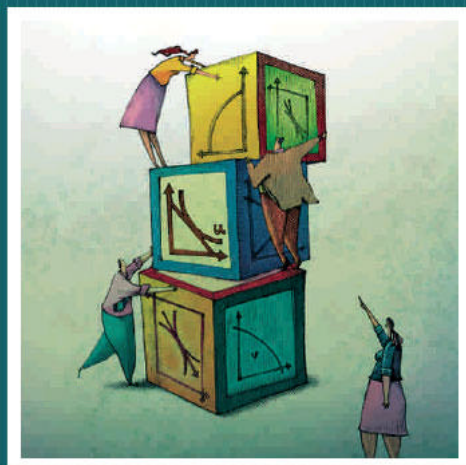


**DOCUMENTOS DE TRABAJO**  
**Serie Economía**



---

Nº 277    PUBLIC-PRIVATE PARTNERSHIPS AND INFRASTRUCTURE  
PROVISION IN THE UNITED STATES

EDUARDO ENGEL - RONALD FISCHER - ALEXANDER GALETOVIC

---

PUBLIC-PRIVATE PARTNERSHIPS AND  
INFRASTRUCTURE PROVISION IN THE UNITED STATES

Eduardo Engel  
Yale University

Ronald Fischer  
U. de Chile

Alexander Galetovic  
U. de los Andes

January 27, 2011<sup>1</sup>

Prepared for the Hamilton Project at Brookings.

---

<sup>1</sup>Engel: Department of Economics, Yale University, 28 Hillhouse Ave., New Haven, CT 06511. Fischer: Center for Applied Economics (CEA), Department of Industrial Engineering, University of Chile, Av. República 701, Santiago, Chile. Galetovic: Facultad de Ciencias Económicas y Empresariales, Universidad de Los Andes, Av. San Carlos de Apoquindo 2200, Santiago, Chile. E-mails: eduardo.engel@yale.edu, rfischer@di.uchile.cl, alexander@galetovic.cl. We thank John Cheng for outstanding research assistance and the Hamilton Team and Richard Norment for valuable comments and suggestions.

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Policy Proposals . . . . .	1
1.2	General overview . . . . .	3
1.3	An overview of PPPs in the United States . . . . .	5
<b>2</b>	<b>Economic evidence</b>	<b>7</b>
2.1	International trends in PPPs . . . . .	7
2.2	Promises . . . . .	7
2.2.1	Relieving government budgets? . . . . .	8
2.2.2	Efficiency gains? . . . . .	8
2.2.3	Introducing competition? . . . . .	9
2.2.4	Charging appropriate user fees? . . . . .	10
2.2.5	Filtering white elephants? . . . . .	10
2.2.6	Distributional aspects: are tolled roads Lexus roads? . . . . .	12
2.2.7	Taking stock . . . . .	13
2.3	Experience . . . . .	13
2.3.1	Renegotiations and the US Experience . . . . .	14
2.3.2	Anticipating Spending and the US Experience . . . . .	16
2.3.3	The UK's Public Finance Initiative . . . . .	17
2.3.4	Is there a PPP premium? . . . . .	18
<b>3</b>	<b>Detailed Recommendations</b>	<b>20</b>
3.1	Proposal: Structuring PPP contracts . . . . .	20
3.1.1	User fee finance . . . . .	20
3.1.2	Tax finance . . . . .	24
3.2	Proposal: Accounting for PPPs . . . . .	24
3.3	Proposal: Improving the governance of PPPs . . . . .	25
3.4	Unsolicited proposals . . . . .	26
<b>4</b>	<b>Conclusion</b>	<b>27</b>

# 1 Introduction

Spending on necessary infrastructure is likely to be cut back in coming decades, as the federal and state governments struggle with large debt burdens. This will hamper future growth, particularly given the dismal state of current infrastructure.

The American Society of Civil Engineers estimates that, as a result of decades of insufficient investment, the infrastructure deficit in the United States amounts to \$2.2 trillion. In particular, spending on roads is little more than a third of the estimated requirement of \$186 billion per year. The lack of resources for infrastructure maintenance and improvement extends across all sectors, from levees to wastewater treatment, and from transportation to schools. In this context, public-private partnerships (PPPs) seem a godsend to replace the lack of government investment, by promising the availability of large amounts of resources for infrastructure projects.

Despite these promises, the wave of PPPs that changed infrastructure provision in many countries during the last two decades only has had minor impact in the United States. While the UK financed \$50 billion in transportation infrastructure via PPPs between 1990 and 2006, the US, an economy more than six times as large as the UK, only financed approximately \$10 billion during this period. While some countries succeeded in harnessing PPPs to develop their infrastructure, most found that PPPs can lead to surprisingly bad outcomes. The object of this paper is to offer proposals that make it more likely that PPPs fulfill a useful role in the recovery of American infrastructure.

## 1.1 Policy Proposals

The following proposals should make it more likely that a PPP programs in states and other levels of government are successful.

**There is no free lunch** Governments must realize that PPP programs have a cost. For example, if a state or local government sets up a PPP to build, maintain and operate a highway in exchange for the toll revenue, the government could have built the project and collected the same toll revenues and used them to pay for the project. Similarly, if the government leases an existing highway in exchange for a lump sum payment, it is exchanging future flows of toll revenue for present funds.

**Awarding PPP contracts** As a precondition, PPPs should be well defined projects awarded in competitive auctions and not through bilateral negotiations, as in the case of the failed 63-20 projects. The transparency and efficiency of competitive auctions can also allay the suspicions of those who oppose tolls and the private participation in infrastructure provision.

**Designing the contract** When new infrastructure projects are financed with user fees, the usual procedure is to assign the project to the firm that charges the lowest fee schedule for the contractually specified number of years. In many infrastructure projects this means that the private firm faces excessive demand risk (for example, an economic crisis reduces use and therefore revenues from user fees). Private firms charge for this risk by asking for higher fees.

We propose, as an alternative, to award the project to the firm that asks for the smallest accumulated user fee revenue in discounted value, which we denote by PVR (Present-Value-of-Revenue). This means that the length of the concession depends on demand for the project. If there is high demand, user fee revenue accrues quickly and the duration of the PPP is shorter than if demand is lower. The advantage is that, unless the project is a complete failure, the requested amount will be collected eventually. This reduces the risk of the project and the required risk premium. Having the firm face less risk also provides fewer opportunities for opportunistic renegotiations, which have been a major problem with PPP programs in many countries.

There are other advantages to the PVR mechanism: it is easier to buy back the project if it becomes necessary, because the uncollected revenue (minus reasonable expenses for operations and management) defines a fair compensation. Other award mechanisms do not have such a straightforward compensation mechanisms for a possible buyback. In addition, with PVR it is easy to adjust user fees to respond to congested demand conditions, since the only effect is to shorten the concession and is not unfair to users. The main disadvantage of PVR is that it provides fewer incentives to increase demand for the project, so it is appropriate for passive investments, such as water reservoirs, airport landing fields and highways.

**Accounting for PPPs** As we have mentioned above, PPPs provide the illusory belief that there is an huge stock of funds available for infrastructure repair, improvement and construction at little or no cost. This is not the case, because the investors ask for returns that must arise either from user fees or future taxes. Thus governments must be restrained by rules so that they consider not only the benefits but also the costs of PPPs. Since the apparent release of budgetary constraints is dangerous and can lead to excessive spending by current governments, at the expense of the future, we propose that PPP projects be treated in the government balance sheet as if they were public investments. This reduces the temptation to overspend and ensures that PPPs will be chosen for the right reason, that is, when they lead to significant efficiency gains.

**Governance** The internal structure of the Public Works Authority (PWA) of state and local governments should be split between a unit responsible for planning, project selection and awarding projects and an independent unit responsible for contract enforcement and the supervision of contract renegotiations. By splitting the objectives of the two agencies we can avoid the temptation to weaken enforcement of contracts in favor of better relations with construc-

tion companies or PPP firms. This also leaves less scope for corruption. Our proposal respects the principle that there should be one instrument for each objective. Since the roles of planning and contracting new works are opposed to the objective of supervising existing contracts, separation of the roles is a healthy principle

**Choosing good projects** One of the banes of infrastructure programs is the danger that a project creates no net social value, being a so called *white elephant* (or perhaps a pork barrel project). If the project is a PPP repaid by user fees, the presumption is that private firms will not participate unless the project is profitable. This provides a defence against bad projects. But in the case of PPP projects financed by future taxation (as in the case of jails) there is no market test for the desirability of the project. For this reason PPP projects which require public funds should be subject to cost-benefit analysis to determine if the project is a good use of scarce resources. Needless to say, this requirement also applies to other (non-PPP) infrastructure projects.

**Summary** The effects of implementing these recommendations can lead to important improvements in infrastructure delivery in the US. Implementing PVR, by itself, can lead to large reductions in the required return on the project and therefore on the revenue that must be collected from users (33% in some simulations). Moreover, if service standards are monitored and enforced by the PWA, it is more likely that they will be kept than under public provision, because of the stakes that are at risk for the private party. Many advantages of PPPs stem from the fact that they bundle construction, operations and maintenance in a single contract, and this provides incentives to minimize life cycle costs which are typically not present under public provision.

The above principles can help a long way to ensuring that a PPP program will be successful, allowing PPPs to show their advantages, unimpaired by erroneous considerations.

## 1.2 General overview

One of the main tasks of public policy is to provide infrastructure that serves the requirements of society at a reasonable cost. As it is difficult to coordinate individuals in order to invest in infrastructure projects with large externalities, governments step in to facilitate coordination and thus provide bridges, highways, streets, jails, airports and other types of infrastructure. Infrastructure projects are usually large sunk investments, so the choice of what is to be built is critical, both in terms of selecting which out of the many possible projects are built with limited resources, as well as their design and characteristics. Moreover, resources should be allocated to future maintenance and operational expenses.

Until recently, in most countries infrastructure was an example of public provision, in which procurement was decided by the Public Works Authority (PWA), which would award the construction of a project designed by the PWA to

a private firm. The firm would build the project and after receiving the agreed payment, its contractual link with the project would end. In most cases the separation between building the project and its subsequent operational history meant that in the design there was little account of the life cycle costs, which include future maintenance and operations costs, beyond what is included in general construction standards for infrastructure projects. This, combined with the fact that governments prefer building new projects than maintaining existing projects, often led to a stop-go approach to project maintenance, resulting in higher costs and lower quality standards than under timely maintenance. The recent attention to maintenance in the US is a reflection of years of neglect and therefore suboptimal service provided by the facilities.<sup>2</sup>

The separation between building and operations and maintenance also resulted in foregone investment opportunities and design choices during the building phase that would have lowered maintenance and operational costs.

