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Are Public-Private Partnerships a Good Choice for U.S. Highways? A Review of the Literature

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## **Are Public-Private Partnerships a Good Choice for U.S. Highways? A Review of the Literature**

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**California PATH Working Paper**

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# **Are Public Private Partnerships a Good Choice for U.S. Highways? A Review of the Literature**

California PATH Project  
*Evaluation of Open Road Electronic Toll Collection for California Applications (XB-604)*

Deliverable B-1  
September 2009

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## ABSTRACT

In light of chronic funding shortfalls and waxing highway construction and maintenance demands, public private partnerships (PPPs) (often though not always in conjunction with road pricing) have been garnering increasing attention from government officials in the U.S. and abroad. Despite many strongly-held opinions on PPPs – both pro and con – systematic evaluations of their efficiency, effectiveness, equity, and feasibility are all too rare.

This paper is the first part of a research project that aims to rectify this shortage of careful, evenhanded, and rigorous analyses of PPPs by drawing on the research literature to develop a comprehensive PPP evaluation framework. Drawing on a careful and extensive review of the research literature, we (1) present the often misunderstood economic properties of highway and road infrastructure, (2) outline the rationales governments cite for engaging in PPPs, (3) review the various types of applicable PPP arrangements, and (4) describe the conditions and factors that influence the success of PPPs. In the final section, we emphasize the differences between financial and socio-economic evaluations of PPP in describing our proposed PPP evaluation framework for highway projects. These differences in focus – between shorter-term financial considerations and longer-term economic considerations – lead to an important point that PPPs are not revenue sources *per se*. Rather they are means by which projects can be financed, delivered, and operated, but may or may not do so more cheaply than through more traditional finance, delivery, and operation. To the extent that tolling may be implemented to generate a revenue stream for a private contractor, PPPs may allow governments to tap into new sources of funding. But in such cases it is the tolls that generate funding, not the PPPs.

Despite this, and despite the potential efficiencies of private sector development and operation, PPPs appear to public officials as a way to generate “free money” for highway projects. But, of course, neither lunches nor highway projects are free. In attracting private capital, PPPs often redistribute costs and risks between the public and private sectors in ways that are not always clear to all involved. When project responsibility and authority is explicitly allocated to either the public sector or the private actor with the most relevant expertise and experience, significant efficiencies can be realized.

Despite the desperate need for upgrades to California’s highway network, officials must approach the PPPs carefully to ensure that projects will generate public benefits that exceed public costs. Whether or not a PPP is a good deal for the public very much depends on the project specifics. When properly structured and managed, PPPs can bring significant public benefit, but poorly conceived projects may entail far more risk than enthusiastic public officials may realize. When it comes to PPPs for highway projects, the devil is indeed in the details.



## EXECUTIVE SUMMARY

In light of chronic funding shortfalls and waxing highway construction and maintenance demands, public private partnerships (PPPs), often in conjunction with road pricing, have been garnering increasing attention from government officials in U.S. and abroad. Despite many strongly-held opinions about PPPs – both pro and con – systematic evaluations of their efficiency, effectiveness, equity, and feasibility are all too rare. This is due partly to the lack of evenhanded research on the topic, and partly because the recent wave of projects is so new that few evaluations have been conducted on them. Furthermore, PPPs vary significantly in terms of political, economic, legislative, contractual, and environmental conditions, making comparisons difficult.

This paper draws on the existing research literature to organize and discuss information about (1) the economic properties of highway and road infrastructure, (2) the rationales for PPPs, (3) the types of PPP arrangements, and (4) the important conditions and factors to consider for the success of PPPs.

The important economic properties of highway and road infrastructure are related to those of *public goods*—which entail both non-rivalry and non-excludability in consumption. While roads as an economic good have typically been difficult to classify, they have historically exhibited traits more characteristic of public goods rather than private (for which public access can be controlled, as in the case of food or clothing). However, due to increasing traffic congestion (which entails “rivalry” for limited road space) and the emerging array of road pricing technologies (which can limit, or “exclude,” access) roads can now be better characterized as “quasi-public” or “club” goods, which opens the door for more private sector involvement. Thus, private involvement in the production and provision of highway infrastructure and service has become increasingly feasible.

However, when making a choice between public and private production and operation of roads, there are many important factors to consider: externalities, accessibility equality, the merit of free parallel highways (demand options), and availability in times of emergency. In addition, some tasks appear in most cases to be best left to the public sector, while others are usually best handled in the private sector. Thus, the most efficient division of responsibility and authority would leave certain responsibilities to the sector best equipped to handle them. Furthermore, accountability – related to public values that justify or prohibit a particular means of production, provision, or distribution of goods and services – is of paramount concern. Finally, transportation infrastructure exhibits both economies of scale and network effects, which usually need coordination through some level of public intervention.

When gauging the success of transportation projects, it is also important to consider a variety of factors, such as the magnitude of the financial investment, the planning and construction time horizons, the stimulation of economic activity via reductions in travel time and costs, and the inevitable uncertainty in evaluating costs and benefits. Using PPPs to provide transportation infrastructure has the potential to affect all of these factors.

The literature on PPPs generally defines a spectrum of PPP arrangements for highway infrastructure based on the degree of private-sector involvement, ranging from traditional public procurement to full privatization, depending on how the responsibilities are divided between the public and private sectors (Table EE-1). This categorization of PPPs is driven mainly by three factors: 1) governmental decisions about whether to (i) outsource or (ii) share the responsibility for designing, constructing, financing, and operating highways, 2) methods by which the public





sector compensates the private sector and provides opportunities for profit, and 3) highway facility ownership arrangements.

**Table EE-1: Key Types of PPPs**

|   |   |
|---|---|
| <i>Traditional Procurement / Service Contracts</i>                          | Public agency issues separate contracts for the design, construction, and operation (if outsourced) to the lowest responsible bidders and remunerates them through direct payments              |
| <i>Design-Build / Turnkey</i>   | Similar to traditional procurement, except design and construction are combined into a single contract  |
| <i>Build-Operate-Transfer / Design-Build-Operate / Management Contracts</i> | Entire project from design to operations is combined under a single contract, including project management, and the public agency pays through direct payments over the lifetime of the project |
| <i>Joint Venture</i>  | The public agency forms a joint public/private company with local stakeholders to complete an improvement. Not frequently used for transportation projects.                                     |
| <i>Lease Agreements</i>   | Existing or new facilities are leased to a private firm, which is allowed to charge tolls, for the purposes of operation  |
| <i>Design-Build-Finance-Operate / Concession</i>                            | Similar to build-operate-transfer, except the private firm is allowed to collect tolls for a set period of time before transferring the facility to public control                              |
| <i>Full Private Provision</i>   | No reversion to public ownership takes place.   |

Each of these PPP types has been implemented with varying degrees of success. It is therefore not possible to conclude that any one PPP model is, in general, better than the others. Instead, the outcome of a particular PPP project depends on how well the agreement is tailored to its social, political, economic, and operational settings. Thus the first step a public agency should take in determining whether to pursue a PPP strategy is to fully understand the many factors and variables that influence the strategy's outcome. The influential factors include not only those related to engineering, such as design standards and the environmental conditions of the construction site, but also economic, fiscal, social, institutional, and contractual conditions. Table EE-2 outlines these conditions.

**Table EE-2: Risks and Background Conditions Affecting PPP Agreements**

|                     |  |
|---------------------|--|
| <u>Legislative:</u> | PPP-enabling legislation allowing a speedy approval process or hefty incentives can lower the transaction and time costs associated with initiating the agreement and make the PPP more attractive to private investors. A good balance between offering private incentives and protecting the public interest is needed. Public agencies usually shield private investors from the risk of legislation turning against a project once it is underway. |
|---------------------|--|



|  |   |
|--|---|
| <u>Contractual:</u>                    | The type of PPP contract used affects the opportunities for the private firm to streamline costs. Ideally, the chosen program would incentivize the private entity to consider the long-term effects of choices made during the project, seek to minimize its lifetime costs, provide flexibility, include opportunities for profit and efficiency gains sufficient to offset the set-up costs of the PPP, and align the motivations of the private entity with the public interest. A key part of the agreement hinges upon the initial value assessment of the project. Undervaluation of the asset is a particular risk of the public sector, while overvaluation, or “winner’s curse,” is a risk facing the winning bidder. |
| <u>Political / Public Perception:</u>  | Public hostility toward PPPs and privatization can jeopardize projects. The political support for PPPs can be worsened if the public has already experienced a failed PPP for a similar type of project.  |
| <u>Public-Private Relations:</u>       | Conditions, such as rate-of-return caps, ensure that the private sector does not exploit the project in the interest of maximizing profits. However, experience to date suggests that a cooperative relationship between the public and private entities is more beneficial to a PPPs success than a meticulously worded contract. Because long-term concessions may span multiple political administrations, PPPs viewed unfavorably by the public may become political campaign issues and worsening public-private relations could result in early termination or violations of the original contract.   |
| <u>Public vs. Private Sector Goals</u> | The PPP agreement must successfully balance the public sector’s goal of protecting the public interest with the private sector’s profit-driven motives.   |
| <u>Competition:</u>                    | If a new toll PPP facility is built too close to an existing parallel toll route, the split traffic demand may be insufficient to financially support both projects. Additionally, there will be high transaction costs involved with orchestrating cooperation between private entities where competing PPP routes intersect affect one another. Where untolled alternatives to a PPP facility exist, anticipating the level of demand for a tolled PPP facility may be very challenging. Also, the public partner should be careful not to limit its ability to carry out its long-range transportation plans by agreeing to excessive non-compete clauses.   |
| <u>Market Conditions:</u>              | PPP proposals must remain competitive with other investment opportunities available to private firms. When the private market presents many attractive investment opportunities, the public sector may have to add incentives and lessen the degree of investor risk transfer in order to keep PPP projects competitive, but this may diminish the overall cost savings and increase payments from both the highway agency and the road users.  |
| <u>Environmental Approval Issues:</u>  | Many countries require environmental approvals before projects can begin construction. Because the length of time needed to obtain these approvals can be uncertain, the public sector usually retains this responsibility either for obtaining approval before soliciting private sector bids, or by offering to compensate investors for time lost due to environmental delays.   |
| <u>Construction:</u>                   | Changes in construction material and labor costs can hinder the cost effectiveness of a highway construction project.   |



|                  |   |
|------------------|---|
| <u>Usage:</u>    | Traffic demand is generally projected to increase over time, but there is a chance that demand for travel along a new roadway may not meet projections, posing financial risks to private entities involved in both real toll or shadow toll PPP programs. The public sector sometimes offers to subsidize this risk because the private sector has little control over traffic demand. |
| <u>Currency:</u> | Developing countries sometimes use foreign finance institutions to fund highway PPPs. Devaluation of the home currency against the finance one can be fatal to a project under this funding program.  |

Assessing a PPP strategy depends partly on one’s definition of success. Our review of the research literature reveals that most analyses to date focus on the net *financial* benefit for government. This involves considering such factors as land values, interest rates, construction costs, transaction costs, and the distribution of risk. Since the most common motivation for governments to pursue PPPs is to advance project development when traditional funding is tight, the evaluation of projects based on financial criteria makes intuitive sense. However, considering only government financial benefits does not provide a complete picture of the total costs and benefits of PPP strategies vis-à-vis other means of project delivery and finance. Public agencies might mistakenly view PPPs simply as a means of getting projects built *cheaply*, since the absolute level of up-front public funding required is typically reduced, especially under toll concession models where the payments to the private concessionaire are made directly by the road users over the concession period. Such arrangements are often, and quite inappropriately, viewed by public officials as “free” money generated by PPPs. Rather such revenues are actually a transfer from road users to taxpayers. This may in fact be a desired outcome, but it is a transfer nonetheless. In other words, toll concession models shift a burden of payment from taxpayers to road users, and in doing so they may or may not increase overall economic efficiency. Such transfers may shift the financial burden for roads on the beneficiaries of roads, internalizing the many externalities of road use and increase overall economic efficiency in the process. But such transfers may also cause the public to pay more in tolls (and transaction costs in collecting the tolls) for the roadway under a PPP than it would have via fuel taxes under traditional finance methods.

