Public-private partnerships: public-economics perspectives

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PUBLIC-PRIVATE PARTNERSHIPS: PUBLIC-ECONOMICS PERSPECTIVES

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ABSTRACT

Public-Private Partnerships are nowadays spread all over the world. It may be quite plausible that they were initially started mainly as an attempt to evade expenditure controls and hide public budget deficits. Nevertheless, they have by now gone a long way of restructuring. If transparently reported and properly designed, public-private partnerships can also play a useful role in enhancing the efficiency of the provision of services that were supplied before solely by the public sector. This paper provides some public-economics perspectives on these partnerships.

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I. INTRODUCTION

Public-Private Partnerships (PPPs) were initiated in the United Kingdom in the early 1980s. They constituted an element in the broader process of privatization undertaken (or accelerated) by the government of Mrs. Margaret Thatcher. Broadly speaking, privatization does not merely refer to the transfer of state-owned enterprises to private investors, but also to a shift of public sector activities to the private sector. Indeed, PPPs enter into this broader category. But they do this in a restricted way; not every transfer of the delivery of public services to the private sector is referred to as a PPP. For instance, the State may ***outsource*** the issuance of driver licenses to the private sector. This would not be normally referred to as a PPP. The later term is reserved usually to an undertaking which involves a sizable initial investment in a certain facility (a road, a bridge, an airport, a prison, etc.), and then the delivery of the services from this facility

Many formerly state-owned enterprises perform ordinary activities that were done elsewhere by the private sector. It is also quite widely accepted that they should not have been probably run by the State in the first place. Therefore, the involvement of the State in these enterprises should, and hopefully does, end upon their privatization. This is not , however, the case with the activities relegated to public-private partnerships. These activities have some public good features. A road, for instance, is usually referred to and studied by the public-economics literature as a ***congested public good***. Similar attributes characterize an airport, a bridge, a tunnel, etc. As any beginning student of welfare economics learns, these

are typical cases of ***externalities*** and ***market failures***.[2] Therefore, they are not privatized once and for all; rather, the State continues to be involved in some way or another, creating a public-private partnership.

Yet, one may still argue that these public-private partnerships are not genuine partnerships that ***properly*** or ***efficiently*** share risks and liabilities (and profits). But that they are rather a means to disguise conventional contracting undertakings that are subject to standard budgeting processes as some new undertakings that are carried out off budget.[3] This claim might have been particularly valid at the beginning, where most public-private partnerships took the form of ***Private-Finance Initiatives (PFIs)***, in which the private contribution was primarily in providing financing. Put differently, the private involvement amounts to no much more than providing the government with a channel through which it could finance infrastructure investments by implicit (or hidden) budget deficits and debts. In the words of Spackman (2002): "Early financing proposals were designed mainly to evade expenditure controls."

However, public-private partnerships have by now went a long way since their embryonic stages of public-finance initiatives. In many instances, they have developed into

[2] See, for instance, Arrow and Hahn (1971).

[3] It should be noted that carrying out an activity off budget does not necessarily imply that transparency is impaired. In principle, full transparency may be maintained for off-budget items. But when a government wishes to conceal a certain item from the public eye or from the international institutions and the business community, it will usually prefer to carry it out off the budget.

genuine partnerships aimed at properly pricing scarce public resources and efficiently sharing and managing risks. They may be still far from being perfected, but it would be inappropriate nowadays to dismiss them altogether on the ground of being merely a tool to make government accounts look nicer. In a preface (written in January 2001) to a PPP manual for South Africa's national and provincial government departments, Mr. Trevor Manuel, the Minister of Finance, states: "...the availability of state resources for these purpose [to meet the socio-economic needs of all South Africans, and in particular, to alleviate poverty] must be used to leverage much-needed private sector investment in public infrastructure and services." Indeed, the desire to raise private financing is explicitly acknowledged. But Mr. Trevor immediately goes on to say: "The benefits [of public-private partnerships] do not consist in an increase of funds, but in the better management of scarce resources."

Whether or not "born in sin", public-private partnerships have by now spread world-wide. Furthermore, when transparently reported and properly designed, they can also play a useful role enhancing the efficiency of the provision of services that were supplied before solely by the public sector. This paper provides some public-economics perspectives of the advantages and disadvantages of PPPs.

The organization of the paper is as follows. The next section describes briefly the scope of public-private partnerships. Section III analyzes some common feature of PPPs: build-operate. Section IV introduces the notions of exogenous and endogenous risks. The succeeding section points out to the role of PPPs in rationalizing public investment decisions. The importance of a proper cost-benefit analysis is discussed in section VI. Section VII is

devoted to the analysis of risk sharing between the public and private partners. Section VIII discusses how the pricing of the service is affected when the facility is transferred to the public partner at the end of the partnership (namely, the end of the concession period). The role of user charges as Pigouvian taxes and their implications for the efficiency of public-private partnerships are analyzed in section IX. The succeeding section describes some "advantage" of public-private partnerships: their being off-budget items. It briefly describes also their relation to resource accounting. Politico-economic considerations associated with public-private partnerships are brought forth in section XI. A case study (the Cross-Israel Highway) is presented in section XII. Section XIII concludes. A discussion of some accounting issues that may have some important economic implications for public-private partnerships is relegated to an appendix.

II. THE SCOPE OF PUBLIC-PRIVATE PARTNERSHIPS

The design of an efficient **Public-Private Partnership (PPP)** project depends crucially on the basic underlying economic environment under which it operates. Therefore, it would presumably be inappropriate to prescribe a "model" arrangement to be entered between the public entity and the private entity in all PPP projects. Rather, these projects are becoming ever popular that they cover many fields: transportation infrastructures, such as roads, bridges, tunnels, above and under ground rail, air and sea ports; utilities, such as water and electricity supply, sewage, and waste disposal; prisons; schools; hospitals; etc. They are therefore carried out in a large variety of circumstances and uncertainties, so that each case

may have to be examined, designed and executed with a close reference to its own characteristics.

Nevertheless, this should not be interpreted to mean that there can be no universal rules to follow. On the contrary, there is a widespread consensus among economists that transparency is crucial in the case of public-private partnerships. Because PPPs may be used to channel public activities off budget and away from the public eye, all public liabilities must be at least properly reported, if not properly quantified according to some generally accepted accounting standards.[4] These liabilities could be either direct (that is, materialize in any event) or contingent (that is, materialize only if a certain event occur); and either explicit (that is, legally binding) or implicit (that is, binding by some social norms, habits, tradition, etc.).[5] Indeed, several countries have recently tried to identify and quantify all government obligations.[6]

We aim to analyze and discuss some basic features that are common to most public-private-partnership projects. These projects come under a variety of forms. A detailed description of these forms may be found in a report of a staff team from the Fiscal Affairs Department of the International Monetary Fund, led by Richard Hemming (2005). The most common forms are some variant or another of DBFO (Design-Build-Finance-Operate), in

[4] This would be true even though such comprehensive standards may yet to be developed.

[5] See Brixi and Mody (2002).

[6] For a notable example, see Echevery et al (2002).

which a concessionaire from the private sector designs, builds, and finances a certain facility (for example, an airport) and then operates it as well; or BOT (Build-Operate-Transfer), in which a concessionaire finances and builds a facility, operates it, and transfer it to the government at the end of the concession period. The BO (Build-Operate) combination features in all of these arrangements.

III. BUILD-OPERATE

In this section we address the issue of why this build-operate combination is so prevalent in public-private-partnership projects. An obvious alternative is the conventional provision, under which the public entity first contracts with a private builder to construct a facility (for example, a multi-lane highway), and then either contracts with a concessionaire to operate the facility for a specified period of time or operates the facility by itself. So, what kind of an advantage is there to be gained when "bundling" these two activities of building and operating under a PPP arrangement? A simple and useful answer was provided by Hart (2003). [7]

Suppose there are two kinds of investments that can be made in the construction stage of the road. One, termed "productive", improves the quality of the road and reduces the cost of operation. For instance, the use of concrete rather than tarmac in building a road both improves the quality of the road and reduces the cost of maintenance and operation .

[7] See also Riess (2005).

Concrete is much more durable than tarmac. Therefore, the use of concrete improves the quality of service, because it saves on the amount of needed repairs which usually tend to slow traffic on the road. Its use generates an additional benefit of reducing the cost of maintenance and operation (repairs). The other investment, termed "unproductive", reduces the quality of the service and the cost of operation. For instance, one can build an extremely tight screening system in order to detect and deter free riders (peoples evading the toll). This may slow down traffic on the road; that is, it reduces the quality of the service. But it also lowers the operation costs (or increases toll revenues).

