Public-Private Partnerships

Risk and Public-Private Partnerships

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Introduction[4]

The use of public-private partnerships (PPPs) to replace or supplement the public provision of infrastructure has become increasingly common. Public infrastructure projects that require large up-front investments, such as highways, light rails, bridges, seaports and airports, water and sewerage, hospitals, prisons and schools, are now often provided as PPPs.

A PPP bundles the investment in and service provision of infrastructure into a single, long-term contract. A group of private investors finances and manages the construction of the project, maintains and operates the facilities for a period of 20 to 30 years, and then transfers the assets to the government at the end of the contract. Depending on the project and type of infrastructure, the concessionaire's revenues are derived from user fees (as in the case of a toll road, for example), or from payments made by the government's procuring authority (as in the case of prisons).

Risk is a central theme in the PPP discussion and appropriate risk transfer to the private firm is essential for incentives. How should the different risks that emerge in any PPP be allocated between the government, the private firm and the users of the project? What is the cost of transferring risk to the private party? This paper offers answers to these questions.

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[4] This article is based on research reported in our forthcoming book (Engel, Fischer and Galetovic 2014a).

Risk, contracting and incentives in PPPs

The basic principle

The basic principle of risk allocation has been clearly stated by Irwin (2007, 14): the PPP contract should allocate risks to maximise project value, taking account of moral hazard, adverse selection and risk-bearing preferences. This is quite general, but it implies that controllable risks should be borne, at least in part, by the party best equipped to control them; for a party has weak incentives to be efficient when it does not bear a risk over which it has some control. Exogenous risk, on the other hand, should be shifted to the party that can bear or diversify it best. Under public provision taxpayers are liable for most of these risks with the exception, perhaps, of availability and service quality risk, which are borne by users.

Risks and contracting in construction and operation

Let us consider construction risk. Completion times and the cost of building often exceed projections, but these variables are usually controlled by the builder. Hence, the private firm should bear these risks (perhaps with the exception of delays caused by eminent domain disputes). Indeed, recent research by Blanc-Brude and Makovsek (2013) indicates that large construction companies bear these risks, but diversify construction risks across many projects and charge the risk premium to concessionaires. By contrast, under public provision construction risks are normally borne by contractors, but endemic renegotiations have the effect of shifting risks to taxpayers.

Similarly, design and diligence during construction have a strong impact on availability, operations and management (O&M) costs and service quality. Thus, these risks should also be borne by the private firm. If this process of risk transfer is effective, there should be large efficiency gains from PPPs, relative to public provision where these risks are mainly borne by taxpayers and users.

Bundling, control rights (the right to make decisions) and service standards are all required to ensure that

these risks are transferred efficiently to the private firm. For example, it is harder to make a firm accountable for service quality if it had no hand in designing and building the facility. Similarly, if the firm has no control rights over investment and operational decisions, it cannot be made accountable for maintenance and service quality. Finally, without objective and measurable service standards, it is difficult to transfer service quality risk from users of the facility to the firm.

As Hall (1998) points out, the extent to which risks are transferred depends largely on the choice of payment mechanism. Thus, to ensure strong incentives to complete the project on time, the firm should begin receiving payments only after the facility is operational. Similarly, payments contingent on the availability of the facility and on meeting service quality standards provide strong incentives for maintenance and management. In contrast, payments that are independent of performance or that transfer cost increases to taxpayers, lead to incentives similar to those under public provision.

Risks created by the government

Some of the risks in our list are controlled or created by the government. The residual value of PPP assets depends on government planning decisions and, as most project assets are specific, it is sensible to transfer that risk to the government. This occurs if the firm is able to recover its investment over the term of the contract. It also suggests that some policy risks should be borne by the government to avoid moral hazard.

Policy risks can be classified, broadly speaking, into two categories. Firstly, the government may implement policies that affect the project and little else. For example, it may build or expand a road that competes with a tolled PPP. It may even change the rules with the express purpose of expropriating the concessionaire. In general, these policy risks should be borne by the government to prevent opportunism and moral hazard.