More recently, and in part as a response to these problems, a number of infrastructure projects have been constructed using Public-Private Partnerships (PPPs) instead of public provision. In its simplest form, a PPP is an arrangement by which a PWA contracts with a private firm to provide or improve an infrastructure facility and to maintain and operate it for a long period, in exchange for user fee revenues for the duration. In a variation of this arrangement, users are not charged and the government promises to make periodic payments for the above services, in what are known as availability contracts. Greenfield projects refer to a new infrastructure, while brownfield projects describe improvements of existing infrastructure. In another variation the facility already exists and the government receives an initial lump sum to lease the maintenance and operations of the facility in exchange for user fee revenues. We refer to these cases as leases.

The characteristic aspect of PPPs in our terminology is that there is a heavy initial investment that must be recovered in along term contract and the facility eventually reverts to government control. In both the case of greenfield and brownfield projects, the firm builds, operates and maintains a project, and internalizes the life cycle costs of the project. In the case of a lease a lump-sum payment to the government substitutes for building the project. Since the firm is rewarded for the provision of the services of the infrastructure, it is in its interest to provide adequate maintenance while reducing life cycle costs. Note that PPPs can be used for various types of infrastructure provision: schools, jails, hospitals, as well as in the transport sector, our main focus.

The final option to provide infrastructure is full privatization, which is appropriate at times, but in many cases runs into political opposition, as well as planning and coordination problems. For example, the owner of a private road may not be amenable to expansion in the face of increased demand, and there may be no feasible alternatives.

Thus, PPPs straddle the gap between full privatization and public provision of infrastructure and fulfill a useful role by bundling maintenance and operations

---

<sup>2</sup>Pennsylvania shifted its highway bridge funds from 75% on maintenance in 2007 to 96% currently.

with construction of the infrastructure project, which public provision does not include. Note that in all cases private firms build the project, so the potential efficiencies of PPPs are not the result of private sector involvement, but originate in the internalization of life cycle costs due to bundling.

While this is the main public policy argument in favor of PPPs, other arguments, with less economic logic, are frequent. PPPs are seen as a way of building new infrastructure when governments are cash constrained, or as a means of generating financial resources from already built infrastructure. For example, Governor Mitch Daniels of Indiana stated, after the state received US\$3.8 billion from a private company that will operate, maintain and upgrade the Indiana Toll Road in exchange for receiving toll revenue for the next 75 years:

“One year ago, Indiana faced twin deficits: a fiscal deficit stemming from years of government outspending its means, and an infrastructure deficit, a \$3 billion shortfall between the cost of needed transportation projects and the dollars due to come in. [...] Today, state government is operating on a balanced budget, and is on its way to paying back its debts to schools and local governments.”

Similarly, a 99 year contract for the Chicago Skyway was exchanged for a large sum, of which an important fraction was spent by the incumbent government. Hence, PPPs can be used to anticipate spending.

Moreover, not only are PPPs often chosen for the wrong reasons, but contracts are incorrectly designed, by misallocating risks, or by being excessively inflexible, or at times, excessively flexible. An example of incorrect risk allocation is the Dulles Greenway project, that went into default in its first few years due to overestimating demand for the road. Alternatively, an incorrect PPP contract may be too inflexible in the face of changing conditions, leading to large costs while the parties reach a new agreement. This is the case of Orange County SR91, where the private party used a non compete clause to oppose an expansion of the competitive public road until it was bought out by the county.

### **1.3 An overview of PPPs in the United States**

The United States has been a relative newcomer to PPPs. Even though there is an old 19th century tradition of privately provided public infrastructure and even of private tolled roads and bridges, since the early twentieth century the US has depended almost exclusively on the government for its public transport infrastructure, with the important exception of railroads.<sup>3</sup> Canada, even though an economy a tenth of the US economy, has developed a similar number of PPP projects.

The use of PPPs in the US is characterized by several features that distinguish it from other countries. First, the federal legislation covering PPPs (the TEA-21

---

<sup>3</sup>Beginning in the 1790s and the first half of the nineteenth century, more than 2,000 companies, looking for ways to make profits by providing road links between interior agricultural markets and ports, financed, built and operated toll-roads with a combined extension of more than 10,000 miles in 1821.



of 1998 and the SAFETEA-LU of 2005) is general enabling legislation, providing guidelines for the States on the implementation of PPPs, but the details, and whether to allow PPPs at all, is left to the States to decide. There is enormous variation in the legislative approach to PPPs among the 23 States that had PPP-enabling legislation by July 2009, perhaps because there is little experience with the system.<sup>4</sup> This means that it is difficult to generalize from the experience of the few cases of infrastructure PPPs.<sup>5</sup> See Iseki et al. (2009) or Rall et al. (2010) for a comprehensive description of US legislation concerning PPPs.

Some general observations are in place. First, it is notable that so few PPP projects exist in the United States: only 20 in the transport sector by our definition (see Table 1 and Figure ??).

Some of the early projects consisted of unsolicited bids, e.g. the Dulles Greenway in 1993, the Pocahontas Parkway in Virginia (originally proposed in 1998) and the Camino Colombia in Texas of 1997; or collaborations with a private party as in the Orange County SR 91 HOT Lanes which opened in 1995.<sup>6</sup>

In those cases in which the projects are financed by user fees, several have required protection because of overestimates of demand (there appears to be only one early PPP in which demand was underestimated). This was particularly the case of the 63-20 public benefit projects.<sup>7</sup> One possible explanation is that these projects were built to take advantage of the 63-20 tax exempt status, without considering the profitability of the projects themselves (except for the builders, developers, engineers and construction companies).<sup>8</sup>

Another factor in more recent problems facing some projects is that several became operational just before or after the 2008 financial crisis. This suggests that a mechanism to shield projects from demand risk may be advantageous, by reducing the risk and the associated returns required by private parties to participate in these projects. As elsewhere, PPP contracts have often been renegotiated in the United States, yet a distinguishing characteristic of US PPPs is that renegotiations proceed without a specific framework of conflict resolution, except that provided by general laws and those related to infrastructure in general.

As mentioned above, given the small number of projects, the relatively short history, and the lack of homogeneity in the PPP processes, our analysis of the US case will be based on individual case studies. Four case studies will play a prominent role in this paper, since they illustrate many of the issues discussed above. These projects are the Dulles Greenway in Virginia, the Orange County Express Lanes in California, the Chicago Skyway and the Greenville Southern Connector in South Carolina .

---

<sup>4</sup>In addition, Massachusetts introduced enabling legislation in 2009 and Maine in 2010. Puerto Rico is also active in PPPs.

<sup>5</sup>States also use TIFIA federal funds to leverage private investment for major transportation projects.

<sup>6</sup>Iseki et al. (2009) observes that in Nevada PPP projects can only come from unsolicited bids.

<sup>7</sup>The 63-20 tax exemption allows for non-profit infrastructure projects by public-private associations.

<sup>8</sup>For this analysis see <http://www.tollroadsnews.com/node/4808>.

## 2 Economic evidence

In this section we examine the evidence, both regarding the US as well as other countries with more developed PPP sectors.

### 2.1 International trends in PPPs

Figure ?? shows annual investment in PPPs for Europe from 1991 to 2006.<sup>9</sup> PPPs in Europe increased six-fold, on an annual basis, between 2005-2006 and the 1990s. Table 2 shows investment in PPPs by country. The countries where PPPs account for the largest fraction of overall public investment are the UK and Portugal (32.5 and 22.8%, respectively, during the 2001-2006 period).<sup>10</sup>

PPPs have been used in Europe to concession projects in defence, environmental protection, government buildings, hospitals, information technology, municipal services, prisons, recreation, schools, solid waste, transport (airports, bridges, ports, rail, roads, tunnels and urban railways), tourism and water. The transport sector is the sector with most investments in PPPs, accounting for 83% of PPP investments in Continental Europe and 36% in the UK. Two-thirds of the investment in the transport sector has been in roads.

Table 1 provides information on the major PPP projects in the transport sector for the United States. Even though the US lags behind many European countries in the use of PPPs, the growth rates have been equally impressive, with a more than fivefold increase, on an annual basis, between 2008-2010 and the preceding decade (1998-2007). Approximately 22 billion dollars of investment were financed in this sector via PPPs between 1998 and 2010, more than half of this sum within the last three years.

The evidence presented above suggests the growing importance of PPPs in providing infrastructure throughout the world and, more incipiently, in the United States.

### 2.2 Promises

Advocates of PPPs have offered many arguments to show that PPPs may help governments provide infrastructure more efficiently. A common claim is that PPPs relieve budgetary restrictions and release public funds. A second argument is that because financing of the project is private, it is subject to the discipline of the financial market, which leads to important efficiency gains. A third argument is that PPPs can mimic a competitive market, since they are often adjudicated in competitive auctions. Fourth, even though user fees can be charged under public provision and under PPPs, the fact that there is at least one interested party in setting profitable tolls under PPPs balances the political pressures to lower fees. Fifth, PPPs should help filter 'white elephants'. Sixth, various arguments have

<sup>9</sup>Source: Blanc-Brude, Goldsmith and Valila (2007).

<sup>10</sup>Other advanced economies with significant PPP programs are Australia, Czech Republic and Hungary (see Hemming, 2004). Among emerging economies, PPPs have been used by China, India and by several countries in Latin America.

been given to justify PPPs on distributional grounds. We review each of these arguments next.

### **2.2.1 Relieving government budgets?**

Governments often justify the use of PPPs because the private sector finances these projects, which they argue frees up scarce government resources that may be used in programs that are socially attractive but not privately profitable. Or, in what amounts to the same idea, PPPs are attractive because governments can get the infrastructure without raising taxes. Of course this argument does not apply to PPP projects whose capital costs are funded by future government payments, as in the case of the various projects which specify a schedule of capital charges payable in the future and which bind the intertemporal budget. Examples include the I-595 Corridor Roadway Improvements Project in Florida, the Port of Miami Tunnel and the Eagle Commuter Project in Denver, all of which are under construction. In these cases, PPPs help state and local governments perform a useful accounting trick, in which future obligations are off-balance sheet for no clear economic reason.

That PPPs relieve government budgets under strain is also a doubtful argument for projects whose capital costs are partially or totally covered by user fees. In this case user fees could also have been used to pay the capital costs under public provision. The resources saved by the government by not paying the upfront investment under a PPP should be equal, in present value, to user fee revenue foregone to the concessionaire.

There is one exception to this argument, which occurs when a (local, state or national) government is borrowing constrained and this is expected to be less binding in the future. A PPP might be the only option to finance a given project now, after separating the revenue flows from the project from the rest of the public budget, something that may be hard to do if the government cannot borrow.

We conclude that in many cases governments choose PPPs because they allow them to make public investments while keeping future obligations off the balance sheet and beyond legislative control. This is not a valid economic justification for PPPs.

### **2.2.2 Efficiency gains?**

A standard argument in favor of privatization is that private firms are more efficient than state-owned enterprises. This argument does not apply when comparing PPPs to public provision since, as mentioned earlier, governments rely on private firms to build, maintain and operate infrastructure under both organizational forms. Furthermore, the firms responsible for construction are often the same under the traditional approach and PPPs. This suggests that any argument linking PPPs with efficiency gains has to be subtler.

