Risk Sharing in Public-Private Partnerships: General Considerations and an Evaluation of the U.S. Practice in Road Transportation

Cristina CHECHERITA and Jonathan GIFFORD

Cristina CHECHERITA (corresponding author) Graduate Research Assistant, Ph.D. Student, George Mason University, School of Public Policy, 3401 Fairfax Drive, MS 3B1, Arlington, Virginia 22201 U.S.A., Tel. +1-703-993-2275 / fax +1-801-749-9198, Email: cchecher@gmu.edu

Jonathan GIFFORD, Professor, George Mason University, School of Public Policy, 3401 Fairfax Drive, MS 3B1, Arlington, Virginia 22201 U.S.A., Tel. +1-703-993-2275 / fax +1-801-749-9198, Email: jgifford@gmu.edu

Abstract: This paper examines risks affecting Private-Public Partnership (PPP) projects in road infrastructure and the ways of sharing risk between the two partners. It provides a comprehensive typology of risks and, most importantly, attempts to identify PPP-specific risks or risks more likely to arise under a PPP arrangement than under traditional financing or complete privatization. The paper assesses the U.S. experience in the use of PPPs for road infrastructure and identifies the most important risk-factors.

Acknowledgments: The authors thank John Petersen for his helpful comments on an earlier draft. Any remaining errors are the responsibility of the authors.
This paper has also been submitted to the 11th World Conference on Transportation Research (WCTR), to be held in University of California, Berkeley, June 24-28, 2007.

INTRODUCTION

The leases of the Chicago Skyway for $1.8 billion in 2005 for 99 years and of the Indiana Turnpike for $3.9 billion in 2006 for 75 years have attracted considerable interest among owners of transportation infrastructure assets in the U.S. The sums associated with these transactions are substantial and in both cases exceeded by large margins the pre-sale expectations of the asset owners. Many considerations support an expanded role for concessions and other forms of public private partnership (PPP) for renewing and expanding the nation's transportation infrastructure, not least the strain on traditional funding sources like the gas tax.

Nonetheless, the PPP movement in financing has also raised concerns, most notably with respect to arrangements for sharing risk between the two parties—the government and the private entity. Are the inherent risks mitigated or are they increased (and other risks introduced) in a PPP framework when compared to other arrangements for infrastructure provision? Who bears the risks in a PPP contract and to what extent?

This paper examines in detail the risks that affect PPP projects in road infrastructure and the adequate ways of sharing risk between the two partners. It begins with a brief review of the theoretical framework regarding the type, extent and optimal allocation of risk under a PPP contract. Next, it provides a comprehensive typology of risks and attempts to identify PPP-specific risks, or risks more likely to arise under a PPP arrangement than under traditional financing or complete privatization. A synthesis of the common risks identified in this part, including recommendations on risk allocation and ways to mitigate risk, is tabulated in the annex. The paper then turns to assessing the U.S. experience in the use of PPPs for road infrastructure and to identifying the factors that pose the highest risk to such projects. A final section presents conclusions and areas for future research.

THEORETICAL CONSIDERATIONS OF RISK SHARING IN PPP PROJECTS

Any investment decision is subject to risk. Even investing in "risk-free" instruments, such as short-term U.S. treasury securities, has risks associated with uncertainty regarding inflation (Brealey and Myers, 2002) and future interest rates.

Transportation infrastructure projects are particularly subject to risk due to large initial costs, high irreversibility (sunk costs), long-term durability of assets, and high complexity (e.g., many parties involved with different objectives and constraints).

The type, extent, and allocation of risks in an infrastructure-oriented PPP contract depend on the fundamentals of the arrangement, the contractual provisions regarding allocation of risks, and the degree to which the contract is enforceable.

An infrastructure-oriented PPP (this paper will use the term PPP from here on) is usually defined as a contractual arrangement involving the private sector supply of infrastructure assets and services that have traditionally been provided by the government[1]. What distinguishes PPPs from other infrastructure provision arrangements is the special bundling of interests (risks and returns) between the sectors. This mixture has three dimensions.

[1] IMF (2004), Engel (2005), de Bettignies and T. Ross (2004)

First, the ownership and the financing-operation of the project belong to different partners. The government usually holds a residual ownership right, while the private sector finances the construction and/or expansion of the facility, its maintenance, operates the facility, and collects the revenue for a given period, typically under a long-term contract. The government can also participate in financing or operation of the project, through guarantees, subsidies or other forms of financial and operational support. This feature differentiates the PPP contracts from traditional infrastructure financing (entirely public) or from full privatization.

The second dimension is that the two contracting parties in a PPP arrangement have different stakeholders, and thus, different objectives, risk perceptions, and constraints. This feature differentiates PPP contracts from purely market contracts between two private agents. In a concession or Build-Operate-Transfer (BOT) framework, for instance, the public authority and the private operator enter into a partnership with the overlapping objective of achieving a successful project, yet with highly distinct motivations (Aoust et al., 2000). Assuming a benevolent planner and rational agents - planner and private agent - the former is seeking to optimize the total social benefit, while the latter is seeking to maximize profit or equity return. More realistic assumptions derived from organizational theory and behavioral economics suggest a bounded rationality-model, which replaces the "optimization" with a "satisficing" level.[2] Hence, in practice, the objective of the public authority would be to improve the quality of service provided to the public and follow a broader public development strategy, whereas the private partner would seek a reasonable rate of return on capital investment[3].

The third dimension, which is related to the previous one, is that the government and the private partner may have different abilities to diversify the risk, especially the "residual" risk that can be ascribed to both. Risk can be diversified by spreading it across a large number of projects or across a large number of bearers. From this perspective, a public-private partnership (PPP) may have an advantage compared to other projects, either fully private or fully public. A PPP project is likely to achieve a higher diversification of risk than other infrastructure financing arrangements, when the private party is able to diversify the construction, operation and financing risk across many projects, while the public entity can diversify residual risk on many bearers (e.g., taxpayers).

