia and Peru

In this section we report on the evidence for the hypothesis presented in this paper. We begin with examples that illustrate how the Chilean government has used renegotiations to circumvent Congressional approval for increased expenditures.

### 4.1 Two examples

**The rainwater collectors** In 2001 there was flooding in Santiago, which led to political pressures on the government to invest in main collectors that would drain the rain waters from flood-prone areas. Since the government was unwilling to obtain the necessary resources from the budget or through increased indebtedness, it decided to renegotiate the contracts of the urban highways scheduled for construction so that they would build the drains. The sums involved were

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<sup>19</sup>Harris (1998), cited in Irwin (2007, p. 113)

<sup>20</sup>See “Supplement on contingent liabilities and potential obligations to the EDP related questionnaire”, Eurostat, 22, July 2013.



in the hundreds of millions of dollars and required changes to the contracts of three urban concessions during the construction phase. The initial payments for the additional works were scheduled to begin several years in the future.

**The San Antonio Bypass** The main port of Chile was hampered by the fact that trucks had to go through the city of San Antonio to reach the port. The government decided to add a special access route to the port that bypassed the city. There were three options to finance the project: i) to fund it with fiscal resources, ii) through an independent self-financed tolled concession or iii) as a non-tolled extension to the Route 78 PPP, from Santiago to San Antonio. The then President had promised the city, while a candidate, that he would not impose a toll on the proposed access. Even though the government had ample access to the international credit markets, it decided to renegotiate the contract, valuing the 8 km project at around US\$ 45 million. The payment consisted in a substantial increase in tolls, and a further increase in 2012. It is not clear whether the expected revenue from increased tolls corresponds to the value of the project.

## 4.2 Concession programs

**Chile** As mentioned in the Introduction, the Chilean concession program is considered among a handful of well established PPP programs (Hemming, 2005). Detailed data on concession contracts are available on the webpage of the Ministry of Public Works (MOP by its Spanish acronym) and the quality of fiscal accounting can be described as at par with average OECD levels.<sup>21</sup> Also, Chile probably was the first country to post all the information on renegotiations (in 2007). Most developed countries still do not make this information readily accessible.

Chilean public infrastructure PPPs were launched in 1993 with the El Melón tunnel concession. Between 1993 and 2006, MOP awarded 50 PPPs: 26 roads, 10 airports, three jails, two water reservoirs, five public transportation infrastructure projects and four other miscellaneous projects. At the time, roads represented 89% of the \$11.3 billion invested in PPPs.

By 2014 there were three major hospitals, plus seven additional roads under construction, in addition to other large infrastructure projects (part II of the underground urban highway Américo Vespucio Oriente in Santiago and the renewal of the Santiago Airport PPP) that were planned to be auctioned in the near future. Also, most Chilean seaports are managed under PPPs.

**Colombia** In Colombia, PPPs in public infrastructure began in 1993, and by 2012, approximately 32% of its road network was under PPP contracts (Institute, 12). By 2012, the government had signed 48 PPP contracts in the transport sector, and local authorities are also involved in PPPs. There were serious problems with the first PPPs, leading to changes in the rules and new “genera-

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<sup>21</sup>Significant improvements in fiscal accounting are possible in all OECD countries nonetheless. See Chapter 6.1 in Engel et al. (2014).

tions” of PPPs. There have been four “generations” of PPPs altogether, and by the last installment (in 2012), the legal environment for PPPs in Colombia was much improved (Bitran et al., 2013).

The first PPPs were not a success. The lack of road shows for international investors and the short preparation times meant that only local firms could participate. Moreover, seven of thirteen projects were awarded directly, without an auction. Among many other problems there were no detailed designs of the roads, so it was difficult to plan the eminent domain purchases for the roads, which caused long delays. Successive “generations” of PPPs improved on previous mistakes and the current fourth generation is under way. The main public infrastructure PPPs are roads, of which 25 had been awarded up to December 2010, for a total contract value of USD 6.5 billion and 4,800 km (Bitran et al., 2013). Currently, there are 48 extant PPP projects in roads (Institute, 12).