The academic literature has emphasized the importance of *bundling* construction and maintenance as a source of efficiency gains. With public provision, a construction firm minimizes building costs subject to design characteristics.

In a PPP, by contrast, the private firm minimizes life-cycle costs, which include building, operations and maintenance costs. When quality of service is contractible, this supplies an argument for preferring PPPs over traditional provision, since the concessionaire internalizes life cycle costs during the building phase without compromising service quality. To the extent that investments during the building phase can lower maintenance and operations costs, this should lead to efficiency gains under PPPs.

We are not aware of studies illustrating the quantitative importance of bundling. Yet once we consider the interaction of bundling with the political economy of infrastructure provision, the efficiency gains from bundling are probably large. Under public provision most governments spend too little on routine maintenance, and too much on new projects or in major reconstruction of existing projects, since it is more attractive for politicians to inaugurate new projects than to do routine maintenance on existing facilities. By contrast, under a PPP that specifies and enforces quality standards, maintaining the infrastructure adequately is usually optimal for the concessionaire. Moving from traditional provision to PPPs serves as a commitment device to provide adequate maintenance.

There is also anecdotal evidence that PPPs can lower construction and operation costs. For example, the concessionaire that built express lanes on State Route 91 in Orange County, California, reduced construction time substantially by innovating in traffic management during construction (see Small (2010); we describe this project below). Also, the consortium that proposed the I-495 Capital Beltway HOT Lanes in Fairfax County, Virginia, built high occupancy toll (HOT) lanes for one-third of the cost of the high occupancy vehicle (HOV) lanes then planned by the Virginia Department of Transportation (Poole, 2006).

Another example of efficiency gains is the Chicago Skyway. During the first four years under a PPP, operating costs decreased by 11%, in real terms, compared with the last four years under city management (average traffic was similar in both four year periods). A large part of this decrease in operating cost was due to lower labor costs, as the concessionaire replaced City workers paid at least \$20 per hour with those paid at market rates of \$12-15 per hour (TOLLROADSnews 2005).<sup>11</sup>

Under PPPs there are strong incentives to finish the project early, since profits increase when users can be charged at an earlier date. Incentives of this sort are usually absent (or weaker) under traditional provision.

### **2.2.3 Introducing competition?**

Setting the appropriate level of user fees can be difficult because many infrastructure projects have market power. One option is to have tariffs set by a

---

<sup>11</sup>However, as stipulated by the concession agreement, the City gave existing employees the opportunity to move to other public jobs, an offer taken by a 100 of 105 unionized workers (Transportation Research Board of the National Academies, 2009). This suggests that, at least in the short run, efficiency gains at the Chicago Skyway were the flip side of efficiency losses elsewhere in the city.

regulator, which poses a host of well known problems. Long ago Chadwick (1859) argued that PPPs can avoid these regulatory difficulties, if the firm is chosen via a competitive auction (see also Demsetz [1968]). In the terms of Chadwick, competition *for* the field is a close substitute for competition *in* the field, eliminating economic rents for the provider of the service.

In order to achieve the benefits of Demsetz auctions, there must be real competition for the contract. This is often not the case. In some countries (Brazil is an example) the PPP legislation biases auctions in favor of domestic participants, for example, by demanding documentation that is only available to domestic firms. In other cases, the government's overt or covert objective is to divide the projects among the main domestic construction firms. Since there is less competition, the cost of infrastructure goes up and the quality may be lower. However, the most important limitation of Demsetz auctions when applied to PPPs is the pervasive use of renegotiations, a topic we consider shortly.

The selection process for 14 out of 20 PPP contracts in the US transport sector during the 1991-2010 period involved competitive bidding (see Table 1). Bidding usually followed a Request for Qualifications used to determine which firms were technically and financially able to participate in the bidding process. The remaining six contracts, three of which were adjudicated during the 1990s, were unsolicited offers and were assigned to the firm that proposed the project.

#### **2.2.4 Charging appropriate user fees?**

The usual concern under public provision is that user fees are set too low, because politicians fear voters. In addition, groups with effective lobbying power, such as truckers in the case of highways, are often charged less than the damage and congestion they cause.<sup>12</sup>

There is evidence that PPPs have helped maintain the real value of user fees in the face of inflation. Tolls at the Indiana Toll Road remained unchanged in nominal terms for more than 20 years under state ownership and management; in real terms they fell substantially. When the road was auctioned as a PPP in January of 2006, tolls doubled and were indexed to inflation, because potential concessionaires were unwilling to bear inflation risk for 75 years. Other US states have since adopted toll indexation for their PPP projects, among them Florida, Pennsylvania and Texas. However, the rise in tolls in Indiana led to the introduction of a shadow toll (by shadow tolls we mean a payment from the government to the firm linked to usage of the project). Hence a PPP does not totally solve the problem of low tolls due to political pressure.

#### **2.2.5 Filtering white elephants?**

Adam Smith's *Wealth of Nations* (V.1.III.1.) mentions that when infrastructure is privately provided and sustained with user fees, a market test filters white

---

<sup>12</sup>Road wear and tear is proportional—as a rule of thumb—to the fourth power of axle loading. See <http://pavementinteractive.org/index.php?title=ESAL>. This implies that in most countries, the tolls paid by trucks are much lower than wear and tear costs they cause.

elephants:

“When high roads are made and supported by the commerce that is carried on by means of them, they can be made only where that commerce requires them.”

This filter works only when PPPs are financed mainly with user fees, since in this case projects that are not expected to be profitable (and therefore not socially profitable in many cases) will fail to attract a concessionaire. Financing capital expenses with user fees may lead to charges that are higher than socially optimal, and this can be avoided under public provision. The large number of infrastructure projects that are evident white elephants suggests that the benefits of having a market test that avoids over-engineered (or outright unjustified) projects is likely to outweigh these costs.

PPPs will not filter white elephants if the project is financed with subsidies or there is an implicit guarantee that the government will bail out a troubled concessionaire. This is the reason for using cost-benefit analysis for most infrastructure projects, except for those fully financed by user fees. In the United States, many Federal infrastructure projects do not go through a process of cost benefit analysis, which explains the pork barrel projects that are so dear to the federal legislature. Yet, as noted, such projects need generous government subsidies to be attractive to private firms, since user fees alone will not suffice.

Various PPP projects in the United States went bankrupt. The South Bay Expressway in San Diego, California, opened in 2007 but filed for Chapter 11 bankruptcy in 2010, citing traffic at less than 40% of initial projections. Similarly, the Camino Colombia Toll Road in Texas was foreclosed by a district court in 2003 — the only such case in the U.S.— due to vastly overestimated demand, as effective revenues were only 6% of projections.

The Greenville Southern Connector in South Carolina filed for Chapter 9 bankruptcy in 2010. A demand forecast study predicted \$14 million in revenue by 2007 while actual revenue only reached \$5.4 million. The above cited forecast failed to notice that the road made no sense as an access road to local commercial developments. Traffic barely justified a 2-lane road, let alone the 4-lane expressway that was actually built, suggesting this project qualifies as a white elephant.

This is one of three cases that went bankrupt, associated to so called 63-20 non profits that benefited from tax exemptions, in which the promoters had nothing at stake. According to the TOLLROADSnews newsletter, these projects were enthusiastically promoted by a combination of consultants, engineering firms, financiers and construction firms, who made money at the expense of bondholders during the development, design and construction phases and had nothing at stake thereafter.<sup>13</sup>

The evidence we could find from public sources suggests that for only one of the 20 PPP projects in Table 1 demand turned out to be higher than forecasted. It is therefore likely that firms have incentives to overestimate demand for

<sup>13</sup>See (<http://www.tollroadsnews.com/node/4808>).

PPP projects. One reason may be to profit at the expense of bondholders, as described above for Southern Carolina's Southern Connector. Another reason could be an implicit agreement that the concessionaire will be bailed out by the government should demand be much lower than expected. As we discuss in section 2.3.1 on renegotiations, concession terms have been extended and tolls raised to help concessions with revenues below projections.

### **2.2.6 Distributional aspects: are tolled roads Lexus roads?**

Most highway PPPs in the US, with the significant exception of a few projects that receive availability payments in Florida, Colorado and Massachusetts) derive their revenue from tolls.<sup>14</sup>

This raises a frequent criticism of PPPs in terms of their impact on different income segments. For example, a common complaint against HOT lanes built under PPPs is that they are *Lexus lanes*. More generally, the argument is that tolled roads are unfair to lower income users. This is an argument for rationing (by congestion), against a market solution.

However, in the case of greenfield or brownfield projects (i.e., those that add to or improve the existing stock of transport infrastructure) even this argument loses force. There are several ways in lower income users benefit from the existence of new or improved tolled roads. First, by diverting some users from the original roads to the tolled highways, congestion in the remaining roads is reduced. Second, whenever there is an urgent need for rapid transportation, there is the option of paying for it, and this must be better than not having the option. Third, those who benefit most directly from the new or improved highway pay for it, so the burden does not fall on other users of the road system. Finally, even in the case of HOT lanes, there is little evidence for a preponderance of expensive cars among users. A study of the SR 167 HOT lanes showed that the most common makes of car using the lanes were: Ford, Chevrolet/GMC, Toyota, Honda and Dodge.

The case of leases, where there is temporary transfer of property but no improvement to the facility, is different and cannot be justified on distributional grounds. This is specially the case when user fees rise after the contract is signed, since then users are paying more without the benefits of new infrastructure. Unless the proceeds from the lease are used to invest in socially productive projects, the government will overspend and "mortgage its future".

In terms of public policy, as well as to avoid hostile public reactions, it is wise to explain the benefits of new or improved toll roads to the public. For example, the Commonwealth of Virginia, specifically the Virginia Department of Transportation and the Department of Rail and Public Transportation, developed an extensive public outreach and public information campaign to inform the public of the purpose of the project and project benefits when it introduced HOT Lanes, that changed the perception of the public, initially 75% against the

---

<sup>14</sup>The exceptions are the Port of Miami Tunnel, the I-595 corridor in Florida, the Eagle commuter Rail Project in Denver, Colorado and the Route 3 in Boston, Massachusetts.

introduction of HOT lanes, to a 65% approval rate. This was accomplished by clearly explaining the project benefits to users: new travel choices (e.g., dedicated high occupancy vehicle (HOV) lanes), first capacity enhancement in the Beltway in a generation, congestion relief, improved safety and performance, and replacement of aging infrastructure.<sup>15</sup>

### **2.2.7 Taking stock**

Summing up, some of the arguments in favor of PPPs have little merit while others are valid. Thus, PPPs provide better incentives for adequate maintenance relative to public provision. They also help governments avoid the temptation of charging inefficiently low user fees. PPPs have not done a good job of filtering white elephants, possibly because high demand uncertainty has facilitated opportunistic behavior by various agents promoting this organizational form. PPPs often have beneficial distributional impact when they involve new infrastructure or a major improvement of existing infrastructure, as long as they are financed with user fees, since those who do not use the project do not pay for it but may benefit from less congestion on free alternatives. Last, contrary to widespread belief, PPPs do not relieve strained budgets; they just change the timing of revenues and disbursement.