Because both PPPs and traditional highway procurement methods entail costs (of one form or another) to the public, public agencies should focus more broadly on the *socio-economic* benefits that new facilities will confer on society when determining whether or not the construction is worth pursuing. While this might sound abstract and academic, the point is not a trivial one. In addition to considering financial criteria, evaluating a project from a socio-economic perspective involves examining factors such as operating efficiency, transportation system innovation, the distribution of public benefits, and environmental costs. It makes little difference whether an ineffective new facility was built at a low cost; expenditures on poorly-conceived projects are wasted. And whether to build a facility using a PPP thus emerges as a secondary consideration in the evaluation process of costs and benefits; an important consideration to be sure, but secondary. But in some cases, the cart has been put before the horse and the decision to pursue PPPs has driven project selection. In doing so, public officials have failed to distinguish the *financial* motives to pursue PPPs apart from the *economic* benefits conveyed by a given highway project.



Given our conceptual review of the literature and past PPP projects, we have developed a conceptual framework to evaluate the financial and economic merits of various PPP (and non-PPP) strategies. In this framework we emphasize the difference between the two criteria discussed above—(1) *financial* costs and benefits, and (2) *socio-economic* costs and benefits. We have, in addition, identify the factors and conditions that influence each criterion and briefly describe the *financial* internal rate of return (FIRR) and *economic* internal rate of return (EIRR), which are commonly used in the project evaluation in the international development field, including transportation infrastructure projects.

To conclude, PPP agreements have the *potential* to help deliver much-needed highway improvements at a lower cost and on a shorter timeline than via traditional procurement methods. On the other hand, there also exists the very real possibility that a PPP agreement could prove more risky and costly in the long run. Even PPPs that help a public agencies “bottom line” may not result economic benefits overall – measured in terms of lower user fees, lower tax payments, or increased economic benefits for the public. Whether or not a PPP is a good deal for the public very much depends on the project specifics. When properly structured and managed, PPPs can bring significant public benefit, but poorly conceived projects may entail far more risk than enthusiastic public officials may realize. When it comes to PPPs for highway projects, the devil is indeed in the details.





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## 1. INTRODUCTION

*Sadly, there is no reason to expect the political process to lead to the right pattern of privatization. Unless we are luckier or more careful than we are likely to be, political pressures will tend to retain for the public sector functions where privatization would make sense, and to privatize tasks that would be better left to government. (John D. Donahue, *The Privatization Decision*, 1989, page 13)*

Facing both chronic funding shortfalls and growing highway construction and maintenance demands, federal, state, and local governments in the U.S. are increasingly turning to alternative highway financing strategies. In particular, public-private partnerships (PPPs), often in combination with tolls or congestion pricing, have emerged as a popular financing strategy since the 1980s in Europe (Medda et al. 2007), and more recently in the US. The recent concession deals for the Chicago Skyway (99 years, \$1.83 billion) and the Indiana Toll Road (75 years, \$3.8 billion) have escalated public debate over the appropriateness, efficacy, efficiency, effectiveness, feasibility, fairness, and equity of public-private highway partnerships.

Supporters range from those who see PPPs as an opportunity to increase the economic efficiency of highway projects in certain, limited situations, to those who view PPPs as a way to avoid unpopular tax and fee increases by the widespread leveraging of private capital at little or no cost to the public. Likewise, opponents range from those concerned that the potential of PPPs may be oversold, to those philosophically opposed to private sector involvement in the provision of traditionally public services. In such an environment, evenhanded analyses of the pros and cons of PPPs have often been in short supply.

While the leaders of several states, such as Indiana, Texas, and Virginia, have been aggressively promoting PPPs by passing state legislation to support them, Congressman James L. Oberstar (D-MN), Chairman of the U.S. House of Representatives Committee on Highway and Infrastructure, and Peter DeFazio (D-OR), Chairman of the Subcommittee of Highways and Transit have called for a slowing of the trend toward PPPs in transportation. In their joint letter to state governors on May 10, 2007, they wrote, “[w]e write to strongly discourage you from entering into public-private partnerships (“PPP”) agreements that are not in the long-term public interest in a safe, integrated national transportation system that can meet the needs of the 21<sup>st</sup> Century.” To some extent, the debate and discussion in Congressional hearings to date are characterized by dichotomous views of PPPs – either strongly for or against them.

Despite the often strongly professed opinions on PPPs, research on highway PPPs is so diffused and limited that it does not adequately inform policy makers. This is due partly to the lack of evenhanded research on the topic, and partly because the recent wave of projects is so new that few evaluations have been conducted on them. Furthermore, PPPs vary significantly in terms of political, economic, legislative, contractual, and environmental conditions, making comparisons difficult.

This paper draws on the existing literature to organize and discuss information about (1) the economic properties of highway and road infrastructure, (2) the rationales for PPPs, (3) the types of PPP arrangements, and (4) the important conditions and factors to consider for the success of PPPs. In the next section, we discuss the properties of highway infrastructure that justify public provision, but do not necessarily require it. In the third section, we define and describe the types of PPPs for transportation infrastructure financing. In the fourth section, we introduce rationales

for shifts from public provision to PPPs, identify the central questions in debates over PPPs, and explore the conditions and factors that affect outcomes of PPPs. In the fifth section, we discuss three PPP cases from three parts of the world—Malaysia, the United Kingdom, and California—as examples to underscore the importance of carefully examining conditions and factors. We then provide our preliminary concept for a comprehensive PPP evaluation framework for highway projects, paying particular attention to the difference between financial analysis and socio-economic analyses.<sup>1</sup> Along the way, we show why comprehensive evaluations PPPs are difficult because it requires consideration of such a wide array of economic, political, and social conditions/context that vary across both space and time (Bult-Spiering and Dewulf 2006). Finally, we conclude the paper by outlining the key questions to be addressed in future research.

## **2. PROPERTIES OF HIGHWAY INFRASTRUCTURE**

When considering the appropriate balance of public and private sector involvement, it is useful to review the theoretical rationales for the provision and production of goods and services. We start with a discussion of public goods, which provides the grounds for public sector provision.

Pure public goods are characterized by nonrivalry and nonexcludability in consumption. Nonrivalry means that once the good is provided, it does not occasion additional resource costs to provide the good for another person's consumption (Donahue 1989; Rosen 1999). While the highway and road infrastructure, as a lump-sum good, may seem like a nonrival good at first, the quality of service on highways and roads decreases as congestion increases. Therefore, with rising congestion, road service does not remain nonrival (Rosen 1999). Nonexcludability means that it is impossible or very costly to prevent the consumption of the good by anyone who does not pay for it (Rosen 1999). In this regard, the consumption of "freeways" is nonexcludable due to legal arrangements; by law, for example, interstate highways cannot be tolled. However, with a variety of technology available for road pricing, the consumption of highways and roads is not strictly nonexcludable. For this reason, private involvement in the production and provision of highway infrastructure and service is generally feasible.<sup>2</sup>

Highways with high levels of traffic certainly generate externalities, in addition to their direct benefits of travel time savings. Positive externalities include economic benefits that can be realized by the increased level of accessibility of surrounding areas. Negative externalities include noise, air and water pollution, disruption of communities, and aesthetic impacts. Some level of collective action through public intervention is justified in order to induce these positive socio-economic benefits, while minimizing negative externalities due to market failure. In addition, since accessibility can be considered indispensable to everyone's life, equity to accessibility (or distribution of the highway service (Rosen 1999)) needs to be carefully examined (Donahue 1989). If the private provision of highway infrastructure leads to the geographic monopoly of accessibility, it will incur significant costs to the public. This issue is more relevant when there is no alternative route available to a corridor provided by the private sector. In addition, others point out the merit of free parallel highways (option demand), which do not

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<sup>1</sup> This framework requires further refinement once the project gets to the stage of in-depth case studies.

<sup>2</sup> Rosen states that the production and provision of public goods are not necessarily in the realm of the public sector (Rosen, 1999).

produce profits in a market economy but bring benefits to society, particularly in the time of emergency, such as accidents in the primary corridors and evacuation due to natural disasters.

Donahue (1989) discusses two basic dimensions of the choice between public and private: 1) financing and 2) performance or delivery. In regard to financing, we need to judge whether we should pay for the goods and services individually (*i.e.* user fees) or pay collectively with funds raised through taxation. Regarding performance (or delivery), we need to answer the question of whether the good or service should be delivered by the government or by the private sector (or any other non-governmental organization). For service contracts, choosing the provider that can perform tasks at the lowest cost is more important than whether that provider is public or private, but the same may not be true for the provision of infrastructure; the public and private sectors each have comparative advantages and disadvantages in performing different tasks, and should share responsibilities in ways that ensure tasks are assigned to the party that can accomplish them most efficiently. In other words, it is ideal to strategically divide tasks in a way that takes advantage of efficiencies both in the market environment and in the public sector.

In addition to efficiency, accountability is an important consideration when selecting the types of production and provision (Donahue 1989). Within this framework of accountability, the means of production and provision, and the quality and distribution of goods and services need to meet the values of the general public -- this includes citizens, voters, taxpayers, and beneficiaries of goods and services. These values also justify public intervention, such as quality control standards for road surface conditions, safety, and environmental impacts. Regarding quality of service, the government cannot write a so-called “complete contract” when unforeseen contingencies are important and may also be taken advantage of by the private firm to maximize profit (Hart, Shleifer, and Vishny 1996). This concern is particularly relevant when traffic demand significantly exceeds forecasts, and the private sector can charge high tolls while the public sector cannot provide alternate routes due to a non-competition clause in the contract. Finally, transportation infrastructure exhibits economies of scale and network effects; coordination between segments of PPP highways and other road infrastructure should remain intact for efficient operations. This need for coordination usually requires public intervention.

