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Model for Public-Private Partnership in the Tax-Free Setup

INTRODUCTION

Public-private partnership as a vehicle for generating results desired by public sector is widely used in developed economies [Blanc-Brude, Goldsmith, Valilla, 2007]. Motivation for engaging the private sector in projects of interest for governments results from variety of reasons [Daniels, Trebilcock, 2000]. One could suggest the public policy motivation is based on stimulating private sector activities in priority areas [Grimsey, Lewis, 2004].

As observed by Engel, Fisher and Galetovic [2007] public-private partnerships began to boom just after the worldwide enthusiasm about privatizations faded. There may be variety of reasons the public sector changed its preferences in this regard. One of them, of mostly political nature, is that governments avoid this way a straight criticism that would be induced in case of outright privatization by those who oppose the process. A good understanding of the economic nature of available forms of public-private partnerships allows for correct interpretation and concluding on their socio-economic impact and role in the national economy [Iossa, Martimort 2008]. For the private sector, a public-private partnership in the most common case provides situation similar to temporary privatization [Savas 2000]. This is a solution in which a private sector agent receives

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most of owner's benefits generated by [public sector-owned] assets at stake. There is another political reason for the popularity of public-private partnerships that flows from the modern public relation approach. Governments are right to claim that private sector participation in the generation of the gross national product is being advanced by using the PPP vehicle.

Public-private partnership could be viewed very often as temporary privatization of public property [Savas, 2000]. In some other cases this is just a form of providing public goods&services by specific business ventures that are guided, and operated, by a separate legal framework. There is no doubt that due to basic characteristics of PPPs this form of government actions clearly resembles privatization. For example, Bennet and Iossa [2006] argue that in addition to bundling, a PPP gives the concessionaire ownership rights over assets and control rights over how to produce the service.

THE MODEL

It may be necessary to define the subject of the paper more precisely. In this regard we would like to follow the formulation used by Engel, Fisher and Galetovic [2007] that it is an infrastructure project such that: (1) assets concerned are controlled by a private entity for a defined term, including infinity, and (2) during the contract the private entity is a residual claimant, and public entity is a residual claimant after the concession.

Distribution of property rights and risks over the term of a concession is unique, and makes the PPPs so special [Dewatripont, Legros, 2005]. First, the contracts are of long-term nature. Second, concessions run for several decades, or indefinitely. Third, this is the concessionaire who manages and controls the public-owned assets. This is remunerated by either one of two or combination of both: user fees and/or subsidies. User fees are paid by the consumers of goods&services offered or by subsidies paid by the government. In fact, these fees are supposed to be also compensation for the investment and other costs incurred due to operating as a PPP. When the concession is over, the assets created for the purpose and used for providing public services (or public goods) become fully government-owned. Subsidies are supposed to compensate for the same elements (investment and operating costs) or supplement the user fees to fully compensate, if demand is insufficient.

We offer an extension of a basic model constructed by Engel, Fisher and Galetovic [2007]. An innovation we wish to introduce to the system is of a very special nature that makes the model applicable in a group of countries that operate without taxes as a source of public revenue. In the original model [2007] the cost of public spending associated with the PPP is based on taxation and social cost of it. However, there are countries in which this setup is not applicable. In

fact, lack of tax revenue may make the original model misbehave as one of crucial elements for optimizing exercise is missing. Many of oil producing&exporting countries do not meet a real budget constraint on public spending, but still they introduce PPP for achieving public policy goals. Therefore, our formulation of the model is tailored for these specific condition governments face in tax-free environment.

We start with defining a general problem a risk-neutral benevolent social planner faces. He is supposed to hire a party that will finance, construct and later operate an infrastructure project. For simplicity we assume that:

1. the infrastructure project does not have any maintenance and operation costs,
2. the value of the initial up-front investment does not depreciate over time of the concession agreement,
3. the partner for the PPP project is selected from a pool of qualified and competent potential partners that are able to deliver the necessary assets for the project at cost *I>0*.

As interpreted by Engel, Fisher and Galetovic [2007] the fact we ignore construction cost uncertainty results from the relatively larger demand uncertainty in PPP projects. All potential contractors-concessionaires are identical, risk averse maximizers of expected utility. Such assumption impose preferences depicted by strictly concave utility function *u*.

We believe that the assumption about the PPP project to be socially profitable [as stated by Engel, Fisher and Galetovic (2007), p. 8] does not hold for the specific situation of tax-free regions with no real budget constraints for social planners. But still, the PPP project should meet this condition to avoid total waste of public funds. We would like to dampen this condition by a requirement of sustainability of the PPP project in the concession period, but not necessarily afterwards.

