Role of the Private Sector in the Management of Highways

A Primer on Public-Private Partnerships

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Abstract

A number of states have used public-private partnerships (PPPs), usually funded at least partially by tolls, to manage highway or bridge projects. Whether to make more use of PPPs has been the subject of considerable debate. If PPPs are to improve social welfare through their management of highway and bridge projects, how the government structures each contract with a private partner is an important consideration. To increase social welfare, PPP contracts need to achieve a balance between the price of tolls, the share of costs borne by taxpayers, and the impact of pricing on the rest of the highway network. Tolls should be high enough to limit congestion but low enough to attract enough traffic to use the additional highway capacity and limit congestion on parallel roads and highways. State departments of transportation should use contracts that pass along some risk to the private partner but include arrangements to limit that risk, such as variable-term contracts and minimum revenue guarantees, in order to reduce financing costs. It is also important that highway departments clearly communicate project goals and tradeoffs involved to voters and their elected representatives.

JEL codes: R42, H44

Keywords: infrastructure funding, transportation investment, network externalities, public-private partnership, toll roads, road construction, road maintenance, congestion, principal-agent problem, public choice, financing, risk management

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A Primer on Public-Private Partnerships

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Introduction

In recent years, a number of highways have been built using public-private partnership (PPP) arrangements. Some states have also chosen to offer PPP concessions to private firms to expand existing highways or change the way they are managed. Public-private partnerships serve a variety of purposes, such as passing along some risks to private firms, accelerating project delivery, increasing the availability of funds for highways, or providing incentives for better asset management or customer service.[1] Some of these PPPs have done well, but others have been financially unsuccessful, with the private firms restructuring or declaring bankruptcy. Other PPPs have evoked considerable public opposition and, in some states (such as Texas), have provoked a backlash that contributed to the state's passing legislation to make entering into PPP agreements more difficult.[2]

Critics of PPPs argue that because private firms are motivated by profits, they cannot be counted on to serve the public interest in managing transportation infrastructure.[3] In many cases, however, it is the public partner that specifies the terms of the contract, which motivates the decisions of the private partner. Many of the most serious problems with PPPs stem not from

[1] US Department of Transportation, Federal Highway Administration, *Public-Private Partnership Concessions for Highway Projects*, October 2010.
[2] Recently the Texas House of Representatives rejected a bill that would have allowed the Texas Department of Transportation to use PPPs to fund several highway projects. See Kyle Shelton, "Tapping the Brakes on Public-Private Partnership in Texas," *The Avenue*, Brookings, May 16, 2017, https://www.brookings.edu/blog/the-avenue/2017/05/16/tapping-the-brakes-on-public-private-partnership-in-texas.
[3] Phineas Baxandall, *Private Roads, Public Costs: The Facts about Toll Road Privatization and How to Protect the Public* (Denver, CO: US PIRG Education Fund, Spring 2009).

inadequate performance of the private firm but from the actions or decisions of the government partner concerning terms of the agreement. Highway PPPs could work better if government clearly stated the goals of each project and if incentives were better aligned with the role that each partner could play in serving the public interest and facilitating the accomplishment of the goals of the project, including managing risks.

Even if highways are managed and funded by government using a traditional approach to project delivery, private firms play an important role. Most highways are built by private contractors, who bid for contracts. A PPP involves expanding the role of the private sector so that a private firm manages multiple phases of a highway project, including some combination of design, construction, finance, operations, and maintenance. When private firms assume some of the roles traditionally played by a government agency, they bring some advantages to highway planning, financing, and management. By combining several steps in the process of designing, financing, building, operating, and maintaining a highway, they may be able to reduce costs more than a public highway agency could. If they have a major ownership stake, managers of private firms benefit directly from anything they do that reduces costs.

The purpose of this paper is to evaluate factors that affect how well PPPs serve the public interest by using social welfare as the normative criterion, and to propose ways to better design and structure PPP agreements. Social welfare is calculated as the sum of gains and losses to all stakeholders. The approach used will be to compare outcomes of PPPs with outcomes of traditional public provision.

The paper begins with a discussion of the role of private firms in PPPs and the incentives these firms face. The next section discusses the economics of PPP arrangements. Following that, some evidence and illustrations are presented that focus mostly on PPPs in the United States and

how those PPPs have been structured. In many US PPPs, the private partner is responsible for financing and bears a substantial share of the risk. It may be possible to reduce costs and improve social welfare by having the government bear more of the risks. The next section discusses how PPPs can be improved to better serve the public interest. It emphasizes setting incentives and performance specifications to maximize welfare, allocate risk efficiently, promote transparency, and account for the relationship between highways within a network. The final section discusses conclusions.

How Public-Private Partnerships Work

Rationale for PPPs

According to the Federal Highway Administration, PPPs

> differ from conventional procurements where the public sponsor controls each phase of the infrastructure development process—design, construction, finance, operations and maintenance. With a P3, a single private entity (which may be a consortium of several private companies) assumes responsibility for more than one development phase, accepting risks and seeking rewards.[4]

With a PPP contract, the public sponsor can combine project elements and assign responsibility for them to a private partner in a way that best serves the goals of a particular project while also transferring project risks from taxpayers to professional investors.[5]

Public-private partnerships are chosen because of a perception that in some cases, if given a greater role, private firms could manage public assets more efficiently. Nevertheless, because the assets serve a public purpose, fully privatizing the assets is not an option. To understand how PPPs work, we first consider the way a private firm would manage a highway.