Because the government can spread the risks among all taxpayers when it undertakes an investment, Arrow and Lind argued that the discount rate to be used in public investments should be the "risk-free" rate reflecting the risk-neutrality of the public sector (1970).[4] Klein, in contrast, argues that if this argument is accepted, then

---

[2] For further discussion of bounded rationality in a transportation context, see (Gifford & Checherita 2006) to be presented at the Transportation Research Board 86th Annual Conference, January 21-25, 2007, Washington D.C. .

[3] "The objective of the public authority is to improve the quality of service provided to the public, whereas the private operator seeks a reasonable rate of return on capital investment" (Aoust, Bennett et al. 2000).

[4] Assuming that the benefits and cost of the investment incur over the entire population and that the payment flows are not correlated with population income. The authors concede that "benefits often accrue to individuals and where there are attendant uncertainties, it is appropriate to discount the expected value of these benefits at higher rates, depending on the nature of the uncertainty and time-risk preferences of the individuals who receive these benefits. [But] most costs incur publicly, and, therefore, should be discounted using the certainty rate" (Arrow and Lind, 1970).

investment decisions will always be biased against private provision. The risk should be attached to the project and a project should not be considered less risky only because the government can spread this risk across all taxpayers. Therefore, Klein argues that the expected value of discount rates for private and public projects should not differ in equilibrium, as the private sector would seek to compensate through higher efficiency. The U.K. government, one of the most experienced in the use of PPP for infrastructure investment, uses the same discount rate for public and PPP projects (Klein, 1997).

With a higher risk diversification potential, PPP efficiency gains will depend on the way risks are allocated among the partners. Two principles are sometimes called upon in the literature to guide the risk allocation: 1) a risk factor should be allocated to the party that is responsible for it or has more control on it; and 2) a risk factor should be allocated to the party that is more able to bear the risk (less risk-averse) (Guasch, 2004). Although these two principles are cited in tandem, an optimal allocation of risk requires a sequence in their application. Hence, a risk should first be allocated to the party operationally responsible for it, which is usually the party that can control it better. The second principle should then be applied for residual risks, that is, risks for which neither party is responsible nor can control better. In this case, one party should either retain the risk (e.g., government for geological risk in the construction phase of a toll-road project) or try to diversify out the risk, that is, to pass it to insurers or other outside parties specializing in pooling the risk.

A TYPOLOGY OF RISK

In order to arrive at an adequate allocation of risks, it is important to know the risks that can occur during the lifetime of a road infrastructure project. We classify risks in two broad categories: common risk and PPP-specific risks[5]. Common risks can arise in any road infrastructure investment, irrespective of the structure of ownership, financing or operation. Apart from these risks, we attempt to identify risks that are either specific for or more likely to arise under a PPP arrangement.

The following classification also addresses ways to allocate risks adequately between the government and the private partner within a PPP contract.

I. Common risks:

Following (Aoust et al., 2000), we classify common risks according to the phase of the project lifetime in: (i) risks arising during the design-construction phase; (ii) operational risks, and (iii) permanent or indirect risk.

(i) Risks arising during the design-construction phase of the project:

In the design-construction phase, technical risks and economic-financial risks can affect the outcome of the project. Technical risks can be classified in the following categories:

[5] Although our examples will make reference to risk more often as the downside part of the outcome - shortfall compared to the planned or contractual arrangement - we consider risk any volatility in a variable's outcome compared to its expected value, positive or negative.

The design fault risk: This risk can arise when untested technical innovations are specified in the tender documents or an existing technology is proposed for a new application (e.g., new location). Insufficient engineering and design work in the preliminary stages of the project can induce risks in all subsequent phases, in terms of compatibility, performance, and demand risk.

> Example: In the Mexican Toll Road program of 1989-1994, projects were often concluded with only very preliminary engineering and design work. In the case of Cuernavaca-Acapulco toll road, for example, this led to cost overruns of 200 percent and time delays of 30 month. (Ruster, 1997).

Cost and schedule overruns: This risk can have different sources: internal to the project, external or a combination of the two. Inefficient construction practices, management practices resulting in bad coordination with suppliers, delays in administrative approvals, land acquisition, geological conditions, default on the part of suppliers. The occurrence of such risks will impact the financial terms during the operating phase, as well.

> Example: (Flyvbjerg et al., 2003) investigates the cost performance of a large sample of transportation infrastructure projects and finds that substantial cost escalation is the rule rather than the exception in this field. For roads, the average costs escalation in the sample is 20%; for rail it is 45% and for fixed links (tunnels and bridges), the average cost escalation is 34%. According to the authors, cost escalation appears a global phenomenon, existing across 20 nations on five continents. Cost estimates have not improved and cost escalation not decreased over the past 70 years.

Project completion/project availability risk: It consists in the private partner's failure to meet performance criteria at completion (quality shortfall and other defects in construction)[6]. This risk stems primarily from the constructor's practices in the area of engineering and management (coordination with suppliers, poor allocation of resources, poor coordination and control over project components). Unforeseen risks related to conditions of the work site – climatic and subsoil conditions – can also play a role, but in this case, quality risk can be traded against cost or schedule overruns.

> Example: In 1988, the Hong Kong Government grant a 30-year franchise to a private consortium led by the Japanese construction firm Nishimatsu to construct, finance and operate the Tate's Cairn road tunnel. The project completion risk was mitigated by the good reputation of the contractors, and by a 10-year performance bond extended by the private consortium (Pyle, 1996).

In a PPP project, technical risks in the design and operation phase should be borne by the party responsible for the risk-generating factors, usually the private partner. If the public authority retains the project design, then any risks stemming from this phase

[6] In a PPP project, this risk stretches over the entire life of the contract, but it usually pertains to construction work phase.

should be borne by the public party. The other risk categories that the public party should cover arise (i) from land acquisition and any related legal disputes; (ii) environmental, safety and other legal changes or delays in obtaining permits triggered by public authorities.

Example: The Bangkok Second Stage Expressway, a private sector BOT infrastructure project, initiated in early '90s, has been confronted with construction cost and time overruns due to delays in land acquisition, disagreement over future toll rise, as well as disputes over legal authority to collect tolls (relevant for the construction works in a second stage - Sector B of the expressway) (Pyle, 1996).