Under conventional arrangement ("unbundling"), the constructor has no incentive whatsoever to incur the cost of any one of these two investments. Consequently, she will make neither of them. Under a public-private partnership, the concessionaire internalizes the cost-reduction feature of these two investments, but not the quality-change feature. As a result, the concessionaire under invests (from a social point of view) in the first kind of investment, because she does not internalize the quality-enhancing feature of it; and she over invests (from a social point of view) in the second kind of investment, because she does not internalize its quality-reduction feature. Thus, under conventional arrangement (unbundling), there is no investment in any one of the two types of investments, whereas under a PPP arrangement (bundling), there is an underinvestment in the first type and overinvestment in the second type of investment. Therefore, *in general* one cannot tell whether bundling is preferable to unbundling or not.

But this illuminating example provides an answer as to under what circumstances, a public-private-partnership arrangement is preferable. If the characteristics, especially the quality-related characteristics of the facility (the road in our example), can be well specified and, more importantly, well monitored and verified by the public partner at a relatively low cost, then a conventional arrangement (unbundling) may be adequate. However, public monitoring and verifying of the quality of a facility which is built to last for a long time are often very costly.[8] In contrast, if the quality of the service, such as the uninterrupted flow of traffic at a certain minimum average speed throughout the day, at no more than a certain noise level, etc, can be well specified and verified, then a PPP arrangement can work fine.[9] In this case, the specification of the quality of the service dictates to the concessionaire the quality of the facility itself, with no need to directly verify it beforehand (at the construction stage).

The specification of the quality of the service yields another advantage in favor of a public-private-partnership arrangement. In most cases, the capacity of the facility may have to be expanded over time. For instance, the number of lanes in each direction of the road may have to increase in order to adequately accommodate for a rising volume of traffic. The size

[8] One should bear also in mind that a high level of public monitoring and supervision may lend itself to bribery and corruption.

[9] Another example of specifying the quality of the service can be drawn from water projects. There are several techniques or methods to desalinate water (some may be protected under patent rights). The government does not have to specify the size of the desalination and the technique to be used. It may suffice to specify that the public partner provide at least a certain quantity of water per year, with no more of a certain level of salinity, at a price not to exceed a certain cap, etc.

and the timing of the expansion does not have to be pre-specified in a PPP contract. Again, it may suffice to specify the quality of the service. For instance, it may suffice to specify only that traffic should be able to flow at a certain minimum speed throughout the day in order to enhance the concessionaire to add another lane to the highway in due time, so as to avoid excessive road congestion which slows down traffic. Alternatively, the PPP contract may specify that the road must be enlarged when the volume of traffic surpasses a certain level per hour or per day. Similarly, a public-private partnership contract for an airport may specify the number of incoming and outgoing flights per gate and/or the number of passengers per square meter of terminal space, etc., in order to ensure the appropriate expansion of the facility at the appropriate time.

IV. IDENTIFICATION OF THE ENDOGENOUS AND EXOGENOUS RISKS

It is important to identify the circumstances under which a public-private partnership operates. Modern economic theories of procurement (whether of the public sector from the private sector or whether wholly within the private sector) consider the procurement problem as that of *ex ante* asymmetric information coupled with moral hazard.[10] Namely, the seller is better informed about production costs and quality than the buyer. But, after carefully examining the construction management literature and speaking with industry participants, Bajari and Tadelis (2001) report that they "have found little evidence that either the contractor or the buyer has private information at the onset of the procurement project. They

[10] See, for example, McAfee and McMillan (1987) and Laffont and Tirole (1993).

both, however, share uncertainty about many important design changes that occur *after* the contract is signed and production begins, such as design failures, unanticipated site and environmental conditions, and changes in regulatory requirements."[11] These uncertainties are *exogenous* to the private builder of the facility or the private provider of the service. To a large extent, they are also *exogenous* to the public entity that sponsors the facility. Even the regulatory changes may be *exogenous* to the public entity, because they may be instituted by the legislators, by local governments, by rulings of the courts, etc.[12]

Similarly, there are *exogenous* uncertainties on the revenue or benefit side of public investment projects. In transportation infrastructure projects, future demand is certainly not certain. The use of a subway system may be severely depressed by terror threats. The volume of traffic on a highway depends on fuel costs, the GDP growth rate, the population growth rate, etc. The demand for electricity from a new power plant is a function of, among other things, the GDP growth rate, the degree of industrialization, the development of energy-

[11] As an illustrative example, Bajari and Tadelis (2001) describe the adaptation process in the building of the Getty Center Art Museum in Los Angeles, which is a 24-acre, $1 billion facility that took over 8 years to construct: "The project design had to be changed due to site conditions that were hard to anticipate. The geology of the project included canyons, slide plans, and earthquake fault lines, which posed numerous challenges for the team of architects and contractors. For instance, contractors 'hit a slide' and unexpectedly moved 75,000 cubic yards of earth. More severely, in 1994 an earthquake struck. Cracks in the steel welds of the building's frame caused the contractors to reassess the adequacy of the seismic design standards that were used. The project design also had to be altered due to the regulatory environment – 107 items had to be added to the building's conditional use permit. These problems were very hard to predict, both for the buyer and the contractor."

[12] In fact, public-private partnerships which are of quite a long duration serve the current government to pre-commit future executive and other branches of governments.

saving technologies, etc. Neither the government nor the private concessionaire is *a priori* better informed about these (risky) variables.

V. "WHITE ELEPHANTS"

We shall come later to analyze in more details the treatment of risk in public-private-partnership arrangements. For our purposes at this stage, it suffices to realize that the costs and the benefits cannot be determined for certain. In this context, PPP may play a useful role in enhancing a proper cost-benefit analysis and reducing the likelihood of erecting "white elephants", such as, for example, a multi-lane highway that leads from nowhere A to nowhere B.

Because costs and benefits cannot be projected accurately, *ex post* (actual) costs and benefits are almost certainly going to be different from what was estimated at the onset. Thus, *ex post*, the net benefit from some projects would be negative or less than *a priori* expected, whereas the net benefit of other projects would be greater than *a priori* expected. However, as Prud'homme (2004) reports, costs are generally underestimated and benefits overestimated, by large amounts, in public infrastructure projects. As Prud'homme puts it, "errors of 50% or more seem to be the rule rather than the exception". For example, the actual number of passengers that used the Euro tunnel in its first year of operation was less than 25% than what was predicted by SNCF, the French-owned railway. In 2003 actual revenues from the tolls were about a third of what had been predicted. As Tanzi (2005) puts it, "this happened in a density-populated area connecting two of the richest cities in the world

(London and Paris) and two G-7 countries!" Similarly, Strong, Guasch and Benavides (2004) report cost underestimations and benefit overestimations in toll roads in Argentina, Brazil, and Mexico.

These findings may be interpreted as providing some indications that the prediction errors are biased[13]. It is possible that public agents, motivated by self-interest, behave strategically. That is, out of a desire to maximize their volume of activity, which can serve to justify their existence, public agents in a sort of "wishful thinking" way underestimate costs and overestimate benefits or revenues. Provision under a public-private-partnership arrangement may be useful in sorting out the economically viable from the economically unviable projects, and rejecting the latter. The private sector will not be generally willing to enter into a public infrastructure undertaking in which it does not expect to recover all of its costs, including capital (direct or opportunity) costs. Therefore, the private sector will double-check the estimates of the public agents concerning costs and revenues. In this way, the private sector may serve as some safeguard, albeit perhaps imperfect, against "white elephants".

This is true even when, as under many public-private partnership arrangements, the government provides the concessionaire with some guarantees against certain cost overruns or revenue shortfalls. Consider, for example, a PPP arrangement for a toll road. Suppose the

[13] Note, however, that we may be missing data on projects where the costs were overestimated and the benefits underestimated; such projects may have been discarded because of yielding negative net benefits.

government provides the concessionaire with some initial design, and agrees to compensate her for any cost increases resulting from changes in this design or from the occurrence of some pre-specified events that were not initially accounted for. For instance, due to some public or political pressures by environmentalist groups, the government may decide later to change the path of the road, so as to pass through a tunnel rather than paving it across a mountain landscape. A public-private partnership contract may specify that in such a case, the concessionaire will be compensated by the government for her extra costs. Similarly, the government may agree to compensate the concessionaire, if some contaminated land is found along the path of the road that need to be treated, causing both a time delay and a cost increase. Also, the government may agree to compensate the concessionaire for future exchange rate changes, for future increases in the price of steel (which may constitute an important component of the cost of bridges and overpasses), etc. Still, the "baseline" cost (under the original design, price and exchange-rate levels, etc.) are at least partially, if not fully as in this example, borne by the concessionaire. Therefore, she will not take at face value the original cost (under)-estimates prepared by public agents eager to undertake the project.