Doi (2002) lists important considerations for transportation project evaluation:

- (1) the size of the investment, particularly sunk costs (Gomez-Ibanez 1999)
- (2) the long planning and construction periods due to the longevity and immobility of transportation infrastructure (Gomez-Ibanez 1999)
- (3) the need to take into account intangible elements, such as time savings and added convenience, in estimating costs and benefits
- (4) the difficulty of computing economic costs based on the market value due to various economic distortions, such as the public intervention in the market
- (5) the difficulty in accurately forecasting future travel demand and other relevant factors related to the valuation of risk
- (6) the significant and complex impacts of the project on economic activities
- (7) the complexity of comparing various plans, including the “no-build” alternative, where travel demand continues to grow over time, but no capacity is added.

### **3. PUBLIC-PRIVATE PARTNERSHIPS (PPPS) FOR TRANSPORTATION INFRASTRUCTURE**

Governments worldwide use a variety of public private partnerships (PPPs) when financing highways. A low-involvement type, for example, might include the combination of the construction and maintenance contracts, or the outsourcing of project management. The more-involved types contain provisions for sharing financing responsibilities between the public and private sectors, such as by transferring effective ownership of the facilities to the private sector for decades.

The literature on PPPs generally defines a spectrum of types based on the degree of private-sector involvement, ranging from traditional public procurement to full privatization (1995; Fayard 2005). In this general categorization of PPPs, we can identify three main factors. First, for the most part, the differences between PPP models stem mostly from governmental decisions about whether to outsource or to share the responsibilities of designing, constructing, financing, and operating highways. Second, the methods by which the public sector compensates the private sector and provides opportunities for profit also distinguish different types of PPPs from one another. Third, PPP models can have different arrangements for the ownership of highway facilities. That is, the public agency might retain ownership of the highway and merely lease it to a private agency for the duration of the partnership, or the private agency might be the rightful owners of the facility, similar to private toll roads. In many cases, the agreements include provisions for control of the facilities to be transferred back to the public sector after a set number of years, usually a few decades or the design life of the roadway.

Each PPP agreement is unique and may fall between two of the following models depending on how the responsibilities are shared between the public and private sectors. For example, a design-build-finance-operate contract with a very long concession period (some are as long as 99 years (Lockwood, Verma, and Schneider 2000)) or one that is renewed upon expiration, begins to imitate full private ownership. Consequently, sorting existing projects into rigid categories of PPP types is difficult.

Difficulty notwithstanding, in the following sections we describe several popular PPP arrangements that can be and have been adopted to highway infrastructure (Table 1).

#### **Traditional Procurement**

Under the traditional public procurement method in the U.S., which is typically not considered as a PPP due to the limited degree of private involvement and risk assumption, the public agency overseeing the project first contracts with a design firm, then holds a competitive bidding process to select the builder once the design is finished (*Public Private Partnerships* 2007). Upon completion of the project, the agency either provides operational services for the facility, or holds another competitive bidding process for operations.

One argument against this model is that because all of the contracts are serviced by different private firms, there is little opportunity for efficiency gains beyond the initial design of the facility. For example, if the public agency combines the design and maintenance contracts, the contractor would have an incentive to look for ways to make small adjustments to the design that would reap long term maintenance cost savings. Under the traditional procurement method with separate contracts, the design firm does not have any financial interest in doing this, and would not likely expend the extra effort. Similarly, under combined contracts, the temptation for any

one contractor to cut corners and transfer costs to the others is removed, thus improving the quality of the roadway and potentially lowering the cost to the public (Ward and Sussman 2006).

**Table 1: Key Types of PPPs**

|   |   |
|---|---|
| <i>Traditional Procurement / Service Contracts</i>                          | Public agency issues separate contracts for the design, construction, and operation (if outsourced) to the lowest responsible bidders and remunerates them through direct payments              |
| <i>Design-Build / Turnkey</i>   | Similar to traditional procurement, except design and construction are combined into a single contract  |
| <i>Build-Operate-Transfer / Design-Build-Operate / Management Contracts</i> | Entire project from design to operations is combined under a single contract, including project management, and the public agency pays through direct payments over the lifetime of the project |
| <i>Joint Venture</i>  | The public agency forms a joint public/private company with local stakeholders to complete an improvement. Not frequently used for transportation projects.                                     |
| <i>Lease Agreements</i>   | Existing or new facilities are leased to a private firm, which is allowed to charge tolls, for the purposes of operation  |
| <i>Design-Build-Finance-Operate / Concession</i>                            | Similar to build-operate-transfer, except the private firm is allowed to collect tolls for a set period of time before transferring the facility to public control                              |
| <i>Full Private Provision</i>   | No reversion to public ownership takes place.   |

Source: (*Public Private Partnerships* 2007; Bult-Spiering and Dewulf 2006; Kumar and Prasad 2004; Reeves 2005)

### **Design-Build**

The design-build model combines the design and construction of the project into a single contract. In the U.S., this is also known as the “turnkey model,” since the contractor is basically selling a finished highway facility to the transportation agency in a ready-to-use condition. It essentially transfers the responsibility for project management to the private sector, simplifying the administrative process for the public agency, and improving efficiency by having one private entity responsible for multiple project tasks (*Public Private Partnerships* 2007).

Although this model reduces the number of public contracts and subsequent administrative costs needed to complete a project, the remaining contracts with the design-build company or consortium are typically more complex and time-consuming to implement because the scope of work is larger and the relationship between the public and private entities is more intricate (Ragazzi 2005). This type of PPP involves a low degree of private sector involvement compared to the others, as the responsibilities for maintenance, financing, and operation fully remain with the public sector. Many government entities in the U.S. are experimenting with design-build, since it offers the potential for cost and time savings, but does not usually require new enabling legislation or carry the political risks associated with strong private involvement in what have been traditionally public sector functions. That is to say, highway design and construction have



traditionally been contracted to the private sector, so combining the two tasks into one contract does not incite as much controversy as the types of privatization below.

### **Build-Operate-Transfer**

Build-Operate-Transfer involves greater private sector involvement than design-build. The public agency issues a contract to a private entity, usually a consortium of firms specializing in the various tasks needed to carry out the project, to construct and operate the facility for a set period of time. The government remains responsible for financing, and remunerates the private entity through any combination of fixed payments, direct user fees (such as actual tolls), or payments based on the amount of road use (so-called *shadow tolls*).

Under a fixed payment agreement, the government is essentially buying the *availability* of the roadway from the private contractor, meaning that the contractor receives payments simply for having the facility open to motorists (Bult-Spiering and Dewulf 2006). When user fees or *shadow tolls* are involved, the private contractor assumes some risk of low traffic levels, but receives payments that are proportionate to the amount of road wear. *Shadow tolling* is especially useful where the public is reluctant to pay tolls to travel on facilities that have historically been free. But there is debate over whether the private sector assumes much financial risk in a *shadow toll* agreement since the traffic levels will almost surely rise over time (Mackie and Smith 2005; Medda et al. 2007). The Portuguese government has begun to favor real tolls as traffic volume increases (Bult-Spiering and Dewulf 2006).

Like design-build, there is the potential for cost savings by having one entity overseeing the entire design and construction process. More significantly, build-operate-transfer allows for potential long-term operation cost savings because the private firms might find it economical to spend additional money on the construction to save on later maintenance, and they typically have access to non-unionized labor. However, it remains to be seen whether private firms will allow the roads to deteriorate when their PPP agreements near expiration.

### **Joint Venture**

Joint venture PPPs are most commonly used in local redevelopment projects, and do not usually enter the realm of transportation improvements. Unlike concession PPPs, the private sector usually consists of local landowners who have a direct interest in the quality of the project and its ability to raise land values. Stakeholders typically partner with the public agency to form a joint public-private company. The government must balance its role as both regulator of public interest and shareholder in the company so as not to become too heavily focused on profit (Bult-Spiering and Dewulf 2006). Public agencies have undertaken programs similar to joint ventures on a few occasions where a new transit or highway facility will bring significant economic benefits to the surrounding area. For example, Texas highway authorities have previously requested the donation of highway rights-of-way from adjacent landowners who stood to profit from the new facility (Brereton and Ashcroft 1986).

### **Lease Agreements**

In some instances, highway agencies will transfer existing or new facilities to a private contractor for the purpose of outsourcing operations and maintenance. The contractor either receives payments from the public agency, or is allowed to charge user fees along the facility.

The public agency typically continues to shoulder some of the operational risk for the highway by guaranteeing a portion of the payments based on *availability* of the roadway for traffic rather than actual usage, so as not to penalize the contractor should travel demand fail to meet projections (Taylor 2005). However, agencies still find it useful to base some of the payment on usage, either through a toll concession or direct payments that vary with usage (*shadow tolls*) to ensure that the contractor maintains the road well enough that it handles traffic efficiently and provides maximum benefit to users (Jamieson et al. 2005). Lease agreements for existing roadways can be politically risky because the public and politicians often object whenever previously-free facilities become toll roads unless significant visible upgrades are added (Bult-Spiering and Dewulf 2006; Gougherty 2005a; Little 2005).

### **Design-Build-Finance-Operate**

Design-build-finance-operate transfers almost all functions pertaining to the facility to the private sector, though the public agency usually retains rightful ownership and regains control over the highway after a set number of years. The government may shoulder the responsibility for gaining environmental approvals, but nearly every remaining aspect of the project's development and operation is transferred to the private sector in the PPP contract (*Public Private Partnerships* 2007).

This model differs from build-operate-transfer in that the responsibility for financing the project does not rest with the public sector. Instead, the consortium, which often includes a bank, uses private capital markets and typically recovers its investment through tolls (Bult-Spiering and Dewulf 2006). Although the direct costs to the overseeing public agency are drastically reduced from traditional procurement under this model, the facility may in fact be more expensive to the public if the tolls rise too high. Additionally, there is a significant political risk since this model exhibits similarities to full privatization.

