Corruption in Public Private Partnerships[*]

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Abstract

In this paper we discuss the potential scope and cost of corruption in Public Private Partnerships (PPPs). We argue that the level of complexity of these procurement mechanisms leaves scope for corruption at each stage of the procurement process : the decision stage, the tender stage and the contract execution stage. The procurement of public services through PPPs should therefore be accompanied by measures that ensure transparency of decision process, accountability of public officials, access to contractual information by stakeholders and media, widespread use of standardized contracts and limited use of revenue guarantees or contingent clauses.

1   Introduction

Fighting corruption in public procurement is essential to ensure the good functioning of public services. Corruption increases the cost of public services and hampers the efficiency of their provision. It undermines citizens' confidence in public institutions and *"hurts everyone whose life, livelihood or happiness depends on the integrity of people in a position of authority"* (Transparency International).

Corruption does not typically just involve a redistribution of the surplus from one economic agent to another. It leads instead to an inefficient allocation of resources and thus to the destruction of surplus. Under corruption, the firm bribes the public official to secure a benefit to which it is not entitled. It may for example ensure a higher price for the service or it may unduly improve its position in the tender relative to those of its competitors. If the most efficient firm still wins the tender with the project design and execution unaffected, then corruption only leads to a reallocation of the surplus. But an inefficient allocation arises if instead an inefficient firm secures the contract thanks to the bribe, or an inefficient project is approved. Here, the cost of the service provision

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will be higher than necessary and/or its quality will be lower, at the expense of users and tax payers.

The economics literature has shown that the efficiency loss due to corruption depends on a number of factors, including the type of procurement mechanism, the award criterion and the contract design. In this paper we take the insights from the literature to discuss the potential scope and cost of corruption in a particular type of concession contract: a public private partnership (PPP).

PPPs are long-term procurement contracts where the supplier takes responsibility for both financing and building the infrastructure and for its managing and maintenance. The DBFO model ('Design', 'Build' 'Finance' and 'Operate'), the BOT model ('Build', 'Operate' and 'Transfer') or the BOO ('Build', 'Own' and 'Operate') are all common contractual modes that feature bundling of building and operation in a single contract with a single contractor (or consortium of contractors). PPPs are used across Europe, Canada, the U.S. and a number of developing countries for the provision of public infrastructures and services in sectors such as transport, energy, water, IT, prisons, waste management, schools, hospitals and others.[1]

Corruption in PPP projects is relevant in all the three stages of the project: at decision stage, at tender stage and during contract execution. Due to the bundling of project phases into a single long-term contract, PPPs contracts typically require long procurement time to be allocated, complex contract negotiations and careful supervision during contract implementation. Over the twenty, thirty years of the contract many contingencies may arise that need to be regulated by the contract. Both at tender stage and at contract negotiation stage, there is then scope for corrupt deals that benefit a contractor at the expense of final users. Further, during contract execution, the quality of the service needs to be monitored and contingencies may arise that call for a change in pricing or service conditions. Corruption at contract execution stage may then compromise a rigorous application of the contract. To illustrate, Cheng and Wang (2009) report that, according to the Chinese Audit Office (2008), 64 out of 106 leased PPP projects that were audited in China showed signs of corruption.

In this paper, we shall discuss how PPPs may perform in the presence of corruption at each of the three stages of the procurement process, and derive implications for the choice of PPPs. The paper is organized as follows. Section 2 discusses the scope for corruption at decision stage. Section 3 analyzes corruption at tender stage. Section 4 studies corruption during contract execution. Section 5 focuses on anti-corruption policy whilst Section 6 briefly concludes.

2   Corruption at decision stage

The parties involved in project identification may include the public officials responsible for approving the project and potential project owners, funders and contractors. Corruption at decision stage occurs where one or more of these individuals seeks to choose a project primarily for their own illicit profit or benefit. For example, incumbent politicians seeking re-election may pressure a public official into building new

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[1]For a discussion on the optimality of bundling in PPPs, see e.g. Bennett and Iossa (2006), Martimort and Pouyet (2008) and Iossa and Martimort (2011a).

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projects, the "white elephants", that are of little use and seldom completed but will secure electoral benefits. Government ministers responsible for approving the project may be bribed by the contractor to commission an airport project as a concession, although the PPP option is not the most desirable one.

Filtering "white elephants". As clearly pointed out by Engel (2011) in his review of PPPs, PPP agreements may help filtering white elephants more than other traditional forms of procurement.[2]

Under a PPP, the contractor provides the initial funds to design the project and build the infrastructure. It then recoups this initial investment through user charges or availability payments made by the government. User charges are typically used for transport projects, leisure centres, energy and waste projects. Here, the contractor bears (some or all of) the demand risk and thus relies on future demand to make its investment profitable. When instead users do not pay, as is the case of prisons, often also of schools and hospitals, the contractor receives a payment from the government for making the service available to users but it does not bear demand risk. The project returns are therefore largely independent of the future demand for the service.

With the first type of projects, contractors will typically be unwilling to invest their own finances in projects that have little or negative value and that are unable to secure a positive future stream of profits. The private finance component of PPP projects may then help filtering "white elephants" and reduce the scope for corruption at decision stage. However, as pointed out by Engel (2011), this filtering of "white elephants" will not take place if the projects are financed with subsidies or if there is an implicit guarantee that the government will bailout troubled concessionaires.

Allocating rents. PPPs contracts are characterized by the transfer of a high degree of construction and operational risk to the private sector, in order to provide incentives for investing in cost reduction and quality improvements during construction and operation. Also, demand risk, legislative risk and availability risk may be transferred. Risk transfer may result in high-powered incentives and excessive informational rents to the contractor in adverse selection contexts. These rents may then provide the contractor with an incentive to capture the decision-maker in order to manipulate his decision so that PPP is always the preferred procurement option. What are the consequences on efficiency and contract design of this form of corruption at decision stage?