## **2.3 Experience**

One fact of life of PPP concessions around the world is that they are routinely renegotiated. From Table 1 we observe that this is also common in the United States: 6 out of 20 projects have undergone a major change in the initial contractual agreement, favoring the concessionaire, and two additional projects have pending renegotiations. If we consider that, on average, seven years have passed since financial closure for US projects, this is a high renegotiation rate.

Industry participants often claim that circumstances change over the life of a concession. Because most infrastructure facilities last for several decades, renegotiations of inherently incomplete contracts are to be expected. If so, the argument runs, there is little to be worried about, as renegotiations give the necessary flexibility to adapt to changing circumstances.

While there is some truth to this point, it ignores three rather disturbing features of renegotiations. One is that sometimes they occur shortly after contracts are awarded. Second, renegotiations typically seem to favor the private party. Third, renegotiations are often used to circumvent budgetary controls and anticipate government spending, as they typically involve additional financial commitments by the public works authority that are paid mostly by future administrations. The high frequency of renegotiations of PPP contracts represents a serious problem, which alters the conceptual basis of the industry.

---

<sup>15</sup>Source: personal communications by Richard B. Norment and John D. Lynch. Note, however, that the following states do not charge tolls (except, in some cases, for bridges crossing to another state): Arizona, Connecticut, Hawaii, Idaho, Mississippi, Montana, New Mexico, North Carolina, South Dakota, Tennessee, and Wyoming.



The problem with renegotiations is that they undo the potential advantages of competitive auctions, when these are used to assign the project.<sup>16</sup> Since renegotiations occur in the absence of competition, the results can be very profitable to the private party. Furthermore, pervasive renegotiation tends to give an edge in projects to firms with more developed lobbying abilities (as they can offer better conditions initially in the expectation of improving the conditions after renegotiation), and this ability is not necessarily related to technical proficiency in infrastructure provision.

Some States require legislative approval of PPP projects *after* the concessionaire has been selected, Florida and Indiana among the states that have PPP contracts. This may be viewed as renegotiation by design, as the conditions under which the concessionaire is selected are modified after the competitive selection process. This is likely to favor firms that are well connected with the legislators that determine the final contract, and may result in selecting a firm that is good at lobbying but less good at building and operating projects.

Another characteristic of PPPs is that there is no good standard for their inclusion in the government's balance sheet. Therefore PPPs have the advantage of allowing governments to build projects even when other forms of financing are restricted by legislative or other constraints (Engel et al. (2009), see also House of Lords (2010, p. 16)).

### 2.3.1 Renegotiations and the US Experience

Circumstances change over the life of a long term contract. For example, if demand grows faster than expected the PPP facility may need to be enlarged before the current concession ends; or if the original user fee schedule proves inadequate, it may be desirable to change it. In those cases, one would like to grant the public works authority flexibility to change the contract and, perhaps, even terminate it unilaterally. But, of course, this would also facilitate regulatory takings. Not surprisingly many contract clauses restrict discretion to protect concessionaires.

The tension between protection against regulatory takings and the costs of inflexibility can be illustrated with the two main PPP concessions in the United States during the 1990s. In 1995 the California Department of Transportation (Caltrans), concessioned a four-lane 10-mile segment of the Riverside Freeway/State Route (SR) 91 between the Orange/Riverside County line and the Costa Mesa Freeway/SR-55 to a private firm, California Private Transportation Corporation (CPTC), for 35 years. Motorists use the express lanes to avoid congestion in the non tolled lanes, paying up to almost \$11 for a round trip. The concessionaire was allowed to raise tolls freely in order to relieve congestion, which it did several times. By the late nineties, 33,000 daily trips brought the express lanes to the brink of congestion at peak time turning the concession into a financial success. At the same time and for the same reasons, users in the

---

<sup>16</sup>In the US and in the UK, it is not uncommon to have the design of projects negotiated directly with the private party. This requires much confidence in the incorruptibility of the public officials involved in these negotiations.

non tolled, public lanes were suffering extreme congestion, and an expansion became urgent. Nevertheless, the contract included a “non-compete clause” which prevented Caltrans from raising capacity at Riverside Freeway without CPTC’s consent during the 35 years of the concession. Caltrans tried to go around the clause arguing that expansions were necessary to prevent accidents, but CPTC filed a lawsuit. The settlement stated that non-compete clauses were meant to ensure the financial viability of CPTC and restrict Caltrans’s right to adversely affect the project’s traffic or revenues. Consequently, no new lanes could be built.

Protracted negotiations ensued and eventually the Orange County Transportation Authority (OCTA) was empowered to negotiate the purchase of the tolled lanes. Unfortunately, the value of the toll road was controversial since, strictly speaking, it should have been the present value of profits from the 91 Express Lanes had the franchise continued as originally planned. Even though the lanes cost \$130 million to build, initially the company set a price of \$274 million in a controversial (and ultimately unsuccessful) attempt at a buyout by a non-profit associated to Orange County. After several years of negotiations, while frustrated commuters of the 91 Freeway were stuck in traffic, the express lanes were bought in January 2003 by OCTA for \$207.5 million. The purchase was enabled by the California legislature which gave OCTA authority to collect tolls and pay related financing costs, and eliminated non-compete provisions in the franchise agreement for needed improvements on SR-91.

It seems clear that the noncompete clause was inefficient ex post and one might believe that Caltrans made a mistake by including it in the original contract. But consider the 14-mile Dulles Greenway Highway which was designed as a greenfield BOT facility that would become the property of the state of Virginia after 42.5 years.

Virginia’s General Assembly authorized private development of tollroads in 1988. A group of investors thought that a toll-road linking Washington’s Dulles International Airport and Leesburg, Virginia, would be a promising investment. Their expectations were based on the prospect of residential and commercial growth in the area, which was expected to increase congestion on existing arterial roads serving the corridor. To finance the greenway, investors put up \$40 million in cash and secured \$310 million in privately placed taxable debt. Loans were to be repaid with toll revenues. Investors underestimated how much users disliked paying tolls, and initial revenues were much lower than forecasted. Moreover, investors did not count on the State of Virginia widening the congested Route 7, which serves the same users. Two independent consulting companies had predicted that when the road opened in 1996, with an average toll of \$1.75, there would be a daily flow of 35,000 vehicles. In practice, however, the average number of vehicles per day turned out to be only 8,500, one fourth of the initial estimates. After tolls were lowered to \$1.00, ridership increased to 23,000, still far below predictions. Bonds that were issued to finance the project were renegotiated and some of the initial investors wrote off their equity. After refinancing and an extension of the franchise term to 60 years, the project became financially viable.

The Orange County example shows that inflexibility may be costly while the Dulles Greenway concession suggests that it may be justified. Both examples highlight the importance of designing contracts that facilitate ‘good faith’ renegotiations while deterring ‘bad faith’ renegotiations, a topic we return to in Section 3.1.

### **2.3.2 Anticipating Spending and the US Experience**

The Chicago Skyway and the Indiana Toll Road are cases where a PPP-type contract was used to lease an existing infrastructure. As we argue next, in both cases the PPP contract was used to anticipate government spending. Nonetheless, unexpectedly high bids suggest that the city of Chicago and the state of Indiana may be better off thanks to the leases.

The Chicago Skyway is a 12.6 km six-lane median-divided toll road in Chicago, Illinois that links downtown Chicago to the Illinois-Indiana State line (much of the material for this case study appears in Cheng [2010]). The Skyway was initially developed by the City of Chicago in 1959, with bond financing linked to toll revenue. However, the City was unable to raise tolls enough to service the debt and had to be ordered by the courts to do so. Even then, the first principal payment (after paying off all due interest) only came in 1991, when the financial situation of the project improved due to congestion in untolled alternative roads. After retiring the original bonds in 1994, the city made no further toll adjustments.

From this point on, the city began using the revenue from the Skyway to fund other transportation projects and to anticipate toll revenues by issuing bonds in 1996 for the same purpose. In 2004 the City issued a Request for Qualifications that led to five qualified bidders for a 99 year lease on the Chicago Skyway. The bidders competed for a lease of the highway, including operations and maintenance, in exchange for toll revenues according to a predetermined toll schedule.

There were three active bidders, and an undisclosed reservation price estimated to lie in the range of \$700-800 million. The winning bid of \$1.83 Billion was submitted by Cintra-Macquarie. The other two bids were more than one billion dollars lower, providing some indications of the *winner’s curse*. Cheng (2010) estimates that under all reasonable demand scenarios, Cintra-Macquarie paid too much for the project.

Some things to note for further reference. First, major toll increases were pushed into the future, past the time of retirement of the then current Mayor. Moreover, before leasing the Skyway the city procured an exemption from leasehold tax for the facility, thus raising its current value at the expense of future revenues. Finally, the original lease was for 55 years, but the final lease was extended (at the instance of the firms) to 99 years, an extension that might loom large in future renegotiations, but whose current present value is just \$3 million.

Cheng (2010) shows that the PPP was financially convenient for the city, because only under optimistic expectations of traffic growth and a, so far

unobserved, ability to raise tolls would it have been able to generate the amount of discounted revenue it received from the winning bid. There are other potential efficiency gains from private management (more efficient maintenance and operations) but their impact is relatively small. Operation costs fall by 11%, a gain of \$1 million per year, of the order of \$10 million in present value. Thus efficiency gains should have a correspondingly small impact on the overall valuation of the facility.

The short term political benefits of the program were important. Part of the debt was used to retire Skyway bonds and City debt, and \$500 million went into a long term reserve, with the remaining \$475 million in discretionary funds, of which the City has spent 83% by 2010, all under the administration, and before the retirement, of Mayor Daley in 2011.

Summing up, politicians managed to convert future revenues into current spending, and were lucky that the winning bid was much higher than the value of the road. This allowed them to develop a reputation for prudence by using part of the resources to pay down debt and invest for the long term, while using the windfall to increase current expenditures. Perhaps the most significant feature of the lease was that the City managed to enhance the value of its asset by committing to higher tolls.

Even though we omit the details, the case of the Indiana Toll Road is similar. In particular, a consortium with the same firms as for the Chicago Skyway paid \$3.8 billion for a 75 year lease even though a state-commissioned analysis valued future cash flows at just \$1.9 billion. Note though, that by contrast with the Chicago Skyway, the Indiana Toll Road contract considers over \$770 million in planned upgrades, including the addition of a lane in each direction from the Illinois State Line to the I-80/I-94 interchange.

### **2.3.3 The UK's Public Finance Initiative**

In the UK, the Private Finance Initiative (PFI) has become an important part of the public investment process, using PPP's to build and operate assets such as hospitals, schools and other infrastructure projects. As of September 2009, the total estimated capital value of these projects across the UK was £55.1 billion.<sup>17</sup> The UK is the most important international test bed for PPPs, given that 667 projects have been signed by 2009, 599 of them operational, and their diversity among transport, education, health, prisons, defence, leisure, housing, courts, technology, government offices and other projects.