There is currently a particularly active debate over the potential effectiveness of the design-build-finance-operate model. Proponents argue that this model maximizes the ability to share risks while still allowing for significant government oversight in the form of regulations, thus enabling significant cost savings due to private sector efficiency (Sawyer 2005). However, there is disagreement over whether this model truly generates savings over public procurement (Boeuf 2003). If PPPs do not generate any real savings, the same goals could be realized if governments simply streamlined administrative and political processes and adopted toll financing. Moreover, whether any cost

#### **Congestion pricing:**

Adopting a toll finance structure provides the added opportunity to implement congestion pricing along the tolled routes. By charging the minimum facility toll needed to keep traffic flowing smoothly, toll authorities can increase total vehicle throughput along the facility during peak hours, and increase passenger throughput even further by incentivizing motorists to carpool and split the toll. Electronic toll collection technologies provide a relatively inexpensive method of implementation compared to manually-staffed toll booths, and do not impose the time costs associated with queuing to pay cash. The time savings generated by the free-flowing lanes and delay-free tolling can increase the public's perception of value for money, and help build political consensus for future toll-financed projects.

savings is returned to the public or simply absorbed as profit by the private entity depends on the PPP contract.

### **Build-Operate-Own**

Build-operate-own is essentially full private provision of traditionally public services and facilities. The public sector may provide some guidance, regulation, or assistance in the design of the project and securing of the environmental and political clearances, for which the private firm might pay. But the construction, operation, and full ownership responsibilities reside with the private sector.

Each of the above-mentioned strategies has been implemented with varying degrees of success. It is therefore not possible to conclude that any one PPP model is, in general, better than the others. The outcome of a particular PPP project depends on how well the agreement is tailored to the social, political, and economic setting. It is possible, however, to offer some recommendations on the ingredients of successful PPP projects.

## **4. CONDITIONS AFFECTING THE SUCCESS AND FAILURE OF PPPS**

The first step in identifying successful PPP strategies is to understand the factors and variables that influence the strategy's outcome. The influential factors include not only those related to engineering, such as design standards and the environmental conditions of the construction site, but also economic, fiscal, social, institutional, and contractual conditions. In this section, we will discuss these influential factors.

### **Government Rationales for Adopting PPPs for Transportation Infrastructure Financing**

Governments typically see public private partnerships as a means of completing much-needed public works projects when traditional funding methods are insufficient. In the U.S., the lack of political will to raise fuel taxes to support the highway finance structures of the past several decades has forced highway authorities to consider the use of other taxation methods as well as user fees and public-private partnerships (Sorensen 2006).

Table 2 summarizes arguments for and against transportation infrastructure financing programs involving PPPs. Proponents of PPPs cite private sector efficiency and innovation as the reason for cost savings under these programs, where the private sector substitutes user fees for traditional taxes in order to retire the debt (Ragazzi 2005; Sawyer 2005).<sup>3</sup> Additionally, keeping the number of contractors working on a project low and allowing each more free reign over the design, construction, and operation removes some of the project management responsibilities from the public sector (1995). Some other commonly cited motives for adopting PPPs include the minimization of risks for the public sector, faster construction, stimulation of private sector business, introducing competition to improve the quality of the finished highway, and assumption of a *lifecycle* approach to the project (Bult-Spiering and Dewulf 2006).

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<sup>3</sup> Furthermore, many proponents suggest that such tolls be set to manage demand on the facility (i.e. variable pricing) so that motorists can enjoy a quicker and more reliable trip than might otherwise be provided (Samuel and Poole 2007). However, variable pricing is not exclusive to roadways financed by PPPs.

**Table 2: Free Money?**

| <b>Financial Motivations for Highway Agencies to Choose PPPs</b>   | <b>Corresponding Potential Disadvantages</b>   |
|--|--|
| <p>PPPs can overcome the state’s budget crisis by circumventing the highway fund and collecting money directly from road users in the form of tolls. The highway agency spends far less money on a PPP road than a traditional road.</p> | <p>Though the highway agency perceives a cost savings, road users can end up paying more in tolls under a PPP than they would have in taxes under traditional procurement. The highway agency’s budget savings may not be a true savings for the public.</p>   |
| <p>PPP agreements often include provisions for an initial cash payment (rent) from the private sector to the highway agency. This payment allows the highway agency to fund other road projects.</p>                                     | <p>The highway agency typically loses the ability to make capacity upgrades to facilities near the PPP project unless they are identified in a long-range transportation plan at the time the agreement begins.<sup>4</sup> This can be difficult to plan when agreements last for several decades.</p>  |
| <p>PPPs allow the highway agency to transfer substantial risks and responsibilities for the roadway to the private sector. This alleviates demands on the public highway fund.</p>   | <p>Should any of these risks become costly, the highway agency might, in the interest of keeping the PPP agreement alive, feel compelled to bail out the private contractor with an extended concession period or other subsidy that negates any actual risk transfer. Also, the private contractor might pay for any additional costs incurred from risks simply by charging road users more in tolls. In both scenarios, the public ultimately bears the brunt of the risk, despite the contractual risk transfer from the highway agency to the private contractor.</p> |

Critics of PPPs often point out that governments may be tempted to enter into PPPs because the costs of project construction will be spread out over their entire lifespan but kept off of public debt rolls, thus freeing up real and debt capital to begin multiple projects at once. That is to say that paying user fees or shadow tolls to a PPP contractor imitates debt service on highway construction without the need to actually take out a loan. However, the state transfers effective ownership and much of its control over the road to the private contractor in order to obtain this cash advance, which is not the case with public bond finance.

This has been the UK’s experience with the *Private Finance Initiative (PFI)* program (Boeuf 2003).<sup>5</sup> Even though the British program did not yield sizeable savings over the traditional

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<sup>4</sup> The initial SR-91 contract included perhaps the most restrictive and egregious example of non-compete clauses, and transportation agencies have learned from this mistake. However, weaker non-compete clauses still remain an option in some PPPs such as the Indiana Toll Road and a number of toll roads in Texas, including the existing Toll 130 and Toll 45 SE routes near Austin and the future Highway 290 east expansion. As a result, concerns over non-compete clauses that can limit improvements or capacity enhancements still remain strong.

<sup>5</sup> The PFI is a form of PPP introduced by the Conservative Government of the UK to increase the involvement of the private sector in the provision of public services, combining a procurement of private capital items by the public with an extension of public services contracting out (Allen 2001). In the PFI, the public sector retains responsibility

procurement methods, it was able to commence many highway projects simultaneously. In the case of the Indiana Toll Road, the State of Indiana received about \$3.8 billion for the 75 year lease, which enables the state to fully fund the 10-year highway modernization program (Poole 2007a). The prospect of such a sizeable cash advance in the face of funding shortfalls could lead highway authorities to adopt a myopic determination to engage in PPPs even when a PPP arrangement is not suitable for a particular *single* project.

By 2001, the British *PFI program* was becoming less popular with the growing realization by the public that so many projects had been undertaken that little public money remained to start new ones (Mackie and Smith 2005). Although using the PFI model reduced the *startup* costs of new highway projects, the government initiated so many projects that its foreseeable funds to pay shadow tolls to the contractors over the lifetimes of the roads had all been committed. In the interest of protecting the government's credibility and keeping PPP programs viable, public agencies are often tempted to bail out the private entities even at high taxpayer expense if the PPP begins to fail (Boeuf 2003). However, this can ultimately lead to more money being spent on the project than would have been under traditional procurement methods. Further, critics argue that no real risk transfer takes place if the public offers a safety net in the event of a failure.

Another critique of PPPs pertains to transactions costs and transfers. Allowing the private sector to enter markets traditionally within the public realm requires increased government regulation of private business, which can raise administrative costs and undermine savings for both the public and private parties involved (Gomez-Ibanez, Meyer, and Luberoff 1991). Additionally, governments sometimes argue that implementing a PPP program will stimulate private sector spending and tax revenues in turn, but the program does not actually increase the amount of investment capital available from the private sector. It is more likely, however, that the program may simply be drawing investments away from other private investment opportunities (Gomez-Ibanez, Meyer, and Luberoff 1991). In their efforts to mitigate the high costs of highway infrastructure provision and stimulate private investment, public agencies might merely be converting costs to administrative overhead and, in the process, adding more investment options to the private market.

### **Factors and Conditions that Influence the Outcome of PPPs**

No simple set of conditions will ensure the success or failure of a PPP, largely because each of many PPP models is represented by only a few projects, and many of these projects are fairly new and their agreement lifetimes have not yet ended. Public agencies are just now establishing the best practices for undertaking PPPs, and their early efforts might not be representative of the full potential of PPP programs. Additionally, the conditions needed for success may vary from country to country based on the economic climate, legislative barriers, policy-makers' willingness to undertake PPPs, and the prevailing cultural attitudes toward private involvement in public sector affairs (1995; Mackie and Smith 2005; Sawyer 2005; Ward and Sussman 2006). Nevertheless, public agencies' experiences with PPPs thus far have yielded some useful lessons

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to purchase services or implement the project, while the private sector is responsible for arranging finance to provide both the services and capital asset for the project. The most common form of PFI is a DBFO with output specifications decided by public sector managers and their departments.

with regard to the conditions needed for a successful agreement, especially in the early stages of the process. Table 3 lists some important conditions affecting PPP agreements.

**Table 3: Risks and Background Conditions Affecting PPP Agreements**

|  |   |
|--|---|
| <u>Legislative:</u>                    | PPP-enabling legislation allowing a speedy approval process or hefty incentives can lower the transaction and time costs associated with initiating the agreement and make the PPP more attractive to private investors. A good balance between offering private incentives and protecting the public interest is needed. Public agencies usually shield private investors from the risk of legislation turning against a project once it is underway.  |
| <u>Contractual:</u>                    | The type of PPP contract used affects the opportunities for the private firm to streamline costs. Ideally, the chosen program would incentivize the private entity to consider the long-term effects of choices made during the project, seek to minimize its lifetime costs, provide flexibility, include opportunities for profit and efficiency gains sufficient to offset the set-up costs of the PPP, and align the motivations of the private entity with the public interest. A key part of the agreement hinges upon the initial value assessment of the project. Undervaluation of the asset is a particular risk of the public sector, while overvaluation, or “winner’s curse,” is a risk facing the winning bidder. |
| <u>Political / Public Perception:</u>  | Public hostility toward PPPs and privatization can jeopardize projects. The political support for PPPs can be worsened if the public has already experienced a failed PPP for a similar type of project.  |
| <u>Public-Private Relations:</u>       | Conditions, such as rate-of-return caps, ensure that the private sector does not exploit the project in the interest of maximizing profits. However, experience to date suggests that a cooperative relationship between the public and private entities is more beneficial to a PPPs success than a meticulously worded contract. Because long-term concessions may span multiple political administrations, PPPs viewed unfavorably by the public may become political campaign issues and worsening public-private relations could result in early termination or violations of the original contract.   |
| <u>Public vs. Private Sector Goals</u> | The PPP agreement must successfully balance the public sector’s goal of protecting the public interest with the private sector’s profit-driven motives.   |
| <u>Competition:</u>                    | If a new toll PPP facility is built too close to an existing parallel toll route, the split traffic demand may be insufficient to financially support both projects. Additionally, there will be high transaction costs involved with orchestrating cooperation between private entities where competing PPP routes intersect affect one another. Where untolled alternatives to a PPP facility exist, anticipating the level of demand for a tolled PPP facility may be very challenging. Also, the public partner should be careful not to limit its ability to carry out its long-range transportation plans by agreeing to excessive non-compete clauses.   |
| <u>Market Conditions:</u>              | PPP proposals must remain competitive with other investment opportunities available to private firms. When the private market presents many attractive investment opportunities, the public sector may have to add incentives and lessen the degree of investor risk transfer in order to keep PPP projects competitive, but this may diminish the overall cost savings and increase payments from both the highway agency and the road users.  |

|                                       |   |
|---------------------------------------|---|
| <u>Environmental Approval Issues:</u> | Many countries require environmental approvals before projects can begin construction. Because the length of time needed to obtain these approvals can be uncertain, the public sector usually retains this responsibility either for obtaining approval before soliciting private sector bids, or by offering to compensate investors for time lost due to environmental delays.       |
| <u>Construction:</u>                  | Changes in construction material and labor costs can hinder the cost effectiveness of a highway construction project.   |
| <u>Usage:</u>                         | Traffic demand is generally projected to increase over time, but there is a chance that demand for travel along a new roadway may not meet projections, posing financial risks to private entities involved in both real toll or shadow toll PPP programs. The public sector sometimes offers to subsidize this risk because the private sector has little control over traffic demand. |
| <u>Currency:</u>                      | Developing countries sometimes use foreign finance institutions to fund highway PPPs. Devaluation of the home currency against the finance one can be fatal to a project under this funding program.  |