As we have seen, the main distinguishing feature of PPP, compared to traditional procurement methods, is the bundling of project design, building, finance and op-

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[2]Political corruption is widespread in procurement. Considering a dataset all the public procurement tenders administered by Italian municipal governments between 2000 and 2005, Coviello and Gagliarducci (2010) investigate the relationship between the time politicians remain in power and the functioning of public procurement. They find that political longevity reduces the efficiency of public spending, decreasing the number of bidders participating to tenders and the winning rebate. They also find that having the same mayor in power for an additional term increases the probability that the contract is awarded to a local firm or to the same firm repeatedly. They interpret these figures as evidence that repeated interactions between politicians and contractors increase the chances of collusion at the local level. Without this effect political longevity should result in an increase in the efficiency of public spending, as mayors acquire experience and learn over time to administer the procurement process better. These findings are compatible with the predictions of Burguet and Perry (2009) who find that time reduces the asymmetric information between mayors and bidders making corruption easier to sustain.

eration into a single contract with a firm or a consortium of private firms, generally including a construction company and a facility-management company. In traditional procurement instead these project phases are separated and regulated by different contracts with different firms (or done in house by the Authority). A problem with traditional procurement therefore is that the firm in charge of the construction or design phase of the project has no incentives to take into account the effect of its choices on the cost of operating the infrastructure and thus providing the service or on the social benefit/demand for the service. The consequence of this is that five or ten years after the infrastructure is built, its low quality will lead to higher maintenance and operating costs and to expenses that could have been avoided had the construction been done with higher standards. Furthermore, social benefits/demand will be lower.

Following Iossa and Martimort (2011a), suppose for example that social benefits from the service are stochastic (due to unexpected changes in user needs or macroeconomic conditions) and influenced both by the innate quality of the infrastructure, denoted by a, and the operating effort, denoted by e, so that one unit of services yields a benefit to users worth

$$B = b_0 + ba + e + \eta,$$

where η is a random shock, and b is a positive parameter capturing the effect of a on B (or services where users pay, B can be interpreted as the number of units consumers are willing to buy).

The operating cost of providing one unit of service is also stochastic (due to maintenance and operational risks) and depends on the quality of the infrastructure a and operating effort e. This externality is positive when improving the quality of the infrastructure reduces operational costs. For example, a better prison design may improve security (i.e., social benefit) and reduce the number of guards necessary to meet security standards. In other cases, improving the quality of infrastructure increases operational costs. An innovative design of a school may lead to improved lighting and air quality, and therefore better educational outcomes, but may also increase maintenance costs. The externality is then negative. These features are captured by considering the following cost function

$$C = \theta_0 - \gamma e - \delta a + \varepsilon,$$

where ε is a random variable capturing operational risk, and where $\delta > 0$ (resp. $\delta < 0$) when the externality is positive (resp. negative). γ is a positive parameter capturing the effect of e on C.

In this context, social welfare maximization requires the choice of infrastructure quality a to take into account both the effect of a on B (given by ba) and the effect of a on C (given by $-\delta a$). However, when the firm in charge of designing and building the infrastructure is not also in charge of operations, it will not take into account the effect of a on C or on B. When there is a positive externality ($\delta > 0$), this firm will therefore underinvest.

The idea behind PPP agreements is then to try to prevent this underinvestment by bundling all stages of the project, from building to operation, into one contract, and then transferring operational risk to the consortium of firms. At the time of designing the project or of building the facility, the consortium has then incentives to take into account how its choices will impact on the costs of maintaining and operating the

infrastructure, C, for the whole duration of the contract. The positive externality (δa) from construction to operation is then internalized and better infrastructures are built in order to reduce operational costs. This insight is common to the literature on public procurement and PPPs (see also Hart, 2003, Bennett and Iossa, 2006, Martimort and Pouyet, 2008).

When instead a better infrastructure raises operational costs ($\delta < 0$), maybe because it is more costly to maintain, unbundling may be preferred since internalizing the externality through bundling would reduce the incentives of the consortium to invest in quality infrastructure. This may exacerbate the underinvestment problem that arises under traditional procurement where low quality infrastructure (low a) are built since the firm does not fully take into account the impact of its investment a on social benefits B.

Martimort and Pouyet (2008) then consider how the possibility of corruption may alter the choice of procurement mechanism, PPP vs traditional procurement. By hiding evidences on a negative externality that would optimally call for unbundling, the decision-maker may let the firm enjoy some extra information rent associated with an inefficient choice of bundling.

To reduce the scope and gain from such form of corruption deal, the authors suggest that the contract design during operations needs to be altered so as to reduce the degree of risk transfer to the private sector. With less transfer of operational risk (so that the firm's payoff is less responsive to changes in C) or less transfer of demand risk (so when users pay, the firm's payoff is less responsive to changes in B), the informative rent of the firm will decrease, thus reducing the scope for corruption. But this brings an efficiency loss in terms of reduced incentive benefits from bundling design, construction and operation in a single contract. Corruption at decision making stage therefore reduces the scope for PPP agreements.

3 Corruption at tender stage

Corruption at tender stage may take a variety of forms. The needs of the public authority may be altered so as to favor a specific contractor; the call for tender may not be given adequate advertisement; the output specifications may be modified so as to exclude undesired competitors; the time to reply to the tender call may be shorten so as to make it difficult to submit an offer to firms that were not unduly informed before; restricted tender procedures may be chosen so as to invite only "friendly" firms; the award criteria be designed so as to increase discretion and scope for corruption, and so on.

Evidence suggests that, whatever the procedure or the award criteria, a corrupted public official can find the way to favor the corrupted firm. However, some procurement methods and award criteria may lend themselves better to corrupted deals. In this section we consider the implications for PPPs of different factors that may ease corruption at tender stage.