The same is true with respect to the benefit side. Public agents typically provide some forecasts of the use of the road – "baseline" estimates. The government may offer the concessionaire an insurance for the baseline estimates, by compensating the concessionaire if the actual use turns out to be less than what was estimated at the baseline scenario. As long as this compensation is not full, that is as long as the concessionaire is *not fully* compensated for revenue shortfalls, she bears some of the risk of such shortfalls. Again, the concessionaire

cannot afford to take at face value the original revenue (over)-estimates prepared by investment-eager public agents.[14] Thus, public-private partnerships may serve as a safeguard, though not fool-proof, against "white elephants" which were not uncommon in many countries, developed as well as developing.

VI. COST-BENEFIT ANALYSIS: PRICES AND DISCOUNT RATES

The scrutiny done by the private sector under a public-private partnership is important for another reason. A key issue in any cost-benefit analysis is the prices at which costs and benefits are evaluated. Proponents of a certain public project of infrastructure investment may argue for calculating costs on the basis of out-of-pockets costs for the government. Thus, a case may be put forth for evaluating the cost of labor at (lower) after-tax wages rather than at (higher) before-tax wages, for indeed all taxes paid on labor are after all recollected by the government.[15] In a second-best world a la Davis and Whinston (1965), one cannot totally dismiss this argument at all circumstances.[16] However, following the work of Diamond and Mirrlees (1971), the public economics literature has established the prevalence

[14] We shall elaborate more on the importance of less-than-100% revenue guarantees later.

[15] See also Spackman (2002) for a related issue concerning interest costs.

[16] An even stronger (Keynesian) argument is to evaluate the cost of labor, especially low-skill labor, at zero in times of relatively high unemployment rates, for the social opportunity cost of unemployed labor is supposedly zero, or even negative, if unemployment benefits are saved. However, one has to recall that high unemployment will not necessarily persist throughout the construction stage of the project. Also, the unemployed labor may be utilized in another, more beneficial, project.

of ***aggregate production efficiency*** under quite general circumstances. That is, it is socially efficient for the production sector to maintain efficiency even though our second-best economies, plagued by distortionary taxes and subsidies, are generally inefficient. An implication of this efficiency requirement is that all production activities, whether carried out by the private or the public sector, must be evaluated at the ***same prices*** – the prices (including those of labor) faced or paid by the private sector. Among other things, labor should be properly evaluated at the wages paid by private producers, namely the (higher) before-tax wages, in cost-benefit analyses of public investment projects. As under a public-private partnership arrangement the private sector is the final "referee" of the project, then indeed the economic viability of the project will be calculated at the socially appropriate prices.

A related issue is the discount rate to be used in evaluating (discounting) future costs and benefits.[17] The private sector borrows typically at a higher rate than its financially-solvent government. Thus, the private sector employs a higher discount rate than the government. In most, if not all, infrastructure investment projects, the bulk of the costs is production costs which have to be incurred up front, whereas the benefits accrue much later. Therefore, an increase in the discount rate tends to have a significantly negative impact on the attractiveness of an infrastructure investment project. Hence, a project which has a positive net benefit, when evaluated by the government, may have a negative net benefit, when evaluated by the private sector, and, consequently, rejected by the private sector. At

[17] See also Grout (1997).

first glance, this may seem as a deficiency of public-private partnerships. But after a careful scrutiny, things turn out to be to the contrary.

Savers are indeed willing to lend money to the government at a lower rate (a "risk-free" rate) than at which they will be willing to lend money to the private sector. This is because savers correctly perceive that the government will not default on its loan, whereas the private sector may. The government is indeed less risky than the a private borrower from the point of view of the savers. The latter are indeed willing to finance a (risky) infrastructure project at a lower interest rate when it is carried out by the government than when it is carried out by the private sector. But this has nothing to do with the underlying, fundamental riskiness of the project itself. The latter risk does not change depending on whether the project is undertaken by the government or by the private sector.

The reason for which savers are willing to finance the project at the risk-free rate when it is carried out by the government is not because the fundamental riskiness of the project disappears when the government carries out the project; but rather because they expect the government to honor its obligations, no matter what adverse event (state of the world) concerning the project realizes. Savers know that if, for instance, the project fails to generate enough revenues in order to pay the interest or repay the principal, then the government can use its power to tax its citizens in order to cover the project revenue shortfalls. The explicit extra cost of private borrowing (over government borrowing) is merely replaced by a contingent tax liability, when a project is built and financed by the government. Thus, one concludes again that an infrastructure investment project should be

evaluated at the private sector prices (namely, discount rates), as is indeed the case with public-private partnerships.

VII. THE ALLOCATION OF RISK BETWEEN THE PUBLIC AND PRIVATE PARTNERS

An important issue in public-private-partnership arrangements is the sharing of risk between the public and the private sector; or, more concretely, the transfer of risk from the public to the private sector. As was pointed out above, much risk is *exogenous*, and the private partner is neither better informed about this risk than the public partner, nor can more efficiently manage or bear it. On the contrary, one may argue that the public sector is less risk-averse than the private partner, so that the former should bear all the *exogenous* risk. In the words of Dewatripont and Legros (2005): "It is thus in the interest of the State to insulate the contractor against *exogenous* risk."

Note, however, that insulating the private partner from exogenous risks does not necessarily imply that the public partner would bear these risks. Consider, for example, inflation risks. The general price level is undoubtedly exogenous to the private partner. (In fact, it is largely endogenous to the public partner–government, as inflation is primarily an outcome of present and future monetary policies.) The public partner may choose to insulate the private partner against inflation risks. Yet, it does not mean that the public partner would compensate the private partner for future rises in the general price level. These risks may be shifted to the users of the facility, say a toll road, by linking the toll to the Consumer Price

Index (CPI), for example.[18] (In this case, the private partner would probably finance the construction of the facility with debt, linked to the CPI , both the principal and the interest.[19]) Similarly, in a public-private partnership pertaining to a rail service, where the locomotives operate on diesel fuel, the risks associated with the future prices of diesel fuel could be shifted to the users by linking the fares to these prices through some formula that takes into account the weight of fuel costs in total costs.[20]

But not all risk is exogenous to the private partner. Some risk is *endogenous* to the private partner, and can be partially managed or controlled by actions or efforts made by the private partners. The level of these efforts may be too costly for the public partner to monitor

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[18] Note that when a risk is shifted to the public partner, it usually means that the risk is shifted to the public at large (or to the public in a certain area, if the public partner is a regional government). The group of the users of a facility is typically a smaller group than the public at large. In general, user charges can be thought of as conforming to the "benefit approach" to taxation, as distinct from the "ability-to-pay approach"; see Musgrave and Musgrave (1989).

[19] Alternatively, the public partner could demand that the private partner bear the inflation risks, that is set tolls which are fixed nominally. In this case, the private party would probably insure herself against such risks by financing the construction of the facility with debt, bearing fixed *nominal* interest (if such instrument are available for long terms) instead of fixed *real* interest, and the nominal toll set accordingly from the onset. With efficient capital markets the nominal instruments would embody some premia for the expected inflation rates, so that *a priori* the users of the road would be indifferent between the nominal and real alternatives.

[20] In this case too, one can think alternatively of fixing the fares in nominal terms. Then, again, the private partner would insure herself against future increases in fuel prices by purchasing forward contracts (if available), and set the fares accordingly from the onset. As these forward contracts would reflect the expected prices in the spot markets, then *a priori* the users of the rail would likely be indifferent between the two alternatives of setting the fares.

and verify. The public partner would be practically unable to enforce the private partner to make the efficient level of efforts or actions. Therefore, such endogenous risks are efficiently transferred to the private partner.

On the cost side, there are many risk elements that are either exogenous to the private partner or endogenous to the public partner that it is inefficient to make the private partner bear them. The general price level, the general construction index, oil prices (which affect, in particular the price of bitumen, a material used to make the tarmac), steel prices, etc. are beyond the control of the private partner. Design changes, new environmental or safety regulations, etc. are not only exogenous to the private partner, but also endogenous to a large extent to the public partner, because the latter often initiates design changes and new regulations. The public partner or the users (that is, the final beneficiaries from the public-private partnership) should therefore bear the associated risk. This is usually done either by a direct compensation from the government to the private concessionaire or by allowing the concessionaire to raise the user charges (such as the toll on a road or the price of water from a desalination plant, etc.) that she collects.