Source: (Bult-Spiering and Dewulf 2006; Doi 2002; Lockwood, Verma, and Schneider 2000)

As the many factors suggest, it is important to understand the types of risks and carefully examine whether it is beneficial to transfer risks from the public sector to the private sector, taking into account a potential tradeoff between the amount of transferred risks and the attractiveness of a project. Among the financial risks associated with highway projects are:

- (1) the environmental clearance risks arising from delays in obtaining the needed approvals,
- (2) the risk of political and public opinion delaying or requiring costly modifications to the project
- (3) construction cost overrun risks,
- (4) risks associated with operations, and
- (5) the risk of natural disasters.

Most of these risks, with the exception of those pertaining to construction and operations, are usually best managed by the public sector because of their political nature and uncertain timeframes. Additionally, public agencies may not be well-versed in the many financial management strategies commonly employed by the private sector. This may place the public sector at a competitive disadvantage when negotiating PPP contracts with private entities.

When public agencies get into a PPP arrangement with a private contractor, they must be careful to only transfer those costs that the private sector is capable of minimizing (*e.g.* construction cost overruns, but not politicians' changes of opinion regarding support for the project), otherwise there may be no cost advantage to having the private sector involved, and the uncontrollable risks will make the project unattractive to investors. In some cases, the project could be worse off if the transferred risks are better managed by the public sector, such as building political consensus. Ultimately there is a trade-off between public and private sector interests: the public sector wants to transfer enough risks to realize financial savings, but not so many that the private sector becomes uninterested in the deal or charges exorbitant user fees to protect itself in an overly-risky transaction. The key is to assign risks to the party best able to control them.

## **Legislation**

PPP-enabling legislation ultimately governs what types of programs highway agencies can undertake. Policymakers can provide incentives to private firms willing to participate in PPPs as a means of making the agreements more attractive than competing investment opportunities. In addition, streamlined approvals processes increase the attractiveness of a project by reducing anticipated delays. However, governments must tread carefully when promulgating supporting legislation since the voters are often wary of governments enacting measures that, on the surface, can be construed to broadly endorse privatization, or that trade public interest for private profit. On the other hand, the laws cannot be so restrictive that they provide insufficient incentives for private sector involvement in PPPs.

In France, for example, the passage of a 2004 law made possible PPP contracts beyond long-term lease agreements (Lestrange et al. 2005). Though France's existing concession model for long-term lease agreements affords the private entities some protection from uncontrollable events that substantially raise the risk of the project, such as changes in law or low demand for the new facility, the system of incentives for the newly-allowed design-build-finance-operate programs may not be attractive enough to offset the risks shouldered by private investors and generate significant interest in the program (Lestrange et al. 2005).

In contrast, Spain has gradually passed a series of laws since the 1950's to increase the attractiveness of PPP agreements by lengthening concession periods, protecting the concessionaires against interest rate fluctuations, and fending off motorist unrest by using shadow tolls (Bult-Spiering and Dewulf 2006). While this increased shouldering of risks by the public sector makes PPPs more viable to private entities, it reduces the potential for savings over the traditional public procurement methods.

## **Contractual (Initial Setup) Issues**

In order to protect the public interest, Gilroy et al. (2007) and Poole (2007b) suggest that concession agreements between public and private entities incorporate detailed provisions to cover a variety of issues, such as limits on tolls or rates of return, who pays for rehabilitation or future expansions, how the contract can be amended, and how to value the project in the case of early termination. A good value assessment of the project is essential to forming a sound agreement, but risk valuation in and of itself can be unreliable because PPP projects usually include complex agreements dependent on location and contextual details (Bult-Spiering and Dewulf 2006). Governments are often at risk of undervaluing existing infrastructure assets due to inexperience (Checherita and Gifford 2007). Conversely, winning private bidders are at risk of "winner's curse:" the possibility that their bid is best because they miscalculated the risks and returns (Checherita and Gifford 2007).

Risk sharing works best when contracts are flexible enough to allow for modifications in the event of unforeseen circumstances. In the case of the Virginia Dulles Toll Road, for example, the State Corporation Commission of Virginia retained the power to set toll schedules along the new facility so as to provide a reasonable return on investment for the private firm while protecting the public against exorbitant tolls (1992). This legislative provision demands a degree of trust between the public and private entities because the profitability of the project for the private entity lies in the hands of the public commission. In addition, provisions for the possibility of a breach of the contract and possible termination (*e.g.* if the public partner were to



limit the private partner's ability to set tolls, or if a competitive clause were to be violated) are both advisable and common to such contracts (Checherita and Gifford 2007). However, very easy early contract termination terms can make it easy for one party to abuse the agreement (Boeuf 2003). For example, given that the public sector often retains the residual risk of asset ownership, public contract partners may experience heightened risk if the private contractor uses the threat of easy early termination clauses repeatedly seek to renegotiate the terms of the contract (Checherita and Gifford 2007).

Streamlining the contracting process is usually desirable because it reduces the amount of time and resources that both the public and private sectors must spend on bidding. Officials in Ireland noticed a drop of PPP proposals because the government demanded that private entities create overly-elaborate submissions with no guarantee of winning the contract (Reeves 2005). In crafting terms more attractive to potential bidders, governments must ensure that the bidding process remains fair and open to public participation, but a completely transparent bidding process poses some risk to the bidders, making their proposals available to their competitors (AECOM Consult 2007).

In addition, the payments to the private sector, whether direct government subventions or in the form of tolls, must cover the costs of providing a reasonable profit to the private investors, something the public sector does not require. Thus, a wide range of PPP projects may appear attractive to public agencies because they present the potential for savings, but in order for PPPs to be a cost-effective choice for the motoring public, the project must realize sufficient efficiency gains and cost savings to offset the increased *transaction costs* over the traditional procurement method and the profit for the private investors. In other words, there is a potential for a PPP to deliver a project at a lower cost than traditional procurement, but the high costs of establishing a complex PPP agreement might negate this savings.

### **Political / Public Perception**

Public perception of PPP projects is a key element in the formation of political consensus, so governments must establish an open and transparent contracting process. PPPs are often misconstrued by the media and general public as privatization and can encounter the ensuing heated debates as seen in the recent debates over the Chicago Skyway and the Indiana Toll Road. Mistrust of the PPP model can be heightened if the jurisdiction has experienced a failed PPP in the past. Motorists are also likely to disapprove of instituting tolls on facilities that were previously toll-free. Hong Kong's government, in the face of the public perception that taxes were high enough to finance new roads if better managed, adopted a policy, whereby new roadways were entirely financed with tolls and existing roadways were entirely financed with tax revenues, to ensure that the tolls were not perceived as a tax increase (Stafford and Chen 1993). The European Union took similar measures in 1999 by banning the levying of tolls and taxes on the same roadway segment, though tolls may be spent on segments where only taxes are collected (Borgnolo and Rothengatter 2005)

Malaysia's government has opted to minimize the amount of time needed to establish PPPs by shortening the bidding process, conducting negotiations in secret, and removing nearly all public participation. However, this savings in setup costs comes at the price of increased political risk, since the public has grown suspicious that the contracts are being awarded based on political connections rather than potential public benefit (Ward and Sussman 2006). Brazil

has taken a different path to streamlining the contracting process by increasing the transparency of the proceedings and setting rigid guidelines for bidding (Dijck and Haak 2006)

In the case of the Virginia Dulles Toll Road, state lawmakers exercised caution by allowing each affected local jurisdiction veto power over the roadway project (1992). While this increases the political acceptability of the project and allays any mistrust of the state government at the local level, it gives one small jurisdiction the power to cancel a project that would have far-reaching regional benefits.

Although PPPs are undoubtedly a step in the direction of privatization, they represent a sharing with, rather than a full transfer of risks and responsibilities to, the private sector (Bult-Spiering and Dewulf 2006). Additionally, the public sector almost always retains ownership of the facility. The public is more likely to be accepting of tolling if they can see the direct benefits of their payments (Stafford and Chen 1993). In any event, the political acceptability of highway PPPs is still not well understood and must be tested further (Little 2005).

### **Public-Private Sector Relations**

Numerous writers have suggested that a positive working relationship between the public and private entities is ultimately more vital to the success of a project than a specifically worded contract, and much of the groundwork for this relationship is laid during the formation and selection phase of the PPP (Sclar 2000). Experience suggests, therefore, that the selection process invariably includes consideration of factors above and beyond the lowest responsible bid; relationships of trust are often the key.

Additionally, most PPP agreements include rate of return caps to ensure that the private sector does not net too much profit at the expense of roadway maintenance, construction quality, or reasonable user fees. Agreements typically require any profits beyond the cap to be returned to the state highway fund (1992). Ideally, the private sector will contribute the positive attributes of speed, efficiency, market familiarity, and risk-taking ability to the project, and the public sector will use its influence over the law, access to low-interest debt, reliability, and eminent domain powers to facilitate the project (Bult-Spiering and Dewulf 2006). In order to increase the political palatability of PPPs, states often reserve the use of eminent domain on behalf of the private entity to circumstances where private negotiations are failing (1992). However, the use of low-interest public debt in a PPP may trigger additional regulatory conditions normally imposed upon fully public projects, or be prohibited altogether (1995). Latin American countries, such as Chile, have also made a point of seeking experienced toll road builders and operators to participate in PPPs as a way of assuring the public of the finished facility's quality (Carniado 2005).