The economic-financial risks **-** These risks relate to the financial arrangements for project evaluation, design and construction, as well as for the phase of operation/implementation. Such risks consist first and foremost of the set of parameters exogenous to the project, which are used in setting up the financial contract: (i) inflation rate risk - inherent for long-term construction projects, where prices are not firm for the whole period, but include an indexation clause to a relevant economic parameter, such as producer price index; (ii) interest rate risk – when the project is financed through variable-rate loans; (iii) exchange rate risk – when costs and revenues are expressed in different currencies.

Example: The project of Mexico City-Cuernavaca toll road was initially planned to be financed through exchange rate-linked bonds, in amount of US$625 million, 20-year maturity. Because of investor's concerns about currency risk and long-term interest rate volatility, the issue was cut back to US$265 million and 7-year maturity (Ruster, 1997).

The government of Portugal annulled in 1984 the concession of two highways managed by a private-public investment company, BRISA, after the company had begun to be confronted with financial difficulties, aggravated by high inflation and soaring interest rates throughout mid to late '70s (the highways were offered in competitive bidding and BRISA won them back) (Fayard and Bonnin, 2000).

Secondly, the economic-financial risks relate to the capacity of the contractual partners to adhere to their financial commitments. This counterparty risk can stem from various causes, such as misevaluation of the financial position of the contractual partner (the constructor in the case of a road project), the chosen subcontractors (e.g. procurement risks), or the companies providing the project's financing, insurance and reinsurance.

Example: In Mexico's toll road concessions, the award criteria were biased towards local construction companies that were more interested in the construction work than in the long-term viability of the projects. In addition, government-owned commercial banks provided financing to insufficiently screened projects financing, and, as a result, the share of nonperforming loans accumulated rapidly. The lack of good screening process also led to the selection of medium sized concessionaires that financed their equity contributions through commercial loans; when the projects started to run into financial difficulties, these concessionaires were often unable to meet their equity infusion requirements (Ruster, 1997).

In a PPP contract, these risks should be transferred to third parties, such as hedging funds, and banks. The premiums for bearing these risks must be paid by the private consortium and transferred to end-users, i.e. toll-road users.

(ii) Risks during the project's operation phase

These risks relate to the period when the project generates revenue, but also continue to incur costs. Such risks can be classified as revenue risk; operating cost risks and financial risks. The last two categories of risks are similar to those encountered in the design-construction phase, but relate to the actual "functioning" of the project:

The revenue risk is often the most important risk a project confronts. This category includes a pure "demand" risk or traffic volume risk, a price risk related to toll setting conditions, and an enforcement risk stemming from technological and regulatory risks in toll collection.

The demand risk is particularly strong in the case of newly built transportation facilities, where the absence of historical data complicates demand estimates. Even in case of extension of existing facilities or the introduction of new demand instruments (e.g., HOV or HOT lanes), demand modeling in transportation is difficult because of the variability of traveler's discrete choices and the difficulty of incorporating realistic assumptions. The traffic volume risk is related to the price risk through the price elasticity of demand, which is in turn influenced by the availability of substitutes for the toll road. A PPP contract should provide for an adequate balance regarding restrictions on competing facilities or development of adjacent roads, so that neither the project, nor the long-term sustainability of transportation development be endangered.

Examples: Many toll road projects in the last decade have dramatically overestimated traffic levels:

- In some of the Mexican road concessions in the late 1980s, traffic volumes were only around 20% of expected volume in the first year of operation;
- In Colombia, 13 road projects were franchised in the mid-1990s with traffic volumes at about 60% of the government forecast;
- In Hungary, the M1 Motorway attracted only 50% of expected volume in its first year of operation;
- In Spain, in several of the twelve toll road concessions awarded before 1973, the traffic was only one third of projections
- In U.S., the case of Dulles Greenway, Virginia, U.S., the traffic in the first months of operations was below 30% of the expected flow (projected by two independent traffic consultants). After cutting the tolls from US$ 1.75 to US$1, traffic increased significantly, but still below the initial projection (around 70%).
  (Estache and Strong, 2000).

Revenue risk can also arise from ***price risk*** or unexpected changes in the level of tolls, including fixing the tolls when the contract provides differently. Political opposition to increasing the level of tolls to the agreed contractual levels will affect the profitability of the contract. Price risk can also arise from the composition of demand. A high variability in the nature of demand structure (e.g. a lower proportion of trucks than initially estimated) induces a corresponding variability in the weighted average tariff, and in revenue.

Enforcement risk arises from technology risks in automatic toll collection systems, as well as the risk of legal and regulatory disputes over revenue collection or, more generally, any regulatory issues that could prevent the project from becoming operational in full and on time. New technologies can significantly improve the profitability of the project, but also adversely impact the functioning of other projects that use obsolete technology (Estache and Strong, 2000).

Example: In the Bangkok Second Stage Expressway, the operation of a second section was delayed in mid '80s by a dispute over the legal authority to collect tolls. Under the public authority (ETA, Expressway and Rapid Transit Authority) Act, only ETA had the right to collect tolls. To address this issue, ETA issued terms of reference, stating that the project was a BOT and the concessionaire would have the right to collect tolls. However, this was only a private contract, while ETA's Act was a sovereign law. The private partners sought legal confirmation of the contract efficacy from Thailand's Attorney General. Although this was finally granted, the contract was still unsecured, due to five consecutive changes in government. When completion of the settlement neared and the private consortium was preparing to hire toll collectors, ETA objected and contested the action, bringing the project to a long impasse (Pyle, 1996). This example shows a combination of unaddressed regulatory risk and political risk during the operational phase of a project.

Dealing with revenue risk is an essential step to any PPP contract in road infrastructure. There is a broad consensus among economists that ideally demand risk should be borne by the private operator, which is in a better position than the government to influence such risk. Quality of the road, safety, level of congestion, toll levels are factors that the private party can influence or provide directly. Government assumption of all or part of the demand risk can create moral hazard from the part of the private partner and can reduce its incentive to perform efficiently (Engel et al., 1997).