Auction vs negotiation. To get the best deal, how should the PPP contract be procured? A first issue is whether the contract should be negotiated with a contractor or instead be auctioned off.

With an auction, the public authority may get a better deal through the lower prices or higher quality that the firms' competition on price and quality dimensions may generate. Also transparency of the procurement process may be enhanced rendering corruption deals more difficult to sustain.

But competition may also fail to generate its potential benefits. First, it may take too much time: the call for tender needs to be prepared, time needs to be given to bidders to prepare their offer and the committee needs time to evaluate and compare the offers. All this can make tendering cost high and tendering time extremely long, creating an additional cost for society in terms of delayed provision of the public service. Also, the long tendering time joint with the high bidding costs may limit the participation of firms and result in little competition. Furthermore, auctions may perform poorly for complex projects where it is difficult to anticipate all the contingencies that may arise during the contract life. Contractual design can be so incomplete that extensive renegotiations during the contract execution are inevitable, rendering the price competition at tenders stage less meaningful. Auctions may also stifle communication between buyers and sellers, preventing the buyer from using the contractor's expertise when designing the project (see Bajari and Tadelis, 2010).

How do these considerations apply to PPP projects? Most PPP projects are complex. They are long-term projects which comprise all stages of the provision of a public service, from the design of the project to the construction of the infrastructure and then the provision of the service. This contributes to requiring high tendering costs, long tendering times and high bidding costs, discouraging participation. Albeit with differences between sectors, it has been estimated that in the U.K., PPP tendering periods last an average of 34 months (NAO, 2007) and that procurement costs can reach 5-10% of the capital cost of a project (Yescombe, 2007).

Furthermore, the project design dimension in PPPs plays a critical role. The contract is often incomplete due to the complexity of the project, and communication between bidders and the public authority is critical since it is often the case that the latter knows its needs but not the best way to meet them. Communication may take place through procurement mechanisms, such as the Competitive Dialogue, that allow a pre-bidding phase where the public authority evaluates the ideas and proposals of all bidders and gives feedbacks before a final offer is submitted. But these procurement methods are very costly and time consuming.

Because of these features, absent corruption, competitive tendering is valuable mainly for high value contracts where the potential cost saving from competition may be significant. Indeed most countries provide rules compelling public officials to award the public contract via competitive tendering when the value of the contract is high.

For small contracts, or when the potential competition is limited, negotiation may be preferred to the tendering process. Granting discretion to public officials to use the information available to select the procurement method may therefore bring the benefit of saving on tendering costs and shortening procurement times.

But discretion may be abused. To the extent that corruption is easier with direct negotiation than with a competitive tender procedure, corrupted officials may unduly choose to negotiate the contract also when an auction would be preferred.

Auriol (2006) considers the possible distortions that may arise when the public official has private information on whether it is better to procure the good via direct

negotiation with the supplier rather than to auction it. Firms may bribe the official to be chosen as contractor rather than to call an auction. This causes a distortion in the choice of the procurement form which raises the cost of procurement.

Stricter procurement rules providing for the use of competitive tendering will then have to be implemented to reduce the scope for corruption. Even when the potential benefits from competitive tendering are small (say because potential competition is small), competitive tendering will be required by law. Thus, corruption at tendering stage increases tendering costs and lengthens tendering times.[3]

Similar considerations apply as to the choice of the auction mechanism. In Italy for example public authorities tendering for a PPP contract can choose among three different mechanisms: a one stage auction with a scoring rule, a two-stage auction, where bidders first submit proposals and second compete in prices, and the Competitive Dialogue Procedure. Discretion allows the authority to choose the procedure that is most suitable to the specific project characteristics or market circumstances but this may leave scope for corruption. Reducing the opportunities for corrupt deals then calls for a reduction in the discretion granted to the public authorities. This in turn may prevent the public authority to take into account specific circumstances or project characteristics. The cost of corruption is then the efficiency loss that an increased level of rigidity in the procurement process, and a reduction in discretion, may bring.

The award criterion. In practice, procuring the public service through competitive tendering does not suffice to protect the public authority from the risk that its public officials will accept a bribe in exchange for some kind of favoritism. The public official may alter the demand needs of the public administration so as to make the winning of a specific contractor inevitable; the call for tender may not be advertised adequately so as to avoid competition from other contractors; the time elapsing between the call for tender and the request for proposal may be made so short to make it impossible to prepare the bids adequately; the tender specifications may be so contractor-specific to identify already the winner; the tender design and the bids or the award criterion may be manipulated so as to favor a specific contractor, and so on.

However, some auction formats or award criteria lend themselves better to corruption than others. This is the case for example of the *"most economic advantageous tender"* (MEAT) criterion, widely used in PPP to provide incentives for firms to submit offers with innovative project designs that may benefit final users.

Under MEAT, the scoring rule rewards not just a low price but also a high quality offer, according to weights that are specified in advance by the public authority. The higher the weight attached to the quality dimension, the greater will be the incentives of firms to innovate on this dimension and submit offers with valuable project design. But a higher weight attached to the quality dimension also leads to a higher scope for manipulation by corrupted officials. To the extent that quality is non-measurable,

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[3]Delegating the choice of the tendering mechanism to a centralized procurement authority may help to reduce the scope for corruption at local level and secure savings in the public sector. Bandiera, Prat and Valletti (2009) study the introduction in Italy of a centralized purchasing authority (Consip) and find that there are sizable cost reductions in centralizing the purchase of standardized goods because of the higher competition among contractors. However, procurement costs were not minimized. A waste of public funds was recorded although the data showed that this was mainly due to red tape rather than bribes.

there is indeed an element of discretion in the assignment of points to the quality offer, which leaves scope for manipulation.

For example, consider Burguet and Che (2005) who study whether corruption undermines price competition and the efficiency of the allocation in a model with bribery competition where the award criterion comprises both quality and price dimensions.