### **Differences in Public and Private Sector Goals**

Officials in public agencies must also realize that their public interest goals often differ from the private sector's profit-driven ones, and they must take care to craft PPP agreements in a way that avoids the *principal-agent problem*. That is, the private entity might carry out projects in a way that serves its own self interests, and this might be incompatible with the public interest (Sclar 2000). To guard against this phenomenon, the Netherlands employs a system of strict performance standards, and can terminate a PPP contract if the concessionaire fails to meet them (Bult-Spiering and Dewulf 2006).

The public sector is oriented toward maintenance of political favor, risk minimization, and democratic pursuit of social goals, while the private sector focuses primarily on profit maximization, risk-taking, and corporate competition (Bult-Spiering and Dewulf 2006). Some degree of reconciliation is needed in PPP contracts, and some conflict of interest may still persist. Private entities are likely to only take an interest in the most profitable projects, where there is potential for streamlining the construction or procurement process (Bult-Spiering and Dewulf 2006). These concerns come to the forefront in countries experiencing heated debates over privatization. PPPs are especially vulnerable to criticism because they bring to light all of the financial and social risks involved in highway projects as they are divvied up between the public and private sectors. These risks, such as cost overruns, construction defects, and delays, have historically been present in all highway construction projects, but they are not readily apparent when absorbed by the public sector (Boeuf 2003).

### **Competition**

Competition among private entities for PPP contracts is the key to realizing efficiency gains. Otherwise, firms will face little incentive to streamline their plans and place the best possible bid. However, this requires a competitive process and precautions against private monopolies, forcing the public sector to spend a lot of time considering proposals and selecting the winner, especially since the lifetime of the agreement usually spans several decades. This adds to the increased set-up or transaction costs over traditional procurement methods.

If multiple PPP projects are constructed by different private entities in close proximity to each other, the government will also have to step in and regulate the tolls to ensure an optimal distribution of traffic, further increasing transaction costs (Gomez-Ibanez, Meyer, and Luberoff 1991). Where alternatives to the PPP already exist, failure to anticipate the level of demand for the PPP facility, or to provide for some form of compensation for competition, may lead to lower than expected returns for the private partner's investors (Page et al. 2008). Highway agencies must also take care to balance their own future development plans with the private entities' needs for profit. On one highway widening project in Southern California, adjacent to the SR 91 Express Lanes PPP, many aspects of the agreement worked well, but a "non-compete clause" in the contract prevented the State of California Department of Transportation (Caltrans) from making improvements to the parallel unpriced lanes, prompting the premature end of the agreement and the Orange County Transportation Authority to buy out the private entity's concession (Gougherty 2005a). This negative experience helped lead California to withdraw plans for additional PPP highway projects, and nearly a decade passed before the state revisited PPP legislation (Tolls, User Fees, and Public-Private Partnerships: The Future of Transportation Finance in California? 2007).

### **Market Conditions**

PPP projects represent an investment opportunity for the prospective private sector contractors. As such, public agencies must package the agreements in a way that makes them attractive vis-a-vis other private investment opportunities. This can be done by adding bonus incentives, allowing for longer concession periods, or diminishing the amount of risk transfer. Each of these strategies can potentially increase the cost of the project to the public, and diminish the attractiveness of PPPs. Consequently, when the market is flooded with investment projects,

public agencies may have to add heavy incentives to PPP projects, thereby increasing public sector assumption of risk and reducing their cost effectiveness.

### **Environmental Approval Issues**

The design of PPPs presents a dilemma for public agencies. Determining the stage at which to bring the private entity into the project can be vexing. Most believe that responsibility for obtaining the necessary environmental clearances is best left with the public sector, since the process involves delay risks that are mostly out of the control of the private entity, and public agencies have more experience with the process. However, a detailed design plan is needed in order for the environmental clearances to proceed.

In PPPs, public agencies generally want to involve the private sector in the design phase of the project so as to allow as much input as possible, but do not want to complicate things by transferring the responsibility for obtaining environmental clearances to the private contractor or impose an uncertain delay period in the PPP contract while the environmental clearances are being obtained. Transferring this responsibility can significantly increase financial risk for design-build-finance-operate concessionaires because environmental study challenges can take years to resolve, particularly in the U.S. This can also greatly increase risk and costs for private contractors to start servicing debt accrued during the project's design phase. The Portuguese government, for example, shields the private concessionaires from delay risks stemming from environmental review court challenges by compensating them for lost time (Bult-Spiering and Dewulf 2006). Likewise, private firms wanted the State of California to include as part of Assembly Bill 680<sup>6</sup> that Caltrans would guarantee repayment for government-caused project delays (1992). Thus, environmental review requirements can reduce the amount of cost effectiveness in the design phase of a PPP by disallowing private entity involvement until after the contract has been signed (Bult-Spiering and Dewulf 2006).

### **Construction, Usage, and Currency**

The wide array of project risks ultimately affects the profitability of a PPP project. Changes in labor and material costs can raise the price of construction and erode the profitability. Construction cost inflation is especially risky for large infrastructure projects, like highways, where construction will likely span several years. Cost overruns and project delivery delays brought about by changing costs or availability of labor and materials, design changes, poor management or construction practices, or defaults by suppliers are typically borne by the private partner, although they may be mitigated in some cases by using fixed-price construction contractors (AECOM Consult 2007; Checherita and Gifford 2007; Fishbein and Babbar). Unexpected construction costs and delays brought about by challenging geography, however, is sometimes shared (AECOM Consult 2007; Checherita and Gifford 2007; Fishbein and Babbar).

When real or shadow tolls make up a significant portion of the private sector's revenues, shortfalls in traffic demand can spell financial trouble. The public sector will usually step in and offer protection against diminished returns due to low travel demand, since it is a factor over

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<sup>6</sup> Assembly Bill 680 (AB 680) was enacted by the California legislature in 1989. It authorized four toll PPP demonstration projects, two in Northern California and two in Southern California. The bill mandated that Caltrans retain official ownership of each highway facility at all times, but permitted leases to private entities for periods of up to 35 years.

which the private sector has little control. The use of shadow tolls, which separates facility usage and toll collections from payments to contractors for collecting the revenue can also expose the public sector to additional risk if demand and toll revenues are higher than projected; the higher revenues and higher associated contract payments may mean that revenue for other transportation needs is lost (Ortiz and Buxbaum 2008; Shaoul, Stafford, and Stapleton 2006). Portugal initially used shadow tolls instead of real tolls so as not to risk reducing traffic levels, but the government eventually shifted toward real tolls when it became apparent that traffic levels nearly always increased over time (Bult-Spiering and Dewulf 2006). In Ireland, the government requires that a free alternative route to every toll road be available (Reeves 2005), but this exacerbates the usage risk because it is uncertain how many motorists would choose the toll road over the free one, and if the toll revenues would be sufficient to cover the private entity's expenses.

Developing countries sometimes use foreign banks to finance infrastructure PPPs, but a devaluation of the project's currency against the finance one can render a project bankrupt. As a result, several Latin American governments have instituted a policy of only using local debt (Carniado 2005).

The numerous factors influencing the outcomes of PPP strategies underscore the need for careful consideration of the appropriateness of PPPs for a given project. It quickly becomes apparent that PPPs exist in the context of a market economy and carry with them all of the associated risks. Private investors will not participate unless it makes financial sense for them to do so, and the compromises required to attract them are sufficient to make public agencies realize that PPPs are not synonymous with free funding. As a result, agencies might find the decision of whether to use PPPs difficult. The following section accordingly draws on PPP use studies to suggest criteria for determining the potential efficacy of PPPs.

## **5. EXAMPLES OF PPP PROJECTS**

All of the above-mentioned risks and issues can be addressed, but not simultaneously. For example, a PPP project cannot have a short, inexpensive setup period and still allow for all public and environmental concerns to be thoroughly incorporated. Policymakers must choose a balance between all of the relevant factors based on the economic, political, social, institutional, and environmental settings in which the PPP projects are to be implemented.

In this section, we discuss three PPP case studies from three parts of the world: 1) Malaysia, 2) the United Kingdom, and 3) California. These examples underscore the importance of carefully selecting a balance between competing factors and risks, as well as comprehensively forecasting future traffic demand and infrastructure needs. Malaysia and the United Kingdom represent two ends of the spectrum when it comes to public input and ensuring an equitable contract awarding process, both with mixed results. California, on the other hand, managed to build a stable PPP that was undone by a disagreement over contractual terms.

### **Malaysia – Political Risks Realized**

Malaysia began using toll road PPPs in the early 1980's to finance nearly 1,000 miles of new highways (Ward and Sussman 2006). At the inception of the program, state-owned enterprises were performing poorly, and political leaders sought to stimulate private Malaysian-owned businesses through a series of PPP programs (Ward and Sussman 2006). Though most of the

PPP projects have proceeded as envisioned, the Malaysian government has, until recently, largely ignored the political risks associated with private sector collaboration, and the resulting public unrest has negatively affected the country's PPP program.

Though the country has managed to construct an expansive highway system using PPPs, this method of finance is becoming increasingly unstable due to growing public opposition towards the contracting and setup process. In order to minimize the setup costs of PPP agreements, the government has opted to largely ignore environmental concerns regarding new roads (such as sprawl, noise, and air pollution) and keep negotiations with private contractors secretive (Ward 2005). Politically well-connected applicants usually win whenever competition arises (Ward and Sussman 2006). Private entities are permitted to propose new PPP projects, a condition that favors the private sector but can lead to under-the-table dealing. Additionally, the government frequently shields investors from financial risks by extending concession periods or granting additional cash payments from public funds whenever toll income begins to lag (Ward and Sussman 2006). Thus, a portion of the financial risk is shifted from the private concessionaire to taxpayers at large. This has resulted in widespread public mistrust, and public protests have proven sufficient to force policymakers to reduce tolls and delay expansion of the highway system (Ward and Sussman 2006). These events underscore the importance of the political risks surrounding PPPs, as insufficient public input and unwelcoming attitudes toward privatization can spawn accusations of government corruption and misuse of toll revenues. In the United States, where public input already plays a prominent, legally-mandated role in planning, the effects of such political unrest would be even more pronounced. Ultimately, the Malaysian government has responded by allowing limited public participation in the PPP planning process, with the first project to allow public comments occurring in 2003 (Ward and Sussman 2006). Though the government is now taking steps toward allaying public concerns about the PPP process, these actions are unlikely to erase the political damage wrought by decades of closed-door negotiations.

### **United Kingdom – Maximum Political Acceptability but Unclear Financial Benefits**

Facing a dire need for highway system expansion and a lack of public funds, the United Kingdom government undertook the Private Finance Initiative (PFI) program in 1992 to help the cash-strapped highway agency use a design-build-finance-operate program (Debande 358). Agency officials tout the successes of the program, citing high-quality project management on the part of the private investors and attractive opportunities to shift moderate-risk projects off of the public budget (Standard & Poor's 2005). However, in efforts to create a politically palatable program, the government has sacrificed some of the potential benefits associated with PPPs.