The public entity must bear the demand risk generated by the factors it is responsible for, such as: (i) breach of contract regarding the ability of the private contractor to set up the level of tolls; (ii) breach of contract regarding the competitive clause; (iii) any changes in the legal or contractual framework directly and demonstrably affecting the demand (e.g., not allowing some types of vehicles to use the toll road).

(iii) Indirect risks related to the project's environment

These risks are residual, not pertaining specifically to either party in the contract, and can be classified in three categories: risk of force majeure; macroeconomic risks, and legal risks.

The risk of force majeure includes risks such as natural disasters, but also political risks such as riots, strikes (outside the two contractual parties), embargoes on supplies, etc. The Multilateral Investment Guarantee Agency (MIGA, part of the World Bank Group), offers risk coverage against war and civil disturbances, expropriation, and other political related risks for about 135 countries.

Example: Political risk in China: The Guangdong-Shenzhen-Zhuhai superhighway in China, a 122.8-kilometer dual three-lane tollway, has been considered as one of Asia's classic private involvement in infrastructure. It operates under a 30-year concession, as a joint venture between Hopewell Holdings in Hong Kong, and a highway construction company representing the Guangdong provincial government. The highest project risks were considered to be political risks and politically related economic risks. External political risk insurance was arranged by the financiers and a project guarantee was offered by GITIC, an investment arm of the Guangdong provincial government. Renminbi risk was an important factor, since about sixty percent of the highway's revenue was denominated in local currency (Pyle, 1996).

Macroeconomic risks include indirect risks related to the overall stance of the economy, such as balance of payment crises, currency crises, severe economic downturns, and other economic and financial disturbances.

Example: The currency crisis of Mexico in 1994 exacerbated the difficulties the toll road concessions had already been confronted with by rising interest rates to more than 100 percent in a year for most projects and contributing to Government's decision to bail-out the projects. New toll-roads financing (e.g. Tepic-Guadalajara) were canceled at the last minute because of the onset of the crisis. (Ruster, 1997).

Legal risks include changes in the general legal framework such as corporate laws, tax laws, environmental standards, changes in the judicial system, especially regarding arbitration-related clauses.

Example: In the Mexico's road concession program, certain tax aspects affected the financial viability of the projects. The 2 percent tax on assets, or the application and calculation of depreciation and tax credits needed to be modified to accommodate the concession-type projects. However, delays in approval of these amendments and the uncertainty associated with requirements of annual re-approval subjected the private partners to risks (Ruster, 1997).

In a PPP project, the risks of force majeure should be transferred to insurance companies, if the risk is insurable, otherwise it should be mostly borne by the public sector. Risks arising from legal changes that are not determined by the public partner of the contract should be born by the private consortium (as opposed to risks determined by changes in the legal or contractual framework that affect directly the private partner, which must be borne by the government).

Table 1 in the Annex synthesizes the typology of common risks, including the adequate risk allocation between the government and the private partner in a PPP road infrastructure project. The table also includes recommendations regarding contractual design and other measures that the public authority could implement in order to mitigate its risk, as well as the overall risk associated with the project.

II. PPP-Specific Risks

Apart from the risks to which any infrastructure investment project is subject, several categories of risks are more likely to arise under a PPP project. We call these risks PPP-specific. They stem from the particular relationship between private and public entities whose economic interests are distinctively bundled in the project, as discussed above: (1) the government usually retains residual ownership, while the financing-operation is mainly transferred to the private sector; (2) the parties have different objectives to maximize (satisfy); and (3) the parties have different prospects for risk diversification. While the contractual distinction according to these three directions can be blurred in practice[7], it is still useful to attempt to analyze which are those risks that pertain specifically to a PPP contract, or that tend to increase in a PPP framework.

We have identified three categories of PPP-specific risks: (i) fiscal risks, (ii) residual value risks, and (iii) bidding risk, which we have further broken down as follows:

(i) Fiscal risks: Contingent liability and fiscal investment risk

PPPs offer the government an approach for alleviating fiscal constraints associated with provision or improvement of road infrastructure. Private funds can thus be used to close the financing gap that exists in many countries between infrastructure needs and available public funds. However, the complexity of PPP projects and the lack of standards regarding their fiscal accounting and reporting open loopholes that enable PPPs to be used for bypassing public expenditure control (IMF, 2004).

We classify fiscal risks into two sub-categories: contingent liability-related risk and fiscal investment risk.

Contingent liability risk is the variability in fiscal expenditure induced by future uncertain events under the use of government guarantees[8]. It is an indirect risk, with the fiscal variability being triggered by factors related to the project to which the guarantee is extended. Under a PPP framework, it is easier for the government to justify moving public investment off the budget, and public debt off the government balance sheet, in spite of still bearing the explicit or implicit fiscal risk resulting from residual asset ownership. Moreover, the partnership behind this type of arrangement can justify provision of government guarantees more easily than within traditional financing or complete contracting-out. Hence, resorting to guarantees to secure private financing can expose the government to hidden and often higher costs than traditional financing (IMF 2004). Fiscal risks and budget management can be complicated by such contingent liabilities due to lack of transparency. While this risk is most likely higher in developing countries, where problems of fiscal transparency and accounting are more pervasive, there are concerns in some developed countries as well.

---

[7] For instance, by the introduction of private management techniques in public administration or given the universal validity of principles of transaction costs economics and contract theory

[8] While we hereby refer to explicit government guarantees, implicit guarantees, more likely to arise under PPPs than other types of infrastructure financing, pose even greater fiscal risks.

Example: In the European Union, a Eurostat decision regarding the fiscal treatment of PPP assets, issued in 2004, shows both the difficulties of dealing with such contracts, as well as the problems that insufficient legislation can trigger. The relatively recent decision (which has the status of recommendation) stipulates that an assets involved in a PPP should be classified as non-government assets if both of the following conditions are met: (1) the private partner bears the construction risks; (2) the private partner bears one of either availability (performance) risk or demand risk. An accompanying opinion indicates that these conditions refer to the private partner bearing "most of the risk". The decision is considered problematic since assets related to projects in which the government bears most demand risk could be classified as off government balance sheet, and could thus create precedents for promoting PPPs projects intended mainly to circumvent budget and debt limits (IMF, 2004).