**Peru** Peru’s PPP program in public infrastructure is more recent than those of Chile and Colombia. Though the initial legislation dates from 1991, only one road was concessioned during the 90’s. That PPP was renegotiated several times during its 13 year duration. A new start in PPP began in 2001, with the concession of Lima’s airport. Thus the program only really got going after that date. In 2008 a new law modernized and added flexibility to Peruvian PPPs in public infrastructure. The new law allowed contracts where concessionaires had no “skin in the game” (neither equity nor long term debt) so that the government assumed all the risk (construction, demand, etc.). By 2010 there were 15 road PPPs, with a total initial value of \$2.3 billion, i.e., it was still a relatively small program in comparison to Chile and Colombia.

### 4.3 Data on renegotiations

Table 1 provides some basic information on road PPPs in the three countries. We first describe these facts and then contrast them with the implications of our model.

Rows 1-7 provide descriptive statistics for the highway concession programs in Chile, Colombia and Peru. Initial investments are similar, on average, with amount close to 200 million dollars (row 1). The main source of differences stems from Peru’s concession program being much younger: the mean number of concession years elapsed is 3.8 for Peru compared with 12.7 for Chile and 9.0 for Colombia.

#### 4.3.1 Extensive and intensive margins

Rows 8-13 provide statistics on the number of renegotiations. Renegotiations are pervasive in all countries under consideration. The fraction of concessions contract that have been renegotiated is 71% in Peru, 84% in Colombia and 85% in Chile (row 8). Most concession contracts have been renegotiated more than once (row 10): with an average of close to 3 renegotiations per concession in the case of Chile and Peru and close to 17 renegotiations in Colombia. A significant fraction of renegotiations take place during construction (row 11): 50 percent of concession contracts in Peru

Table 1: Characteristics of renegotiations in each country

	Chile	Colombia	Peru
<i>Descriptive statistics on concession programs</i>			
1 Number of road concessions <sup>1</sup>	20	25	14
2 Average initial investment (2009 MM USD) <sup>2</sup>	256.8	263.2	166.3
3 Mean length of highway (kms)	118.9	194.8	383.4
4 Average term length (years)	25.4	16.7	23.2
5 Mean concession years elapsed	12.7	9.0	3.8
6 Mean concession years elapsed during construction	4	3.4	3.0
7 Mean concession years elapsed during operation	8.7	5.6	0.8
<i>Statistics on number of renegotiations</i>			
8 Number of concessions with renegotiations	17	21	10
9 Total number of renegotiations	58	430	47
10 Average number of renegotiations per concession	2.9	17.2	3.4
11 Number of concessions with renegotiations during construction	14	21	7
12 Total number of renegotiations during construction	31	218	33
13 Average number of renegotiations per concession during construction	1.6	8.7	2.4
<i>Statistics on amounts renegotiated</i>			
14 Average amount renegotiated (2009 MM USD) <sup>3</sup>	42.5	224.1	22.7
15 Average amount renegotiated/Average initial investment (%)	16.5	85.1	13.7
16 Avge. amount renegotiated per renegotiation (2009 MM USD)	14.7	13.0	6.8
17 Avge. amount renegotiated per renegotiation/Avge. initial inv. (%)	0.45	0.55	1.08
18 Avge. amount renegotiated/([avge. init. inv.]x[concession-yr]) (%)	1.3	9.5	3.6
19 Avge. fraction of inv. renegotiated per concession year, weighted (%)	1.4	16.5	3.6
20 Average time to first renegotiation (years from award) <sup>4</sup>	2.7	0.9	1.4
21 Average term increase due to renegotiations (yrs)	0.9	5.3	0.1
<i>Statistics on amounts renegotiated during construction</i>			
22 Average amount renegotiated during construction (2009 MM USD)	19.2	108.8	15.0
23 Avge. amount renegot. during constr./Avge. initial inv. (%)	7.5	41.3	9.0
24 Avge. renege. during constr./([avge. init. inv.]x[concess.-constr.-yr]) (%) <sup>5</sup>	1.9	12.2	3.0
25 Avge. fract. init. inv. renegot. during constr. per yr., weighted (%) <sup>5</sup>	1.9	18.5	3.0
26 Avge. fract. init. inv. renegot. during operation per year, weighted (%)	1.1	14.9	5.8
27 Amount renegot. during constr./Total amount renegot. (%)	45.2	48.6	66.1

Source: Bitran et al. (2013) and the corresponding database, which covers data from the 1993 to 2010.