Demand uncertainty concerning the demand for goods or services provided on the basis of assets created under the PPP project is summarized by a probability density over the present value of the total user fee revenue *f(v)* with cumulative density function *F(v)*. All stakeholders, the private and public partners in PPP know this density. It has a lower bound v_{min} and an upper bound v_{max}.

The social planner faces a very special problem. Producer surplus in state *v* we denote with *PS(v)* and consumer surplus in the same state is denoted by *CS(v)*. The parameter $\alpha \in [0, 1]$ represents the importance the social planner assigns to producer surplus in the social welfare function. The social planner's aim is to maximize objective welfare function that assumes that the benefits of users are not correlated with the benefit of using the PPP assets. It means, as formulated by Arrow and Lind (1970) that consumers of public goods (and/or services) generated by the PPP project will value them as if they were risk-neutral. The objective function is defined as in Engel, Fisher and Galetovic [2007]:

$$\int [CS(v) + \alpha PS(v)] f(v) dv \tag{1}$$

with the private sector partner's constraint

$$\int u(PS(v))f(v)dv \geq u(0)$$

The r.h.s. single element **u(0)** is a utility of not joining the PPP. The question that maximizes the objective function is the user fee charged from citizens when using the public goods (or services) provided by the PPP project. The fee in question belongs to the concessionaire for the whole period of the PPP, possibly indefinitely. Let's denote the present value of user fee revenue collected in state **v** by **R(v)**. And let the **S(v)** denote the present value of the potential subsidy it receives. As a consequence the producer's surplus **PS(v)** is formulated as follows:

$$PS(v) = R(v) + S(v) - I \tag{2}$$

The subsidy element is conditional on the state **v**. If the revenue from user fees is not sufficient to meet the initially agreed level of income for the private concessionaire he will receive a subsidy. The social planner has several options for the actual cash payment of the subsidy. It may be up-front payment made with conditional unbundled provision. In this case **S(v)** is identical for all states of nature (i.e. demand) **v**. Alternatively, the subsidy may depend on demand in state **v** and be adjusted to make up for the insufficient revenue generated by the PPP's assets. Such solution is classified as 'minimum revenue guarantee'.

The situation is a zero-sum game with the private sector partner receiving *R(v)* in state *v* and the government receiving *v − R(v)*, which implies **0<R(v)<v**. In the world with taxation as the source of public revenue finite term of the concession contract with **v-R(v)>0** these funds, the revenue, are used to reduce distortionary taxation elsewhere in the national economy. If the concession is supposed to run indefinitely, and the willingness to pay user fee is positive over this period, then **R(v)=v**.

With the original formulation by Engel, Fisher and Galetovic [2007], the PPP project externality is $\varepsilon(v)$ and $1+\lambda>1$ represents the cost of public funds. If we allow for the variable externality, conditional on demand, we get consumer surplus in state **v** defined by:

$$CS(v) = [v - R(v) - (1+\lambda)S(v)] + \varepsilon(v) + \lambda[v - R(v)] = (1+\lambda)[v - R(v) - S(v)] + \varepsilon(v) \tag{3}$$

The difference between society willingness to pay in state v and the total amount of subsidy transferred to the concessionaire is in [] brackets on the right hand side of equation (3).

For countries that operate without taxation as the source of public revenue this formulation is different, however. There is no additional scaling up of subsidy (or the total cost of public funds used to subsidize the concessionaire) by this distortion caused by tax imposed to finance the transfer of subsidy to the conces-

sionaire. And again, with no taxes, the term **v-R(v)** is not multiplied by the cost of public funds (λ) parameter, and there is no reduction in distortionary taxes after the concession contract expires, and the government gets the total revenue from the PPP assets. Therefore, for tax-free environment we shall have consumer surplus defined as follows:

$$CS(v) = [v - R(v) - S(v)] + \varepsilon(v) + [v - R(v)] = 2[v - R(v)] + \varepsilon(v) - S(v) \quad (4)$$

Now, returning to the main problem faced by the maximizing social planner the objective function becomes, by substituting (2) and (4) in (1):

$$\int [2[v - R(v)] + \varepsilon(v) - S(v) + \alpha(R(v) + S(v) - I] f(v) dv \quad (5)$$