Being (predominantly) initiated by the government, PPP contracts in public infrastructure, especially BOT-type contracts, are still a tool of fiscal policy and have an impact on aggregate demand. With or without contingent liabilities-risk attached, PPPs can complicate the management of fiscal policy as a macro-stabilization tool. For instance, under conditions of high aggregate demand, high capital inflows, and inflationary pressures, shifting traditional capital expenditure from the public to the private sector (and thereby reducing the budget deficit) could compound domestic demand pressures, while creating the (misleading) impression of stabilizing fiscal policy. Domestic demand pressures could intensify if current expenditure are substituted in the budget for capital expenditure.

Fiscal investment or fiscal management risk

Concessions of road infrastructure can provide large upfront funding for the government, as shown by the recent U.S. experience with Chicago Skyway and Indiana Toll Road. Even if amounts are less spectacular, the way the money is allocated and spent can induce variability, and thus risk, in the financial position of both the government and the concessionaire.

Large upfront payments from the private partner to the government can have two impacts on government debt ratings. In principle, a prevalent impact, stemming for the time value of money – a dollar received today is worth more than a dollar tomorrow – would be an upgrading of the government fiscal position and risk outlook. However, there is a need to match investment decisions made today with long-term sustainability of public transportation (the government will not receive any revenues from the project during the entire duration of the concession). If this matching is not achieved, then this type of arrangement is likely to have a negative impact on the risk's assessment. FitchRatings, for instance, considers the choice of high up-front payments as a risk to the government's fiscal position, and correspondingly, to the project, because it may limit the flexibility of the government to meet future transportation needs. However, Fitch assesses positively arrangements that generate large up-front payments "if proceeds are invested in comparable long-term assets that provide lasting economic benefits". Conversely, it will view negatively "the use of proceeds for short-term operating needs of the government" (FitchRatings, March 2006). The credit ratings assigned to government debt

and to the project itself can influence the financial parameters of the project in case of refinancing, hence impacting on the overall risk of the project.

(ii) **Residual value risk**

This risk relates to the future market price of an asset (IMF 2006). It is specific to concession or leasing contracts, in which the road infrastructure assets is returned to the government after (a long period of) private operation.

According to FitchRatings, "toll road projects are unique in that their economic value grows over time, thereby permitting increasing credit stability the longer they have been operating. As a result, with the passage of time, credit stability is also being found in weaker projects [even in projects that have previously defaulted]" (FitchRatings, April 2006). Residual value risk is related to the type of payment for concession, mentioned above. A gradual payment of concession fees, as opposed to an upfront lump sum, may capture more of the increasing value of a maturing project.

Example: Chesapeake Bay Bridge and Tunnel District (CBBT), presently rated A by Fitch was in default during 1970-1985, while Chicago Skyway Toll Bridge, rated A- prior to concession, was in default during 1959-1976 (FitchRatings, March 2006).

(iii) **The bidding risk - winner's curse or opportunistic renegotiation risk**

This risk arises from the bidder's evaluation of other risks involved in the project.
We distinguish between two categories of bidding-risk: the winner's curse and opportunistic behavior. This distinction is difficult to determine in practice, as it may arise more often as a combination of the two. However, in a theoretical framework, the factors behind these risky situations are different and the risk is also likely to be borne by different parties. Hence, risk emanating from the winner's curse is to be borne by the private partner, the bidder, if no subsequent renegotiation takes place. The opportunistic behavior risk, once triggered by the private sector, can be borne by both parties, but mostly by the government.

The winner's curse[9]

This risk arises in a competitive bidding, when a private firm makes a much better offer than any other competitor, based on its evaluation of the project. It can result from insufficient experience of the bidder, poor risk assessment, or simply from high confidence in the project's potential. Hence, the winner may actually end up paying more than the project is worth, or in any case, more than if he had bid more conservatively.

[9] Term used in Engel (2005) – Lecture Notes on Public-Private Partnership; Seminar organized by the International Monetary Fund, Washington D.C., February 22- 23, 2005.

Example of winning bid much higher than the second best offer:
Engel (2005) provides several examples for the winner's curse, such as Peru's telecom's privatization where the highest bid was US$ 2 billion and the second highest US$ 800 million.
In the U.S., Cintra and Macquarie Group bid US$ 1 billion more than their closest rival in both Chicago Skyway and Indiana Toll Road leases. In the latter deal, the winner's bid was US$ 3.9 billion, while the other bidders made much closer (and lower) offers: US$ 2.84 billion, 2.52 billion, and 1.9 billion (Source: Public Works Financing, Vol. 206, June 2006).

The winner's curse is more dangerous in case of (i) a new project, characterized by high uncertainty; (ii) new business or no source of competitive advantage; or (iii) many bidders (Engel, 2005). Engels recommends that bidders, which do not have a competitive advantage, should bid more conservatively especially if they expect many other bidders.

The risk of opportunistic behavior

The risk of opportunistic behavior has been part of Williamson's critique of Demsetz's auction effect. Demsets (1968) argues that ex-ante competitive auction *for* the right to operate a monopoly under a franchise can lead to the same outcome as standard competition *in* the market. The mechanism by which such an outcome can take place is to invite bids for unit price for the good or service under monopoly, with the lowest bid receiving the award. If companies are behaving competitively, then the winner will be the most efficient company, bidding at its average cost, and no monopoly rent will be earned in practice (Demsetz, 1968).

Williamson raised the question of opportunistic behavior, especially under contract incompleteness and institutional complexity. He points out that a thorough analysis of franchising (concession) framework reveals difficulties in practice due to uncertainty regarding future events, asymmetric information between the parties and transaction costs (Williamson, 1976).