[4] US Department of Transportation, Federal Highway Administration, *Risk Assessment for Public-Private Partnerships: A Primer*, December 2012, https://www.fhwa.dot.gov/ipd/pdfs/p3/p3_risk_assessment_primer_122612.pdf.

[5] This definition of a PPP was suggested by an anonymous reviewer.

When a private firm manages a road or highway, its goal is to maximize profit. This goal is consistent with serving many dimensions of the public interest, but not all of them. For a highway, the public interest includes promoting the safety of motorists who use the highway, limiting congestion, and maintaining pavement quality, all while being conscious of costs. A profit-maximizing firm, whose earnings depend on how many people use the highway and how much they pay to do so, will seek to achieve these objectives in order to attract more customers.

A private firm, however, does not have incentives to take account of the externalities associated with the way it manages a particular highway. Several kinds of externalities are associated with managing a highway. Highways and highway users may generate environmental externalities that include air and water pollution, runoff, and noise. The problem of environmental externalities, though important, is not essentially different whether the highway is privately or publicly managed. In either case, design standards can be enforced to control runoff and associated water pollution and to limit noise, and emissions standards can be enforced to limit air pollution.

Perhaps the most intractable challenge is network effects. These are effects on users of other roads and highways and other transport modes, including pedestrians. How a road or highway is managed will affect traffic on parallel and connecting roads and highways. These effects are important to the public and to governments that manage other parts of the road and highway network.

The government cannot count on a private profit-maximizing firm that is managing a particular highway to consider changes in the cost or benefits to users of the rest of the highway network that result from the firm's actions. The private firm does benefit by coordinating with the government regarding plans and actions that affect connecting roads and highways, but its

interests may conflict with those of the government and the public concerning parallel roads and highways.

The conflicting interests of a private highway manager and the government are particularly problematic if government roads and highways are funded by taxes and the private highway is funded by tolls. The higher the toll, the fewer the vehicles that will use the toll road. Too high a toll will result in underuse of the highway and overuse of alternative roads, increasing congestion and maintenance for nontoll routes. Privatizing the management of highways entirely may thus lead to a situation where optimal pricing by the private contractor leads to network inefficiency and misallocation of traffic. This is an important reason why, in the United States, governments do not permit private firms to own or fully control highways. Instead, a PPP arrangement is used so that the government can take steps to get the private partner to manage the highway in the service of several objectives compatible with the public interest. Having a stake in a PPP, the government retains some latitude to balance the private interest of the PPP and the public interest, including the difficult question of promoting efficiency and cost-effectiveness at the network level.

How PPPs Compare with Traditional Procurement

In highway projects, what sets PPPs apart is the role the private partner plays. In traditional arrangements, a government contracts with several different firms, each of which is responsible for a different phase of the highway project. A PPP, in turn, combines separate contracts, with a private firm undertaking or overseeing more than one aspect of a project, such

as designing, building, financing, operating, and maintaining (DBFOM).[6] This vertical integration encourages economic efficiency at the project level. A PPP will offer a bid reflecting the sum of the costs and revenue expected from all its different contracts jointly. For example, hiring the construction contractor that offers the lowest bid—a common practice when government manages each aspect of the project—may not be the best choice if the proposed method of construction results in higher maintenance costs that offset savings in construction costs.

When a state department of transportation (DOT) oversees highway projects by itself, a common approach is for the DOT to enter into a design-bid-build contract. First, the design of the project is bid out, and then the construction of that design is bid out separately. Tax-exempt municipal bonds are used to finance any debts incurred in constructing the project once a funding plan, which typically involves revenue from user fees, is set in place. The government may also enter into separate contracts with private firms to operate or maintain the highway.

In a DBFOM contract, the government sometimes contracts with a special purpose vehicle company created for a specific project, whose responsibility is to manage all the different aspects of the process.[7] The company may enter into separate contracts with a construction company to design and build the project, with lenders to finance it, and with a facilities management company for operation and maintenance.

[6] For consistency, I use the term public-private partnership to refer to arrangements that are sometimes described by other terms, such as private finance initiative, concession agreement, or partial privatization.
[7] Darrin Grimsey and Mervyn Lewis, "Public Private Partnerships and Public Procurement," *Agenda* 14, no. 2 (2007): 171–88.

Economic Analysis of PPP Arrangements

Critieria for Evaluating Public-Private Partnerships

Because the public interest is multifaceted, the profitability of the PPP may not be an adequate measure of its success. A better measure is "total social welfare," defined as the weighted sum of the consumer surplus, producer surplus, employee surplus, and taxpayer surplus from a project.[8] We can then compare a PPP project to a public-sector comparator for provision of the same goods or services, estimating which one produces the biggest gain in social welfare relative to the status quo. This approach to calculating social welfare raises normative questions about whose interests count and how to weigh the welfare of competing groups when a project redistributes income from one group (such as taxpayers) to other groups (such as consumers or producers).