But there are also risk elements that are *endogenous* to the private partner and/or it is better informed about them than the public partner. Even putting aside design changes, new regulations, oil and key commodity price changes, occurrence of adverse effects (such as contaminated land, the discovery of new archeological sites), and the like, still there remain quite a lot of risk concerning production or construction costs. The quantities of the various inputs, such as labor, sand, cement, and similarly their future prices can only be estimated ex

ante. (And for some of these inputs such as labor, for instance, there are no forward markets.) In a conventional contracting (unbundling) a fixed-price bid may lead the contractor to compromise on the quality or durability of the facility by saving on input quantities or by employing low-quality materials. Assuring high quality is perhaps the reason for which in many construction projects (and almost in all construction projects in the area of transportation) the bid is a fixed-variable price, rather than a fixed-price. That is, the price P offered in a bid (or in a negotiated contract) is of the form

$$P = w_1X_{1E} + w_2X_{2E} + \cdots + w_nX_{nE} + P_0 \ ,$$

where w_i is the price of the ith input, X_{iE} is the quantity of the ith input, as pre-calculated (estimated) by the buyer-government, i = 1,2,3,...,n, and P_0 is all other costs. That is, the bidder does not offer merely a single, total lump-sum price P. Rather, she offers also for each input a price w_i that she will charge or refund for deviations of the actual (ex post) quantity of the ith input from the estimated quantity X_{iE}. The actual price P_A paid at the end will be

$$P_A = w_1X_{1A} + w_2X_{2A} + \cdots + w_nX_{nA} + P_0,$$

where X_{iA} is the quantity of the ith input that is actually employed. Naturally, these deviations are subject to authorization by an independent supervisor, typically appointed by the buyer.

In contrast, in a public-private-partnership arrangement, where construction of the facility and operating it for an extended period of 25-30 years are bundled together, the concessionaire has an incentive to build a facility of good quality that will last for long and will not require heavy maintenance costs. In this case, all the *endogenous* risk associated with the production costs aforementioned above is shifted to the concessionaire. The public

partner is insulated from all this risk, which is often a major source of cost-overrun under conventional contracting. This is a major advantage of PPP arrangements. The concessionaire's incentive to keep the facility in good conditions is further enhanced, when she is also required to transfer the facility in good conditions to the government at the end of the concession period. This is the case with Build-Operate-Transfer (BOT) projects.

Similarly, on the revenue side, there are many risk elements which are exogenous to the private partner. A major source of uncertainty in infrastructure projects is future demand. The latter depends crucially on macro-economic variables such as the rate of growth of the population, of GDP, fuel costs, the degree of urbanization, etc. These risks are efficiently borne by the government. Furthermore, some other factors are endogenous to the government as they constitute policy variables. For instance, the demand for the services of an underground metro in a certain city crucially depends on whether the (local) government will enact means to restrict private cars access to the city center. Similarly, the volume of traffic on a toll road depends on whether or not the government will develop an alternative fast rail service and at which (subsidized) rates; it depends also on whether or not the government will develop access roads to the toll road according to the timetable presumed ex ante, at the planning stage. The demand for water may depend on the price subsidy that may be determined ex post for socio-economic or merely political considerations.

But, again, there still remain many risk elements that are *endogenous* to the private partner. Consider for concreteness the case of a toll road. The uncertain demand depends also on some hard-to-verify actions or efforts undertaken by the concessionaire-operator. The

operator can encourage demand by investing efforts on aggressive advertisement and marketing, by providing clean and comfortable rest areas along the road, by providing fast and good breakdown services, by charging a toll below the maximum level allowable in the concession agreement (if demand is elastic), etc. If the government guarantees the private partner a fixed revenue, such as in the case of a "shadow toll" paid by the government on behalf of the motorists according to a pre-specified traffic volume, then the concessionaire-operator has no incentive whatsoever to boost traffic on the road.[21] On the contrary, because a higher volume of traffic would probably inflict higher maintenance costs on the concessionaire-operator, she has an incentive to depress traffic. Therefore, some revenue-sharing arrangement, between the public and private partners, would seem to be efficient, as it would maintain an incentive for the concessionaire to take demand-enhancing measures. Typically, the ex ante estimated demand is set out as a benchmark. If actual demand falls short of this benchmark, then the public partner pays to the private partner a fraction α of the deficit; if actual demand exceeds the benchmark, the private partner transfers to the public partner a fraction β of the surplus.[22]

In this context, it is important to distinguish between two alternative terms in which the demand guarantee is set out. One way is to set out the guarantee in terms of the quantity of demand; the other – in terms of revenues. The first seems to be more efficient, because the

[21] A "shadow toll" is quite common under Private-Finance Initiatives (PFI) which were first launched in the U.K. in 1992.

[22] The two fractions, α and β, need not be equal to each other.

revenue is the quantity, multiplied by the price *actually collected*, and the private partner may be required to exert some effort to actually collect the proper price. Consider again the case of a toll road. Collecting the tolls is not a costless or effortless activity. The collection of the tolls may be relatively simple if there are manual toll booths at all entrances to and exits from the road. But this method certainly slows down traffic and may require very large spaces for installing manual toll booths, especially on heavily trafficked roads. These spaces are quite scarce, in particular in densely populated areas. For these reasons, the exclusive use of electronic means may be preferred by the public partner and imposed in the concession agreement. The collection of the tolls is no longer simple when the use of manual means at the road entrances and exits is strictly forbidden. In this case, a guarantee set in the form of a benchmark traffic volume rather than a benchmark revenue seems to be a more efficient way of (endogenous) risk sharing, as it enhances the concessionaire's incentive to devote means to collect the tolls.

An alternative specification of the revenue guarantee (putting aside the possible distinction between quantity and revenue guarantee) is to endogenize the terminal date of the concession. That is, the concession agreement can specify that the concession terminates at the date by which the *discounted* sum of revenues reaches a certain benchmark. Unlike with the revenue-sharing alternative discussed above, the public partner has the advantage in this variable terminal-date alternative of not having to make out-of-pocket compensations to the private partners. Still, this alternative also provides some sort of revenue sharing between the two partners in the up side, as the private partner receives all the revenues only until the termination date of the concession (which is pushed earlier), and the public partner pockets

all the revenues thereafter. However, it seems that the incentives for the private partner to enhance demand and revenues are weaker under the variable terminal-date alternative. The gain that the private partner enjoys when she makes an effort to boost demand is only her saving in maintenance costs as a result of the consequent shortening the concession period.[23] This gain seems practically meager relative to the gain under a direct revenue-sharing alternative (with α in the order of magnitude of 0.7-0.8 and β in the order of magnitude of 0.5-0.6).

A further advantage of the revenue-sharing, fixed terminal-date alternative over the variable terminal-date alternative is that under the former alternative the private partner bears much of the *endogenous* risk associated with the length of construction period. The fixed terminal date may be specified independently of the date of the completion of the construction of the facility. For instance, the PPP agreement can specify that the concession period is thirty years from the beginning of the project. This period covers both the construction and the operation periods. Thus, the concessionaire has an incentive to shorten the construction period of the facility as much as practical, in order to extend the operation period in which she collects the revenues from the use of the facility. (Note that the public partner also benefits from a longer revenue-generating operation period under a revenue-sharing scheme; and the public at large also benefits from a longer period of use of the facility.)

[23] Note that the private partner does not gain anything from merely receiving the toll revenues earlier, because her benchmark revenues (for the determination of the concession terminal date) are defined in present value terms.

The idea of revenue sharing, as a means of demand guarantee, has also some practical advantages. The distinction between endogenous and exogenous risks may not be clear-cut in practice. Furthermore, their direct implications for the cost and benefit of a public-private partnership may also be hard to separate from each other and evaluate. For instance, an observed decline in toll revenues from a highway may ensue because the public partner failed to construct access roads on time, because the private partner failed to provide a high quality service or charged a too high toll (though within the limits set by the concession agreement), because of bad weather, and so on. It may be impractical to try to decompose the observed decline in revenues into its various possible causes. A pre-specified formula for revenue sharing may thus provide a "reasonable" rule of thumb for risk sharing between the public and private partners.[24]

VIII. TRANSFER OF THE FACILITY

Another widespread practice in public-private partnerships is the transfer of the facility to the public partner at the end of the concession period. The most common form of a PPP with this feature is the Build-Operate-Transfer (BOT) arrangement. The concessionaire is usually required to transfer the facility in good condition at the end of the concession period. The transfer element seems to be inevitable for no public partner would agree to set

[24] Note nevertheless that revenue sharing or, more generally, risk sharing may induce the private sector to undertake "too" risky projects.

no time limit to the concession (operation) period. But this element can be distortionary if not properly treated.