<sup>1</sup>Only those with all data, leaves out one concession in Chile and one in Peru.

<sup>2</sup>Unless indicated otherwise, averages and sums consider all concessions, not only those with renegotiations.

<sup>3</sup>Considers only fiscal cost because of data limitations. Information on additional costs is available for Chile, leading to 59.0.

<sup>4</sup>Considers only concessions with renegotiations.

<sup>5</sup>Assumes 4 years for construction period, or less if reported length of concession is less.

were renegotiated before becoming operational, 70 percent in Chile and 84 percent in Colombia. Many concession contracts were renegotiated on multiple occasions during the construction phase (row 13) with an remarkable 8.7 renegotiations on average in the case of Colombia.

Rows 14-21 provide statistics that are useful to gauge the magnitude of renegotiations (the intensive margin). The total amount renegotiated is equal to 13.7, 16.5 and 85.1 percent of initial investments for Peru, Chile and Colombia, respectively (row 15).

#### **4.3.2 Standardized comparisons**

The above numbers can be misleading when comparing the importance of renegotiations across countries, since they will be larger for countries with older concessions programs even if renegotiation rates are the same. For this reason we report the average amount renegotiated per year as a fraction of initial investment (row 18). The order changes and Peru renegotiates, on average, 3.6% of the initial investment on an annual basis compared with 1.3% for Chile. Colombia continues to lead with close to 10 percent. Colombia's lead in the magnitude of renegotiations looks even larger once we weigh concession years by the upfront investment (row 19) with annual renegotiations reaching 16.5% of initial investment, suggesting that larger projects are more prone to renegotiation. No such correlation is present for Chile or Peru.

The average time to the first renegotiation, among concessions that have been renegotiated, is inversely related to the average amount renegotiated (row 20): 0.9 years for Colombia, 1.4 years for Peru and 2.7 years for Chile. Row 21 shows that only renegotiations in Colombia involve, on average, an important increase in the concession term (5.3 years). The corresponding figures for Chile and Peru are less than a year.

#### **4.3.3 Renegotiations during construction**

If we only consider renegotiations during the construction phase, the relative ordering remains. As a fraction of initial investment, Colombia is most prone to renegotiations, followed by Peru and then by Chile (row 23). The rate and average magnitude of renegotiations may differ between the construction and operation phases of a concession. Rows 22-27 help assess this difference. For example, a comparison of rows 18 and 24 (or 19 and 25) shows that renegotiation rates differ between the construction and operation phases of a concession, being larger during construction for Chile and Colombia. The converse holds for Peru, yet the number of concessions in operational phase is small in this case and the difference is not significant.

### **4.4 Testing the predictions**

This section describes the tests of the predictions of the model, using the results from Section 4.3, Bitran et al. (2013) and Engel et al. (2009).

**Type of renegotiation** A first thing to notice is that most renegotiations are by mutual (or bilateral) agreement, so there is no conflict among the parties. In Chile 83% of renegotiations lead to these agreements and it is also true for 98% of the cases in Colombia and in all cases in Peru. The remaining cases go to arbitration, which are the result of an inability to reach an agreement.

In Chile and Peru, most renegotiations are led by the government, and to a lesser extent in Colombia, with 40%, but there jointly led agreements represent another 40% of cases. This seems to indicate a political economy reason for renegotiations. This option transfers more of the fiscal costs onto future governments than arbitration (Engel et al., 2009) and may be one of the reasons for the preference of governments for this type of renegotiation.