An alternative approach could define the public interest as the welfare of voters or residents of the state or local government that undertakes the PPP. This approach would not consider or would give less weight to the interests of those producers or consumers who are not residents or voters. For example, if the project is financed by foreign investors, the effect of the agreement on their welfare might not be counted. This approach has clearly influenced the contractual arrangements governing some PPPs and may be appropriate for roads and highways that were previously funded primarily by state and local governments, but it does not seem appropriate for assessing PPPs that affect the interstate highway system, which was funded largely by the federal government.

[8] For a more detailed exposition of this approach, see Anthony Boardman and Aidan Vining, "The Political Economy of Public-Private Partnerships and Analysis of Their Social Value," *Annals of Public and Comparative Economics* 83, no. 2 (2012): 117–41. They argue that allocative efficiency is the appropriate normative criterion and thus that, for a first approximation, distributional weights should be 1.

Theory of How PPPs Can Be Used to Increase Social Welfare

Proponents of PPPs in Europe, especially in the United Kingdom, argue that for certain kinds of projects, PPPs provide better value for the money than public provision does. Other goals play a more important role in motivating governments in the United States to use PPPs, among them reducing congestion, reducing "wasteful political and special-purpose spending by incorporating financial accountability for transport investment decisions," gaining access to private capital, providing an alternative source of highway funding as revenue from fuel taxes declines because of improved fuel efficiency and use of alternative fuel vehicles, and accelerating project delivery by providing up-front capital for a project's full cost.[9]

Why or under what circumstances can we expect these goals to be better accomplished when, instead of a government department of transportation, a private firm takes responsibility for two or more phases of a highway project? The profit motive is likely to have a bigger effect on private highway managers than on government agencies, because with a well-structured agreement, the income of the owner of the private firm will depend on how well the highway project is managed. Private firms may therefore manage projects at a lower cost than government agencies and may be able to deliver projects in a timelier manner. Market incentives are a key factor influencing costs and the time it takes to complete a project, since "PPP developers meet deadlines and budgets, or they lose money and someone gets fired."[10]

Although a PPP might lower the total costs to government, it does impose an additional burden in terms of the costs of negotiating the agreement and monitoring the private partner.

[9] US Department of Transportation, *Innovation Wave: An Update on the Burgeoning Private Sector Role in U.S. Highway and Transit Infrastructure*, July 18, 2008, https://www.fhwa.dot.gov/reports/pppwave/.
[10] William Reinhardt, "The Role of Performance-Based Infrastructure," *Public Works Financing*, November 2014.

These transaction costs could be substantial, and yet some of them might not be entered in the project's budget but instead be accounted as general government expenses.[11]

Exactly how can PPPs lower costs to government? Some evidence suggests that cost reductions are primarily the result of private partners paying lower wages, imposing more onerous working conditions, or requiring increased work intensity.[12] Unless they boost output and job creation enough to compensate for the loss of welfare to employees, such cost reductions do not increase social welfare.

The goal of achieving better value for the money depends not only on lowering costs but also on providing the same or better quality than if government manages the highway. How private managers are paid, including whether they collect tolls from highway users, affects their willingness to provide high-quality roads and highways and manage them to better serve the interests of users. Their incentive to do so will be enhanced if they can set the level of tolls and keep the revenue or if the government pays them in proportion to the number of users or rewards them for satisfying quality standards.

One way to encourage efficient use of a highway is to charge different tolls depending on how much damage each vehicle causes to the highway surface. Government toll authorities often set tolls based on the number of axles rather than weight per axle, charging heavy vehicles less than the cost of the damage they cause.[13] In turn, PPPs can increase their profits by varying tolls

[11] By one estimate, transaction costs in the procurement phase average well over 10 percent of the capital value of a project. See Gerti Dudkin and Timo Valila, "Transactions Costs in Public-Private Partnerships: A First Look at the Evidence," European Investment Bank, 2005, accessed September 5, 2017, http://www.eib.org/epec/resources /guide-to-guidance-en.

[12] John Quiggin, "The Fiscal Gains from Contracting Out: Transfers or Efficiency Improvements?," *Australian Economic Review* 27, no. 3 (1994): 97–102.

[13] It is more politically acceptable for private firms than for government toll agencies to charge tolls based on costs. See Eduardo Engel, Ronald Fischer, Alexander Galetovic, Ernesto Shargrodsky, and Juan-Pablo Montero, "Privatizing Highways in Latin America: Fixing What Went Wrong," *Economia* 4, no. 1 (2003): 129–64.

with the weight per axle of the vehicle, which gives operators of heavy vehicles an incentive to use trucks with more axles, carry lighter loads, or reduce their mileage.

Private highway managers who collect tolls have an alternative source of funding and a tool to modulate congestion and potentially improve financial accountability. Nevertheless, the level of toll they would choose might not be conducive to welfare maximization. A PPP would earn more by charging a toll that is high enough to result in freely flowing traffic, so as to maximize the number of paying vehicles on the highway. Private firms also have an incentive to improve technology in order to reduce the cost of collecting the toll, assess the tolls owed by vehicles of different weights, and vary the toll over time to account for differences in highway congestion.