Consider for concreteness the case of a toll road. The length of the concession period and the tolls are typically determined with the aim of making the toll revenues during the concession period cover the costs of construction, maintenance and operation (all in present values). But, abstracting from possible externalities, this policy may result in determining the toll at a higher-than-efficient level. The users of the road ended up paying to finance a facility (the road) which *in effect* they had not used, because the facility is rendered back to the government like new ("in good condition"), due to proper maintenance whose costs were also financed by these users. Thus, the tolls cover more than all the economic costs of the PPP project.

Alternatively, the public partner could buy the facility (namely, the road) from the private partner, at the "market" price. Because there are no markets for toll road, the market price would be probably set at the cost of constructing a new facility of similar standards. The public partner can "resell" the facility to a new operator, and so on. Compared to the toll under this alternative (of transferring the facility to the public partner at cost at the end of the concession period), the commonly-used free transfer alternative can result in a significantly higher toll. Table 1 provides some illustrations of the "markup" between these two tolls.

One can think of the users of the facility under the transfer-at-cost alternative as taking a loan from the public partner (through the private concessionaire) in which they pay

throughout the concession period interest only, and then repay the whole principal at the end of the concession period. Under the free-transfer alternative, the users pay a fixed annual payment which covers both the interest and the principal, so that at the end of the concession period they owe nothing to the public partner.[25] So, we essentially have to compare the annual payment on a loan when the principal is repaid at the end and when the annual payment covers the principal too. This comparison depends on the length of the loan period and on the interest rate, as illustrated in Table 1. With an operation period of 20-25 years (which may be common under a concession period of 25-30 years with a construction period of about 5 years) and a *real* interest rate of 4-5% per annum, the toll under the free-transfer alternative is about 42-84% higher than under the transfer-at-cost alternative.

IX. PIGOUVIAN TAXATION

The sizable mark-up of the toll discussed in the preceding section points out to another deficiency of public-private partnerships. A PPP project tends to be carried out in a "closed budget" or "stand alone" framework. That is, revenues from user charges (for instance, tolls on roads, airport "taxes", etc.) are expected to cover more or less the costs (of construction, maintenance, operation, etc.) of the facility. However, recovering the costs cannot be the sole, or not even the major, consideration behind the determination of the level of the user charge. For many, if not all, investments in infrastructures are of a congested local public good nature. That is, each user of the facility generates an external diseconomy on

[25] This simplification abstracts from maintenance and operation costs.

other users. The user charge must therefore play also another crucial role in this setup, that is the role of a congestion toll, as a Pigouvian, externality-corrective tax. As was pointed out by Oakland (1972), an efficient congestion toll rarely just suffices to cover the costs of constructing, maintaining and operating the facility.[26] This may depend on the specific functional form of the congestion externality and the returns to scale in production.

Furthermore, major toll highways may often be less congested than other freeways. The users of a toll road may generate a positive externality, relative to the users of a freeway, in that they reduce the level of traffic congestion on the freeway. For instance, the Cross-Israel Highway (the only toll road in Israel, constructed as an international public-private partnership initiative) is rarely congested. In contrast, the almost-parallel coastal, *free* roadway is often heavily congested. A more efficient allocation of traffic between the two roads can be achieved by lowering the toll on the Cross-Israel Highway and introducing a toll on the free coastal roadway. Such a cross-subsidization cannot, of course, emerge when the public-private partnership is a stand-alone enterprise. Therefore, public-private partnerships may distort the efficiency of resource allocation.[27]

But one can in a straightforward manner conceive of a different framework under which efficient tolls may be charged. For instance, a public national or a regional authority may be put in charge of construction, maintenance, and operation of all inter-city highways

[26] See also Oakland (1974).

[27] See also Valila (2005).

in the nation or the region. This authority may impose tolls on all roads, if required. When deemed feasible and appropriate, this authority can initiate the construction of a new toll road under a PPP arrangement. It can use its revenues from other tolls in order to offer a certain grant or a toll subsidy in the specification of the bid for the PPP, so as to enable the concessionaire to charge a efficient toll even in circumstances under which the efficient toll is below the level that would be required in order to cover all costs of the project.

X. OFF-BUDGET INVESTMENTS AND RESOURCE ACCOUNTING

It may be quite plausible that the whole idea of public-private partnerships was "invented" out of an intent or desire to circumvent normal and regular budgetary procedures. In the words of Dewatripont and Legros (2005): "...it is clear that PPPs have been attractive for Governments trying to make their accounts 'look good', thereby (ab)using public accounting rules that do not properly value State assets and liabilities." No matter whether this claim is true or not, still, as we have seen above, properly designed PPPs entail many economic advantages that cannot and should not be dismissed just because they "were born in sin". Nevertheless, in their embryonic stage, public-private partnerships indeed took mostly the form of Private-Financing Initiatives (PFI) which, *in a nut shell*, may be seen as providing not much more than a window-dressing or a fancy make-up for conventional public investment undertakings.

Roughly speaking, a private-financing initiative, as its name suggests, provides merely private financing for public investment. For instance, the government may contract

with a private party to construct an office building to be occupied by it. But, instead of the government paying to the private party a certain price at the completion of construction and taking possession of the building, the government agrees to rent the building from the private partner at a pre-determined monthly or annual payment for a pre-determined period of time. At the end of this period, the building is transferred to the government at a pre-determined price (often zero). Similarly, the government contracts, for instance, with a public party to construct a highway; but instead of paying directly for the construction of the highway, the government "rents" from the private party the services of the highway (on behalf of the motorist users) at a pre-determined "shadow toll" for a pre-determined period of time; at the end of this period, the highway is transferred to the government.

Put differently, a private-financing initiative bundles together the conventional provision of a public facility with its financing. Instead of first contracting with a private party to construct a facility (a highway, an office building, etc.), and then resorting to its tax revenues or borrowing in the domestic or international capital markets to secure the funds required to finance the construction of the facility, the government forces the provider of the facility to provide the financing. It is hardly conceivable that the private party has any comparative advantage over the government in raising funds in the domestic, not to mention the international, capital markets. But the government accounts certainly look nicer with a PFI than with conventional (unbundling) arrangement, if the government is able to put in its budgetary accounts only the annual rent (or shadow toll) payment for the facility under a PFI rather than the entire amount of the investment in the facility right away under a conventional contracting. With the restrictions put on the members of the European Union under the

Stability and Growth Pact, public-financing initiatives may certainly look attractive to many governments.

A similar "advantage" could be obtained with the method of "resource accounting" that was initiated in the U.K. under the government of Mr. John Major. The latter method postulates that the true *annual* economic cost of the use of an economic resource (say, an office building) is its *annual* rental price. Therefore, the cost of using a building must be evaluated annually by its rental price and recorded accordingly in each annual budget over the life time of the building rather than recording the entire purchase price in budget for the year it was purchased.[28]

One should note, however, that the proponents of resource accounting often make also a legitimate claim that it promotes the allocative efficiency of the government's use of economic resources. In the example of the office building a sound case may be made that resource accounting will enhance an efficient use of office space by governmental offices and departments, as they will be charged annually for the space that they occupy and will therefore internalize the annual cost of occupying an office space. In contrast, when they are charged once and for all for the entire purchase price of a building at the time of purchase, they have no incentive to save on office space in subsequent years.

[28] It is worth noting that the principles of resource accounting are essentially based on generally accepted accounting principles that prevail in the private sector according to which the cost of a fixed asset is not recorded as an expense in the year in which it is purchased but rather depreciated over the life time of the asset. In fact, resource accounting is an inherent feature of accounting on accrual (rather than cash) basis.