In 2002, the Treasury conducted a sample study of 61 projects, out of 451 operational projects at the time. The conclusions were positive. First, the percentage of projects that were late was much lower than under public provision, both in studies by the National Accounting Office (NAO) and by the Treasury.<sup>18</sup> Furthermore, the Treasury reported that there were four bidders on average for each project, signalling healthy competition. The H.M. Treasury

<sup>17</sup>These data from HM Treasury worksheet: *PFI Signed Projects List - September 2009*.

<sup>18</sup>See Hellowell and Pollock (2007) for a criticism of the methodology, however.

claimed that there were no overcosts in PFI projects, but it did not include overcosts associated to changes in the specifications, i.e., those whose contracts were renegotiated. In fact, according to the figures presented in the report, in 22% of projects, there were increased costs due exclusively to changes in the specifications.

An additional problem described in the Report were the long lead times necessary for PFI projects, which averaged 22 months (though there is no public sector comparator). However, it must be noted that similar long delays would also occur under the traditional provision approach if the project were as carefully designed as under a PFI. The only delay that can be unambiguously assigned to PPPs is that due to arranging private financing. Also, because of high contracting costs, the UK only considers PPP contracts for large projects (£20 million minimum).

A further topic of interest is the issue of contract flexibility. The government keeps the right to change any aspect of the building or service, subject to agreement with the contractor on cost. If the change exceeds £100,000, competitive tendering is required, but this only occurs in 29% of cases. It is also interesting to observe that 20% of the changes requested by the public sector correspond to the reinstatement of requirements that had been excluded from the initial contract due to their cost. The Treasury Report is correct in indicating that it is not appropriate to eliminate items at the competition stage and then reinstate them when the project has already been awarded.

In retrospect, it seems clear that the original motivation for the introduction of PPPs in the UK was to have a source of off-budget public investment. Only 23% of capital cost of 599 PFI projects up to April 2009 are on balance sheet, which explains why on July 2nd, 2009, *The Economist* wrote that “cynics suspect that the government remains keen on PFI not because of the efficiency it allegedly offers, but because it allows ministers to perform a useful accounting trick.” Since the UK faced no rationing in the credit markets, using PPPs to provide more funds for public investment served no social purpose, but it did help comply with the debt limit of the Maastricht Treaty.

Also, some of the problems faced in the UK have been exacerbated by the extensive use of availability contracts, in which users fees (if they exist) only pay for operations and maintenance costs, and not for capital costs. When users pay fees (especially when they are sufficient to defray the capital costs of the project), they are less willing to accept cost increases and quality reductions. There is a tendency to renegotiate contracts during the construction process, leading to increases in 35% of projects. And, as already mentioned, in a substantial number of projects, requirements were dropped at the bidding stage and were reimposed after awarding the franchise.

#### **2.3.4 Is there a PPP premium?**

Project finance has emerged as a financing technique well suited for PPP projects, by allowing the project’s sponsor—an equity investor responsible for bidding, developing and managing the project—to borrow against the cash flow of a

project that is legally and economically self-contained. During construction, expenses are financed with sponsor equity and bank loans. In some cases, the project may receive government subsidies and/or minimum revenue guarantees from the government. Once the PPP facility becomes operational, long-term bonds substitute for bank loans and the sponsor's equity may be bought out by a facilities operator, or even by third-party passive investors, usually institutional investors.

Project finance has clear advantages over corporate finance. During the construction phase, the stand-alone nature of the SPV precludes underinvestment in the project, a possibility in a more diversified sponsoring corporation, due to competition for resources. Moreover, when setting up a PPP as a division within a diversified corporation, the free cash flows generated by the PPP in its operational phase are tempting, and may be diverted away from debt repayment towards higher yielding (but riskier) uses. Since the SPV has no growth opportunities, the possibility of diverting resources away from creditors is limited. Hence, the project's cash flow can be credibly pledged to bondholders, thus allowing a higher gearing.

Even though project finance is advantageous, financing costs for PPPs are higher than those of government debt by at least 200 basis points. In part, this is due to the fact that bondholder risk under public provision is subsumed under general government default risk. Moreover, public debt is cheaper because, implicitly, the public absorbs the risk through potentially higher taxes or lower public expenditures in case of imminent default on all government debt (the risk of PPP default is procyclical and thus has a higher impact on welfare). As noted by John Kay:

“The view that *private sector capital costs more* is naïve because the cost of debt both to governments and to private firms is influenced predominantly by the perceived risk of default rather than an assessment of the quality of returns from the specific investment. We would lend to government even if we thought it would burn the money or fire it off into space, and we do lend it for both these purposes.”

There are two additional reasons that help explain the size of the the observed “PPP premium”. First, the use of inappropriate contract forms, a topic we discuss in detail in Section 3.1. Second, because the premium compensates for the risk associated to providing incentives for efficiency. Since efficiency is one of the justifications for PPPs, this component of risk is desirable.

As argued in Section 3.1, in many PPP facilities it is optimal to transfer demand risk to the government. Because PPPs involve large upfront investments, exogenous demand risk is an important concern for lenders when user fees are the main source of revenue. By assigning this risk to the government, the risk premium falls. Thus, inadequate contracts explain part of the higher financing cost facing infrastructure PPPs.

However, even in the case of availability payments (and thus there is no demand risk), the rates faced by the private sector are higher than the rates charged

on government debt. These higher rates reflect the risk that the availability payments will not be forthcoming to service the debt, either because service quality deteriorates or because the services are unavailable, thus providing incentives to keep the service standards and the availability.

We conclude that the higher costs of project finance are probably due to a combination of the implicit guarantee provided by taxpayers for government debt, faulty contract design, and cost-cutting incentives embedded in PPPs. For a well designed PPP contract, the higher cost of capital may well be the flip side of the efficiency advantage of PPPs as compared to public provision.

### **3 Detailed Recommendations**

PPPs can do a better job than public provision when the quality of infrastructure services is easy to define and supervise. Yet, as discussed in preceding sections, opportunistic renegotiations, poor risk allocation, and the absence of proper budgetary accounting may render the potential benefits of this organization form moot. In this section we make specific proposals that should help PPPs attain their potential advantages.

#### **3.1 Proposal: Structuring PPP contracts**

As a general principle, it is better to select a concessionaire through a competitive auction of a well defined project (or with clear and enforceable service standards) than through direct negotiations. As discussed above, a competitive auction dissipates the rents that are extracted from users, and which can be large, since projects often have substantial market power. A competitive auction is also more transparent than the alternative of selecting the concessionaire via bilateral negotiations, avoiding discretionary decisions by public servants.

Next we discuss our proposals for a competitive auction mechanism, offering separate proposals for the case of projects that are financed mainly via user fees and for those where user fees do not cover the capital cost of the project.

##### **3.1.1 User fee finance**

For various infrastructure services that are financed by means of service fees, demand risk is large and, assuming quality standards are contracted, mostly exogenous. This risk arises because demand forecasts are unreliable. As discussed above, the Dulles Greenway, the Camino Colombia Toll Road and the Greenville Southern Connector are among many US examples illustrating the difficulty of making accurate demand forecasts, even in the short run. It follows that risk sharing is an essential part of the problem when designing a PPP contract.

The fact that opportunistic renegotiations have been a major problem under PPPs, suggests considering contractual forms where the firm bears little demand risk. This will provide fewer excuses to renegotiate the contract in the event of low demand realizations.

Despite the high demand uncertainty faced by many PPP contracts, it is often the case that user fees will eventually pay for the project, the question being how long it will take. For example, even though demand for the Dulles Greenway turned out to be much lower than expected, accumulated toll revenue would have eventually paid for capital and operating expenses. For projects like these—we refer to them as ‘high demand’ projects—we argue next that flexible term contracts, more precisely a present-value-of-revenue (PVR) contract, offers a number of attractive properties.<sup>19</sup>

Under a PVR contract, the regulator sets the discount rate and user fee schedule, and firms bid the present value of user fee revenue they desire. The firm that makes the lowest bid wins and the contract term lasts until the winning firm collects the user fee revenue it demanded in its bid.

A first advantage of a PVR contract is that it reduces risk: When demand is lower than expected, the franchise period is longer, while the period is shorter if demand is unexpectedly high. Under the assumption that the project is profitable in the long run so that repayment eventually can occur, all demand-side risks have been eliminated. This reduces the risk premium demanded by firms when compared to fixed term concessions (e.g., by one third in the case considered by Engel et al. [2001]). This should attract investors at lower interest rates than traditional Demsetz franchises with fixed terms.<sup>20</sup> Annual user fee revenues are the same under both franchises, but the franchise term is variable under PVR. If demand is low, the franchise holder of a fixed term contract may default; in contrast, a PVR concession is extended until user fee revenue equals the bid, which rules out default. Of course, under PVR, the bondholders do not know when they will be repaid, but that is less costly than not being paid at all. PVR schemes also reduce the need for guarantees because the risk to investors is much smaller.

The United Kingdom was probably the first country to use a contract similar to PVR. Both the Queen Elizabeth II Bridge on the Thames River and the Second Severn bridges on the Severn estuary were franchised for a variable term. The franchises will last until toll collections pay off the debt issued to finance the bridges and are predicted to do so several years before the maximum franchise period. Chile was the first country to use an outright PVR auction.<sup>21</sup>

In February of 1998, a franchise to improve the Santiago-Valparaíso-Viña del Mar highway was assigned in a PVR auction. The reason for choosing the PVR option was that it is easy to calculate fair compensation for the concessionaire should early termination of the contraction be desirable for the government (see Box 1 for details). Beginning in 2008, PVR auctions became the standard to auction highways PPPs in Chile: seven highway PPPs have been auctioned using

---

<sup>19</sup>In Engel et al. (2007) we derive a flexible term contract where firms bid both a cap on the present value of user fee revenue they desire and a minimum income guarantee. The regulator combines both bids using a scoring function. We show that these “two-threshold” contracts have many (but not all) of the advantages of PVR contracts in the case of intermediate and low demand projects.

<sup>20</sup>Traditionally firms bid on the lowest toll, the shortest contract term or the lowest payment to the government. In all these cases the contract length is set before knowing demand for the project.

<sup>21</sup>Colombia ran a flexible term auction a couple of years before where firms bid on total income, without discounting.



this approach with winning bids adding up to close to US\$2 billion (see Table 3 for details). Portugal also recently adopted flexible term contracts for all its highway PPPs.