While these risks can occur in any relationship involving a competitive bidding, the incidence may be higher PPP project given that (i) the government still has the asset ownership and consequently, it has an interest in the project/bears at least a residual risk (as opposed to asset privatization); (ii) the project usually involves a complex risk-sharing and institutional arrangement, which, according to Williamson's critique, can make it easier for the private partner to invoke the occurrence of other risks in asking for a renegotiation; and (iii) the private partner's involvement in the project is usually longer and a bigger stake is involved in a PPP framework than under traditional financing.

Example: Guasch (2004) analyzes about 1000 concession contracts awarded in Latin America and the Caribbean between mid-1980s and 2000 and finds a high incidence of contract renegotiation, mainly initiated by the private partner. Renegotiation was especially common in the transportation sector, occurring in 55 percent of cases (151 concessions out of the 276 analyzed). Guasch (2004) finds that the most important determinants of renegotiation can be grouped into macroeconomic shocks, concession design, regulatory framework and political environment.
In analyzing contract renegotiation, it is difficult to distinguish between bidding risk, and performance risk or other risks during the construction/operation phase of the project (failure of the company to deliver, even if it bid conservatively or in good faith). However, contract renegotiation as a result of opportunistic behavior risk is more likely to take place when political risks are high. Guasch identifies three categories of political factors that could determine concession renegotiation and all three tested statistically significant, based on the sample data he used. The first was the affiliation variable, i.e. having a local operator increases the probability of renegotiation. The second was the country's level of corruption – the more widespread the corruption, the higher the probability of renegotiation. The third factor was the election cycle, which mostly explains the government-led renegotiations (Guasch, 2004, Engel et al., 1997, Aoust et al., 2000).

THE U.S. EXPERIENCE WITH PPP IN ROAD TRANSPORTATION

The use of PPP arrangements in the U.S. in the area of road transportation has been more limited than in other countries. However, recent deals have opened the door for a sizable expansion of such arrangements, leading one analyst to declare that "the U.S. market could soon become one of the most robust PPP deal generators in the world"[10].

Based on the analysis presented above, and assessing the risk factors in the U.S. economy and road infrastructure market, it appears that the risks in the U.S. PPP toll road transactions thus far have been limited.[11] While every project has its specific setting and risk-conditions, there are some general factors that mitigate the overall risk perception, and correspondingly, its price – the project's risk premium.

First, macroeconomic risks, as well as financial risks are lower in the U.S. than in other countries. The development of the capital market mitigates financial risks (e.g., exchange rate risk because revenue and expenditure, including debt, are likely to be both expressed in USD, and interest rate risk because a broad range of hedging instruments is available). Inflation risk has also been well contained. Local (state) governments in the U.S. - unlike most of the rest of the world - have much stronger revenue systems, greater market access, plus the ability to borrow at low rates because of tax-exemption. While the

[10] "The Pros and Cons of Toll Road leasing" in Public Works Financing, May 2006, Volume 205, citing Euromoney, May 2006. FitchRatings, Spatial Report of March 22, 2006 considers that toll road concessions "will undoubtedly be increasingly considered [in the U.S.]"

[11] This does not include the Greenway Toll Road in Loudoun County, which is purely a private toll road, linked into the state-owned Dulles Toll road. It is regulated by the Virginia state utilities commission and was funded purely by private capital.

U.S. states and municipalities haven't used private capital extensively in the past due to their privileged access to bond markets, the private liquidity flooding the market is part of what is driving the U.S. PPP initiatives at present.

According to FitchRatings, the vast set of financial options currently available, particularly the use of flexible amortization schedules, allow U.S. toll road projects with sound economic fundamentals to find sustainable financing and proceed to construction far sooner than before (FitchRatings, April 2006).

Second, fiscal risk stemming from contingent liabilities is lower compared to other countries, given relatively good fiscal accounting and transparency practices in the U.S. public budgeting, as well as the lower incidence of guarantee use. While in some countries, an important fiscal risk stems from the creation of a "guarantee culture", leading the private sector to seek guarantees as an alternative to properly managing risks themselves (IMF, 2006), guarantee extension is not common for the U.S. road infrastructure PPPs. Moreover, budgeting for loan guarantees in the United States has been improved with the Federal Credit Reform Act (FCRA) of 1990. FCRA introduced present value cost budgeting for federal government loan guarantees, recording the expected net cost to the government when guarantees are granted (IMF, 2006).

Third, the risk of bidder's opportunistic behavior, although not to be excluded, may be lower in the U.S. compared to other countries if factors like corruption; government's track record on renegotiation, guarantees-support and efficiency; contract enforcement; and rule of law or fiscal transparency are taken into account.

Finally, given the good relative quality of the U.S. interstate system, various risks associated with existing road infrastructure (maintenance, construction of additional lanes or operation) are likely to be lower than in many other countries. The perception of such limited risk has been reflected in the two recent concession sales (Chicago Skyway and the Indiana Turnpike). These are systems with established travel ways, for which the impetus for concession was from the government owner wishing to capitalize on an asset with substantial earning capacity. Implicit was the decision that the asset's value was believed to be more easily recognized if operations were turned over to private companies and toll rates were allowed to grow under contract formulas.

Brand new toll roads (such as are envisioned in several states) will present more risks, regardless of their being traditional government owned and operated projects or are PPP in nature.

Overall, the most prevalent risks in the U.S. for PPP projects in road infrastructure seem to be (i) demand risk, especially stemming from good competing free roads and potentially from public and political resistance to toll roads and privatization, (ii) legal risk, arising from relatively insufficient experience with PPP projects, and (iii) residual value risk, given the high value associated with such assets.

The demand risk remains the most important risk attached to toll-road infrastructure in the U.S. From an investor's standpoint, the greatest risk with very long-term obligations is that future development patterns will not provide the traffic to sustain profitability even if toll rates are allowed to climb on a regular basis.[12] Over the long run, the tension between maintaining toll traffic versus improving alternative roads may be the

[12] In the case of the Skyway and Indiana Toll Road, tolls are allowed to climb at set amount for the first few years and then are permitted to rise at the *greater* of the 2 percent a year, the rate of inflation (the CPI), or growth in the per capita gross domestic product.

most pressing issue from a policy standpoint. In the case of the Chicago Skyway, greater traffic may divert to the City streets or the costliness of tolls and the congestion of alternative streets may push development in alternative areas of the region. In the case of the Indiana Toll road, there are no suitable alternatives (especially for trucks) so long as the tolls are not excessive. Nonetheless, the PPP toll roads can become political issues when tolls start to increase on a regular basis.