Governments sometimes build highways where demand is insufficient and benefits are less than costs. By contrast, a private firm whose profit depends on toll revenues would not build a highway unless it expected sufficient demand to cover the construction costs.

Although government agencies manage some toll highways and earn revenues by doing so, they sometimes fail to build or expand highways in places where there is enough demand that benefits of additional highway capacity would exceed the costs. If private firms anticipate sufficient demand, they may be willing to bear the risk of financing and building a highway before a state DOT does so. The Dulles Greenway is an example where a private firm, anticipating future demand, financed and built a highway before the government did.[14] Although private firms sometimes make such decisions based on overly optimistic forecasts of future

[14] James R. Hardcastle, "A $326 Million Private Toll Road to Spur Growth: In Northern Virginia, Investors Are Betting It Helps Development," *New York Times*, July 24, 1994, https://search-proquest-com.mutex.gmu.edu /cv_786252/docview/109311171/fulltextPDF/6A789A26E8EE412EPQ/4?accountid=14541.

demand, their willingness to bear such risks results in highways that would not be built if PPPs were not permitted.

Whether PPPs actually improve social welfare depends on a number of factors. Among them are contractual arrangements determining how the highway is funded, how the private partner is paid, the length of the concession, and procedures used for deciding which private firm manages the project and what aspects of the project they are responsible for.

Another advantage of PPPs over direct privatization of highway management is that the government remains involved in running the project. This allows the government to better see the operative details and decisions of the project. Transparency is key in managing the principal-agent relationship—in this case, the government-PPP contract. See box 1 for more on the principal-agent problem.

Box 1. Principal-Agent Problems and Public Choice Theory

The principal-agent problem concerns how well an agent carries out the interests of a principal. In the provision of public goods and services, the principal is the public and the government is its agent. In the case of highway management, the government acts as principal and the contractor as agent. The government is accountable to the public by several mechanisms, one of which is the election process.

The government partner must provide incentives to the private partner to pursue the goals it has established, and it must incur monitoring costs. These monitoring costs in turn reduce the advantages of having the government work with a private partner. The private partner may also be accountable to users of the highway, particularly if the users pay tolls when they travel on it.

In addition to the incentives of the private partner, incentives influence how the government pursues the interests of taxpayers and highway users. Public choice theory emphasizes that politicians will choose policies that optimize the achievement of their private goals, such as the probability of being reelected to office. Voters are

inclined to be rationally ignorant in their perceptions of the costs and consequences of proposed policies. Their inaccurate perceptions will determine whom they vote for.

Governments tend to "underweight future liabilities" because politicians expect to remain in office for a limited time.[15] Some evidence suggests that elected officials act as though voters do not exhibit rational expectations with respect to current versus future expenditures.[16] If this "fiscal illusion" accurately describes voters' thinking, then government officials can benefit politically by delivering project benefits now but postponing payment until the future.[17]

Risks and Their Management

Risk and who bears it is an important dimension of PPP arrangements. Because of political considerations, governments do not necessarily negotiate contracts that assign risk in a way that enhances social welfare.

Highway projects involve a variety of risks, including design risks, regulatory risks, construction risks, traffic risks, financing risks, and revenue risks. A taxonomy of risks is included in box 2.

Box 2. Risks and Risk Management in PPPs

Risks affecting PPP projects can be categorized in a number of ways.[18] The different kinds of risks that affect one or both partners in a PPP agreement include the following:

[15] Boardman and Vining, "The Political Economy of Public-Private Partnerships."
[16] Joseph D. Ura and Erica M. Socker, "The Behavioral Political Economy of Budget Deficits: How Starve the Beast Policies Feed the Machine," *Forum* 9, no. 2 (2011): article 7.
[17] Boardman and Vining, "The Political Economy of Public-Private Partnerships." Government accounting rules, by not accounting for future financial obligations, may also create a bias toward projects financed with private debt that government must pay back over time.
[18] This list is based on the author's combining and prioritizing categories of risk based on those listed in US Department of Transportation, Federal Highway Administration, *Risk Assessment for Public-Private Partnerships*. For a different taxonomy of key risks applicable to PPP projects, see Infrastructure Australia, *National Public Private Partnership Guidelines Overview*, December 2008, https://ausinf.affinitext.com/viewer/book?id=5319 &toc_id=7377510#PG_7377463_78464234.

- Political risk involves the cancellation of projects, the inability of public and private partners to reach an agreement or resolve a conflict, and the failure to appropriate sufficient funds.
- Regulatory risks arise from the environmental review of projects, government-initiated changes in contract terms after the agreement is signed, and the cost and difficulty of obtaining required permits.
- Site risks include costs of acquiring right-of-way, physical conditions, and community relations issues associated with the location of the project.
- Procurement risks include risks associated with evaluating and choosing the private partner for a project.
- Financing risks include being unable to obtain adequate financing and making decisions that could lead to default caused by overestimating project revenues or underestimating project costs.
- Engineering and construction risks include planning errors or flaws in design that lead to cost increases, delays, or environmental and safety problems, as well as increases in labor or materials costs.
- Market risks arise from changes in market conditions that result in one or both parties incurring substantial losses resulting from changes in costs or changes in demand that were not accounted for in the contract.
- Operation and maintenance risks include problems with the physical condition of facilities, changes in operation and maintenance costs, and lost revenue resulting from unanticipated closure.