It is possible to drop few elements from the objective function as they do not depend on the planner's choice variable (which are: R and S). These elements to drop are:

a). $\int \varepsilon(v) f(v) dv$

b). αI

c). v

Due to these simplifications and transformations we obtain the objective function to maximize:

$$\alpha \int [R(v) + S(v)] f(v) dv \quad (6)$$

which is equivalent to minimizing:

$$\int [R(v) + S(v)] f(v) dv \quad (7)$$

The problem faced by the social planner can be presented as:

$$\min_{\{R(v), S(v)\}} \int [R(v) + S(v)] f(v) dv \quad (8)$$

Subject to: $\int u(R(v) + S(v) - I) f(v) dv \geq u(0) \quad (9)$

With revenue $R(v) \leq v$ and non-negative subsidy $S(v) \geq 0 \quad (10)$

Arguments supporting PPP as vehicles for providing public goods is that this form liberates public funds (permanently). As we show in our modified version of the original model by Engel, Fisher and Galetovic [2007], even if the PPP operates in a tax-free environment, social welfare depends on joint flow of revenue **R(v)** and subsidy **S(v)** to the concessionaire. The respective shares of

R(v) and *S(v)* in total transfers are irrelevant. For governments with non-tax revenue and no budget constraints, the PPP vehicle is no longer as desirable as in the standard model. This is because there is no benefit related to alleviating distortionary tax finance.

We arrive to a conclusion that by our modification for tax-free countries, the original result obtained by Engel, Fisher and Galetovic [2007] still holds. This means that the social planner's problem is solved by equalization of total transfers to the concessionaire and the value of the infrastructure investment: *R(v)+S(v)=I* for all *v*.

Possible solutions therefore include:

I. $R(v) \equiv 0$ and $S(v) \equiv I$, which is appropriate for low-demand projects, but still, socially desirable by the social planner,

II. $R(v) \equiv I$ and $S(v) \equiv 0$, with no subsidizing necessary, and $v_{\min} \geq I$, which implies high demand PPP projects,

III. Infinite number of combinations with partial subsidies to supplement insufficient revenue to the concessionaire.

If there are any negative effects of increased taxation levied in order to finance additional subsidy, then one unit of currency transferred from the society via government to the concessionaire costs more than the unit transferred directly in a form of plain user fee.

This finding, and the reasoning behind, allows for a conclusion that user fees should be preferred to subsidies by a maximizing social planner in a tax environment. However, the concessionaire may be inclined to claim she experiences low-demand situation in order to obtain excessive subsidies from the government. Therefore, it becomes crucial for the PPP in all environments (tax, and tax-free) to estimate this particular feature accurately. Otherwise the social planner faces a problem of misallocation and sub-optimal use of resources.

CONCLUSIONS

The main findings and conclusions are as follows: (1) without taxes there are no negative externalities of financing subsidies to support PPP, (2) some of the benefits of the PPP are not present without distortionary taxation. It may be interpreted in the following manner.

First, the tax-free economies with vast public resources have much more comfortable situation in shaping the social welfare. It means that standard arguments against public-private partnerships do not exist in such conditions. What is more, provision of public goods and services and expanding the infrastructure for the sake of the underlying society does not need to bother with negative effects it may cause due to distortionary taxation.

Second, the benefits listed in the literature that are associated with the presence of the distortionary taxation are not really supportive for the use of the PPP vehicle in providing public goods&services. The nature of these benefits is that distortionary taxation is removed on the expiry of the concession period. Having long-term concessions, and high propensity not-to-decrease taxation once in place, such arguments in the literature shall be dismissed on the theoretical and empirical ground, as inconsistent, and far from the reality of public finance practice.

The further studies shall engage in the development of other boundary conditions to make the original model adjusted even better to local conditions, both in public, and in private sector.

REFERENCES

Arrow K.J., Lind R.C., 1970, *Uncertainty and Public Investment Decisions*, "American Economic Review", No. 60.
Bennettand J. and Iossa E., 2006, *Building and Managing Facilities for Public Services*, "Journal of Public Economics", No. 90.
Blanc-Brude F., Goldsmith H. and Valilla T., 2007, *Public-Private Partnerships in Europe: An Update*, Economic and Financial Report 2007/03, European Investment Bank, http://dx.doi.org/10.2139/ssrn.1107418.
Daniels R. and Trebilcock M., 2000, *An Organizational Analysis of the Public-Private Partnership in the Provision of Public Infrastructure* [in:] P. Vaillancourt-Roseneau (ed.), *Public-Private Policy Partnerships*, Cambridge, Mass.: MIT Press.
Dewatripont M. and Legros P., 2005, *Public-Private Partnerships: Contract Design and Risk Transfer*, EIB Papers, No. 10.
Grimsey D. and Lewis M., 2004, *The Economics of Public-Private Partnerships*, Northampton: Edward Elgar.
Grimsey D. and Lewis M., 2005, *Public-Private Partnerships,* Northampton: Edward Elgar.
Iossa E. and Martimort D., 2013, *The Simple Microeconomics of Public-Private Partnerships*, CEIS Research Paper 139, Tor Vergata University, CEIS, http://dx.doi.org/10.1111/jpet.12114.
Martimort D. and Pouyet J., 2008, *To Build or Not to Build: Normative and Positive Theories of Private-Public Partnerships*, "International Journal of Industrial Organization", No. 26, http://dx.doi.org/10.1016/j.ijindorg.2006.10.004 .
Savas E., 2000, *Privatization and Public-Private Partnerships*, New York: Chatam House Publishers.

