Engaging the Private Sector in Transportation Infrastructure – The Role of Public-Private-Partnerships

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Abstract

Since a couple of years, we observe a controversial discussion about the role of the state in European transport infrastructure policy. Public Private Partnerships (PPP) are discussed as an outstanding alternative to the public provision of transport infrastructure. As first steps in practice show, however, it is much more difficult than common consulting driven literature on PPP asserts to make use of the benefits of PPP without bearing its negative consequences.

Comparing PPP with traditional approaches of infrastructure provision has to address the different relevant types of cost. One can assess these costs using a so called comparative cost calculator. Empirical investigations show that private firms work more efficient than the public sector: Making Use of Private Public Partnerships leads to lower planning and construction costs and a shorter construction time for example. On the other hand, we have to take care of several risks connected with PPP. There are risks emerging during the planning and the construction period that are commonly known from conventional methods of infrastructure provision. New kinds of risks, however, result from disincentives during the running period and the transfer of infrastructure to the state after the period of private usage.

Risk management is obviously the main challenge for planning, installing and controlling infrastructure by PPP. For this reason, our paper will deeply assess the risk structure of Public Private Partnerships using a life cycle approach. Special attention is paid to the transaction and agency costs of PPP, because one has to identify incentives and disincentives of the parties thereto in order to prevent a failure of PPP. Transaction costs are related to the specification of tenders and contractual arrangements, especially with regard to service level agreements. There is a trade off between these transaction costs ex ante and the ex post transaction costs concerning the fulfillment of contracts and the risk allocation. To examine the relevance of ex post transaction costs we have to analyze the determinants of monitoring cost and the underlying incentive schemes. One important problem of risk allocation is the question of pricing, especially the possibilities and restrictions for efficient pricing for private run infrastructure in an environment that is characterized by public provision of infrastructure.

The problem of risk management is closely connected with the institutional framework of national infrastructure policy. Therefore we will address the political economy of infrastructure policy in Germany and Europe in this paper as necessary background information. There seems to be conflict of goals between a market-oriented infrastructure policy and other policy objectives. Transport policy has to become clear about its objectives and has to perceive that Public Private Partnerships are not a panacea – solving every problem of infrastructure policy without additional cost.

1. The Problem

Infrastructure economists and politicians in Europe changed their mind about the role of private activities for infrastructure provision over the last decades. Nowadays, there is apparently a consensus that transportation infrastructure should not be provided by the state itself furthermore (Aberle 2003). On the other hand there are still lots of obstacles to a full privatization of infrastructure. Public Private Partnerships (PPP) are discussed as an outstanding alternative to the public provision of transport infrastructure and a substitute for full privatization.

Indeed there are qualitative and quantitative deficits of transportation infrastructure in some countries because of the currently practiced public provision (Hartwig 2003). Infrastructure policy in countries like Germany, where provision of transportation infrastructure is traditionally a public task, leads to various disincentives. The lack of public funding we can observe causes infrastructure bottlenecks and a creeping erosion of assets. The ongoing shortage of public funding contrasts with the stable cash flow from traffic related taxes and levies, especially in the road sector. Notwithstanding, a main political objective of private engagement in transportation infrastructure is to attract additional funding from private investors.

From an economic point of view private engagement is rather supported by a lack of normative legitimation of public provision. Transportation infrastructure is no longer assessed in general as a public good that has to be provided by the state: the degree of rivalry when using infrastructure depends on the grade of capacity utilization; exclusion is technically feasible and can be practiced at reasonable cost. Therefore, we can qualify transportation infrastructure as a club good or mixed good (Ewers/Rodi 1995). There isn’t any economic justification for public provision, if you do not pursue other political objectives with the provision of infrastructure.