Secondly, actions by the government may unintentionally affect PPPs. For example, a devaluation of the exchange rate may reduce the foreign firm's return, or a change in environmental standards may require additional investments. In these cases the government is not acting opportunistically and there is no good reason to have it bear the risk, as the private firm is in the same position as any other private firm in the economy. This principle is routinely overlooked. More generally, policy risks that have little to do with the project and affect most firms in the economy (e.g. those caused by monetary policy) should not be a reason for preferential treatment for PPPs.

Exogenous risks

Perhaps the main exogenous risk in a PPP project is uncertainty about demand for the project over the life of the contract. Indeed, as the work of Flivbjerg, Bruzelius and Rothengatter (2003) shows, under public provision forecasts are notoriously imprecise and tend to overestimate demand.

The general principle, as mentioned before, is that exogenous demand risk should be borne by the party best able to bear or diversify it. It is worth noting, however, that if the private firm assumes demand risk, taxpayers are, in fact, purchasing an insurance contract. As Hall (1998) notes, this does not seem to be cost-effective. For example, future changes in policy, unknown at the time of tendering, may impact the demand for the facility. There is often little that an infrastructure concessionaire can do to reduce the impact on demand.[5] In these cases, either a present-value-of-revenue contract or availability payments are the appropriate compensation schemes (see below).

The principle of transferring exogenous demand risk to the government admits one clear exception, however. When the PPP is fully sustained by user fees, the willingness of private firms to bid for the contract signals that there is sufficient demand for the project. This market test is absent in publicly provided infrastructure services and helps to avoid white elephants.

One might think that, as in the case of demand risk, financial risk is largely beyond the control of the firm. Hence the government should also bear interest rate or exchange rate risk. This argument overlooks the fact that firms can choose across alternative capital structures and that, more generally, governments are not particularly efficient at providing and selling financial insurance.

Is there a PPP interest rate premium?[6]

A recurrent criticism of PPPs is that they cost more per dollar of financing than public debt – the so-called PPP

[5] This applies to the case of highways, for example, where actions of the franchise holder have little effect on demand if contracted service levels are adequate and enforced.
[6] Based on Engel et al. (2014b).

premium. The numbers that have been quoted vary widely. According to Yescombe (2007, 18), the cost of capital for a PPP used to be 200–300 basis points higher than the cost of public funds. He also shows that the spread over the lender's cost of funds lies in the range of 75–150 basis points, with highway projects being at the upper limit (Yescombe 2007, 150).

Other authors, however, argue that there is no PPP premium. One line of argument claims that bondholder risk under public provision is subsumed under general government default risk. Thus, public debt is cheaper because the public implicitly absorbs the risk through potentially higher taxes or lower public expenditure in case of imminent default on all government debt. In other words, while many failed projects go unaccounted for under public provision because taxpayers assume the costs of this risk, under a PPP these risks are made explicit and priced, increasing the observed financing cost of a PPP project. This reflects the reward for carrying those risks, and is not a PPP premium.

Is the government better at diversifying exogenous, non-systematic risk?

Financial economists distinguish between systematic risk – that varies systematically with the market or the economy – and project-specific risk. Systematic risk cannot be diversified and should affect public and private financing in the same way. Is there a *prima facie* reason to think that the public sector is better at diversifying non-systematic risks than PPP financiers?

With perfect capital markets, the diversification that can be achieved by government participation in a large number of projects is also achievable through the capital market, so no PPP premium would exist. Hence, the PPP premium and the alleged financial advantage of public provision would seem to rest on capital market imperfections that give an edge to the diversification opportunities available to the government. Indeed, in the real world transaction costs preclude the existence of complete markets and limit diversification through the capital market. On the other hand, the increased diversification opportunities available to the government must be weighed against the administrative cost of its bureaucracy. Thus, it is not clear that the public sector has an edge over private firms and the capital market, again casting doubts over the existence of a PPP premium.

Are exogenous risks poorly allocated in PPP contracts?

A complementary explanation of the PPP premium is that the government has a superior capacity to bear risk. That could be the case in practice, but we will proceed to show that with appropriate contracting, the government can replicate the risk profile under public provision with a PPP, thereby eliminating the PPP premium.