**BOX 1 (First PVR Auction)** *The Route 68 concession, joining Santiago with Valparaíso and Viña del Mar, was auctioned in February of 1998. It was the first road franchised with a PVR auction. The Route 68 concession contemplated major improvements and extensions of the 130 kilometer highway and the construction of three new tunnels. Five firms presented bids, one of which was disqualified on technical grounds. For the first time in the Chilean concessions program, minimum traffic guarantees were not included for free, but instead were optional and at a cost. That the pricing of guarantees by the government was not way off the mark can be inferred from the fact that two of the bidders chose to buy a guarantee, while the winner declined. Bidders could choose between two rates to discount their annual incomes: either a fixed (real) rate of 6.5% or a variable (real) rate given by the average rate of the Chilean financial system for operations between 90 and 365 days. A 4% risk premium was added to both discount rates. Three firms, including the winner, chose the option with a fixed discount rate. Somewhat surprisingly, the present value of revenue demanded by the winner turned out to be below construction and maintenance costs estimated by the Ministry of Public Works (MOP): the winner bid US\$374 million while the MOP estimated costs to be US\$379 million. One possible explanation for this outcome is that the regulator set a risk premium (and hence the discount rate) that was too high, neglecting the fact that PVR auctions substantially reduce the risk faced by the franchise holder. A return on capital in the 10-20% range is obtained if a more reasonable risk premium (in the 1-2% range) is considered.*

*It is also interesting to mention that, apart from the pressure exerted by the Ministry of Finance, the main reason why MOP decided to use the PVR mechanism is that it facilitates defining a fair compensation should the ministry decide to terminate the franchise early. This feature of PVR is relevant in this case since MOP estimates that at some moment before the franchise ends, demand will have increased sufficiently to justify a substantial expansion of an alternative highway (La Dormida) that competes with some sections of Route 68. Thus, the contract of the Route 68 concession allows MOP to buy back the franchise at any moment after the twelfth year of the franchise, compensating the franchise holder with the difference between the winning bid and the revenue already cashed, minus a simple estimate of savings in maintenance and operational costs due to early termination. As pointed out in the main text, no such simple compensation is available if the franchise term is fixed.*

A second advantage of PVR is that they allow for non-opportunistic renegotiations of PPP contracts. Indeed, an advantage of PVR contracts is that they provide a natural fair compensation should the public works authority (PWA) decide to terminate the franchise early. It suffices to add a clause allowing the PWA to buy out the franchise by paying the difference between the winning bid and the discounted value of collected toll revenue at the point of repurchase (minus

a simple estimate of savings in maintenance and operations expenditures due to early termination). No such simple compensation is available if the franchised term is fixed.

Third, the flexibility incorporated into PVR contracts is convenient for urban highways. Setting the appropriate *ex ante* toll for these projects is a complex task. Unless traffic forecasters are unusually fortunate in their estimates, the resulting tolls are likely to be incorrect – either so low that they create congestion or so high that the highway is underutilized. In the case of the Orange County SR 51 HOT lanes, fees responded directly to congestion, but this made the franchise holder reluctant to consider expansions for the untolled adjacent road, leading to excessive congestion. In a PVR franchise, the regulator could set tolls efficiently to alleviate congestion, without distorting the incentives of the concessionaire (care must be taken to ensure that the tolls generate sufficient revenue to pay for initial capital expenditures).

Fourth, a PVR approach also reduces the likelihood of bad faith renegotiations. Traditional fixed term infrastructure contracts are often renegotiated by either extending the length of the concession, increasing user fees, providing a government transfer or combinations of these approaches. Extending the concession term in a PVR contract is not possible because, by definition, the term is variable. Increasing user fees is ineffective because it shortens the concession term without increasing overall income. Government transfers are not logically impossible under PVR but, because the PPP partner cannot claim that it will receive less user fee revenue than it expected, a government transfer would be difficult to explain to the public. Furthermore, to the extent that firms are more likely to act opportunistically under financial duress, PVR contracts reduce the incentives firms have to lobby for renegotiations, since scenarios with losses for the firm are less likely under PVR. Yet both fixed term and PVR arrangements do not deter renegotiations that involve building additional infrastructure, which motivates the proposals we make below to improve PPP governance.

While PVR schemes have a big advantage in terms of facilitating good faith renegotiations and deterring bad faith renegotiations, as well as reducing risk, the downside is that the PPP franchiseholder has fewer incentives to manage demand for the infrastructure project because any action that increases demand will shorten the contract term. Projects earn their income regardless of efforts of the concessionaire. By contrast, demand increasing investments are more attractive under fixed term franchises. This suggests that the PVR method is applicable in cases in which quality of service is contractible and demand for the infrastructure is inelastic to the actions of the concessionaire, that is, when demand is mainly exogenous. Another important assumption underlying our analysis is that major investments are not needed frequently. Thus port infrastructure (not operations), water reservoirs, airport landing fields and highways are natural candidates for PVR, while mobile telephony is not.

### 3.1.2 Tax finance

When it is impossible to charge user fees that pay for the capital costs of the project (though they may pay the marginal costs of providing services), there are three alternatives to provide for the project. First, the government can use conventional provision. Second, it is possible to use shadow fees, where the government pays the private operator a fixed fee for each user of the infrastructure. Finally, it can pay a fixed periodic fee, contingent on quality of service standard being met, under an availability contract.

A fixed term contract where the firm is remunerated with shadow fees introduce demand risk, as the firm and taxpayers are forced to bear the opposite sides of risks they could avoid under an availability contract. This will increase the risk premium included in the winning bid. Since having the firm bear this risk brings no countervailing benefit, this approach should be deprecated. The purported benefit of shadow tolls is that, as they are demand dependent, they avoid white elephants. Consider, however, that a project in which all the payments are made by the government is a project that should be subjected to careful social evaluation, so the benefits of filtering white elephants are limited, if present at all. It follows that, at least for projects with contractible quality, availability contracts should be the preferred option when financing mainly out of general funds.

## 3.2 Proposal: Accounting for PPPs

One of the reasons for PPPs has been the desire of governments (local, state or national) to indulge in public works even when restricted by budgetary constraints. For this reason, the accounting standards-setting organizations have struggled to determine when a PPP project should be included in the balance sheet of the public sector. Governments would prefer that the implicit debt incurred (or the temporary asset transfer) not be considered in the budget, in order to observe debt covenants or to keep rating agencies from downgrading government debt. Taking projects off the balance sheet allows governments to elude spending and debt caps. Under conventional provision, on the other hand, caps on spending or net fiscal debt are reasonably effective in controlling the bias towards spending anticipation, because projects must be included in the budget. This is the reasoning behind the comments of the Governor of Indiana quoted in the introduction.

In Europe, a standard-setting committee, Eurostat, has promoted a system by which PPP investment is off the public balance sheet if the private party bears a large fraction of the risks of the project. The reasoning seems to be based on an analogy with the fact that with full privatization, the private party assumes all risks. However, since the definition of what is a *large fraction* is discretionary, this resulted in most PPP projects being off the balance sheet.

How should PPPs be accounted for in the budget? The starting point is to note that, as we have already seen, PPPs change the timing of government revenues and disbursements and the composition of financing, but do not alter

the intertemporal budget constraint. Given a demand trajectory, the present discounted budget will be the same under public and optimal PPP provision. The main conclusion is that PPPs should be treated just as standard government investments. To see why, consider first a PPP project fully financed by future payments from the budget. From an accounting point of view this PPP just substitutes debt to the concessionaire for standard public debt. Thus, there is no reason to treat PPPs differently from projects under conventional provision. It follows that upon award of the PPP, the present value of the contract should be counted as a public capital expenditure and public debt should be increased by the same amount.

In the case of projects whose main source of revenues is user fees, the analysis is somewhat different, but reaches a similar conclusion. To see this, consider a project whose user fee revenues will pay all expenses, including capital expenses, over the lifetime of the PPP. In that case, the project will have no effect on the intertemporal budget of the government. Under conventional provision, project revenues from user fees would have accrued to the government and would have been registered as revenues during each year of the operational phase. At the same time, the government would have made interest and principal payments to pay back the debt. Under a PPP, therefore, one should, as before, register user fees as current revenues and credit those revenues as payments for interest and principal of the “debt” with the concessionaire. At the end of the concession the debt will be run to zero.

Including PPP projects in the government balance sheet in the same way as conventional public investment has several advantages. First, the incentives to anticipate spending—which are chronic with PPPs—are reduced, so that PPPs will be chosen when they are socially beneficial and not because they help avoid budgetary controls. Second, treating PPPs the same way as public provision implies that both types of projects compete on a level playing field for scarce resources. In particular, both types of projects should be subject to social cost-benefit analysis. Third, the possibilities of increasing spending by renegotiating PPP contracts decreases, as any additional investment that results of a renegotiation will also add to recorded debt and thereby be forced to compete with other projects.

### **3.3 Proposal: Improving the governance of PPPs**

In many local, state and national governments, the same public works agency is in charge of planning the infrastructure, designing and awarding the PPP contract, monitoring compliance and renegotiating contracts (though there may be higher level supervision, the level of detail that is possible to supervise efficiently at a central level is limited). We believe this represents bad governance.

First, public works agencies tend to be biased in favor of building. This means that project selection is inefficient and building projects is the goal of the agency, rather than providing infrastructure services efficiently. Even when this is not the case, there is an inherent conflict of interest between promotion of infrastructure projects and monitoring compliance with contractual conditions.

Moreover, the renegotiation of contracts is generally a closed door process. Often the agreements reached between the private party and PWA are not subject to expert independent scrutiny. This allows public works agencies to cover up their mistakes and reduces the incentives to be careful in the design and award of PPP contracts (more so than in the case of conventional contracts where adjustments come from the current budget).

We believe that the governance of the agency in charge of PPPs should be designed to separate contract design and award from contract monitoring; it should also subject renegotiations to independent review.

Our recommendation is that different functions should be kept separate. First, there should be an independent planning agency that designs, evaluates—through cost benefit analysis—and selects projects, with the possibility of accepting public input, suggestions and with public display of the background material. An independent Comptroller should review a sample of the projects approved by the planning agency, to ensure that the agency has done its homework and publish its findings. The PPP authority should award the project in a competitive process and supervise the contract.

After the award of the project, the comptroller or another independent supervisory agency should ensure that both the PPP authority and the private party have complied with the PPP contract. It should also monitor performance standards and service quality, and provide information to users and the public. There should also exist a well defined conflict resolution mechanism, that ensures that contract renegotiations do not change the profitability of the project for the private party. This would ensure no regulatory takings nor opportunistic behavior by the private party.

Finally, it is a bad idea to require legislative approval of PPP projects *after* the concessionaire has been selected, as this may lead to choosing firms good at lobbying the system instead of the most efficient firms. Any legislative approval should take place before the project is put up for tender.

### **3.4 Unsolicited proposals**

It is often the case that a private party approaches the PWA with the idea for an infrastructure project. When the idea is good and does not belong to the set of projects under study by the PWA, there is the issue of remunerating the proponent in order to create incentives for the private sector to contribute additional worthy proposals. The question is how to structure a procedure such that the private sector generates innovative ideas for infrastructure projects. This requires the development of mechanisms for compensating the private parties for their ideas without affecting the transparency and efficiency of PPP awards (see Hodges and Dellacha (2007) for more details on unsolicited proposals). Countries that have developed systems for receiving unsolicited proposals must deal with large numbers of proposals, running into the hundreds in the case of Chile, South Korea and Taiwan, the ones with the most mature systems.