Summary

The concept of public-private partnership as a vehicle for arranging provision of public goods or achieving socially desirable public policy goals has a long history and multitude of studies. This paper offers a simple, but crucial modification of the basic model of the public-private partnership financing by Engel, Fisher and Galetovic (2007). Due to growing popularity of PPP in creating and

operating infrastructure in resource-based economies, our innovation is intended to adjust the model setup to specific public finance conditions. It happens that in case of many resource-based economies the central government operates in favorable conditions. Budgets in oil&gas exporting countries do not face any constraints on public spending. This is sometimes associated with a tax-free system of public finance. As a consequence, models for optimizing social welfare by benevolent, risk-neutral planner with taxes and cost of public funds do not match the actual situation in countries we wish to focus on. The choice for the government, when PPP is considered is simple. Decision concerns the scale of subsidy. While the subsidy is not financed with distortionary taxation, the cost of public funds is different from what we find in available formulations of models. Therefore, in our paper we discuss the specific features of tax-free, resource-based economies and we modify the original model by Engel, Fisher and Galetovic (2007) to arrive at a formulation more appropriate for Arab countries, or other, where distortionary taxation does not exist. The main findings and conclusions are as follows: (1) without taxes there are no negative externalities of financing subsidies to support PPP, (2) some of the benefits of the PPP are not present without distortionary taxation.

Model partnerstwa publiczno-prywatnego w warunkach bez podatków

Streszczenie

Idea partnerstwa publiczno-prywatnego, jako sposobu na dostarczanie dóbr publicznych lub osiąganie społecznie pożądanych celów polityki posiada już długą historię i liczne studia literaturowe. Niniejszy artykuł oferuje drobną modyfikację podstawowego modelu finansowania partnerstwa publiczno-prywatnego (PPP), stworzonego pierwotnie przez Engela, Fishera i Galetovica (2007). Ze względu na rosnącą popularność PPP w tworzeniu i użytkowaniu infrastruktury w gospodarkach opartych na wydobyciu surowców naturalnych nasza innowacja w modelu ma na celu dopasowanie ram modelu do specyficznych warunków sektora finansów publicznych w tych właśnie krajach. Okazuje się, że w wielu gospodarkach opartych na wydobyciu surowców sektor publiczny funkcjonuje w sprzyjających warunkach. Budżet centralny w krajach naftowych nie posiada tradycyjnie pojmowanych ograniczeń dla wydatków publicznych. Jest to jednocześnie połączone z brakiem jakichkolwiek podatków. W konsekwencji, modele optymalizacyjne dla dobrobytu społecznego z punktu widzenia dobroczynnego, neutralnego wobec ryzyka planisty centralnego w warunkach z podatkami nie odpowiadają faktycznej sytuacji w krajach bezpodatkowych. Właśnie dla tego przypadku oferujemy nasze rozwiązanie. Wybór, przed którym stoi rząd, gdy rozważane jest partnerstwo publiczno-prywatne jest prosty. Decyzja dotyczy subsydiowania. Jeśli subsydia nie są finansowane z podatków, koszt funduszy publicznych rożni się od tego, co znajdujemy w dostępnych modelach. Z tego powodu, w naszym artykule prezentujemy specyficzne cechy gospodarek opartych na wydobyciu surowców, w których brak podatków i oferujemy modyfikację oryginalnego modelu stworzonego przez Engela, Fishera i Galetovica [2007] pozwalającą na uchwycenie cech charakterystycznych dla krajów naftowych lub innych, w których nie istnieją podatki. Główne wnioski to: bez podatków nie występują negatywne koszty zewnętrzne z tytułu finansowania subsydiami projektów infrastrukturalnych w formie PPP, (2) niektóre z korzyści wskazywanych w przypadku PPP nie występują, gdy brak jest podatków.