In the long run, the exit provisions may prove to be the most important aspects of the long-term leases, related to both legal risks and residual value risk. Were the governmental lessors to find the privately determined tools politically unsustainable, then they would need to buy out the remaining life of the lease. How that buy-out value is determined will be key to their final returns of investment. For example, in the case of California State Route 91, the state's repurchase of the franchise at US$ 207.5 million appears to have been significantly below market value (Fitch Ratings, March 2006).

CONCLUSIONS AND AREAS OF FUTURE RESEARCH

We have attempted in this paper to give a comprehensive overview of the risks that road infrastructure projects provided under PPP are subject to. In addition to those risks common to infrastructure projects and widely cited in the literature, we have proposed categories of risks that are specific or more likely to arise under public-private partnership than under traditional financing or complete privatization. Starting from the basic principle that a risk should be allocated to the party operationally responsible for it, we have corroborated recommendations regarding the adequate risk-sharing arrangements between the public and the private partner.

The U.S. experience with PPP financing in road financing was preliminary explored, essentially through a comparative perspective with other countries where such arrangements have been used extensively.

A significant amount of systematic research remains to be done in this area. First, a sound theoretical model of optimal risk allocation between the government (the planner) and the private agent would be useful as an analysis framework. Second, a significant empirical work is needed to test many of the conclusions and recommendations on risk sharing in the PPP literature, including the present paper. While this is a difficult endeavor, given the specificity of each PPP project and the intricacies of such complex legal contracts, this work is needed for a stronger analytical clarification of the PPP framework.

References:

AOUST, J. M., BENNETT, T. C. & FISZELSON, R. (2000) Risk analysis and sharing: the key to a successful public-private partnership. IN PERROT, J.-Y. & CHATELUS, G. (Eds.) *Financing of major infrastructure and public service projects: Public-Private Partnership.* French Ministry of public works, transport and housing.

ARROW, K. J. & LIND, R. C. (1970) Uncertainty and the Evaluation of Public Investment Decisions. *The American Economic Review,* 60**,** 364-378.

BREALEY & MYERS (2002) *Principles of Corporate Finance,* Tata McGraw-Hill.

DEMSETZ, H. (1968) Why Regulate Utilities? *Journal of Law and Economics,* 11**,** 55-65.

ENGEL, E., FISCHER, R. & GALETOVIC, A. (1997) Infrastructure Franchising and Government Guarantees. IN IRWIN, T., KLEIN, M., PERRY, G. & THOBANI, M. (Eds.) *Dealing with Public Risk in Private Infrastructure.* The World Bank.

ESTACHE, A. & STRONG, J. (2000) The Rise, the Fall and the Emerging Recovery of Project Finance in Transport. *Manuscript, The World Bank Institute.*

FAYARD, A. & BONNIN, O. (2000) Roads and road-related infrastructure. IN PERROT, J.-Y. & CHATELUS, G. (Eds.) *Financing of major infrastructure and public service projects: Public-Private Partnership.* French Ministry of public works, transport and housing.

FITCH RATINGS (March 2006) Special Report "U.S. Toll Road Privatization: Seeking the Right Balance".

FITCHRATINGS (April 2006) Special report "U.S. Toll Road Projects: A 2006 Performance Report".

FLYVBJERG, B., HOLM, M. S. & BUHL, S. (2003) How common and how large are cost overruns in transport infrastructure projects? *Transport Reviews,* 23**,** 71-88.

GUASCH, J. L. (2004) *Granting and Renegotiating Infrastructure Concessions. Doing it Right,* Book published by The World Bank in the WBI Development Studies.

IMF (2004) Public-Private Partnerships. Report of International Monetary Fund, Fiscal Affairs Department.

IMF (2006) *Public-Private Partnership, Government Guarantees and Fiscal Risk,* International Monetary Fund, Fiscal Affairs Department.

KLEIN, M. (1997) The Risk Premium for Evaluating Public Projects. *Oxford Review of Economic Policy,* 13**,** 29-42.

PYLE, T. H. (1996) Project Finance in Practice: The Case Studies. IN MODY, A. (Ed.) *Infrastructure Delivery: Private Initiative and the Public Good.* EDI Development Studies, The World Bank.

RUSTER, J. (1997) A Retrospective on the Mexican Toll Road Program (1989-1994). *Public Policy for the Private Sector, The World Bank Group.*

WILLIAMSON, O. (1976) Franchise Bidding for Natural Monopolies - In General and with Respect to CATV. *Bell Journal of Economics,* 7**,** 73-104.

Annex

Table 1: A typology of common risks arising in a road infrastructure project: Risks, Factors behind, Adequate allocation between parties in a PPP arrangement, Measures to mitigate risks under PPP

Category of risk	How does it arise?	Who should bear it?	How can the government/public authority mitigate the risk?
I. Design-construction phase			
I.1. Technical risks			
1. Design fault	Technical Innovation; New travel demand tools; Errors in the tender specification	The party in charge of design; The public partner for tender specification	Conduct extensive simulations of the impact; Choose a well-experienced technical advisor if the public authority retains the design.
2. Cost and schedule overruns	Within construction consortium's control (inefficient construction practices, technologies, management)	Private partner	Select a single contractor for both construction and operation of the project; Design a comprehensive tender specification to be able to select a well experienced constructor-operator with adequate financial backing and good track-record; Negotiate a fixed-price construction contract, include penalties for delays (penalties should be proportional to the shortfall, e.g. penalty per day or week of delay); Can combine it with bonuses for early completion.
	Within public partner control or other levels of government, directly affecting the contract - changes of legal and contractual framework; - failure or delay in land acquisition; - failure or delay in granting necessary project approvals and permissions.	Public partner	Conduct if possible an ex-ante research study on public attitude on the project, as well as political support. Have a legal opinion on the necessary changes in legislation, from an experienced law firm (to take into account successful experience in other jurisdictions).
	Outside either party's responsibility	See indirect risks	