Further note that the seemingly advantageous feature of private-financing initiatives (or resource accounting) in making governments' accounts look nice dissipates in the long-run steady state. That is, this advantage prevails only in the transition period from conventional to PFI contracting (or from the conventional cash-based accounting to resource accounting). To see this, suppose that the government makes every year an investment in a new public facility at an amount of $1000. Suppose further (merely for computational ease) that the interest rate is zero. Under conventional contracting, the government records every year an outlay of $1000. Now, suppose that in year 1 the government shifts fully to PFI contracting (or resource accounting). Assume also that each facility last intact (like new) for 10 years and then collapses. The annual competitive rent or "shadow rent" of each facility is therefore $100. Then the government budget will show an outlay of $100 in year 1, instead of $1000 under conventional contracting. But in year 2, there will be an outlay of $200 (consisting of a rent of $100 for the facility built in year 1 and a rent of $100 for the facility built in year 2), and so on. In year 10 there will be an outlay of $1000, exactly as under conventional contracting.[29] Thus, one may argue that in the longer run, after a possibly quite long transition period, private-financing initiatives entail only the *real* advantage of a more efficient resource allocation, with no meaningful bearing on how governments' accounts look. As with respect to a shift to resource accounting, this "look good" advantage dissipates

[29] Assuming a positive rate of interest will not change our conclusion. A positive rate of interest will raise by roughly the same amount the rent paid under PFI arrangement and the interest payments on the loans taken by the government to finance the construction of the facilities under conventional contracting.

even faster, if the government acts quickly to estimate the "market values" of its existing capital assets and to charge its departments an offices rents based on these values.

Furthermore, private-finance initiatives may play a useful economic role in transition periods. Consider a situation in which infrastructure investments were largely neglected over a relatively long period. This may give rise to the so-called "infrastructure gap" between the existing stock of the infrastructure capital and some notion of a "growth-maximizing" stock of infrastructure capital.[30] Suppose further that the government decides to embark on a major plan to close this gap. A good case may be established on economic grounds as to whether the government should partially use debt to finance the closing of the gap during this transition period, ***provided that the public debt is relatively low and increasing it will not deteriorate the financial risk-rating of the country.*** PFIs indeed facilitate the use of debt, as the latter is a built-in feature of them.

First, if the current generation is finite-looking, non-Ricardian, then it may question the rationale from an inter-generational economic justice point of view as to why it should pay taxes at present in order to finance the closing of an infrastructure gap that has largely accumulated by its preceding generations; and, furthermore, the benefits from closing the gap would probably accrue only to the next generations. Therefore, from the perspective of

[30] For instance, Romp and de Haan (2005) and Kamps (2005) provide some analysis in support of the notion that some Central European countries lack "adequate" public capital. Similarly, the Bank of Israel, in its recent annual reports, estimates the "infrastructure gap" in Israel to amount to some 20% of GDP.

economic justice among generations, one can make a case of extending the cost of the transitory increase in investment to future generations as well. That is, it may be appropriate for the government to partially resort to debt to finance the closing of the infrastructure gap.

Second, there are also economic efficiency grounds. Because the ***marginal excess burden*** of taxation is usually rising, one should attempt to smooth taxes over time in order to minimize the ***total excess burden*** of taxation[31]. Therefore, efficiency considerations would imply that the transitional acceleration of investments in infrastructure could be financed partly by debt rather than fully by current taxes. In this way, taxes are smoothed over time.

XI. POLITICO-ECONOMIC CONSIDERATIONS

A public-private partnership, even at its least advantageous form of a private-financing initiative, may entail another advantage when politico-economic considerations are taken into account. True, PPPs may enable the treasury to shift public investment project off the public budget (and the public eye). But one has always to bear in mind than in many political systems, especially with many-party coalition governments, the alternative to spending money on PPPs may be spending money on other budgeted items, such as government current consumption or transfer payments.

[31] See, for instance, Barro (1979) and Lucas and Stokey (1983). This is true even when parents are altruistic towards their children and the non-negativity constraint on bequests are not binding.

For instance, the treasury may put forth to a cabinet meeting its proposed budget for the coming year, concentrating first on some general guidelines such as certain caps on total expenditures, total revenues, and the ensuing budget deficit (or target surplus). Explaining to the cabinet members that these caps are essential to enhance economic growth and macro and financial stability, the treasury may be able to obtain a unanimous cabinet approval of its proposed caps.

The real hurdle, however, will come later when discussing the allocation of total expenditures. In a coalition government, composed of many small parties and sometimes even without the prime minister's party enjoying a solid majority within the government, it is quite hard, if not impossible, for the treasury to resist demands by cabinet ministers to allocate money to their well-concentrated constituencies[32]. Public investments tend to take a long time to complete and even much longer time for their benefits to show up; also, their benefits tend to spread in little bits over very large populations.[33] Therefore, political parties may not be particularly interested in public investments. They may be much more interested in securing benefits to their well-concentrated constituencies. Thus, in the budget approval process, either at the government level or more often at the parliament level, public

[32] See Alesina and Perotti (1995) for a nice survey of the political processes of budgeting; they also explain how setting the agenda may affect the budget outcome; see also Alesina and Perotti (1996a and 1996b).

[33] In many cases the only interest group associated with public investments is the association of builders and contractors. However, the construction industry is usually very competitive world-wide, and its lobby is not always sufficiently strong.

investments may well be cut in favor of other spending (such as defense[34] or social transfers to the elderly). The treasury may fear that if it "legitimizes" a certain budget deficit in order to invest in much-needed public infrastructure (that is, with a very high social rate of return), it may end up with a budget deficit financing current consumption or transfers.

For this reason the treasury may prefer to exclude certain public investments from the public budget, and propose lower caps on total expenditures and the budget deficit. It can then resort to public-private partnerships to promote those public investment projects that are fit for such partnerships. Furthermore, it may well be the case that when a public facility is financed by the private sector, it is *politically* more feasible to impose a user charge, such as a highway toll, for instance. When a highway is financed by tax revenues, the users-taxpayers may feel that they have a "right" to use the highway *freely*, as it was built by their own tax money. Also, a typical PPP agreement would disallow the government to reduce the toll, unless a full compensation is paid to the concessionaire. Having to compensate the concessionaire, a government will not easily offer to reduce the toll as a sort of "an election bribe".

Indeed, in many cases, there is a widespread belief within the treasury, especially among its civil service professionals, that PPPs are the only means by which large public investment projects can be carried out, without compromising fiscal sustainability. Not

[34] The military establishment and the defense industries often compose a very powerful political lobby.

withstanding this belief, fiscal responsibility may be seriously hampered, ***unless all government liabilities in connection with public-private partnerships – implicit or explicit, direct or contingent, and at all layers of government – are properly evaluated and recorded.***

XII. CASE-STUDY: CROSS-ISRAEL HIGHWAY

Cross-Israel Highway (henceforth CIH) is the first public-private partnership undertaken in Israel. It is of the Build-Operate-Transfer (BOT) type. It was initiated in 1992, but the design of the bid, the selection process and , and the final negotiations between the government (through a state-owned company, established solely for this purpose) and the winning consortium of contractors and between the government, the winner, and the financing consortium, etc. took several years, so that actual construction started only at the beginning of the year 2000. In fact, the very nature of a PPP is that it is very large in size and involves a complexity of agreements concerning the bundling of the concession itself, construction, operation, and maintenance, so that concluding final agreements is very costly in time and money. (The various agreements spread over thousands of pages.) This seems to be a major deficiency of public-private partnerships.[35]

[35] Currently, there is another major PPP project in process: an underground metro system for the metropolitan area of Tel-Aviv. It was started about four years ago. The deadline for the pre-qualification offers was postponed several times in order to allow potential bidders to organize in groups; no potential bidder wanted to undertake the whole project just by itself, nor did the government allowed this to happen. The deadline for submitting the final offers was also postponed several times per requests by the potential bidders. Actual construction is expected to begin only toward the end of this decade.

This public-private partnership CIH refers only to the central portion, about 90 kilometer long, of a planned highway that would cross Israel from north to south. CIH is a multi-lane, two lanes on each side, toll highway. The cost of the initial construction and the toll-collection equipment (see below) amounted to about $1,200 millions. When traffic volume would reach a certain volume, the highway is to be expanded by the concessionaire with one lane on each side. The estimated cost of this expansion could reach as much as 25-30% of the initial investment. The tender for it was an international tender (published in English), and it was hoped that many foreign companies will bid for it. Despite some initial intense international interest in it, at the end of the day foreign company did not seem eager to participate, and the winner was a consortium consisting of two Israeli companies and one foreign (Canadian), relatively small company. Recall that the tender took place in the second half of the last decade, after the Camp-David accord and before the eruption of the second intifada, so that the political and security environment was relatively calm. Therefore, the major deterrence for foreign companies was not a political or security concern.