The buyer procures a good and cares about both quality and price, contractors submit multidimensional (price and quality) offers and simultaneously compete in bribes. The public official (or committee) manipulates the quality offers to favor the contractor that wins the bribing competition.[4]

So for example suppose two firms, firm 1 and firms 2, simultaneously submit quality/price bids (q_i, p_i) and bribe offers, where q_i denotes the quality offer, p_i the price offer and b_i the bribe. The public official compares b_1 with b_2. If $b_1 > b_2$, the public official favors firm 1 by exaggerating its quality offer q_1 by an amount m (the manipulation power) as long as firm 1 wins with the manipulation. With a scoring rule reflecting the public authority's preferences and assigning value $V_i = q_i - p_i$ to an offer (q_i, p_i), firm 1 wins if the following condition is satisfied:

$$q_1 - p_1 + m > q_2 - p_2.$$

If the agent can significantly manipulate the quality offers to favor the contractor (that is, if m is high), corruption in procurement softens price competition and inflates the cost of procurement. If the efficient firm (the one that would win the auction absent corruption) bribes the public official to obtain a higher score on the quality offer, it will now win the auction with a less aggressive price offer (that is, with a higher p_i). If a competitor makes a bribe offer that secures the favour of the corrupted official, this inefficient firm will win the auction despite a high price offer.

If instead the public official has little manipulation power (m low), but this can still be effective in influencing price competition, then corruption in procurement hardens price competition and lowers the cost of procurement. Intuitively, if the efficient firm anticipates that the public official may manipulate the quality offer of the competitor, it will submit a more aggressive price offer (that is, a lower p_i) to compensate for the quality manipulation of the rival and thus secure the win. The winner of the auction remains the most efficient firm.

These results suggest that providing for a scoring rule that assigns weight to PPP project quality so as to incentivize innovation may lead to much higher prices and to an inefficient allocation. In fact, corruption may also prevent innovation all together, as firms anticipate the possibility to win the auction through corruption and thus quality manipulation. Estache and Imi (2009) report indeed that setting the optimal scoring rule remains problematic in PPP, as the complexity of the selection process is likely to increase the susceptibility to rent-seeking activities.

How should the award criterion for PPP project then be selected? Burguet and Che (2004) also address the question of how the buyer should design his award criterion to limit the adverse effect of corruption. In particular, they investigate what should be the relative weight in the scoring rule that is assigned to the price and the quality offer.

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[4]The first theoretical contribution to consider quality manipulation is Laffont and Tirole (1991). They assume that the auctioneer has some leeway in assessing complex multidimensional bids, and is predisposed to favor a given bidder.

A greater weight on the price offer generates two conflicting effects. On the one hand, it distorts quality choices thus lowering the surplus that the buyer can obtain from the provision of the service. On the other hand, it reduces the capacity of the public official to manipulate the offers, which in turn helps to intensify price competition. Thus, instead of using a scoring rule assigning value $V_i = q_i - p_i$ to an offer (q_i, p_i), the buyer may gain by raising the weight on p_i and lowering the one on q_i, by modifying the scoring rule to $V_i = \alpha q_i - (1 - \alpha) p_i$ with $\alpha < \frac{1}{2}$. So for example, with $V_i = q_i - p_i$, at $q_1 = q_2$ and $p_1 > p_2$, the high price offer p_1 wins if the manipulation power satisfies:

$$m > p_1 - p_2.$$

With the scoring rule $V_i = \alpha q_i - (1 - \alpha) p_i$, instead, the threshold level of m is higher. To ensure that the corrupted firm wins the tender, the level of manipulation needs to satisfy:

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\begin{aligned}
V_1 &= \alpha (q_1 + m) - (1 - \alpha) p_1 > V_2 = \alpha q_2 - (1 - \alpha) p_2, \\
&i.e. \\
m &> \frac{1 - \alpha}{\alpha} (p_1 - p_2)
\end{aligned}
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which is a more stringent condition.

The effect of corruption on the efficiency of the procurement process. The above discussion highlights how corruption may bring different consequences. First, the most efficient firm may still manage to secure the contract, but at a higher price. Here corruption does not lead to allocative efficiency but to a transfer of resources from the procurement authority (who pays a higher contract price) to the public official (who enjoys the bribe) and the firm (who enjoys a higher contract price). Second, the efficient firm may bid more aggressively to prevent its rivals from unduly securing the contract through bribing. Here, corruption benefits the buyer by leading to a reduction of the cost of procurement for the public authority. Third, an inefficient firm may win the tender in exchange for a bribe to the public official. With the most efficient firm failing to win the tender, the cost of corruption is a loss in efficiency and an increase in procurement cost for the public authority.

In Burguet and Che (2004), which case arises mainly depend on the extent of the manipulation power, which we reinterpreted as the weight attached to the quality dimension in the scoring rule. In practice a number of other factors also contribute to determine the scope and consequences of corruption.

For example, considering the urban land market in China in 2003—2007, Cai, Henderson and Zhang (2009) highlighted a link between the characteristics of the product sold in the auction, which defines the stake of corruption, and the auction format chosen by corrupted officials. When the stake from corruption is higher, officials select the auction format that lends itself better to corruption. There are two main types of auction: a regular English auction and an unusual type of auction which they call a "two stage auction". They find that the use of the two-stage auction is more widespread for properties that exhibit characteristics compatible with a higher stake from corruption, and sales prices are lower.

The form of corruption used also affects the consequences of corruption. In Compte, Lambert-Mogiliansky and Verdier (2005), corruption occurs through bid adjustment rather than quality manipulation. The corrupted firm is allowed to secretly review its offer once all other firms have submitted theirs so as to submit a new price offer which secures the contract. This form of bid readjustment may soften price competition to such an extent to make price collusion among firms easier to sustain. If a firm defects from a price agreement, that firm's deviation can be detected by the corrupted firm, who can then punish the deviation by readjusting its offer and winning the auction. Here corruption leads to collusion and surplus destruction.