With public-sector financing, the public sector incurs the financing costs and bears the risk that toll or earmarked tax revenues will not be sufficient to repay the debt, so general government revenues may be needed to make up the difference. By contrast, a PPP concession that includes financing allocates to the private partner some or all risks and rewards associated with project financing. The government partner could share the risk, for example, by guaranteeing a minimum amount of revenue to the private partner. In some cases, government also shares in the rewards, reaping a share of the profits.

Another important risk faced by a private provider is regulatory risk, the risk that the government could change the rules in a way that negatively affects the PPP contract.[19] Governments can limit this risk by assuring a private service provider that rules will not change. If, however, government wants to preserve the option of changing the rules in response to new information, then public provision makes more sense, because it would likely be too costly for a private firm to bear this risk.[20] The greater the flexibility desired by the government and its constituents, the less viable a PPP arrangement will be. Such arrangements work best in a context where project objectives and the criteria for measuring whether the objectives are achieved can be spelled out clearly in advance and the government's options for pursuing discretionary changes in firm-specific regulations are contractually limited.

The private partner will need to be compensated for bearing any share of the risk. If the additional costs exceed the benefits to the public from the reduced risk, having a private partner bear the risk may make the public worse off. Government officials may have an incentive to pay a substantial risk premium so that private firms will bear project risks, since a failed project could end someone's political career.

A private firm may require a large risk premium to be willing to bear the political uncertainties associated with a project, including the possibility that government will take advantage of the fact that it has more leeway than a private firm to abrogate contracts.[21] In some cases, however, the private partner does not bear all the risk that it was paid to bear.[22] If, for

[19] Quiggin, "The Fiscal Gains from Contracting Out."
[20] As discussed later, permitting certain kinds of changes, such as a government-imposed change in tolls, need not have much effect on the risk faced by the private partner, if compensation is provided for in the terms of the contract, such as with revenue guarantees for the private partner.
[21] Boardman and Vining, "The Political Economy of Public-Private Partnerships."
[22] Aidan Vining, Anthony Boardman, and Finn Poschmann, "Public Private Partnerships in the US and Canada: There Are No 'Free Lunches,'" *Journal of Comparative Policy Analysis* 7, no. 3 (2005): 199–220.

example, demand turns out to be lower than anticipated, governments sometimes renegotiate contract terms in a way that reduces the losses of the private partner.

What happens when outcomes differ from what was anticipated? Sometimes the agreement is renegotiated, but renegotiation is costly and may contribute to negative public perceptions, reducing the viability of future PPP agreements.[23] Renegotiations may be the result of unforeseen changes in circumstances, the incompleteness of PPP contracts, or both. At its worst, it is one partner's "strategic response to rent extraction opportunities . . . at the expense of other parties in the deal."[24]

Certain firms may bid aggressively even if they cannot afford to fulfill their bids, because they are confident in their ability to renegotiate ex post facto.[25] This is a risk for the government, because the terms of renegotiation are no longer driven by the stress of competition with other bidders. Knowing it is costly economically and politically for the public party to seek another contractor, the private partner usually enjoys sufficient bargaining power to get better terms.[26]

Governments may also renegotiate in pursuit of a political agenda. Public-private partnerships usually involve long-term contracts. Contracts that may be acceptable to voters at the time they are negotiated might not be consistent with the political interests of voters in the future. Changes in the governing party may result in government's seeking to renegotiate

[23] Jonathan Gifford, Lisardo Bolanos, and Nobuhiko Daito, "Renegotiation of Transportation Public-Private Partnership: The US Experience" (Discussion Paper No. 2014–16, OECD International Transport Forum, Washington, DC, 2014).
[24] Gifford, Bolanos, and Daito, "Renegotiation of Transportation Public-Private Partnership."
[25] For an example of this, see L. Alcazar, M. Abdala, and M. Shirley, "The Buenos Aires Water Concession," in *Thirsting for Efficiency: The Economics and Politics of Urban Water Systems* (Washington, DC: World Bank, 2002), 65–102, cited in Julie de Brux, "The Dark and Bright Sides of Renegotiation: An Application to Transport Concession Contracts," *Utilities Policy* 18 (2010): 77–85.
[26] J. L. Guasch, A. Kartacheva, and L. Quesada, "Contract Renegotiations in Latin America and Caribbean Region: An Economic Analysis and Empirical Implications" (World Bank Policy Research Working Paper, World Bank, Washington, DC, 2000), cited in de Brux, "The Dark and Bright Sides of Renegotiation."

contracts on terms that appeal to voters, such as by lowering tolls.[27] This happened with the Elizabeth River Crossings project between Norfolk and Portsmouth, Virginia. In 2014, when tolls were set to begin, the newly elected governor, Terry McAuliffe, renegotiated the contract to reduce toll rates in exchange for an $82.5 million payment from the state.[28]

Tolls, Funding, and Compensation of the Private Partner

Private firms managing highways can be paid in several ways. How the firm is paid influences both the amount of net benefits and costs to the different parties as well as the distribution of those benefits and costs. Most PPPs are funded with revenue from tolls, but some are funded with availability payments, in which the government pays the private partner an agreed payment when the facility is available and operating at a specified performance level.[29] This approach is currently being used to fund bridge reconstruction in Pennsylvania, with funds from the Pennsylvania Department of Transportation.