On the other hand, economists have to think about solutions for the conceivable problems related with private engagement in infrastructure provision. As first steps in practice show, it is much more difficult than common consulting driven literature on PPP asserts to make use of the benefits of PPP without bearing its negative consequences. Therefore, the consequences of the governance structures to be established should be assessed ex ante. One has to bear in mind the probable opportunistic behavior of the participants. Opportunistic behavior may lead to hold up-problems in connection with asset specificity and to other types of distortion because of asymmetric information. This is especially true with regard to PPP. Protagonists of PPP in Germany stress the mutual trust and interests of the public and private partners (Bundesverband deutscher Banken 2004). Actually, one should look rather at the possible conflicts of interests between the parties and the consequences for the society as a whole.

In this paper we assess the structure, efficiency terms and risk allocation of Public Private Partnerships in the transportation infrastructure sector. Our analysis will focus on the provi-

sion of road infrastructure (highways and motorways). To derive some policy recommendations, we refer mainly to the situation in Germany and analyze the structure of the presently discussed PPP-models for highway infrastructure. Our paper closes with some remarks on the requirements PPP have to fulfill to become really successful in practice.

2. PPP – Concept, Application and Risk Structure

2.1. Concept and Forms

If we look at the literature, we find lots of definitions what a Public Private Partnership means. Common to all these definitions is that PPP include various types of cooperation between the state and private firms with respect to the planning, construction, financing and operation of hitherto state controlled projects. Long term cooperation and risk sharing between the partners are important features of PPP. PPP try to establish risk sharing in the sense that private firms should take responsibility for the success of the project.

There are three main reasons for the participation of private firms in so far exclusively state run infrastructure projects (Bertelsmann Stiftung/Clifford Chance Pünder/Initative D21 2003):

- a lack of public funds that causes infrastructure bottlenecks and a creeping erosion of assets;
- (asserted) gains in efficiency because of the participation of private firms;
- a general attitude to reduce the volume of the public sectors' tasks (outsourcing to the private sector).

Under governance aspects, Public Private Partnerships can be qualified as hybrid organization models with specific incentive and risk schemes (Williams 2003, Eggers 2004). From this point of view pure outsourcing in the sense of procurement of services from private firms should not be denoted as PPP. Such outsourcing activities follow the regular rules of contract law. PPP however include contracts for cooperation containing a broad scope of activities (planning/design, construction, financing, operation, transfer) with a complex allocation of rights and options. The contractual agreements are of a mixed neoclassical or relational type (Macneil 1978). Participants at least accept gaps in the contract and bow to mediation or courts of arbitration; contracts of relational type allow stepwise adjustment of rules and a mutal monitoring of the cooperation.

If you look at the different tasks included in PPP contracts you may distinguish between financing-, operation- or franchise-types of PPP. One should bear in mind that private firms already carry out tasks when infrastructure projects are realized under public supervision; for example private construction firms are normally occupied with construction work, and plan-

ning tasks are also carried out by private consulting engineers. On the other hand, transportation infrastructure was traditionally financed by public sector funds in Germany; maintenance and operation of the infrastructure is done by the public sector. Public Private Partnerships create a new and different allocation of responsibilities. It is important to distinguish between at least three types of PPP (Deutscher Städte- und Gemeindebund 2002):

- Financing models only transfer the financing of a project to private investors; design, construction and operation of the infrastructure still belong to the responsibility of the state. The first PPP-solutions practiced in Germany were such financing models. One has to query for the specific advantages of this type of PPP, because the government normally is able to refund at most favorable conditions and other efficiency gains of private engagement cannot be realized because there is no such engagement in other tasks.
- Further benefits are related to operation models, commonly known as BOT-models (Build-Operate-Transfer). Private firms are responsible for financing, construction and operation of an infrastructure project. The contractual agreement shows elements of rental and leasing contracts or mixed forms of contracts. In the case of the BOT-model the ownership of the infrastructure will be transferred to the state at the end of the running period. Otherwise we refer to a BOO-model (Build-Own-Operate), where private firms become owners of the infrastructure without time limitation. In any case, the government will stay politically responsible for the infrastructure. Private partners are normally not allowed to set up infrastructure charges; they will get an operators' compensation from the authorities which possibly refund their expenditure by general infrastructure charges.
- Franchise models will allow the private operators to levy infrastructure charges directly on the infrastructure users. The right to charge the user directly means that the private operator has to bear the utilization risk on the other hand, whereas this risk is shifted to the public sector in the case of the BOT-model. Both for the operation and the franchise type planning and design of the project can be done by private firms (e.g. the model type DBFO – Design-Build-Finance).