Corruption may facilitate collusion also in another way. Through bribing, the illegal cartel may secure the protection from investigation of public officials or anti-trust authorities, reduce controls and ensuring the rules and procedures are not changed to make it more difficult to sustain the agreement (Della Porta and Vannucci 2007).

4   Corruption at post-tender stage

Ensuring appropriate planning of infrastructure and public service projects and a fair tendering process does not suffice to protect procurement contracts from corruption. Corruption may take place during contract drafting and execution. Considering roads projects founded by the Bank between 1999 and 2009, the Worldbank (2011) found that fraud in the implementation of a contract was one of the most common forms of misconduct.

Corruption during contract execution may take a variety of forms. Corrupted public officials may secure better conditions to the firm during the renegotiation of the contract for some required adaptations of the service. Second, public officials may also manipulate circumstances to apply contingent clauses embedded in the contract, justifying price revisions or contract lengthening. Furthermore, the quality standard agreed at tender stage may not be delivered without the authority being compensated by the contractor. As reported by Søreide (2002), and references therein, the contractor may use sub-standards materials and construction shortcuts without this being reported by a complacent public official. Corrupted officials may protect the contractor when the materials invoicing are falsified. The technical expertise of the procurement department can be bribed to ignore part of the contract or to waive penalties for underperformance.[5] Albano and Zampino (2011) show that in a sample of 800 inspections for Italian procurement contracts between September 2006 and April 2007, 437 were not at the required contractual level. But in only 16 cases (3,66%) were penalties enforced, although whether this was due to corruption could not be ascertained.

Contract enforcement. As argued by Piga (2011), post-tender corruption is a more serious problem than corruption at tender stage. The award procedure receives the highest level of attention from various stakeholders. This makes it easy to spot changes in tender documents provided by contractors. For instance, IT secure technologies make it difficult to change prices by modifying tender documents received. Awarding

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[5]In Iossa and Spagnolo (2011), contractual penalties for underperformance may make a corrupt agreement more stable, facilitating corruption.

the tender at a higher price than the market price could be risky as stakeholders can easily benchmark the outcome with the price available in the market. Changing the required good or service to be purchased, or abusing discretion in the award criterion, can also be risky due to the ease of spotting deviations from standard documents used by other procuring entities.

Instead, post tender corruption is out of the public eyes and more difficult to spot. Contract execution is monitored less effectively by judges, authorities and media than corruption at tendering stage since contract execution involves long and expensive periods of monitoring and often higher expertise than what is needed for making price comparisons or unveiling blatant favoritism in the tender documents. Post-tender corruption is also monitored less by rival suppliers who cannot properly see the nature of the services delivered.

Contract incompleteness and renegotiation. Post tender corruption is an issue particularly relevant for PPP contracts whose long-term nature and complexity makes ex post adjustments likely to occur. When user needs change over the long length of the project, or when legislative changes introduce new standards, the service characteristics must be renegotiated. About 30 percent of PPP contracts were indeed renegotiated within two years after being award, as reported by Guasch (2004).

At this stage, corruption may occur. The contractor may pay the public official so as to be favored in the renegotiation over price and contract terms, leading to too high prices, undue lengthening of the contract, substandard quality and so on. The greater the contract incompleteness, the higher the scope for corruption at contract renegotiation stage. Further, the anticipation that the contract will be renegotiated often affects the bidding at tendering stage (Bajari, Houghton and Tadelis, 2006). The contract is secured not so much by the firm that is the most efficient one but by the firm that is more able to anticipate the future renegotiations and extract gains from corrupt deals. This firm could therefore bid a very low price at tender stage, certain of a future rent at renegotiation stage .

Contingent clauses. PPP contracts typically provide for 'Specific Circumstances' clauses which list a number of 'supervening events' for which the authority provides some sort of relief for the contractor. The Standardized UK contract gives an example of these clauses (see HM Treasury 2006). 'Compensation Events' require the authority to provide monetary compensations to the contractor following the occurrence of events beyond the contractor's control and that result in a delay to service commencement and/or increased costs to the contractor. Specific changes in law which affect the contract, say by modifying standards of service in a given sector, for example, fall within this category. '

Another form of contingent clause widely used in PPPs is constituted by 'Relief Events' clauses. These refer to events preventing the contractor from meeting its obligations, in respect of which the contractor bears the financial risk in terms of increased costs and reduced revenue, but for which it is given relief from the application of penalties or from contract termination. The events include fire, explosion, lightning, storm, tempest, flood, bursting or overflowing of water, tanks, apparatus or pipes, ionizing radiation, earthquakes, riot and civil commotion.

Furthermore, PPP contracts typically provide for revenue guarantees. These are guarantees by the public authority that in states in which revenues from user fees are lower than some pre-specified amount, the contractor will receive a monetary compensation from the public authority. Revenue guarantees shift risk from the contractor to the authority, and like specific-circumstances clauses, they are contingent on the realization of some external event.[6]

These contingent clauses create scope for corruption at post-tender stage. Complacent public officials may report states of the world that justify a contingent subsidy or a change in contractual conditions that unduly improves the financial position of the firm. When self-reporting is used, complacent public officials may fail to control reports or to denounce misreporting.

Hemming (2006) reports that many countries have poor records of the guarantees they have provided to the contractors and that little transparency exists on their extent and application. Engel (2011) reports that in Chile there is evidence that the authority relies solely on traffic data provided by contractor, having neglected to setup independent procedures to collect this information. Government guarantees are triggered by low traffic flows, so firms have incentives to underreport traffic.