In cases where the private partner collects toll revenue, several different contractual relationships between the government and the private partner are possible. The private partner could lease the highway from the government in exchange for an up-front or periodic payment, as was done with the Chicago Skyway and the Indiana Toll Road.[30] Alternatively, the private partner could be given a concession that lasts for a period of time, subject to an agreement concerning the quality of services to be provided and the toll that the private partner may charge.

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[27] J. L. Guasch, J. J. Laffont, and S. Straub, "Concession of Infrastructure in Latin America: Government-Led Renegotiation" (Working Paper, University of Edinburgh, Edinburgh, Scotland, 2006).
[28] Gifford, Bolanos, and Daito, "Renegotiation of Transportation Public-Private Partnership."
[29] Availability payments are usually funded with tax revenue, but in some cases, such as for the Interstate 595 express lanes in Florida, availability payments are funded by tolls collected by the government.
[30] Lease payments are often used for brownfield PPPs, where an existing highway is privatized, but have rarely been used for greenfield projects, where virgin land is used, which are much less likely to be profitable once capital costs are accounted for.

This is the approach used for many projects, including the tolled express lanes on the Capital Beltway in Virginia.

The approach of giving away the concession (in exchange for the private partner agreeing to a specified toll schedule) has advantages over leasing a highway when the government wishes to increase vehicular flow. With a lease, the government can earn more revenue by allowing the private partner to set tolls at its discretion.

Socially Efficient Tolls vs. Profit Maximization

Service quality may be enhanced by tolling if private partners use those revenues to enhance maintenance, but high tolls may result in excess capacity and too much diversion of traffic to alternate routes. Therefore, the lower tolls usually set by governments may be more efficient and result in better use of highway capacity. Recall that highway profitability is not the same as network efficiency, and it may be that lower tolls induce efficiency across the road network better than tolls that would maximize revenue from traffic along that highway.

When building a new highway (a greenfield project) that does not receive government subsidies, the anticipated toll revenue must be high enough to cover the private firm's amortized costs of building, operating, and managing the highway. Setting too high a toll, however, may redirect traffic to parallel highways and streets, increasing congestion and reducing the welfare of drivers who use those highways and possibly also that of residents who live nearby. In addition to consumer welfare losses, government may have to incur higher costs to maintain those alternate routes where traffic was diverted. This total consumer and government welfare loss is called deadweight loss.

Concerns about traffic diversion, especially the diversion of trucks to parallel highways, motivated the Ohio Turnpike Commission to reduce tolls in 2005.[31] Private firms managing toll highways, such as the firm managing the Dulles Greenway in northern Virginia, have been less willing to reduce tolls in spite of considerable excess capacity and diversion of traffic to parallel roads. For firms that financed greenfield projects, the costs of servicing their debt are such that they may risk bankruptcy if they set tolls much below the profit-maximizing level.

If a toll is used on an otherwise congested highway, welfare can be increased by varying the level of the toll with demand to limit congestion so that traffic can travel at or close to highway speed at all times. One simple pricing strategy is to increase tolls during rush hours and decrease them at other times. Requiring or at least encouraging drivers to track their tolls electronically rather than paying cash could reduce or eliminate congestion around tollbooths.

On some highways where congestion would be severe without a toll or with tolls set at a lower level, congestion tolls could increase throughput on the highway.[32] In this case, raising the toll to reduce or eliminate congestion would produce not a deadweight loss but instead a net gain in efficiency. Some drivers would be worse off, but others would be better off, because the time savings from reduced congestion would exceed the cost in higher tolls. Even if the sum of the effects on drivers were a net loss, that loss would be more than offset by the sum of gains to producers and the government from the higher tolls. As long as tolls do not reduce throughput on a highway, the additional toll paid by consumers equals the additional revenue earned by producers, so any time savings is a net gain.

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[31] Peter Swan and Michael Belzer, "Empirical Evidence of Toll Road Traffic Diversion and Implications for Highway Infrastructure Privatization," *TheNewspaper.com*, November 1, 2007, http://thenewspaper.com/rlc/docs /2008/tolldiversion.pdf.

[32] Bottlenecks resulting from congestion can cause throughput to drop by up to 25 percent, according to literature cited in Jonathan Hall, "Pareto Improvements from Lexus Lanes: The Effects of Pricing a Portion of the Lanes on Congested Highways," *Journal of Public Economics* 158 (2018): 113–25.