If you look at the economic implications of the three types of PPP mentioned, operation and franchise models seem to be attractive alternatives to the public provision of transportation infrastructure. Therefore, we will discuss risk and efficiency characteristics of PPP with reference to these solutions and with some implicit emphasis on the road infrastructure in the following.

2.2. Efficiency Attributes of PPP

Because PPP require a governmental decision to give infrastructure responsibility to private partners a formal procedure for the evaluation of the efficiency of PPP has to be applied. A comprehensive catalogue of efficiency criteria is provided by the Public Sector Comparator (PSC) that has been developed in the United Kingdom (Treasury Taskforce 1999). Using the PSC the authorities in charge are able to calculate the net present value (NPV) of a project on the basis of the project description and the expected terms of design, operation, maintenance and financing. This NPV is compared with the calulation of the traditional provision by public authorities (Willms 1998). The PSC is used to prove the productive efficiency of a PPP-project; allocative efficiency of a project is still ensured by Cost Benefit Analysis (CBA) within the framework of public transportation infrastructure planning.

An important factor of PSC calculations is that the benefits of PPP have to be analyzed under life cycle aspects. In spite of the various difficulties to overcome with life cycle costs one has to try to model the relevant cost parameters for a very long period of utilization. The following types of cost should be included:

- Cost of investment: investment costs address the expenditure for planning/design, project development, acquisition of land and construction until the infrastructure project is completed. Economists argue that there are cost savings to be expected within a PPP arrangement caused by the joint optimization of project design, planning and construction by a single private firm or a consortium of private companies. While public authorities are subject to restrictions that reduce efficiency and speed of project management, PPP ensure integrative solutions for project development and construction especially under dynamic environmental conditions (Ewers/Tegner 2000).
- Cost of financing: as we argued, there are disadvantages of private firms regarding the financing conditions compared with the state. Looking at the life cycle costs of a project these disadvantages become less important. Cost Advantages of private planning, operation or maintenance may compensate for inferior funding conditions.
- Cost of operations and maintenance: Using the PSC you have to estimate cost of maintenance and repair for a running period of 30 years or longer. Significant advantages of PPP could be generated by a higher organizational efficiency or lower personnel costs in the private sector.
- Transaction and agency costs: Every Public Private Partnership will cause additional transaction and agency costs. Such extra costs emerge in all phases of the project from the negotiation period until the transfer of infrastructure at its close. E.g., risks have to be allocated during the period of design and construction, a prob-

lem that is known from the conventional modus operandi of infrastructure provision. A new challenge appears with the risks during the operation period, especially the utilization risk or the problem of an unexpected rise of maintenance costs. Additionally, one has to consider agency costs of the concerned private and public institutions. The parties are exposed to reciprocal asymmetric information with respect to the performance of their partners. In any case, the assessment of transaction, risk and agency costs requires a comparative calculation, because the also existing costs of the conventional provision scheme, which have probably never been calculated, have to be kept in mind.

The problem of transaction and agency costs is assessed to be the main economically important issue of PPP (Thom/Ritz 2003). While productive efficiency gains of private engagement in the infrastructure provision may reach 10 – 25% of the project budget, as industry experts estimate (Ewers/Tegner 2000), reliable estimations of additional transaction and agency costs do not exist at all (Kochendörfer/Jacob/Schönfelder 2000). On the other hand, the calculation of transaction and agency costs raises nearly unsolvable difficulties not only because of lacking data but also due to fundamental methodic reasons. Therefore PPP carry the possibility that higher productive efficiency is at least partly compensated by higher transaction and agency costs (Mühlenkamp 2004). In the case of a full compensation (or remarkably higher transaction costs) the society as a whole will have to bear a loss of welfare caused by PPP compared with the public provision of infrastructure. Therefore we have to assess the risk allocation of PPP in detail.