One possibility is that the PWA contracts with the proponent to develop the project as a PPP. The lack of competition and transparency and the space it leaves for corruption of the PPP system have made this option unattractive.

The alternative is to design a clear-cut mechanism for remuneration. The first stage consists of the approval or rejection of the unsolicited proposal, according to clear guidelines (in particular, excluding obviousness). Once an unsolicited proposal is approved, there are various options that have been used to remunerate the proponent. In some countries the proponent has an advantage in the competitive auction for the project (or the proponent can transfer its option). Its bid is chosen if it is no more than say, 5% or 10% off the best bid. In other countries, the proponent can match the best offer. The problems with these approaches is that the advantage possessed by the proponent may detract from participation in the auction, and therefore lead to projects awarded with little competition.

The alternative, which we espouse, is to separate the proposal stage from the award stage. Each year only a small number of proposals are chosen by the PWA, rewarding the selected proponents with a fixed prize that is sufficiently attractive to attract good projects. The prize is paid by the PWA, but it is reimbursed by the winner of the project once it is awarded under standard competitive conditions. This proposal combines incentives for competition in unsolicited proposals while not altering the competitiveness and transparency of the award process.

## 4 Conclusion

The advice provided in this paper should be easier to implement in states that are starting PPP programs from scratch rather than in states where the PPP industry is already established. One of our recommendations is already accepted, most recent PPP projects have been assigned by competitive mechanisms.

Regarding the remaining recommendations, government bureaucracies prefer not to change methods that have worked in the past, because they fear the new procedures may fail and that they will be blamed by politicians seeking scapegoats. In addition industry incumbents oppose the changes because of the threat they pose to their established advantages. The capture of the public works authority by political interests represents a major hurdle when reforming the public works sector in general, and the PPP industry in particular, with the objective of improving the selection process of infrastructure projects.

Our proposal of using cost-benefit analysis before approving infrastructure projects faces deeply ingrained political mechanisms that favor uncontrolled earmarks at the state and federal level. The Obama administration, which has a notable defender of cost-benefit analysis as an advisor, might be in favor of increasing the scope of programs that use this tool, but state and federal Congress love earmarks. The separation of roles within the PWA may also clash with well-entrenched interests, but may be workable after a sufficiently large corruption scandal, a recurrent feature of PWAs.

Next, consider the adoption of flexible term contracts for transport PPPs. Adoption has been slow, given their desirable characteristics. These contracts are opposed by incumbent firms and industry lobbies, which seem to fear that the added transparency of the PVR mechanism will limit their ability to renegotiate contracts, a major source of rents. The PWA tends to support the concession lobby, since its governance structures are oriented towards new projects (and therefore wants to be in good relations with industry), rather than towards supervision and regulation of existing contracts.

By contrast, budgetary authorities favor PVR contracts, since they reduce the need for revenue guarantees. It is not surprising, therefore, that flexible term PPPs were adopted when the budgetary authority had the upper hand over the public works authority. In Portugal, the first wave of highway concessions that began in 1999 used shadow tolls and this led to massive deficits. Portugal switched to PPPs based on flexible term contracts and in 2004 auctioned the 795 million euro Litoral Centro highway, whose project finance won the Eurofinance prize for project of the year.

In Chile, after the 2001-2003 Minister of Public Works committed the resources of the Ministry for several years in the future, the Finance Minister managed to make PVR contracts the standard for highway PPPs. Since 2008, six PVR-using contracts have been awarded, amounting to more than \$1.2 Billion. These international examples, coupled to the awful results of the recent winners of PPPs, partly caused by the economic crisis, should make stakeholders more amenable to PVR contracts.

PPPs can be expected to become increasingly popular, as cash constrained (local, state and federal) governments seek means to provide infrastructure services. We have shown that this is not an appropriate motive for PPPs, and that PPP projects should be included in the government balance sheet. This might be difficult to implement, except as the result of public campaigns against “mortgaging the future”. There are good reasons to use PPPs, but releasing public resources is not one of them.

## References

- [1] F. Blanc-Brude, H. Goldsmith and T. Valilla, "Public-Private Partnerships in Europe: An Update," Economic and Financial Report 2007/03, European Investment Bank, 2007.
- [2] E. Chadwick, "Results of Different Principles of Legislation in Europe," *Journal of the Royal Statistical Society A* 22, 381-420, 1859.
- [3] J. Cheng, "The Chicago Skyway Concession," Senior essay, Yale University, Fall 2010.
- [4] H. Demsetz, "Why Regulate Utilities," *Journal of Law and Economics*, 11, 55-66, 1968.
- [5] E. Engel, R. Fischer, and A. Galetovic, "Least-present-value-of-revenue Auctions and Highway Franchising," *Journal of Political Economy*, 109, 993-1020, 2001.
- [6] E. Engel, R. Fischer, and A. Galetovic, "The Basic Public Finance of Public-Private Partnerships," NBER Working Paper No. 13284, 2007.
- [7] E. Engel, R. Fischer, and A. Galetovic, "Soft budgets and renegotiations in public-private partnerships," Technical Report 15300, NBER, August 2009.
- [8] M. Hellowell and A.M. Pollock, "Written Evidence to the National Assembly for Wales Finance Committee with Regards to its Inquiry on Public Private Partnerships," University of Edinburgh, 2007.
- [9] R. Hemming, "Public-Private Partnerships, Government Guarantees and Fiscal Risk". Washington, DC: IMF, 2006.
- [10] J.T. Hodges and G. Dellacha, "Unsolicited Infrastructure Proposals: How Some Countries Introduce Competition and Transparency," Working Paper No. 1, PPIAF, 2007.
- [11] House of Lords Select Committee on Economic Affairs, "Private finance projects and offbalance sheet debt. Volume 1: Report. 1st Report of Session 2009-10. The Stationery Office Limited, March 2010.
- [12] H. Iseki, J. Eckert, K. Uchida, R. Dunn, and B.D. Taylor. "Task B-2: Status of legislative settings to facilitate public private partnerships in the U.S.". Research Report 32, California Path Program, Institute of Transportation Studies, University of California, Berkeley, July 2009.
- [13] R.J. Poole, "Lessons Learned from Early PPP Toll Road Projects." Presentation to the Florida Transportation Commission. August 6, 2006. [http://www.ftc.state.fl.us/PDF/Presentations/Lessons\\_Learned\\_from\\_Early\\_PPP\\_Toll\\_Road\\_Projects\\_\(8-14-06\).pdf](http://www.ftc.state.fl.us/PDF/Presentations/Lessons_Learned_from_Early_PPP_Toll_Road_Projects_(8-14-06).pdf).



- [14] J. Rall, J.B. Reed, and N.J. Farber. "Public-Private Partnerships for Transportation: A Toolkit for Legislators." National Conference of State Legislatures, 7700 East First Place, Denver, Colorado 80230, October 2010.
- [15] K. Small. "Private provision of highways: Economic issues." *Transport Reviews*, **30**, 1, 11-31, January 2010.
- [16] TOLLROADSnews, "Chicago CFO touts Skyway privatization benefits," TOLLROADSnews. 2005 30-December. <http://www.tollroadsnews.com/node/1392>.
- [17] Transportation Research Board of the National Academies, "Public Sector Decision Making for Public-Private Partnerships: A Synthesis of Highway Practice," National Cooperative Highway Research Program, 2009.