To analyze how post-tender corruption affects the design and performance of PPP contracts, Iossa and Martimort (2011b) consider a public procurement context where project net revenues (hereafter "revenues" for brevity) increase with the contractor's operating effort and are affected by shocks reflecting market conditions. The revenue function thus takes the following form:

$$R = \theta + e + \zeta.$$

where e is the operating effort, capturing for example the higher demand from users of transport services when service reliability, on-the train services, or the efficiency of the ticketing system are higher. The operating effort e improves revenues but its provision is costly for the operator and difficult to observe for the public authority.

θ represents a demand or productivity shock that occurs before the operational stage, because, for example, of changes in legal standards of service or innovations in the procedure. In transport concessions, building excavation may reveal archeological sites delaying construction, macroeconomic conditions may change affecting future demand, and so on. θ is unknown to all parties at the time a PPP contract is signed. But as events unfold, there arises an informational advantage of the operator on the productivity shocks that affect the building stage, the operator being able to observe the realized level of θ. θ also embeds an element of verifiability. A public official can gather information to bridge the informational gap with the firm. The public officials may verify the realized state and be corrupted to make false reports. In the absence of such information, self reporting by the firm may be used.

The random variable ζ represents a demand or productivity shock that occurs during the operational stage and that cannot be verified. In transport concessions, demand can be affected unpredictably by competition from other modes or facilities, by

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[6]Engel, Fisher and Galetovic (2007) derived the price duration and revenue garantees in a typical concession contract where users pay. The optimal contract involves both a state-dependent subsidy in low-demand states and a state-dependent revenue cap above which the government collects all revenues.

the conditions affecting the wider network, such as economic activity levels or tourism demand, and by the price of inputs (e.g. fuels), and it is difficult to disentangle the effect of each of these factors.

In this setting, with perfect monitoring, that is when the country's institutions comprise reliable and independent procedures to collect information on contract performance, optimal risk sharing calls for the set up of contingent clauses where the contractor is compensated for the occurrence of events beyond its control that negatively affect its revenues. This risk sharing is obtained by setting up a payment mechanism with the following structure:

$$t = \alpha + \beta R,$$

where t, the payment received by the firm, comprises a fixed component, α, and a variable component βR. The fixed component can be thought of as an availability payment due to the firm for making the infrastructure available to final users. The variable component is given by the percentage β of revenues R retained by the firm; $1 - \beta$ being instead paid to the government. When β is higher, the firm retains more revenue risk.

To maximize efficiency, the contract includes a contingency clause providing for the fixed payment α to change when external conditions change. For example, suppose that input prices increase so that the revenues decrease by $(\bar{\theta} - \underline{\theta})$ and the share of revenues kept by the firm decrease by $\beta (\bar{\theta} - \underline{\theta})$. Denote by $\alpha(\underline{\theta})$ the fixed payment received by the firm when a low productivity shock $\underline{\theta}$ is observed and by $\alpha(\bar{\theta})$ the fixed payment when a high productivity shock $\bar{\theta}$ is observed. Then it follows that by setting

$$\alpha(\underline{\theta}) - \alpha(\bar{\theta}) = \beta (\bar{\theta} - \underline{\theta}).$$

when the firm's revenue share decreases by $\beta (\bar{\theta} - \underline{\theta})$, the firm receives an increase in the fixed payment, $\alpha(\underline{\theta}) - \alpha(\bar{\theta})$, that perfectly compensates the loss in revenues. The firm is fully insured against changes in exogenous conditions. As the revenue shock θ is exogenous and thus outside the firm's control, this contingency clause reduces the risk premium, without weakening incentives.

Such contingent clause is equivalent to a *revenue guarantee* ensuring that the firm enjoys total revenues of

$$\alpha(\bar{\theta}) + \beta (\bar{\theta} + e + E_\zeta \zeta)$$

in each state of the world ($E_\zeta \zeta$ denotes the expected value of ζ), since in state $\underline{\theta}$ it will obtain:

$$\begin{aligned} \alpha(\underline{\theta}) + \beta (\underline{\theta} + e + E_\zeta \zeta) &= \alpha(\bar{\theta}) + \beta (\bar{\theta} - \underline{\theta}) + \beta (\underline{\theta} + e + E_\zeta \zeta) \\ &= \alpha(\bar{\theta}) + \beta (\bar{\theta} + e + E_\zeta \zeta). \end{aligned}$$

The size of β captures the transfer of the residual revenue risk to the operator. Whilst the contractor is fully ensured against θ, he bears revenue risk at operational stage because of the shock ζ which cannot be verified. Whilst it would be optimal for insurance purposes to also insure the contractor against revenue risk ζ, this would require to let the firm's payment be independent of R. That is, β would have to be zero. But with the firm's payment only given by the availability component α, the firm would have no incentive to increase revenues by exerting operating effort e as it would

get no benefits from higher effort. For this reason, the optimal level of β is positive and it trades off incentives with risk premium. A higher risk transfer (higher β) raises the operator's incentives (raises e), but at the cost of a higher risk premium to compensate the firm for the operational risk he bears.

How does corruption affect the optimal payment structure? When monitoring can be ineffective, because of corruption and weak monitoring technologies, using contingent contracts leaves scope for public officials to manipulate relevant information to favor the contractors. Iossa and Martimort (2011b) then show that the contract should make less use of contingent clauses and leave more exogenous risk to the contractor. This is done by reducing the extent of the revenue guarantee by setting

$$\alpha(\underline{\theta}) - \alpha(\bar{\theta}) < \beta \left(\bar{\theta} - \underline{\theta} \right).$$

In the extreme case where monitoring technologies are so unreliable, or public officials so corrupted, that no revenue guarantees should be used, the payment structure should exhibit:

$$\alpha(\underline{\theta}) = \alpha(\bar{\theta}).$$

These changes in the payment structure compared to the benchmark of strong institutions create inefficiencies. Since the firm is less insured against revenue shocks beyond its control, the risk premium increases. This raises the cost of the project and calls for a reduction in the use of revenue sharing as a mechanism to provide incentives. That is, as $\alpha(\underline{\theta})$ gets closer to $\alpha(\bar{\theta})$, the level of β decreases, which in turn weakens the incentives of the firm to exert operational effort e. The cost of corruption at contract execution stage is the increase in ex post risk faced by the contractor, which in turn calls for weaker incentives at operational stage. Since the main advantage of PPPs is related to the incentives provided via bundling and risk transfer, the scope for PPPs is reduced when corruption and weak monitoring makes risk transfer more costly, that is under weak institutions.