2.3. Risk allocation of PPP

In the following, we would like to discuss the risks and the risk allocation of PPP by means of the life cycle concept. We will distinguish between risks of the planning/design period, the construction and operation period and the transfer period (Kochendörfer/Jacob 2002).

A fundamental principle of risk allocation claims that a risk should be allocated to the party that is primarily responsible for the risk. Responsibility means that this party is best suited to control the risk and the risk factors. If a type of risk cannot clearly be allocated to the control sphere of one party, we have to use other principles of allocation. In this case the party which is able to bear the risk with the lowest cost or incorporates the highest risk bearing capacity should be given responsibility. In any case, rules for risk allocation have to be negotiated ex ante. Higher transaction costs ex ante because of these negotiations will lead to considerable lower ex post transaction costs. The complexity of PPP, however, does not allow an allocation of every type of risk ex ante. In most cases it will only be possible to negotiate and agree on fundamental rules for the management of risks (Tegner 2003). These rules have then to be interpreted during the cooperation under a going concern rule for the partnership.

Risks of the planning phase are of different type. For example, you may think of change requests both of the public and the private partner. (Financial) risks resulting therefrom do not involve severe allocation problems because they can be assigned to the particular party which imposed the change request. More difficult to deal with would be shortcomings or a failure of the private planning activities. May be, the creative and in the long run advantageous ideas of the private planning firm could only be realized at much higher cost. At first glance the private operator should bear these higher costs. Such a risk allocation will be counterproductive, however, if it leads to the bankruptcy of the operator and a collapse of the whole project. On the other hand you should not define a comprehensive public responsibility for all potential risks. General responsibility of the state would set inadequate incentives for private opportunistic behavior and disturb a well balanced incentive scheme not only during the planning and construction phase.

Risks of project development and construction had already to be allocated between public authorities and private firms in the case of public provision of infrastructure, because construction work was normally done by private construction firms. Therefore, we may use adequate risk allocation procedures developed by the construction industry in the past (e.g. independent investigators, contract penalties). Typical risks will appear as cost or time overrun or construction failures. Contract penalties and co-payments in the case of time and cost overruns set efficient incentives for keeping the deadlines and the planning features.

Furthermore, self interest of the private operator will ensure timely completion and construction work without failure. A time overrun will make it impossible for the private operator to start the private use in due time; the consequence of a delay will be a decline of revenues. Insufficiencies of the construction work will lead to lower revenues or higher maintenance and replacement costs in the future. Therefore we expect strong incentives to fulfill the contracts and deliver accurate construction work.

During the operation period the participants in PPP are confronted with new types of risk. The state as owner and operator of transportation infrastructure was not forced to care about the utilization of infrastructure. Furthermore, transportation infrastructure was sometimes provided beyond economic calculations for military or regional policy reasons. Infrastructure projects under a PPP-regime now explicitly show the utilization and demand risks, in particular when private operators impose infrastructure charges or rely on public funding that depends on the utilization of the project. To analyze such operation risks we assume performance-related payments in the following.

First we have to discuss the operators' risk with respect to the demand side. The volume of risk will rely on the type of the project. One possibility is that an investor takes an already existing infrastructure and operates this infrastructure after some strengthening and upgrading. Volume and structure of traffic are well known in this case. Therefore the private operator

could bear the utilization risk without an additional risk premium. Another case would be a completely new infrastructure: private operators have to rely on traffic forecasts that might be too optimistic, especially in the case of a single tolled highway within a toll free road network. Private operators will therefore ask for an additional risk premium; maybe a funding by infrastructure charges will not work at all.