The question that must be answered in PPP contracts is how much latitude to give the private partner in setting tolls. Without government oversight, private partners will likely set the toll at a level consistent with monopoly pricing. If there is too much government oversight, however, tolls may be set below the marginal cost simply for political reasons. If government specifies the schedule of tolls that a PPP may charge, such tolls are likely to be similar to those charged by public toll authorities.[33]

Evidence and Illustrations

The Role and Structure of PPPs for Highway Projects in the United States

Toll-based improvement projects, though still a small percentage of highway projects in the United States, have been growing in number since the 1990s.[34] Most highway improvement projects are tax supported and are managed by state highway agencies or local governments.

A number of toll-based highway improvement projects in the United States since 1992 involved a private entity in some form of PPP. In that time period, 28 highway projects involving PPPs have closed, and 14 of them were real toll concessions, where the private partner built new highways and bore toll revenue risk to do so.[35] The contract for nine others included "availability payments"—that is, guaranteed payments not tied to toll collection. The remaining five projects

[33] Besides the common practice of charging heavy trucks tolls that are not high enough to cover the costs they impose, at least one public toll authority—the Indiana Toll Road before its sale to a private firm—was deferring maintenance because tolls were too low. See Leonard Gilroy and David Aloyts, "Indiana Toll Road: The First Six Years under Private Operation" (Reason Foundation Policy Brief, Reason Foundation, Los Angeles, CA, May 2013).

[34] US Department of Transportation, Federal Highway Administration, *Report to Congress on Public-Private Partnerships*, December 2004, https://www.fhwa.dot.gov/reports/pppdec2004/#2b.

[35] US Department of Transportation, Federal Highway Administration, *Report on Highway Public-Private Partnership Concessions in the United States*, December 2016, https://www.fhwa.dot.gov/ipd/pdfs/p3/p3-toolkit_report_on_highway_p3s_122916.pdf.

were long-term lease transactions where a private partner paid an up-front lease payment in order to be able to collect tolls on an existing facility for a specified period of time.

With only a few exceptions, PPP concessions in the United States are used for toll highways or bridges, not freeways. The US government has rules that limit the discretion of states to use tolls on existing interstate highways.[36] Although they constitute only 2.5 percent of all highway lane miles, interstate highways carry about 25 percent of all vehicle miles traveled in the United States.[37] The federal government permits tolls only on newly constructed interstate highways, newly constructed express lanes, or lanes previously used as high-occupancy-vehicle (HOV) lanes.[38] If a toll is imposed on an existing interstate highway, the number of lanes open for general use without tolls must not be reduced.[39]

Public-private partnerships have been used to build new expressways and bridges, to add express lanes to existing freeways, and to lease some existing toll roads. In 13 of the 14 real toll concessions referred to earlier, the private partner is responsible for designing, building, financing, operating, and maintaining the highway (hence the acronym DBFOM).[40] In these cases, according to the contract, the private partner bears most of the risk. If the private partner provides equity financing, it may be possible to finance the highway without any contribution

[36] Although interstates and other major highways are managed by state governments, the fact that they, along with other major highways, are funded with federal aid gives the federal government jurisdiction.
[37] Robert Poole, "Interstate 2.0: Modernizing the Interstate Highway System via Toll Finance" (Reason Foundation Policy Study, Reason Foundation, Los Angeles, CA, September 12, 2013).
[38] US Department of Transportation, Federal Highway Administration, "Tolling Programs—Fact Sheet for Highway Provisions in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)," February 1, 2017, https://ops.fhwa.dot.gov/safetea/tollingfactsheet.htm.
[39] Changju Lee and John S. Miller, "Lessons Learned from the Rise, Fall, and Rise of Toll Roads in the United States and Virginia" (Working Paper, Virginia Department of Transportation, Office of Public-Private Partnerships, 2015). One recent exception to this is the way that tolls were imposed on Interstate 66 inside the Capital Beltway in northern Virginia. Although the implementation of the toll opened up the highway to those traveling without passengers during rush hour, it also extended the time period when drivers of HOVs were the only ones permitted to use the highway without paying the toll, effectively reducing the number of lanes available for general use without tolls for two hours each weekday.
[40] US Department of Transportation, Federal Highway Administration, *Report on Highway Public-Private Partnership Concessions*.

from the government budget. By contrast, when government borrows to finance a toll highway by using tax-exempt municipal bonds, it does not usually borrow enough to cover the full cost of the project.[41] Thus, the government will have to spend some money from its own budget to pay the difference. Although the government could choose to finance toll highways only if anticipated toll revenue is enough to cover all costs, including the cost of using its own funds, it incurs a risk that toll revenue might fall short of expectations, which would require spending on the highway out of the government budget.

Unlike PPPs in some Latin American countries and parts of Europe, where government has sometimes stepped in to bear some of the risks contracted out to the private partner, private partners in the United States have not benefited from such bailouts.[42] Because of a tendency to overestimate traffic and revenue when setting terms for a PPP concession, a number of private operators have not earned enough to cover their costs and in some cases have even filed for bankruptcy. Under US law, bankruptcy delays liquidation, so the highway can continue to operate. In only one case, the Camino-Colombia toll highway in Texas, was the continuing operation of the highway threatened by bankruptcy. The owner liquidated the highway, and the new owner threatened to shut it down, putting pressure on the Texas Department of Transportation to pay an inflated price to purchase the highway. Nevertheless, the price it paid was considerably less than the cost of constructing the highway, and private investors and lenders lost millions of dollars on their original investments in the project.[43]

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[41] If the Texas Department of Transportation had financed State Highway 130 with traditional toll revenue bonds, the state would have been able to borrow less than half the cost of the $1.3 billion project. See State of Texas, *Legislative Study Committee on Private Participation in Toll Projects, Final Report*, December 2008.
[42] State of Texas, *Legislative Study Committee on Private Participation in Toll Projects*.
[43] For more information on this highway, see "Camino Colombia Will Be the State's First Toll Road," *Plainview Daily Herald*, September 7, 2004, https://www.myplainview.com/news/article/Camino-Colombia-will-be-state-s-first-toll-road-8871639.php.