This result provides the basis for recommending against the use of PPP in countries with weak institutions for complex projects such as complex IT and transport projects, where demand risk is high and revenue shocks are difficult to forecast or verify. When uncertainty is high ($\bar{\theta} - \underline{\theta}$ is high), for example because demand risk is high, state-contingent clauses that reduce the risk exposure of the contractor are most valuable. In these instances, weak institutions with little transparency at contract execution stage have more to lose from the use of rigid contracts to fight corruption. Overall the scope for PPPs is lower when project risks are higher.

5   Anti-corruption policy

To fight corruption in PPP procurement, typically three main measures have been undertaken around the world.[7]

Decision stage. In this phase, the critical issue is how to make sure that the goods and services to be purchased or the investment to be made is socially and economically

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[7]For a wider discussion on anti-corruption policies in public procurement, see Transparency International (2006).

justified and that the best of the various alternatives is chosen to meet the assessed need. Transparency International views as key at this stage the transparency of the evaluation process. In line with this view, in the UK, for example, to ensure that the PPP option is chosen when it is efficient, regulations have been introduced to require local public administrations to compile the public sector comparator (PSC). The PSC is a costing of a conventionally financed project delivering the same outputs as those of the PPP deal under examination. It provides a benchmark against which both relative functionality and value for money of the proposed PPP solution can be assessed.

The value of the PSC is twofold. First, it requires the public administration to think carefully as to the cost of the project. Second, it increases transparency and accountability. When the PPP option is approved because found more convenient than the PSC, there is a reputational loss that is suffered by the administration if later renegotiations and contract changes make the PPP option become worse than the PSC.

However, the use of PSC has been the subject of considerable debate about its reliability, accuracy and relevance. In the UK many cases have been recorded where the PSC was incorrectly used as a pass or fail test. In these cases the desire to show that the PPP deal was "cheaper" than the PSC has led to manipulation of the underlying calculations and erroneous interpretation of the results.[8]

Other anti-corruption measures can be undertaken at decision making stage. Transparency International (2006) for example also considers as important to enable the civil society to participate in the decision making process. This allows to check the needs of society, enable accountability; and identify necessary/unnecessary elements of the goods, services or investment to be acquired. Public consultations can be implemented for example by asking stakeholders to express their views on an infrastructure proposal in a questionnaire. Public hearings may also be useful to help assure that public concerns are fully invited and reflected.

Tendering stage. To reduce the scope for corruption at tendering stage, in many countries, rules have been introduced to require the use of competitive tendering to procure public services via PPPs, with transparency and adequate advertising of tender calls or sufficient time to prepare bids. Some countries have also chosen to allow for the MEAT criterion, whilst others have shown a preference for the lowest price offer. Further, best practices have been designed so as to help public authority reduce the scope for corruption by their public officials (see e.g. the procurement guidelines of the World Bank, 2011; and Lengwiler and Wolfstetter, 2006) or increase the scrutiny of auditing offices. Centralized PPP Units have been created so as to support local authorities in their tendering process and contract design. Further, as highlighted by Compte, Lambert-Mogiliansky and Verdier (2005), if the firms participating to a procurement process are subject to careful scrutiny by the public authority, they will not have incentive to bribe but to compete on price and quality dimensions in order to secure the contract. Auditing can then help to re-establish the benefit of competition and ensure that the most efficient firm will win the auction.

Additional safeguards against corruption that governments consider are provided by the application of the Integrity Pact concept to the bidding process. As it has been demonstrated quite successfully in a number of countries, Integrity Pacts (IP) can

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[8]See House of Commons' reports on http://www.publications.parliament.uk/pa/cm200203/cmselect/cmpubacc/76

be implemented in less competitive situations (markets) by introducing transparency measures and even fostering participation and accountability. This is the case for example of the IP implemented in Argentina in 2003 for the textbooks supply for the Ministry of Science and Education (see Transparency International 2006). IPs commit bidders and authority to refrain from bribery. Also, IPs provide for bidders to disclose all commissions and similar expenses paid by them to anybody in connection with the contract; sanctions will apply when violations occur. These sanctions range from loss or denial of contract, forfeiture of the bid or performance bond and liability for damages, to debarment for future contracts on the side of the bidders, and criminal or disciplinary action against employees of the government. Koessler and Lambert-Mogiliansky (2010) analyze the incentives of firms to voluntarily commit to a transparent behaviour in a competitive procedure. They show that under certain conditions such commitment can eliminate corruption when it is pure extortion. However, in other circumstances, it may be useful to make commitment conditional (the commitment of one firm is valid only if the other firms also commit) and explicitly rewarding with a selection advantage the firms who choose to commit.

Contract execution stage. Third, some rules and procedures have also been designed so as to reduce the incidence of corruption at contract execution stage. They provide for example for the compulsory use of standardized contracts to prevent that bribes are offered in exchange for favorable contract terms. Standardized contracts are widely used for example in the UK (see HM Treasury, 2007).