This specific demand risk of an infrastructure operator has to be distinguished from the general operators' risk, resulting from the future economic development in a country and the general traffic forecasts derived from such socio-economic projections. E.g. one has to bear in mind the consequences of demographic changes on traffic in the society. These general risks should be fully allocated to the private operators. Their studies of economic feasibility of a project normally include some kind of sensitivity analysis of such economic figures. They will also be able to use pricing policy or other suitable economic tools to reach a stable utilization of the infrastructure in the long run. Therefore, private infrastructure operators should be allowed to set prices without limitations and also to make use of price discrimination to attract customers. However, pricing policy without limitations means a possibility to exploit a monopoly position if there are not enough alternatives for substitution. In this case, an infrastructure operator should be regulated by the state. Due to the fact, that price discrimination is desired to optimize traffic flow and utilization, only a price cap should be used for regulation (Knieps 2004).

Besides the general socio-economic influencing factors on traffic demand we have to assess the influence of the transport policy framework, especially regarding infrastructure policy and general mobility policy (Tegner 2003). Risks for private operators may derive from policy decisions concerning infrastructure projects in competitive relationship. E.g., public authorities could build toll free alternative roads during the running period of the PPP. Another distortion may result from lacking compliance regarding complementary agreements. For example state authorities may not eliminate disturbances in complementary parts of the network or simply do not establish complementary infrastructure features.

In both cases private firms need rules for recourse to deal with the public failure. Such a compensation scheme will be nontrivial to establish, because a separation of the different influencing factors is almost impossible. To decide whether a distortion is caused by external factors or by mismanagement of the private operator will be extremely difficult. Infrastructure operators will refer to external influences whereas public authorities suppose private failure. Considerable agency costs arise because of a situation with mutual asymmetric information (Tegner 2003).

Additionally, there are lots of common operational risks for a private operator of a transportation infrastructure. These risks are typically entrepreneurial risks stemming form the kind of business the infrastructure operator carries and therefore should be allocated to the

operator. An infrastructure operator, for example, will be interested in permanent operational readiness of his asset, because he cannot take in revenues, when the infrastructure is not ready for use because of road works or other distortions. In general there are strong incentives regarding the operational readiness of infrastructure, disincentives may only appear with respect to maintenance in the periods before the transfer of the infrastructure. A BOT-model provides a transfer of the infrastructure to the state after the period of operation (at least 30 years). Linked with the transfer is a disincentive for private operators to neglect maintenance and repairs before transferring the asset. But such opportunistic behavior of operators can be restricted successfully by contractual arrangements. The government may withhold a part of the operators' fee as a security or arrange an auction of the assets in a way that the former operator participates in the revenue.

It should be noted, that our considerations on the risk structure and favorable models of risk allocation depend on the basic assumption that a private infrastructure operator is able to set prices on his own account. If the level and structure of infrastructure charges is determined by a mandatory and inflexible public tariff, we will observe disincentives regarding maintenance and readiness for use. Even stronger disincentives will come along with fixed revenue arrangements for operators. In this case we have to use additional regulatory measures for the quality of operation (e.g. bonus/malus rules).

3. Transportation Infrastructure investment in Germany – the role of PPP

Whereas Public Private Partnerships are relatively common investment models especially in Anglo-Saxon countries (Pollitt 2000), we notice various obstacles for PPP in Germany – regardless of the political lip services to PPP (Beratergruppe 2003). One reason for the fact that PPP are treated with reserve could be that most big private financing projects in the transportation infrastructure sector were not crowned with success. Debating on private engagement in transportation infrastructure means to remember Eurotunnel, the Oresund crossing or the failed privatization of Railtrack. There are many examples for private engagement in the field of formerly public infrastructure where economic calculations and forecasts did not hold and the society as a whole had to bear risks and residual losses of the private operators (Aberle 2005).