To illustrate this, let us consider the following scenario: demand for the infrastructure is uncertain, so that the consumer surplus at time t, CS_t , and user fee revenues, R_t , are random variables determined by the state of demand, v, which represents one possible trajectory of demand realizations. The upfront investment, I, is the same in all demand states and operating and maintenance costs are zero. Finally, the PPP firm is selected in a competitive auction that dissipates rents.

Table 1 shows the distribution of the present value of cash flows and surpluses in demand state, v. Rows distinguish between funding sources (user fees and taxes). Columns distinguish between governance structures (public provision and PPPs). Within PPPs, alternative contractual forms are possible, depending on the source of revenues: PVR contracts (the concession term is flexible and lasts until a given revenue in present value is collected by the concessionaire)[7], fixed-term concessions, availability contracts (the concessionaire receives a regular payment provided that the infrastructure is available meeting service standards); and shadow tolls (the government pays the concessionaire a fixed fee per user).

It is worth noting that with user fee funding, public provision (column 1) and PVR (column 2) are identical. Similarly, public funding under public provision and availability payments are identical. This is our main claim: independent of the source of funds, PPP contracts exist that replicate in all demand states the surplus and cash flow distribution of public provision, and have the same impact on the intertemporal public budget.

To illustrate this, let X_a^b denote the present value of X_t between $t=a$ and $t=b$ at $t=0$ and consider first the case in which user fees fund the project. Under public provision, the project is built at cost I, and the firm receives I before the infrastructure becomes operational. Hence,

[7] See Engel et al. (2001, 2013) for the conditions under which PVR contracts are optimal and Engel et al. (2014a) for an analysis of worldwide experience with flexible term PPP contracts.

Table 1

Risk allocation, source of revenues and contractual form

Funding	Contractual form		
User fees	(1) Public provision	(2) PPP:PVR	(3) PPP: Fixed-term toll
Users	$CS_0^\infty(v) - R_0^\infty(v)$	$CS_0^\infty(v) - R_0^\infty(v)$	$CS_0^\infty(v) - R_0^\infty(v)$
Taxpayers	$R_0^\infty(v) - I$	$R_0^\infty(v) - I$	$R_0^\infty(v) - R_0^T(v)$
Firms	$I - I$	$I - I$	$R_0^T(v) - I$
Tax-subsidy	(1) Public provision	(2) PPP:Availability payment	(3) PPP: Fixed-term shadow toll
Users	$CS_0^\infty(v)$	$CS_0^\infty(v)$	$CS_0^\infty(v)$
Taxpayers	$-I$	$-I$	$-R_0^T(v)$
Firms	$I - I$	$I - I$	$R_0^T(v) - I$

Notation. v = state of demand; CS = consumer surplus; R = user fee or shadow toll revenue; I = upfront investment; X_s^t = present discounted value of X between times s and t, as of time 0; T = term of fixed-term contract.

Assumptions. The table depicts cash flows and social surplus in a given demand state v (corresponding to present discounted value of user fee revenue in the state). Rows distinguish between sources of funds (user fees and taxes); columns between procurement forms (public provision and PPPs). Demand for the infrastructure is uncertain (i.e. v is a random variable), so consumer surplus, CS, and user fee revenues, R, are random variables (as they are functions of the demand state, v). The upfront investment, I, is the same in all demand states, and operating and maintenance costs are zero. Firms are selected in competitive auctions that dissipate all rents.

Source: The authors.

taxpayers pay I upfront, collect $R_0^\infty(v)$ in state v and receive $R_0^\infty(v) - I$ in present value. Users, on the other hand, receive a net surplus equal to $CS_0^\infty(v) - R_0^\infty(v)$. Under a PVR contract, taxpayers save I upfront, but they relinquish user fee revenue during the length of the concession, which is equal to I in present value (because of competition for the PPP). Because the state collects user fees after the concession ends, taxpayers receive $R_0^\infty(v) - I$. Users' net surplus in state v is $CS_0^\infty(v) - R_0^\infty(v)$, as with public provision. This confirms that any risk bearing advantage for the government can be realized with a PPP under a PVR contract and no PPP premium should be observed.