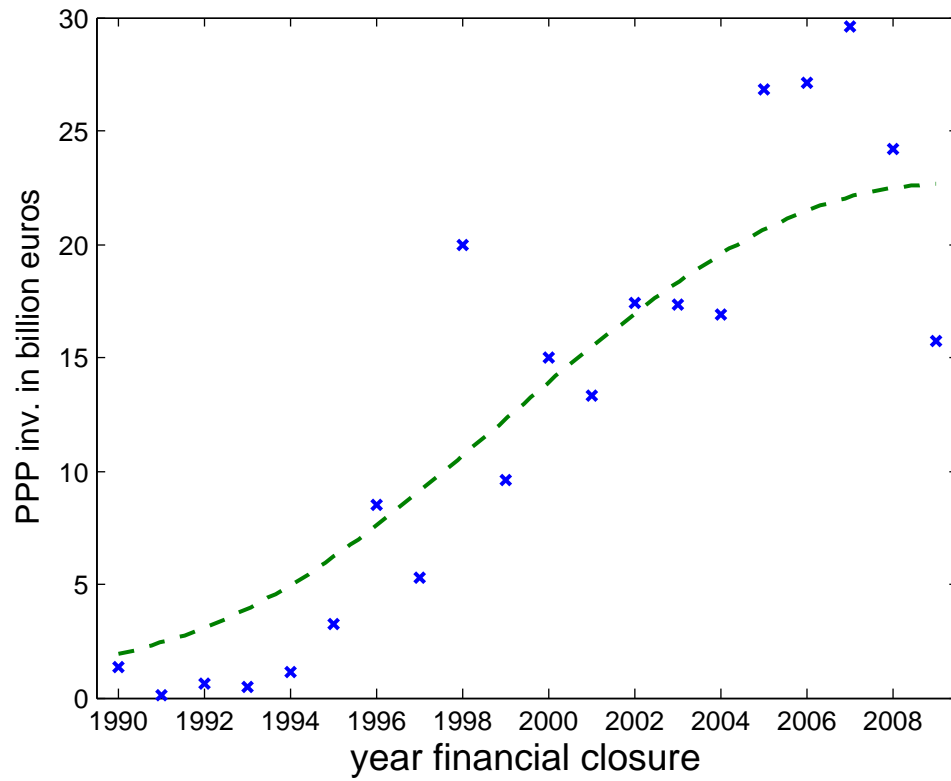


Figure 1: PPP investment in Europe

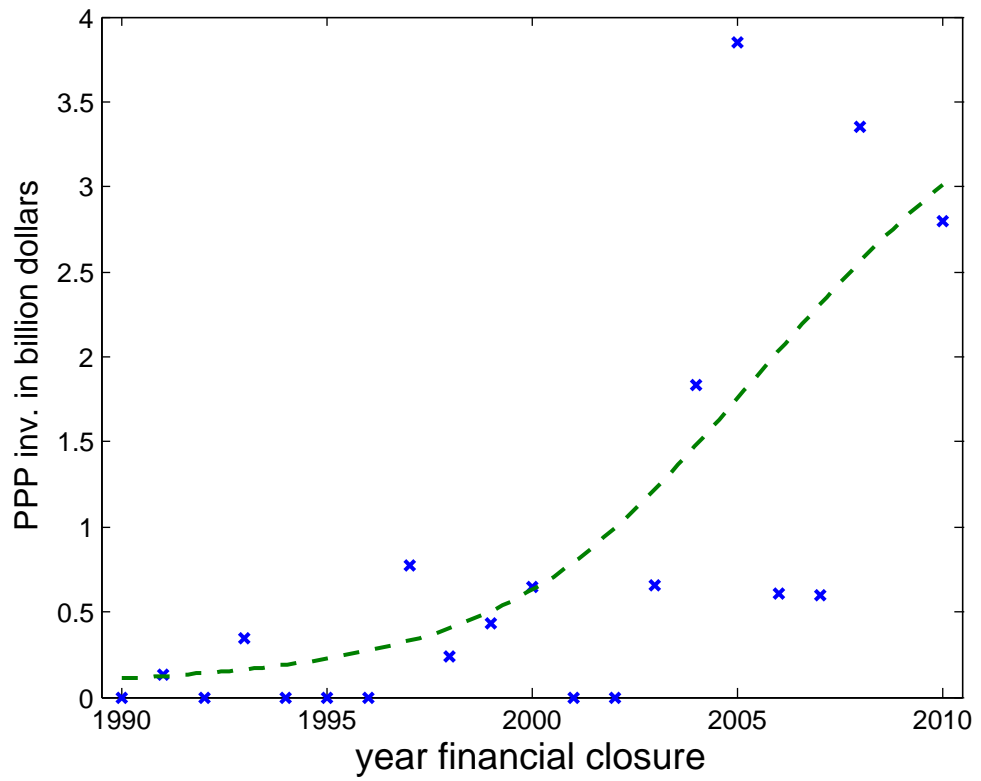


Figure 2: PPP investment in the US Transport Sector

Table 1: Transport PPPs in the United States: 1991–2010

Project	State	Investment (in US\$ millions)	Year fin. closure	Selection process*	Renegotiation**	Current status
IH 635 Managed Lanes	TX	2,800	2010	CB	No	Construction begins 2011
Eagle Commuter Rail Project	CO	2,100	2009	CB	No	Under construction
Port of Miami Tunnel	FL	914	2009	CB	Yes	Under construction
North Tarrant Express	TX	2,047	2009	CB	No	Under construction
I-595 Corridor	FL	1,814	2009	CB	No	Under construction
I-495 Beltway HOT Lanes	VA	1,998	2008	UO	PR	Under construction
SH 130 Seg. 5-6	TX	1,358	2008	CB	No	Under construction
Northwest Parkway	CO	603	2007	CB	No	Operational. Went from public road to PPP
Pocahontas Parkway	VA	611	2006	UO	Yes	Near default 2005, renegotiated, expected completion 2011
Indiana Toll Road	IN	3,850	2005	CB	Yes	In operation. Went from public road to PPP
Chicago Skyway	IL	1,830	2004	CB	No	Operational. Went from public road to PPP
Southbay Expressway (SR 125)	CA	658	2003	CB	Yes	Operational. Bankrupt 2010
Las Vegas Monorail	NV	650	2000	None	PR	Operational. Bankrupt 2010
Rte. 3 Boston	MA	385	1999	CB	No	Operational
Foley Beach Express	AL	44	1999	UO	No	Operational. Governor's son main proponent
Greenville Southern Connector	SC	240	1998	CB	No	Operational. Bankrupt 2010
JFK Terminal 4	NY/NJ	689	1997	CB	No	Operational
Camino Colombia Toll Road	TX	85	1997	UO	No	Foreclosed 2003, repurchased by Texas DOT
Dulles Greenway	VA	350	1993	UO	Yes	See main text for details
Orange County SR 91 Express Lanes	CA	130	1991	CB	Yes	See main text for details

Source: Public Work Financing, October 2010, and other sources.

\* CB=competitive bidding, UO=unsolicited offer.

\*\* Significant changes in initial contract terms to the advantage of the firm. PR=pending renegotiation.

Table 2: PPP Investment in Europe\*

Country	Total Investment (1990-2006, MM €)	Fraction of public investment (2001-2006, %)
Belgium	2,112	3.5
France	7,670	1.3
Germany	5,658	1.5
Greece	7,600	5.9
Hungary	5,294	7.3
Italy	7,269	2.5
Netherlands	3,339	2.2
Portugal	11,254	22.8
Spain	24,886	6.9
UK	112,429	32.5**

\*Source: Blanc-Brude et al. (2007). 10 countries with most investment.

\*\*If the London Underground is excluded, this becomes 20%.

Table 3: PVR highway concessions in Chile and winning bids

Name of Project	Month/year auctioned	Winning bid (MMUS\$)
Ruta 68 (Santiago-Valparaíso-Viña del Mar)	02/1998	513
Ruta 160, Tramo Coronel - Tres Pinos	04/2008	342
Acceso Vial Aeropuerto Arturo Merino Benítez	07/2008	56
Conexión Vial Melipilla-Camino de la Fruta	08/2008	46
Ruta 5 Vallenar-Caldera	11/2008	288
Autopista Concepción-Cabrero	01/2011	318
Alternativas de acceso a Iquique	01/2011	167

Source: Dirección de Concesiones, MOP. Exchange rate: 1UF=US\$43

**Centro de Economía Aplicada  
Departamento de Ingeniería Industrial  
Universidad de Chile**

**2011**

- 277. Public-Private Partnerships and Infrastructure Provision in the United States**  
Eduardo Engel, Ronald Fischer, Alexander Galetovic

**2010**

- 276. The economics of infrastructure finance: Public-private partnerships versus public provision**  
Eduardo Engel, Ronald Fischer y Alexander Galetovic
- 275. The Cost of Moral Hazard and Limited Liability in the Principal-Agent Problem**  
F. Balmaceda, S.R. Balseiro, J.R. Correa, N.E. Stier-Moses
- 274. Structural Unemployment and the Regulation of Product Market**  
Alexandre Janiak
- 273. Non-revelation Mechanisms in Many-to-One Markets**  
Antonio Romero-Medina y Matteo Triossi
- 272. Labor force heterogeneity: implications for the relation between aggregate volatility and government size**  
Alexandre Janiak y Paulo Santos Monteiro
- 271. Aggregate Implications of Employer Search and Recruiting Selection**  
Benjamín Villena Roldán
- 270. Wage dispersion and Recruiting Selection**  
Benjamín Villena Roldán
- 269. Parental decisions in a choice based school system: Analyzing the transition between primary and secondary school**  
Mattia Makovec, Alejandra Mizala y Andrés Barrera

**268. Public-Private Wage Gap In Latin America (1999-2007): A Matching Approach**  
Alejandra Mizala, Pilar Romaguera y Sebastián Gallegos

**267. Costly information acquisition. Better to toss a coin?**  
Matteo Triossi

**266. Firm-Provided Training and Labor Market Institutions**  
Felipe Balmaceda

## **2009**

**265. Soft budgets and Renegotiations in Public-Private Partnerships**  
Eduardo Engel, Ronald Fischer y Alexander Galetovic

**264. Information Asymmetries and an Endogenous Productivity Reversion Mechanism**  
Nicolás Figueroa y Oksana Leukhina

**263. The Effectiveness of Private Voucher Education: Evidence from Structural School Switches**  
Bernardo Lara, Alejandra Mizala y Andrea Repetto

**262. Renegociación de concesiones en Chile**  
Eduardo Engel, Ronald Fischer, Alexander Galetovic y Manuel Hermosilla

**261. Inflation and welfare in long-run equilibrium with firm dynamics**  
Alexandre Janiak y Paulo Santos Monteiro

**260. Conflict Resolution in the Electricity Sector - The Experts Panel of Chile**  
R. Fischer, R. Palma-Behnke y J. Guevara-Cedeño

**259. Economic Performance, creditor protection and labor inflexibility**  
Felipe Balmaceda y Ronald Fischer

**258. Effective Schools for Low Income Children: a Study of Chile's Sociedad de Instrucción Primaria**  
Francisco Henríquez, Alejandra Mizala y Andrea Repetto

**257. Public-Private Partnerships: when and how**  
Eduardo Engel, Ronald Fischer y Alexander Galetovic

## **2008**

**256. Pricing with markups in industries with increasing marginal costs**  
José R. Correa, Nicolás Figueroa y Nicolás E. Stier-Moses



255. **Implementation with renegotiation when preferences and feasible sets are state dependent**  
Luis Corchón y Matteo Triossi
254. **Evaluación de estrategias de desarrollo para alcanzar los objetivos del Milenio en América Latina. El caso de Chile**  
Raúl O’Ryan, Carlos J. de Miguel y Camilo Lagos
253. **Welfare in models of trade with heterogeneous firms**  
Alexandre Janiak
252. **Firm-Provided Training and Labor Market Policies**  
Felipe Balmaceda
251. **Emerging Markets Variance Shocks: Local or International in Origin?**  
Viviana Fernández y Brian M. Lucey
250. **Economic performance, creditor protection and labor inflexibility**  
Ronald Fischer
249. **Loyalty inducing programs and competition with homogeneous goods**  
N. Figueroa, R. Fischer y S. Infante
248. **Local social capital and geographical mobility. A theory**  
Quentin David, Alexandre Janiak y Etienne Wasmer
247. **On the planner’s loss due to lack of information in bayesian mechanism design**  
José R. Correa y Nicolás Figueroa
246. **Política comercial estratégica en el mercado aéreo chileno**  
Ronald Fischer
245. **A large firm model of the labor market with entry, exit and search frictions**  
Alexandre Janiak
244. **Optimal resource extraction contracts under threat of expropriation**  
Eduardo Engel y Ronald Fischer

## **2007**

243. **The behavior of stock returns in the Asia-Pacific mining industry following the Iraq war**  
Viviana Fernandez

242. **Multi-period hedge ratios for a multi-asset portfolio when accounting for returns comovement**  
Viviana Fernández
241. **Competition with asymmetric switching costs**  
S. Infante, N. Figueroa y R. Fischer
240. **A Note on the Comparative Statics of Optimal Procurement Auctions**  
Gonzalo Cisternas y Nicolás Figueroa
239. **Parental choice and school markets: The impact of information approximating school effectiveness**  
Alejandra Mizala y Miguel Urquiola
238. **Marginal Cost Pricing in Hydro-Thermal Power Industries: Is a Capacity Charge Always Needed?**  
M. Soledad Arellano and Pablo Serra
237. **What to put on the table**  
Nicolas Figueroa y Vasiliki Skreta
236. **Estimating Discount Functions with Consumption Choices over the Lifecycle**  
David Laibson, Andrea Repetto y Jeremy Tobacman
235. **La economía política de la reforma educacional en Chile**  
Alejandra Mizala
234. **The Basic Public Finance of Public-Private Partnerships**  
Eduardo Engel, Ronald Fischer y Alexander Galetovic
233. **Sustitución entre Telefonía Fija y Móvil en Chile**  
M. Soledad Arellano y José Miguel Benavente
232. **Note on Optimal Auctions**  
Nicolás Figueroa y Vasiliki Skreta
231. **The Role of Outside Options in Auction Design**  
Nicolás Figueroa y Vasiliki Skreta
230. **Sequential Procurement Auctions and Their Effect on Investment Decisions**  
Gonzalo Cisternas y Nicolás Figueroa

\* Para ver listado de números anteriores ir a <http://www.cea-uchile.cl/>.