**When do they occur** In the standard interpretation of renegotiations, there should be more of them as time passes as more events that were uncertain initially come to pass. In the three countries, however, more than 45% of the renegotiations, as measured by value, took place during the construction phase, that is, within the first four years of the contract.<sup>22</sup> Moreover, as mentioned above, the time between when the concession is awarded and the first renegotiation is short: 2.7 years in Chile, 1 year in Colombia and 1.4 years in Peru. The difference remains when we compare the differences, by value, of renegotiations during the construction and operation phases for Chile and Colombia (rows 25 and 26 in Table 1). As mentioned earlier, the small number of concessions that have reached the operational phase render this comparison non significant for Peru.

There are three interpretations for these observations. One is that projects were not carefully designed and require modifications. This can be described as the incompetence (or moral hazard) interpretation of renegotiation. The second interpretation is that government wants to add additional works without going through the normal budgetary process and may also want to take advantage of the equipment already at the site. Third, the firm may want to recoup from lowballing its offer. The last two interpretations work together in our model.

**When does the cost of renegotiations come due?** A large chunk of the cost of renegotiations falls onto future governments, as predicted by the model. According to Bitran et al. (2013) in Peru, only 14% of renegotiations have fiscal costs that fall on the current government. In Chile most renegotiations involve some costs falling onto the current government, but 90% of renegotiations have costs falling on future governments: by a combination of project term extensions, raises in future tolls, and by the government assuming additional risks. In Colombia, most renegotiations (88%) have costs falling on the current government. However, 6% of renegotiations involve future costs, and these account for 60% of all fiscal transfers. The database in Bitran et al. (2013) does not allow for more precise statistics on how the burden of renegotiations is distributed between current and future administrations. By contrast, Engel et al. (2009) do make this distinction. They

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<sup>22</sup>Engel et al. (2009) consider a database with 50 PPPs, the 26 highways considered by Bitran et al. (2013) as well as 24 non-highway PPPs and find that 72% of renegotiations, in value, occur during the construction phase.

find that, in the case of Chile, 60.5% of fiscal costs associated with renegotiations are passed on to future administrations.

Extending the term of the concession is one way of transferring cost to future administrations. When the term of the concession ends, the government in place has a valuable asset that it can either operate by itself, obtaining toll revenue, or it can put it to auction, in exchange for additional works and revenues. Chile and Peru have used term extensions, but they have added less than a year to the typical concession. In the case of Colombia, on the other hand, the average concession has been lengthened by 5.3 years (row 21 in Table 1). This means that a future government that would have received the resources associated to the released PPP will be denied their use (assuming a presidential term of less than seven years). However, this was the case of the 15 early concessions whose lengths were extended by an average of 70%. More recent PPPs have variable duration, depending on accumulated revenues, and term extensions have been avoided.

**What do they pay for?** Engel et al. (2009) show that in the case of Chile, for those renegotiations where data is available, 84% of the sums contracted were designated as additional investments, with the remaining 16% designated as additional payments for works included in the original contract. The latter is consistent with lowballing by firms in the original auction, as suggested by our model.

In Colombia, only 5% of renegotiations involved road extensions, but these accounted for a third of the total renegotiated value. As Bitran et al. (2013) mention, concession projects have been used to achieve objectives for which they were neither intended nor designed. These authors add that the costs of these additional stretches of road may be higher than registered in the data, because these extension projects are also renegotiated, and the added costs are no longer included as parte of the original renegotiation. In Colombia there was one example of extreme lowballing that eventually led to the cancelation of the contract.

## 5 Conclusion

In this paper we have shown that one of the benefits of renegotiating PPPs for incumbent governments is that they allow them to exceed spending limits. This was the case in England, where the PFI program was, in general, not included in the fiscal balance sheet, given the Eurostat rules.<sup>23</sup> In this paper we also note that renegotiations provide a further advantage to PPPs from the point of view of incumbent governments. We showed that, because PPP renegotiations do not lie under the purview of Congressional budgetary oversight they can be used to increase government spending. This leads to a set of predictions: i) competitive firms can make lossmaking offers, expecting to recoup their losses through renegotiation., ii) these renegotiations can also be used to increase government expenditure, iii) governments will shift part of the payments onto future governments

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<sup>23</sup>In Engel et al. (2013) we provide a normative argument for why PPPs should count as public investment on fiscal accounts.

and iv) we will observe renegotiations during the construction stage of the PPP. We describe data on renegotiations of highway concessions in Chile, Colombia and Peru that are broadly consistent with the results of our model, while showing significant differences among countries in the extent of renegotiations.