Now let us consider the usual fixed-term PPP that lasts T years (column 3). The concessionaire collects $R_0^T(v)$ with surplus $R_0^T(v) - I$, which is a random variable; this contrasts with the case of a PVR contract where the concessionaire faces no risk. Taxpayers receive $R_T^\infty(v)$, and, in general, their risk falls.[8] A fixed-term contract thus shifts risk from taxpayers to the concessionaire because there is uncertainty about demand for the project during the fixed term T. Thus, part of the observed PPP premium may reflect faulty contract design, rather than a fundamental disadvantage of PPPs.

Let us move on to consider projects that are fully funded by taxes. Again, with public provision the project is built at cost I, which the firm receives before the infrastructure becomes operational – taxpayers pay I upfront. When a PPP is financed by availability payments, the timing of disbursements differs, but the present value of payments is still I. Hence, neither taxpayers nor the concessionaire bear risk, and the impact of the project on the intertemporal public budget is the same in both cases.

PPPs funded via taxes have sometimes resorted to shadow tolls. That is, the state pays a fee to the concessionaire for every user of the infrastructure for a fixed number of years, T. This type of PPP contract not only shifts risk to the concessionaire, but also creates risk. Since the concessionaire now bears risk, a PPP premium should be observed (lower right corner of Table 1). Viewed from this perspective, a shadow fee contract

[8] This assumes that the standard deviation of R_T^∞ at time zero is decreasing in T, which is generally the case. It follows that with public provision or a PVR contract, the standard deviation of taxpayers' discounted revenue will be higher than under a fixed-term PPP.

consists of adding a lottery to an availability contract. The firm and taxpayers are forced to participate in a zero-sum lottery in which whatever is won by one party is lost by the other. Again, this leads to a risk premium that is not inherent to PPPs, but results from a specific contractual form. Of course, a lottery is a non-systematic risk *a fortiori*, and should be fully diversifiable through perfect capital markets. Nevertheless, it does not make sense to make the concessionaire play this lottery, because in the real world there are transaction costs.

Endogenous risks: is the PPP premium the cost of incentives?

There are many reasons why society may be better off under a PPP than under public provision. These motives generally impose additional risk on the private party. Firstly, investing in cost reductions and other efficiency-enhancing activities usually implies assuming risk, which usually increases the cost of capital for the concessionaire. This is the cost that must presumably be incurred to obtain a larger benefit. As Klein (1997) pointed out, the cost of funds cannot be considered independently of the incentive system under which intermediaries collect the funds.

A second argument in favor of PPPs is that projects are structured to provide incentives to internalize life-cycle costs during the construction phase. These incentives are not present under public provision (because of extensive renegotiations) and force the concessionaire to bear more risk.

More generally, one of the main points of a PPP is to shift endogenous risk to the concessionaire, to prevent moral hazard and strengthen incentives to cut costs and provide adequate service quality. Unless the concessionaire is risk neutral, society needs to pay to force him to accept the risk. Moreover, this risk is not diversifiable in the capital market, for if it could be diversified, there would be no incentive to improve performance in the first place. Hence, the 'right' PPP premium should compare financing costs under public provision coupled with an incentive contract where the agent bears endogenous risk, with the financing costs of a PPP. In practice, however, the inability of government to make remuneration depend on performance means that public provision cannot transfer endogenous risks to agents. Hence, there is no reason to believe *prima facie* that achieving equivalent incentives with public provision would be cheaper.

Conclusion

In this paper we have made two points. Firstly, in a PPP contract, policymakers choose which risks to transfer, and this affects efficiency and costs. On the one hand, there are compelling reasons to transfer construction and operation risks to the concessionaire. Concessionaires should also bear policy risks that have no direct relation to the project. On the other hand, demand risks should probably be borne by the government.

Secondly, with adequate contracting, PPPs can replicate the intertemporal risk profile of public provision. Hence, the so-called PPP premium may reflect faulty contractual arrangements, which inefficiently assign exogenous risks to the private partner. Alternatively, the PPP premium may pay the concessionaire for assuming endogenous risks that cannot be meaningfully separated from the incentive structure that is responsible for the efficiency gains under PPPs. For these reasons, the apparently higher cost of capital should not necessarily be interpreted as evidence against PPPs.

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