It appears that the major hurdle for international companies was the collection of the toll. The tender required that no toll booths or any other obstacles could be established alongside or at the entrances to the highway, and no vehicle would be denied entry. Drivers were not required to pre-arrange any means of payments before entering the highway. The concessionaire would be expected to use electronic devices to photo the license plate of a vehicle using the road, then identify the owner of the vehicle through the registry of motor vehicles (access to which was granted to the concessionaire by a special law), and send a bill

to her address which is listed at the registry of motor vehicles. The concessionaire was allowed to employ fairly stiff means to collect overdue bills, such as confiscating vehicles of owners with long-overdue bills whenever they use the highway again (the concessionaire monitors in real-time all the vehicles on the highway).

The government offered no construction grant whatsoever; the highway was to be transferred to the government free of charge at the end of the concession period[36]; so that the tolls were the almost exclusive source of revenues for the concessionaire.[37] The tender specified a set of criteria according to which the winner would be selected, but the level of the toll was by far the dominant criterion. Practically, the offer with the lowest toll would be the winner. The method of collecting the toll that was required in the tender was indeed very novel and innovative. It was not tried before anywhere else, except in a city road in Canada which was operated by a public entity (and therefore would not be particularly minded about revenues). It also required a sizable amount of investment in electronic equipment. Apparently, the collection of the tolls was deemed too risky for the private partners; most foreign companies pulled out of the tender[38].

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[36] See section VIII for a discussion of the problems that may arise in this case.

[37] The concessionaire was also allowed to pocket some of the revenues from service stations and convenience stores located alongside the highway, but this source of revenues was inconsequential.

[38] Actually, it is not completely clear why the government insisted on not having toll booths. One explanation, which has some credibility, is that toll booths require a large space to be installed. Indeed, toll plazas are quite spacious in the U.S.A. The Cross-Israel Highway passes through densely populated areas, and most of the land along its path had to be expropriated from private, largely agricultural users. Expropriation of land in Israel is very

(continued)

In line with the idea enhanced in section VII of insulating the private partner from *exogenous* risks, the government indeed offered some demand guarantees. As explained in that section, the government would not offer insurance for risks which are *endogenous* to the concessionaire. Therefore, the government offered a less-than-full insurance, which applied only to the *use of the highway* rather than the *revenues from the tolls*.

Specifically, if actual *traffic volume* falls in any year below a certain pre-specified, baseline estimate, the government will pay the concessionaire the tolls referring to 80% of the shortfall in the use; if actual *traffic volume* exceeds this estimate, the concessionaire will pay to the government the tolls referring to 57% of the excess use. But note that the guarantee is defined in terms of traffic volume rather than revenues, so that the collection risk, deemed *endogenous* to the concessionaire, is fully borne by her. For instance, if actual traffic volume happens to be exactly according to the baseline scenario, then the government pays nothing, even if the concessionaire is unable to collect the tolls due on this traffic volume. In practice, the concessionaire has indeed internalize the collection risk. She offers substantial discounts for users who agreed to pre-arranged payments (by installing personal electronic transponders in their vehicles with charges made automatically to their credit cards or bank accounts). The majority of the frequent users did indeed take advantage of these discounts. All in all, the collection rate is close to 100%.

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emotional and often involves long court battles. Therefore, in order to minimize on the size on the land to be expropriated, it was decided to avoid the establishment of land-consuming toll plazas.

The concession period was set for 30 years, including the construction period. As explained in section VII, defining the concession period to include also the construction period transfers to the private partner the *endogenous* risk associated with the length of the construction period. This gives the concessionaire a clear incentive to complete construction as soon as practical.[39] Indeed, the construction of the Cross-Israel Highway was completed ahead of schedule (in a little over 4 years instead of 5 years, as originally estimated by the government).

The government was in charge of constructing some major access roads to the Cross-Israel Highway. In view of its demand guarantees, the government had to chose between two spending alternatives: either to spend the amount of money necessary to complete the construction of the access roads according to schedule; or spend money to pay the concessionaire for the shortfall in traffic volume on the CIH, caused by the delays in completing the construction of the access roads. The right choice was quite obvious. Nevertheless, the construction of the access roads was not completed on time, and traffic would fall below the baseline estimate, though slightly, in the first year of operation (2005).[40] (According to the statistical models built beforehand to forecast the traffic volume, the latter

[39] Recall that because the concessionaire is also the operator of the highway, she would not compromise on the quality of the highway in its attempt to speed up the completion of its construction; see section VII.

[40] According to recent forecasts, traffic volume would meet the estimate in the second year of operation.

would have not fallen below the baseline estimate in the first year of operation, had the government completed the construction of the access roads on time.)

Another aspect of risk-sharing relates to the inflation, foreign exchange, and interest rates. The risks associated with these rates are clearly *macro* risks, *exogenous* to the private partner. To a large extent, they are also exogenous to the government. The latter cannot bear or manage these risks more efficiently than the consumers. Therefore, the decision that was made to transfer these risks to the users of the road seems quite reasonable. That is, the concessionaire was allowed to change the toll in response to changes in the inflation, foreign exchange, and interest rates. Part of the financing came through dollar-denominated loans[41]; and another part – through loans denominated in New Israeli Shekels (NIS), linked to the Consumer Price Index (CPI). Some of the loans were at variable interest rates, and some – at fixed interest.[42] The toll was therefore linked to a weighted index of the changes in the Israeli CPI, the dollar-NIS exchange rate, and the interest rate on the variable-interest loans.

The Cross-Israel Highway was the first and major public-private partnership in Israel. As such, it suffers from several "infancy" problems. One cannot escape the thought that government bureaucrats, though having already internalized the notion that the private sector can often do things better or more efficiently than they can do, have yet to internalize how

[41] Some of these loans, though dollar-denominated, were extended by Israeli lenders (mostly, financial institutes).

[42] *Ex ante*, there is no advantage to taking fixed-interest rather than variable-interest loans, due to arbitrage possibilities.

the private sector operates. As one Israeli businessman has put it: "they have yet to internalize the fact that the private sector is a *for-profit* organization." The prospect of making profits is a vital element in mobilizing the private sector. Nevertheless, the tender for the CPI contained several clauses that are aimed to prevent the concessionaire from making "excessive" profits *ex post*. But these clauses seriously hampered economic incentives and distorted the efficiency of resource allocation. We shall briefly discuss two of these clauses.

First, the winning consortium established a special-purpose company (the concessionaire) to carry out the project of the Cross-Israel Highway. The tender required the consortium to give the government a put option at such terms that essentially amounted to transferring to the government almost one-half of the profits of this company! (This is in addition to paying the government 57% of the excess of the toll revenues over the baseline estimate.) Not only that such a provision depresses the incentives for the concessionaire to invest (unremunerated and unverifiable) efforts in order to increase profits, but it also induces the bidders in the tender to offer a higher toll. With higher profit prospects, the bidder could have settled for a smaller toll.

Second, the tender stipulates that the toll be reduced in the event that actual traffic exceeds the baseline estimate, even though the government receives 57% of the revenues from the excess traffic. (It seems that government officials could not live with the idea that the private partner would take 43% of the excess revenues.) Note, however, that efficiency of resource allocation would call for exactly the opposite! As explained in section IX, the toll, serving as a Pigouvian corrective tax, should be efficiently set at the level of the marginal

congestion. As the marginal congestion is usually presumed to rise with the volume of traffic, efficiency considerations would call for raising the toll when the volume of traffic is excessive.

XIII. CONCLUSION

Public-private partnerships have become nowadays a major vehicle for investments in public infrastructures and other facilities that provide public services. They cover transportation infrastructures such as roads, bridges, tunnels, above and under ground rail, air and sea ports; water and sewage infrastructures; electricity and gas infrastructure; prisons; hospitals; government office buildings; and others.

It may well be the case that public-private partnerships were initiated as a means of evading expenditure controls and hiding budget deficits. They enabled a government to spread a certain amount of an investment over many future budget years rather than report the whole amount of the investment in the same year it was carried out, thereby converting a present budget deficit into future budget deficits. But there is nothing inherent in PPPs that leads inevitably to fiscal laxity and imprudence. Needless to say, there is a wide consensus among economists that these sins could and should be corrected: all government liabilities, whether direct or contingent or whether explicit or implicit, have to be properly evaluated and accounted for. Putting this issue aside, it remains to examine the economic advantages and disadvantages of public-private partnerships.

This paper takes a public-economics look at public-private partnerships. The latter can serve as a safeguard, albeit imperfect, against the construction of "white elephants". They can also play an important role in enhancing the economic efficiency of resource allocation. When properly designed, in particular with respect to the sharing of risks between the public and private partners, PPPs can improve the quality of the services provided before solely by the public sector, without raising their costs to the society as a whole. Their major drawback is in their complexity, which renders their transactions costly in both money and time terms, and make them impractical for small undertakings.