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# Appendix

## Proof of Result 2.

Assume the firm bids  $B$  for building infrastructure  $\frac{1}{2}$ , so that it lowballs by  $L = \frac{1}{2} - B$ . To determine the equilibrium value of  $L$  we analyze the renegotiation, conditional on  $L$ .

The government's utility gain from contracting infrastructure  $W$  at a cost  $R$  during the renegotiation equals

$$\mathcal{S}(W, R; L) \equiv u(\frac{1}{2} + W) + p(\frac{1}{2} + W)u(\frac{1}{2} + L - R) - u(\frac{1}{2}) - p(\frac{1}{2})u(\frac{1}{2} + L).$$

The second period monetary equivalent of this gain,  $M_2(W, R)$ , is defined via:<sup>24</sup>

$$\mathcal{S}(W, R; L) = u(\frac{1}{2}) + p(\frac{1}{2})u(\frac{1}{2} + L + M_2) - u(\frac{1}{2}) - p(\frac{1}{2})u(\frac{1}{2} + L),$$

which leads to

$$u(\frac{1}{2} + W) - u(\frac{1}{2}) = p(\frac{1}{2})u(\frac{1}{2} + L + M_2) - p(\frac{1}{2} + W)u(\frac{1}{2} + L - R). \quad (9)$$

Implicit differentiation w.r.t.  $W$  and  $R$  yields:

$$u'(\frac{1}{2} + W) = p(\frac{1}{2})u'(\frac{1}{2} + L + M_2)\frac{\partial M_2}{\partial W} - p'(\frac{1}{2} + W)u(\frac{1}{2} + L - R), \quad (10)$$

$$0 = p(\frac{1}{2})u'(\frac{1}{2} + L + M_2)\frac{\partial M_2}{\partial R} + p(\frac{1}{2} + W)u'(\frac{1}{2} + L - R). \quad (11)$$

Total surplus to be split during renegotiation equals:

$$[R - W] + M_2(W, R; L), \quad (12)$$

where the term in square brackets represents the firm's profit while the second term corresponds to the government's monetary gain. Maximizing total surplus w.r.t.  $W$  and  $R$  leads to the FOC:

$$\begin{aligned} \frac{\partial M_2}{\partial W} &= 1, \\ \frac{\partial M_2}{\partial R} &= -1. \end{aligned}$$

Substituting these expressions in (10) y (11) and adding both expressions yields:

$$u'(\frac{1}{2} + W) + p'(\frac{1}{2} + W)u(\frac{1}{2} + L - R) - p(\frac{1}{2} + W)u'(\frac{1}{2} + L - R) = 0. \quad (13)$$

Imposing the zero profit condition we have  $R = L + W$ . Substituting this expression for  $R$  in (13) and comparing with (4) shows that the equilibrium value for infrastructure contracted during the renegotiation,  $W$ , satisfies  $W = I_1^* - \frac{1}{2}$ . The government therefore attains its optimum.

We complete the proof by deriving (8). If the firm's surplus share is  $\alpha$ , then

$$L = R - W = \alpha[R - W + M_2(W, R; L)] = \alpha[L + M_2(W, L + W; L)],$$

<sup>24</sup>A similar proof holds if we work with the first period monetary equivalent.

where we used (6) in the first and third equalities. Therefore

$$L = \alpha[L + M_2^*], \tag{14}$$

with  $M_2^* \equiv M_2^*(L, L + W; L)$ . It follows from (9) that  $L + M_2$  is determined from:

$$u(I_1^*) - u(\frac{1}{2}) = p(\frac{1}{2})u(\frac{1}{2} + L + M_2) - p(I_1^*)u(1 - I_1^*).$$

Using (14) to substitute  $L/\alpha$  for  $L + M_2$  leads to (8) and completes the proof. ■