Category of risk	How does it arise?	Who should bear it?	How can the government/public authority mitigate the risk?
3. Project completion risks (availability risk)	Defects in construction, quality shortfalls within construction consortium control or due to poor management in relation with subcontractors	Private partner	Select a single contractor for both construction and operation of the project; Stipulate clear quality standards and penalties for quality shortfalls to be included in the contract; Require the private partner to provide insurance-backed guarantees for project completion.
	Within public partner's control (technical specification in the tender)	Public partner	
	Outside either party's responsibility	See indirect risks	
I.2. Economic and financial risks (for both construction and implementation phases)			
4. Financial parameters of the contract	- Inflation rate (costs indexation) - Interest rate - Exchange rate	Third party insurers (Risk transferred by the private partner to insurers/hedge funds/banks; premiums to be borne by end-users)	Public entity can facilitate access of private consortium to international insurers, if necessary (e.g. multilateral financial institutions in case of developing countries), without extending public guarantees.
5. Counter-party financial risks	Capacity of the contractual partners to uphold their financial commitments; Procurement risks	Private partner (consortium members)	Good tender specification for consortium selection; pre-selection criteria Require insurance-backed guarantees
II. Operation phase			
6. Operating cost overruns and maintenance delays; Maintenance quality.	Within the private partner' control	Private partner (operator)	Specify in the contract: - firm and clear maintenance requirements; - clear expansion obligations or benchmarks that trigger expansion obligation (e.g. congestion levels) - penalties for quality shortfalls in maintenance.
Revenue risks:			
7. Demand risk	Variability in the traffic volume (economic growth;	Private partner (operator)	First best: Let the private company to bear the risk of demand, both upward and downward variability, without granting

Category of risk	How does it arise?	Who should bear it?	How can the government/public authority mitigate the risk?
	tourism; urban development etc.) Price elasticity of demand		revenue guarantees (test the market first by advertising the contract tender with no demand guarantee). - Introduce a contract design to limit the demand risk, such as: • flexible NPV (Engels et al. 1997), plus strict quality standards and non-performance penalties, or • fixed-term contract plus a given extension period if the level of demand is below an agreed break-even point specified in the contract; - Offer a balanced non-competing clause Second best: After trying the first option and no private interest is expressed, grant an upfront subsidy or a demand guarantee for the downsize risk, limited to a strictly enforceable period (e.g. 3 years, to vary according to the project's attractiveness). Collaborate with the private consortium in adequate demand modeling; finance or co-finance experienced consulting firm; Introduce dynamic toll pricing - Vary toll levels according to travel peaks on the toll roads and congestion in the free lanes/nearby free roads; vary tolls during the day and direction of traffic and by day of weak. Let the private partner absorb the downside risk of price elasticity of demand. As regards the upside risk, correlate the level of tolls with congestion levels and the non-competing clause.
	Alternative road capacity (competing facilities, development of adjacent roads)	Public partner	Clearly stipulate in the contract non-competing clause and restrictions on alternative road capacity; Link this clause with congestion limits and expansion obligation; Need to strike a balance between the project's objectives and the long-term sustainability of the public transportation in the region.
8. Price risk	Acceptable toll levels: - Political pressures:	Public partner/government	Conduct sensitivity studies on toll road support among the public; Develop a PPP marketing strategy; adopt a

Category of risk	How does it arise?	Who should bear it?	How can the government/public authority mitigate the risk?
	government breach of the terms of contract - Demand structure variability (e.g. lower proportion of trucks than estimated leading to a lower weighted average tariff)	 Private partner	"quality enhancement" policy oriented towards attentiveness to users' suggestions; Encourage the development of auxiliary facilities along the toll road.
9. Collection enforcement risk	Legal disputes over authority to collect tolls Enforcement of automated toll payments	Public authority Private partner for quality of technological equipment/ Government for police enforcement	Clarify in the PPP legal framework any potential conflicts regarding the ability of the private operator to collect tolls. Ensure adequate patrol monitoring of toll non-payment under automated payment systems (?).
III. Indirect risks			
10. Force majeure	Natural disasters Political events affecting the contract indirectly (wars, political embargo, strikes) Exceptional political events affecting the contract directly, such as expropriation, nationalization of private consortium assets	Insurance companies (Private partner to transfer the risk to insurers) Public and private partner for risks not covered by insurance Insurance companies Public partner for risks not covered by insurance	Public entity can facilitate access of private consortium to international insurers, if necessary (e.g. multilateral financial institutions in case of developing countries), without extending public guarantees. Stipulate firmly and clearly in the contract cases of force majeure for: - transfer of the project into public operation; - cases/ thresholds for renegotiation (e.g. toll levels) in case the profitability of the project is affected.
11. Macroecon-omic risks	Economic/financial/ balance of payment/currency crises Real output crises (severe energy shortage)	Insurance companies (Private partner to transfer the risk to insurers) Private partner for risks not covered by	Stipulate firmly and clearly in the contract cases for: - transfer of the project into public operation; - cases/ thresholds for renegotiation (e.g. toll levels) in case the profitability of the project is affected

Category of risk	How does it arise?	Who should bear it?	How can the government/public authority mitigate the risk?
		insurance	
12. Legal and institutional risks	Changes in the general legal framework (taxes, environmental standards)	Private company	The contract can specify clearly the trigger clauses for renegotiation (e.g. toll levels) in case the profitability of the project is affected Ensure compatibility of PPP legislation with current legislation (contract legal advisory if necessary) Strengthen the institutional framework in advance
	Institutional changes; legal recourse by third parties on non-commercial matters; conflicts between jurisdictions	Public partner Private partner (seek insurance coverage for the sub-sovereign risk)	

Source: Authors' compilation based on (Aoust et al., 2000), (Guasch, 2004), (Engel et al., 1997).