However, making it compulsory to use a standardized contract comes at the cost of reducing the extent to which valuable local or specific information can feed into the contractual agreement. It may therefore be advisable to use an 'intermediate' approach towards contract standardization where the public-sector party is given the option to introduce changes into the standardized contract but these changes must be motivated and recorded. The benefit of this increased flexibility would then have to be weighed against the cost of a higher risk of corruption and favoritism (see Iossa, Spagnolo and Vellez, 2007, for a more in depth discussion).

It is quite well recognized that salaries may play an important role in anti-corruption programs. The low salaries of public officials was for example seen as one of the main explanations of the high level of corruption in Singapore during the colonial period. In 1972, when public finances allowed it, Singapore raised significantly the salaries of ministers and senior civil servants to the level of the top earners in the private professions to ensure competitive pay and avoid the brain drain that had characterized the past years of government. The effectiveness of Singapore Anti-corruption policy is reflected in the consistently low CPI index from 1995 to present and the high ranking in the World Bank Good Governance Index.

But incentivizing the public officials to behave honestly is not just a matter of raising the overall salary. One way to increase incentives is to link more explicitly the budget of the government agency in charge of monitoring, or even the salary of the individual public official, to the effectiveness of its monitoring and thus the monitoring outcome.

To understand the rationale for this policy, consider again Iossa and Martimort (2011b). The incentive of the firm to bribe the public official stems from the size of the contingency payment (the revenue guarantee) that is provided for in the procurement

contract. The firm has incentives to report that a negative revenue shock $\theta = \underline{\theta}$ has hit operations and the public official, corrupted by the firm, has incentive to support this claim.

To fight corruption the public authority can offer a wage schedule for the public official which provides incentives not to make false claims. This incentive payment must be designed to make the public official prefer to take it rather than be corrupted.[9] There is then a good reason to pay an extra wage to the public official when he provides informative and verifiable reports that revenues are not low. Fighting corruption then requires to reach a balance between two forces. The first one is the cost of anti-corruption policies that is incurred to create accountability. This is given for example by the cost of improving the auditing technology or by the extra wage of the public official. The second force has a more indirect impact. It captures the efficiency gain of using contingency clauses to allocate risks effectively and avoid transferring too much risk to the contractor. A better risk allocation results in a lower cost of capital for privately financed PPP projects and/or in a greater participation of private firms to the PPP tender.

Contract Transparency. Disclosure of contractual terms and performance information can improve monitoring and help authorities to provide the right incentives to public officials involved. In practice many public authority argue that contract clauses must be confidential since their disclosure could damage the contractor by revealing strategic information to its competitors. This may be true for information about the production processes and strategic choices, but confidentiality is more difficult to justify for contractual terms such as payment schemes, quality standards, deductions, prices, etc., or for other output-related measures (revenues).

Ex post analyses such as Gosling (2004), however, have revealed that even in a country like the UK, with a good general level of accountability and a lively public debate, non-binding 'best practice' recommendations to disclose information were seldom followed by public administrations, even when directly asked for the information. It is clear, therefore, that in countries with weaker general accountability and public debates, non-binding disclosure requirements are likely to have little or no impact.

Perceived corruption vs actual corruption. Transparency International, a nonprofit anti-corruption organization, launched in 1995 the Corruption Perceptions Index (CPI). The CPI ranks almost 200 countries by their perceived levels of corruption, as determined by expert assessments and opinion surveys. This is potentially a very useful tool, since actual corruption is difficult to measure. Corruption deals cannot be observed and the number of corruption convictions in a country does not necessarily mean that the level of corruption is higher; it may suggest that anti-corruption persecutions are more effective.

But is perceived corruption correlated with actual corruption? What is that should be tackled: actual corruption or perceived corruption? Holken, (2009) examines the accuracy of corruption perceptions by comparing the reported perceptions about corruption of inhabitants of an Indonesian village with a more objective measure of 'missing

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[9]On the endogenously determined degree of corruption in regulatory hiearchies, see Tirole (1992), Kofman and Lawarée (1996), Auriol (2006), Lambert-Mogilianski (1998) and Martimort and Straub (2009).

expenditures' in a road-building project. He finds that villagers' perceptions is related with actual corruption but only to a limited extent, this is in part because officials hide corruption where it is hardest for villagers to detect. He also finds that there are biases in reported perceptions. For example, the greater the ethnic heterogeneity in the population or the less homogeneous the religious belief, the greater the perceived perception but not the actual one. Further, more participation to the social decision making in the village reduces perceived corruption but not necessarily the actual one.

The findings illustrate the limitations of relying solely on corruption perceptions, whether in designing anti-corruption policies or in conducting empirical research on corruption, although the value of the CPI index in bringing the corruption issue to the fore and in stimulating discussions is unquestionable.

Other interesting insights were obtained by Martimort and Straub (2009), who explain the empirical evidence showing that perceived corruption increases with privatization. Under state ownership, managers may bribe public officials to secure higher subsidies, at the expense of tax payers. Under private ownership, they may bribe public officials to secure higher prices or less stringent regulation, at the expense of consumers. With privatization, the cost of corruption thus shifts from tax payers to consumers and perceived corruption may then increase as a result.

How does perceived corruption change with the use of PPP agreements rather than traditional procurement? PPPs are likely to result in higher prices for the service. In this respect, the choice of PPPs can lead to an increase in the corruption perception precisely as privatization does in Martimort and Straub (2009).

6   Conclusions

In this paper, we have discussed the scope for corruption in PPPs at each of the three stages of the procurement process, the decision stage, the tender stage and the contract execution stage. We have seen how the level of complexity of these procurement mechanisms leaves great scope for manipulation by corrupted officials and firms at each of these three stages of the procurement process. Before delegating to local governments the task of procuring public services through PPPs, central governments should therefore ensure that procedures are in place to ensure transparency of the decision process, accountability of public officials involved in the process, access to contractual information by stakeholders and media, widespread use of standardized contracts and limited use of revenue guarantees or monetary compensations.

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