APPENDIX: THE EFFECT OF ACCOUNTING ISSUES ON ECONOMIC CONSIDERATIONS

The allocation of risk between the public and the private partners in a public-private partnership has important implications for the accounting treatment of the business performance of the private partner. When the private partner is a public company whose stocks are regularly evaluated and whose credit-worthiness is closely monitored and rated, then its profit and loss, as reported according to *generally accepted accounting principles*, may often play a relevant role in the decision-making process of the managers (or even the owners-managers), alongside the *true economic* performance. Low accounting earnings may affect the ability of a private partner to secure credit at a reasonable cost. They affect also the ability of the private partner to distribute dividends for the latter may be distributed only from (accounting) earnings.

In a typical public-private partnership project, there is a relatively very high investment up front, and relatively low maintenance and operating costs thereafter. Also, revenues are typically expected to grow steadily over the lifetime of the project (that is, the concession period). Revenues are thus expected to be much higher at the final years than at the first years of operation. For instance, with a grow of just 5% per annum, the revenues at the final years would be three to four fold higher in the final years than in the first years of an operation period of 20 to 30 years. This means that depreciation allowances (especially when the facility is transferred to the government free of charge at the end of the concession period) and, more importantly, the finance costs would dominate the profit and loss statement of the project in the first few years of operation, whereas the revenues would be dominant only much later down the road.[43]

This means that the accounting profit and loss statement of the private partner (which acts through a special-purpose company whose sole purpose is to undertake and carry out the obligations of the private partner in the concession agreement) would almost surely show considerable losses in the first few years of operation. In practice, these losses could well accumulate to write-off the entire equity of the special-purpose company. Furthermore, even though the special-purpose company is a limited-liability company, generally accepted accounting principles would require the private partner to integrate the negative equity of the special-purpose company (in the very common case in which losses exceed the initial equity)

[43] The finance costs and other costs during the construction period would be commonly capitalized and added to the cost of the facility, so that they would not show in the profit and loss statement during this period.

into her consolidated profit and loss statement. Thus, the public-private partnership asset, when treated as a *fixed asset*, would yield to the profit and loss statement of the private partner losses in excess of the equity she invested in this initiative. This is usually an undesirable outcome for the private partner, and it may weaken the attractiveness of public-private partnerships to the private partner.

However, if the allocation of risk between the public and private partners is such that, ***after or conditional on the completion of the construction of the facility***, the bulk of the remaining overall risk, especially the *macro* risk associated with the demand for the services of the facility, rests with the public partner, then the public-private partnership project may be treated as a *financial asset* rather than a *fixed asset*.[44] This is deemed so especially when the public partner provides insurance against *macro* risks associated with the demand for the services of the facility, and the private partner is required to transfer the facility to the public partner at the end of the concession period at a pre-determined price (possibly zero).[45] When the public-private partnership project is deemed to be a financial asset (rather than a fixed

[44] See also Hemming (2005) for a related discussion of an operating lease versus a *financial lease.*

[45] At first glance, it may seem odd that the private partner is presumed to bear *less* risk when she is required to transfer the facility to the public partner at a pre-determined price of zero than when she is allowed to negotiate the price with the public partner at the end of the concession period. But, upon reflection, this is quite reasonable, because in the latter case the revenues from the user charges are expected to cover some *uncertain* portion (to be negotiated later between the parties) of the construction costs of the facility, whereas in the former case the revenues would cover the certain construction costs of the facility.

asset), then the accounting profit is usually spread over the whole operation period of the project, provided indeed that the project is expected to be profitable, so that the unpleasant outcome of relatively high reported losses for the private partner in the first few years of operation is avoided.

A simple numerical example can serve to illustrate this point. Consider a toll road, constructed and operated under a public-private partnership. Suppose that the construction of the road lasts one period (period 0), after which the concessionaire has the right to operate the road as a toll road for three periods (1,2, and 3), after which she transfers the road to the public partner at a zero price. The construction cost amounts to $1000. Suppose further that entire cost was financed by debt at an interest rate of 5% per annum.[46] The gross revenues from the tolls are estimated to be $400, $624, and $757 in period 1, 2, and 3, respectively. The operating (and maintenance) costs are estimated to be $125, $200, and $225 in period 1, 2, and 3, respectively. The estimated *net* revenues are thus $275, $424, and $532, respectively. The internal rate of return of the project is 10% per annum, that is $275/1.1 + 424/1.1^2 + 532/1.1^3 = 1000$. Clearly, the project is very profitable.

However, if the allocation of risk between the public and the private partners are such that the project is treated as a fixed asst, then the profit and loss statement will show a

[46] Indeed, public-private partnerships are highly leveraged. The private partner does not usually finance more than 10% of the investment by investing in the equity of the special-purpose company; and remaining 90% of the investment are financed by (non-recourse) debt. Quite often, the private partner finances her equity investment by debt too.

considerable loss in period 1. Employing a straight-line depreciation method, the depreciation allowance in period 1 amounts to $333 (= 1000/3). The finance costs will be $50 (5% 0f $1000), putting the total accounting cost at $383. Compared with net revenues of $275, this yields a reported net loss of $108 (or a reported net loss of only (1-τ)1000, in case a tax of a rate τ may be carried forward).[47]

But, as explained above, once construction of the facility is satisfactorily completed, the public partner may bear the bulk of the remaining risk in many public-private partnership arrangements. This is particularly true when the public partner provides adequate demand guarantees and the facility is transferred to the public partner at a pre-determined price (possibly zero). In this case, the PPP project is treated as a financial asset, and its financial statements change as follows.

First, suppose that an independent financial expert evaluates the return on financial assets with similar risk and maturity characteristics at 7% per annum. Next, a profit margin is calculated for the operation (and maintenance) of the road as follows. It is assumed that this margin is *time invariant*; denote it by π. This profit margin is then calculated by attributing the excess of total revenues over the operating revenues (calculated as costs, plus this profit margin) as the financial revenues from the financial asset; and equating the present value of

[47] Similarly, one can calculate the net profits in the remaining two periods and show they are positive, assuming that the net cash flow in each period is used to service the debt.

the latter revenues, at a discount rate of 7% per annum, to the acquisition cost of the financial asset (namely, the construction cost of the facility which is \$1000). That is: $[400 – 125(1 + \pi)]/1.07 + [624 – 200(1 + \pi)]/1.07^2 + [757 – 225(1 + \pi)]/1.07^3 = 1000$. Solving this equation yields $\pi = 13\%$.

Accordingly, the profit and loss statement for period 1 will change to read as follows[48]:

Finance revenues		\$70	(= 7% of \$1000)
Finance costs		\$50	(= 5% of \$1000)
Net finance revenues	\$20		
Operating revenues		\$141	[= (1 + 0.13)125]
Operating costs		\$125	
Net operating revenues	\$16		
Net earnings (before taxes)	\$36		

Thus, a *profitable* public-private partnership project does indeed yield reported positive profits in the first few years of operation[49], under a suitable allocation of risk between the public and the private partners.

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[48] Naturally, the balance sheet will also change.

[49] Note that the calculation of the return on the financial asset (7% in our example) does not play a significant role in the determination of the *total* net earnings (\$36). It only determines the allocation of this total between net finance revenues (\$20) and net operating revenues (\$16).

The implications of the allocation of risk between the public and the private partners for the financial statements of the private partner is particularly relevant in the "penetration phase" of public-private partnerships, that is in the transition phase from conventional contracting to PPP arrangements. Given the very long-term nature of these arrangements, this period could be quite long. For quite a few years, a typical private partner would have only a few PPP projects in her portfolio, and most, if not all, of them would be at their initial stages of operation. That is, she would report losses on these projects (if treated as fixed assets). But in the long-run steady state, a typical private partner would have a variety of PPP projects with heterogeneous maturities. Some would be at their initial stages, reporting losses, but other would be at more advanced stages and reporting sizable profits. Therefore, the financial reporting problem may be mitigated in the long-run steady state; but one has to bear in mind that, in view of the very long duration of PPP projects, it may take several decades to reach this steady state.

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Table 1. The Toll Markup due to the Free Transfer of the Facility (in Percent)

Interest Rate (Percent)	Length of Concession Period (Years)				
	10	15	20	25	30
3	290.77	179.22	124.05	91.43	70.06
4	208.23	124.85	83.95	60.03	44.58
5	159.01	92.68	60.49	41.90	30.10
6	126.45	71.60	45.31	30.38	21.08
7	103.40	56.85	34.85	22.59	15.12