What are the reasons for the failure of privately financed infrastructure projects? One main reason for difficulties common to the above mentioned projects is the underestimation of the project budget and the overestimation of the attractable demand. Similar phenomena we find if we look at other examples of private-public collaboration, e.g. the arms industry (Flyvbjerg/Holm/Buhl 2002). What we notice is, that there are frequently cost overrun situations because the project partners find themselves in a lock-in situation after closing the contract, and cost and demand driven risks were frequently contracted as to be borne by the pub-

lic authorities. As an actual German example you can also take the Toll Collect case and the problems of the introduction of a highway toll for heavy goods vehicles.

An important problem of numerous infrastructure projects with private engagement is that the main objective of the project is to attract private financing. Gains in productive efficiency driven by private engagement cannot be exhausted when the institutional structure of a PPP does not allow this. This is especially the case for the PPP-models practiced in Germany in the nineties. PPP projects were set up as a pure financing model to substitute scarce public funds and realize infrastructure projects sooner than otherwise possible. Infrastructure was earlier ready to use but this advantage came along with severe disadvantages: Public expenditures were much higher compared to a direct public financing of the projects and the fixed repayments restrict actual and future public budgets (Aberle 1995).

In Germany another type of PPP were discussed as the so called F-model, an application of the BOT-model. Projects of the F-model type, however, have to fulfill tight restrictions from EU and national law. Therefore, there are only few infrastructure projects in Germany suitable for this project structure. Two projects have been realized (Warnow-crossing Rostock and Trave-crossing Lübeck). The success of both projects is questionable, primarily because (potential) users are able to choose toll-free alternatives to the crossings. As mentioned before, it is obviously very difficult to operate a tolled infrastructure successfully within a toll free network with alternatives (Gawel 2005).

At the moment, there are strong efforts to establish another type of BOT-PPP in Germany which is called A-model. Private Companies get a license to operate and maintain a section of a national highway after enhancing it from two to three lanes. The contracts last for about 30 years with a subsequent transfer of the infrastructure to the state. Construction activities, operation and maintenance are financed by a “shadow toll” from the state, refunded by the highway toll for heavy goods vehicles. Due to the fact that private cars do not pay special infrastructure charges, the infrastructure operator gets a start up financing of maximum 50% of the project volume (Fislage/Heymann 2003).

At a first glance, the institutional arrangement of the A-model seems at least to be feasible. Because the private operators enhance existing roads, the costs of upgrading, operation and maintenance are relatively easy to estimate compared with a completely new project. Additionally operators needn’t to charge separate tolls. Looking closer at the project, one has to assert that an A-model does create only some of the benefits related to PPP. Public authorities define the key data of the projects; possibilities for private partners to improve the efficiency of infrastructure provision are limited. This is particularly true with respect to infrastructure charging which is beyond the scope of the private operator.

4. Conclusion

Public Private Partnerships will only be viable in future if they are adapted to the specific conditions of the transportation infrastructure sector and bring distinct economic advantages for the society as a whole. In the case of Germany, it is not convincing to call for private financing because the state gains revenues of about 50 bn € p.a. from traffic-specific taxes and levies (mineral oil tax, motor vehicle tax, highway toll for heavy goods vehicles). Under these circumstances it is hardly possible to set up additional infrastructure charges for financing PPP.

PPP are supposed to realize efficiency gains of up to 25 % of the project volume - following the experiences from abroad. Looking at the institutional and political framework of the infrastructure sector in Germany, there is some doubt about a simple transfer of these figures to our country. Public authorities have to develop themselves from the role of a paternalistic provider of infrastructure to the role of a partner of private infrastructure suppliers. PPP have to be structured in order to make use of the creative ideas and the various competences of private infrastructure operators. In particular private operators should be able to set up infrastructure charging systems and advanced pricing models. Only if the possible efficiency gains of PPP are really exploited in future, society will be able to bear the additional transaction and agency cost of PPP. Another crucial condition for the success of PPP is to develop incentive schemes which diminish transaction and agency costs by intelligent measures.

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