Unlike Malaysia, the UK's bid review process is lengthy and comprehensive, involving several stages of negotiations taking up to two-and-a-half years to complete (Bult-Spiering and Dewulf 99-101). This markedly increases the PFI setup costs, shouldered by both the public and private sectors, underscoring the need for financial savings over the lifetime of the PFI agreement to sufficiently offset the additional money spent on establishing the contract. Though the enabling legislation standardizes this process, it still proves time-consuming. Furthermore, the UK does not allow the private sector to propose new projects, thus ensuring that bidders cannot propose contracts that they are best-suited to win, but reducing the potential for innovative proposals (Bult-Spiering and Dewulf 99-101). However, these laws allot adequate time for public input and provide for very transparent negotiations.

The PFI program favors protecting taxpayers' investment in the highway system more than it shields private firms from risks that could result in financial losses. Highway officials admit that some contractors have lost money on PFI projects, up to £100 million in some cases, but maintain that these were due to faulty cost estimates at the time when fixed payment amounts were negotiated (Standard & Poor's 2005). The UK government has typically not offered contract renegotiations to bail out concessionaires who begin to experience financial trouble, thus protecting taxpayers from paying for potential mismanagement on the private sector's part (Standard & Poor's 2005). As a result, banks and lawyers representing the private concessionaire now spend even more time examining PFI contracts prior to approval, further increasing the setup costs. Officials also note that private firms have also become more averse to accepting clauses allowing changes in specifications (Standard & Poor's 2005).

The UK has elected to use shadow tolls to maintain political acceptability in areas where people are accustomed to using highways free of charge, while still remunerating the concessionaire in proportion to road wear and encouraging roadway design that maximizes traffic throughput. In most cases of the PFI projects, traffic is almost certain to increase, and shadow tolls have generated revenue close to fixed payments which are indexed to inflation (Mackie and Smith 2005). By substituting largely-predictable government payments for direct user fees, shadow tolls essentially convert PFI finance to a long-term mortgage more akin to a build-operate-transfer program than design-build-finance-operate. In these cases, the public sector pays about the same amount as it would under traditional procurement methods, but the up-front costs are converted to payments stretched out over a the lifespan of the PFI agreement, thus initially freeing up capital to begin multiple projects at once (Mackie and Smith 2005). Though the public can potentially benefit from having much-needed roads built sooner for the similar price, it is unclear whether the UK's PPP financing program brought any additional economic benefits compared to traditional procurement. By 2001, the committed shadow toll payments added up to a level where no public funds remained to issue new contracts, effectively ending the PFI program. Additionally, increases in interest rates in 2003 made private debt unattractive compared to public debt, though the substitution of private finance for public funds nevertheless remains attractive whenever public money is scarce (Mackie and Smith 2005).

Though the UK government has taken steps to maximize the political acceptability of toll roads, these precautions have placed limitations on the potential for savings over traditional procurement methods. The combination of shadow tolls, exhaustive setup procedures, and substantial deference to public opinion is indicative of a PPP program that is unwilling to accept new risks on the public side, and subsequently provides few opportunities for public benefit.

### **California – Contractual Issues**

California initiated its experimentation with PPP toll roads in 1989 with the passage of Assembly Bill 680 (AB 680). The bill authorized four demonstration PPP projects, with at least one in Northern California and at least one in Southern California so as to promote geographic equity. The bill allowed the State of California Department of Transportation (Caltrans) to enter into PPP agreements with private entities for the purposes of facility construction, with lease periods of up to 35 years. The private entities would be able to charge tolls to recover their investments, and Caltrans had the option of continuing the tolling after the facilities reverted to full public control. In order to prevent private profits from absorbing a large amount of the toll revenues, contract limited the rate of return on each project to 18 percent (Gougherty 2005).

One of the AB 680 projects, the SR 91 Express Lanes, added four new lanes to an existing eight-lane freeway in Orange County between Anaheim and the Riverside County line, a distance of about ten miles. In order to preserve the benefits of congestion relief provided by the new lanes, they were designed as congestion-priced high-occupancy toll (HOT) lanes, where variable tolls would keep traffic moving freely at all times of day. The private consortium, California Private Transportation Company (CPTC) undertook the construction and then transferred the new lanes to the Orange County Transportation Authority (OCTA), which then allowed CPTC to operate the roadway and charge tolls for 35 years (Gougherty 2005).

OCTA sought to construct the SR 91 expansion under the provisions of AB 680 largely because voters had defeated a sales tax initiative to fund the project. Problems began to surface when neighboring Riverside County became frustrated that it had spent public funds to build its portion of the expansion, but Riverside County residents would still have to pay tolls on the facility when passing through Orange County. Though the two counties eventually reached a compromise, a later problem led to the premature termination of the PPP contract. After the facility had opened, Caltrans announced its intent to add capacity to the free lanes along SR 91 in the vicinity of a congested interchange. However, the contract with CPTC stipulated that Caltrans could not add any additional free capacity near the PPP facility because it would diminish the advantage of driving in the toll lanes, and hence eat away at toll revenues. Eventually, OCTA bought CPTC out of the contract so that the interchange upgrades could be built, but still contracts with CPTC for the purposes of operating the roadway (Gougherty 2005).

The PPP troubles with SR 91 spurred the state legislature to pass Assembly Bill 1010, which effectively ended the program set forth by AB 680 by scaling it from four projects down to just two: SR 91 and another project already underway in San Diego County (Gougherty 2005). California's experience with SR 91 demonstrates the need for both parties (public and private) to carefully consider long-term traffic projections and anticipate the potential need for new traditionally-financed projects when considering PPP contract provisions. This case proves especially true when inserting a new PPP road into a network of deteriorating public roads that will likely require upgrades in the near future. Though the initial disagreement between Orange County and Riverside County officials proved minor compared to the later contractual problems over the "non-compete" clause, the conflict highlights the potential "double payment" equity problems of having a PPP road whose users reside in multiple jurisdictions, especially where one jurisdiction will be using fuel tax revenues for construction, and another will be using tolls. Even if the road is fully contained in one jurisdiction, motorists frequent cross political boundaries in their daily commutes, and disparities between payment mechanisms should be taken into account. Motorists traveling exclusively on toll highway networks would still be paying fuel taxes into a general highway fund.

In light of the arguments by PPP supporters that the fundamental aspects of the SR 91 partnerships were successful and the toll structure provided sufficient payment to CPTC while in place, California legislature enacted Assembly Bill 1467 in 2006. This bill, like AB 680, allows for four PPP HOT lane demonstration projects, as well as four PPP goods movement projects to be supported by tolling commercial vehicles (Caltrans 2007). Additionally, the Caltrans Director recently called for further legislation identifying high-priority corridors for PPPs and allowing regional transportation authorities the ability to enter into PPPs for these projects, as well as to build toll roads using traditional procurement methods (Caltrans 2007). Thus it appears that, in light of overwhelming port and highway traffic and the lack of public funds to improve the



existing transportation system, California officials are ready to learn from their experiences with AB 680 and revisit PPPs for the state's highways.

These three examples present different situations in which tradeoffs among different risk factors resulted in less success than expected. These examples also suggest that it is simply not possible to treat all PPP transportation programs/projects in the same way due to a wide variety of economic, political, social, institutional, and environmental factors. Therefore, each proposed project requires a careful evaluation. At the same time, legislative settings provide, if appropriate laws are enacted, the basic legal framework that can protect public interests and foster conditions for successful PPPs. Given appropriate legislation, a prudent public agency can design an effective contract to best utilize particular PPPs for a project. Contractual conditions, combined with legislative conditions, determine potential costs, benefits, and risks for both the public and private sectors. With several different models to choose from, public agencies must develop a framework for selecting the most appropriate type of PPP, if any, for a given project.

## **6. PRELIMINARY FRAMEWORK FOR EVALUATING PPPS**

Assessing a PPP strategy depends partly on the definition of success. Our review of the research literature reveals that most analyses to date focus on the net *financial* benefit for governments. This makes intuitive sense, since the most common motivation for governments to adopt a PPP strategy is to advance project development when traditional funding is tight. However, conventional evaluation of transportation projects is based on the net *socio-economic* benefits to the public, a more comprehensive approach. When spending public money, public agencies must primarily consider the *socio-economic* benefits that new facilities will produce to the society when determining whether or not the construction is worth pursuing. It makes little difference whether an ineffective new facility was built at a low cost; any amount of expenditure constitutes wasted funds if it does not meaningfully benefit the public. Whether to build a facility using a PPP thus emerges as a secondary consideration, and any evaluation should focus first and foremost on how such a program would affect the *socio-economic* effects of the facility, rather than the much narrower question of whether the public agency could save money relative to other means of project finance. In essence, it is important to distinguish in any discussion of PPPs between an evaluation from the *financial* perspective and an evaluation from the *economic* perspective. Making no explicit distinction between the financial and economic evaluation perspectives ultimately a principal source of disagreement between public officials who promote PPPs to reduce the government financial spending, and those who are concerned about the broader economic effects of a given project.

Considering only government financial benefits does not provide a complete picture of the total costs and benefits of PPP strategies vis-à-vis other means of project delivery and finance. Public agencies might mistakenly view PPPs simply as a means of getting projects built *cheaply*, since the absolute amount of up front funding required in the public agencies' budget is typically reduced, especially under toll concession models where the payments to the private concessionaire are made directly by the road users over the concession period. However, PPPs should under no circumstances be construed by public officials as "free" money; rather toll concession models shift a burden of payment from taxpayers to road users, which may or may not be desirable depending on public policy objectives. It is possible that a PPP will increase economic efficiency, and it is likewise possible that the public may end up paying more in tolls

for the roadway under a PPP than it would have in fuel taxes or issuing bonds under traditional finance methods.

Focusing exclusively on the financial costs and benefits for a moment, while PPPs often appear beneficial from the public agency's relatively narrow financial perspective, they may not necessarily generate *net financial* benefits for the public. More broadly, the question of net financial benefits (most often framed as cost savings) to the public does not ensure a project with a PPP method result in net positive economic benefits for the society.

In addition, should the private entities involved in a PPP encounter financial troubles, motorists may experience toll changes due to factors unrelated to the instant project. In other words, the public agency is not always the loser when risks arise in a PPP deal. This can cause highway agencies to overlook important potential drawbacks when entering into PPP agreements or use PPPs to implement projects that may not be financially sound, creating "principal-agent" problems between highway users and the transportation agency.

It is thus important for public officials to keep in mind that PPPs *may or may not* reduce the costs of highway building. If not, PPPs may only shift the responsibility for paying for roads from one group to another. Both PPPs and traditional procurement, in other words, ultimately draw funds from the pockets of the public, both road users and taxpayers more broadly (Federal Highway Administration 1992). Any real value addition will come only from financial, managerial, and technological efficiency gains large enough to offset the increased transaction costs,<sup>7</sup> and it is debatable whether PPPs are the only or best means of creating these efficiency gains.

Table 4 describes criteria frequently used to evaluate PPP projects. It also specifies whether each criterion is typically included in the *financial* evaluation and the *economic* evaluation.

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<sup>7</sup> Cost-savings that the highway agency intends to realize through new PPP methods may be offset by additional transactions or other costs of such new methods. Whittington and Dowall (2006) compared two projects of similar scope, one delivered by a design-build contract and the other by more traditional means, and found that design-build contracts produced virtually no cost savings. While the design-build project had relatively small costs associated with change orders and administration, these savings were offset by much higher construction cost estimates.

**Table 4 Criteria Frequently Used to Evaluate PPP Projects**

| <b>Criteria Typically Considered in Financial Evaluations</b>                              |  |
|--|--|
| <b><u>Type</u></b>   | <b>Description</b>   |
| <u>Valuation of asset:</u>   | Procurement of land, opportunity cost of use of land   |
| <u>Construction costs</u>  | Material and labor costs   |
| <u>Maintenance &amp; management costs:</u>   | On-going costs associated with operation, management, administration, and maintenance of the facility  |
| <u>Interest for bond issuances/borrowing</u>   | Interest that public agencies need to pay creditors when they borrow money, such as loans and bonds  |
| <u>Revenue:</u>  | Income from toll collection, and the private entity's ability to carry out the highway project at a lower cost to the highway agency and motorists than the traditional public procurement and finance methods                     |
| <u>Transaction Costs:</u>  | The length and complexity of the bidding and contract management process, and whether the process is costly enough to erode the potential benefits of the project and/or scare away potential bidders.                             |
| <u>Risk Distribution:</u>  | Whether the risks transferred to the private entity were the ones that it had the most control over, and was therefore best-suited to minimize.  |
| <b>Additional Criteria Typically Considered in Economic, but not Financial Evaluations</b> |  |
| <b><u>Type</u></b>   | <b>Description</b>   |
| <u>Efficiency:</u>   | Whether the private entity delivered the project on schedule and within budget.  |
| <u>Innovation:</u>   | Whether the private sector involvement resulted in technological innovation despite the government and financing institutions' aversion to untested practices that could add risk.   |
| <u>Public Benefit:</u>   | The degree to which the project and the use of a PPP program served the public interest. This is often difficult to describe with certainty, because there is usually no consensus over what factors comprise the public interest. |
| <u>Others:</u>   | Environmental costs, equity impacts in users' accessibility  |

Source: (Bult-Spiering and Dewulf 2006)

In order to promote better informed evaluations of transportation infrastructure projects, our preliminary evaluation framework integrates both financial and economic criteria into the project evaluation process. The most effective and efficient transportation investments are those that significantly reduce travel times and costs for users. However, as we have noted, transportation agencies in the U.S. tend to focus only on financial criteria, and not economic criteria, in their consideration for various PPP financing methods, although various PPP financing methods often have different economic cost and benefit outcomes that include financial costs to and benefits for society. While often ignored in PPP research here in the U.S., the difference between financial and economic evaluation is nothing new in the international development field, and such project evaluations are commonly used by international investment organizations for projects, including

transportation infrastructure development. The difference between the financial and economic evaluations can be seen in the discounted cash flow (DCF) method, which is commonly used for a project evaluation (Doi 2002; McFarquhar 2001). The DCF converts a stream of costs and benefits over time to a net present value (NPV), an internal rate of return (IRR), and a benefit/cost ratio (B/C ratio), all of which can be used to evaluate the effects of a project.

Among these, the IRR has an advantage in its ability to be calculated in analyses even with substantial uncertainty regarding interest rates or social discount factors (SDR), compared to the NPV and B/C ratio methods (Doi 2002). The IRR is, by definition, is a value, which is equivalent to an interest rate (or social discount factor) to make a NPV equal to zero in equation (1).

$$NPV = \sum_{t=1}^T \frac{B_t}{(1+r)^t} - \sum_{t=1}^T \frac{K_t + O_t - S_t}{(1+r)^t} \quad \text{Eq. (1)}$$

where

$B_t$ : annual revenue in the financial analysis, and annual benefit in the economic analysis

$K_t$ : capital investment/cost

$Q_t$ : annual operating cost

$S_t$ : salvage value

$r$ : interest rate or social discount factor (SDR)

$t$ : year,  $T$ : the total number of years of a project

The IRR has two types. First, the *financial* internal rate of return (FIRR) focuses the financial flow of money and vitality of the project, ignoring externalities (costs and benefits) to the financing entity. In this case,  $B_t$  in equation (1) represents annual financial revenue from the project. In contrast, the *economic* internal rate of return (EIRR) takes into account externalities in the computation of costs and benefits for a specified time period, and is used in a public project proposal.<sup>8</sup> In this case,  $B_t$  in equation (1) represents benefits accrued from the project by the society—typically travel time savings, reduction of accidents, and reduced negative environmental impacts.

In the economic benefit analysis, the EIRR from the proposed project can be compared to that for an alternative plan (including the “no-build” option). In this way, this method can evaluate the net benefits of a project for different types of provision strategies, including PPPs. However, in reality, the factors discussed in the previous sections influence benefits, costs, different risks

**Net Present Value (NPV):** The discounted present value of future benefits

**Internal Rate of Return (IRR):** The expected percentage yield on capital invested in a certain project

**Benefit/Cost Ratio (B/C):** A measure of investment worthiness, comparing the value of expected benefits to the costs needed to obtain them.

<sup>8</sup> Particularly in the case of international agricultural development projects, the intervention effects of a project cause price distortions for both consumers and producers, resulting in changes in societal benefits and costs. In principle, “[s]ocial or economic benefit must account for externalities by incorporating social or shadow prices, i.e. prices that would occur in the market, were it free from intervention” (McFarquhar 2001).

associated with different strategies, and what should be reflected in discount rates (McFarquhar 2001).

One of substantial advantages of using the private capital is that a transportation project can be implemented earlier than it would be if queued up waiting for scarce public funds. When traffic tends to increase over time and benefits include only reduction in user costs, *the first year return method* shows the net benefit to implement a project by one year can be shown by the following equation (Doi 2002).

$$(\text{Net-Benefit})_{t^*} = (b - a)Q_{t=\tau^*} - \bar{r}K \quad \text{Eq. (2)}$$

where

a: maintenance cost per unit of traffic

b: reduction in the user cost per unit of traffic

$Q_t$ : annual maintenance cost

K: the construction cost of facility (assumed to complete in one year for simplicity)

$\bar{r}$ : known interest rate

t: year,  $\tau$ : time period

This equation also needs to be modified for a more general case of a PPP strategy, taking into account the evaluation criteria: 1) cost savings (or increase) to the public agency, 2) cost savings (or increase) to taxpayers and highway users, 3) avoidance of cost overruns, 4) transaction costs, 5) timeliness of construction completion, 6) transfer of risks which the private sector has the ability to minimize, 7) technological innovation (Bult-Spiering and Dewulf 2006), 8) other socio-economic benefits for the society, 9) interest rates for the initial investment, and 10) the stream line of revenue from user fees for the private firm.<sup>9</sup> It should be noted that these evaluation criteria are greatly influenced by subjective values that vary based on political and social context. These contexts, combined with the presence of many stakeholders disagreeing over what exactly comprises the public interest, make it difficult to assess the degree to which the public interest is served and compare projects across borders (Bult-Spiering and Dewulf 2006).

One of the critiques to this type of analysis can be seen for a public sector comparator used in the United Kingdom to determine if a project will yield good value for money if carried out using a PPP. A public sector comparator is a measurement of how much it costs and how long it takes to execute and complete a project with a PPP agreement, compared to the estimated costs and time of traditional procurement. That is, public sector comparators estimate the value added to a project by using a PPP agreement. However, these comparators are often criticized for relying too heavily on quantitative measures at the expense of important factors like public satisfaction (Bult-Spiering and Dewulf 2006). If the project provides little public benefit in the first place, the use of a PPP will do little to improve the usefulness of the facility.

## 7. CONCLUDING REMARKS

Public private partnerships (PPPs), often in combination with some form of road pricing, have garnered increasing attention from public officials in the U.S. and abroad who find

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<sup>9</sup> This idea of modification requires more careful consideration.

themselves short of funds to construct and maintain transport infrastructure. In this extensive review of the PPP literature, we discussed the properties of highway and road infrastructure relevant to PPPs, described various types of PPP arrangements applicable to highway infrastructure projects, reviewed the factors and conditions that influence the outcome of PPPs, and discussed examples from recent PPP projects in both the United States and abroad. Based on both contracting theory and our reviews of past PPP projects, we developed a preliminary conceptual framework to evaluate both the financial and economic merits of various PPP (and non-PPP) strategies. In this framework, we emphasize the differences between two criteria—(1) *financial* costs/benefits, and (2) *socio-economic* costs/benefits, and identified factors and conditions that influence each. We then briefly compare and contrast *financial* internal rate of return (FIRR) and *economic* internal rate of return (EIRR), which are commonly used in the project evaluation in the international development field.

In later phases of this research we will review and examine both federal and state legislative and institutional frameworks that significantly affect the adoption, feasibility, risk, and outcomes of PPP strategies for highway projects. This research in combination with our ongoing review of PPP highway projects will allow us to develop useful guidelines on both the legislative and contractual settings that lead to the best PPP outcomes from the perspective of the public sector. We also intend to develop an evaluation framework that public agencies can use when considering various highway finance strategies, including PPPs.<sup>10</sup>

To close, PPP agreements have the *potential* to deliver much-needed highway improvements to the public at lower costs and on shorter timelines than traditional procurement methods. Such potential can lead some to advocate PPPs with uncritical enthusiasm. But the potential rewards of PPPs are balanced by risks: PPP agreements can go sour and cost the public more than it benefits society. PPPs may save a given public agency money, but such savings do not necessarily translate to lower user fees, lower tax payments, or increased economic benefits for the public. Although public officials anxious to find new revenue sources for highways, PPPs may at first appear to generate “free money” for highway projects. But money, like lunches, is never free. PPPs generate revenue by redistributing costs and risks between the public and private sectors in a way that often benefits the party with the most relevant expertise and experience. Public officials would thus be wise to consider PPPs, but in a careful way that ensures that the public financial and economic benefits of PPP projects outweigh their risks and costs.

## 8. ACKNOWLEDGMENTS

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<sup>10</sup> Most of this research is slated for Phase II of this project, which was on hold at the time of this report.

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