Critics have accused PPPs of privatizing the gains and socializing the losses, offering unlimited upside for the private partner, with taxpayers bearing the risk, often through renegotiation. However, renegotiation has been less common with US PPPs than with those in other parts of the world, particularly Latin America.[44] Apart from bankruptcy, renegotiations in the United States have generally occurred at the request of the government partner.[45] When private partners experience financial problems in the United States, state and local governments have generally let bankruptcy run its course so that losses are borne by the private partner or the investors who financed the project, not by taxpayers.

Although there are clear advantages to having each party bear the risk it was expected to bear, reducing the share of risk borne by the private partner can reduce costs. One way to reduce risks to the private partner is to pay the partner from availability payments rather than from toll revenue.

This is the approach the Florida Department of Transportation (FDOT) used with the Interstate 595 express lanes in Florida, which are partially funded with tolls. It collects tolls on this highway but pays availability payments to the private partner. The amount it pays does not depend on the amount of toll revenue collected. By agreeing to pay the private partner a specified amount, FDOT took away most of the financial risk, enabling the private partner to obtain more favorable financing terms and thereby reducing the total cost of the project.[46]

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[44] Gifford, Bolanos, and Daito, "Renegotiation of Transportation Public-Private Partnership."
[45] This was the case with State Road 91 in California, when the state highway department decided to build a new highway that would have violated a noncompete agreement it had with the private partner. Under the threat of a lawsuit for breach of contract, Orange County bought the express lanes from the private partner.
[46] Jeffrey Parker and Associates, "I-595 Corridor Roadway Improvements, Value for Money Analysis" (BATIC Institute, Tallahassee, FL, June 2009), http://www.transportation-finance.org/pdf/funding_financing/financing/i595_vfm_0609.pdf.

Because FDOT wanted to maximize throughput on the highway and not revenue collection, the greater risk it assumed can be seen as the price it paid for advancing the public interest.[47]

Publicly vs. Privately Managed Highways

Research shows that only 47 percent of US transportation projects managed by government are completed on budget, and only 55 percent are completed on time.[48] A 1997 study by the General Accounting Office (now the Government Accountability Office) found that the average overrun on publicly procured transportation projects was 41 percent. By contrast, a survey of states found that 10 out of 11 states indicated that the use of PPPs on their highway projects enabled them to remain under budget and within schedule.[49] Evidence from international studies also shows that PPP projects are more likely to be completed on time or early and within budget than projects constructed using conventional procurement.[50]

Spending no more than the amount budgeted does not mean highways built by PPPs cost less, but it does suggest that private firms are more likely than government agencies to forecast project costs correctly. Empirical studies of the value for money of PPPs show mixed results concerning their effect on costs.[51] Several studies find evidence that PPPs lower costs compared

[47] US Department of Transportation, Federal Highway Administration, *Public-Private Partnership Concession for Highway Projects: A Primer*, October 2010.
[48] This is based on research on optimism bias cited by Macquarie in its value-for-money report done for I-70 East in Denver, cited in Reinhardt, "The Role of Performance-Based Infrastructure."
[49] Dean Papajohn, Qingbin Cui, and Mehmet Emre Bayraktar, "Public-Private Partnerships in U.S. Transportation: Research Overview and a Path Forward," *Journal of Management in Engineering* 27, no. 3 (2011): 126–35.
[50] Grimsey and Lewis, "Public-Private Partnerships and Public Procurement"; National Audit Office, *PFI Construction Performance* (London: National Audit Office, 2003).
[51] For a survey of the literature on value-for-money studies for highway projects, see Robert Krol, "Highway Infrastructure: The Role of the Private Sector" (Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA, 2018).

to the public sector. Other studies, however, suggest that PPP costs are as high or higher than those of public-sector comparators.[52]

One important difference between private and public toll agencies is how tolls change from year to year. Many state toll authorities engage in "disruptive pricing"—sharply increasing tolls occasionally after holding them constant for many years.[53] For instance, before the Indiana Toll Road was sold to a private investor, its tolls did not increase enough to keep up with inflation. This is because increasing tolls is unpopular, and departments of transportation report to elected officials, who avoid taking responsibility for unpopular measures.[54] Once an asset becomes privately managed, elected officials lose discretion over setting tolls and, in general, the management of highways becomes less responsive to citizen demands.[55] Although private highway managers are less accountable to drivers as voters, they are accountable to them as customers, whose willingness to use the highway determines the level of toll collection. For this reason, private highway managers increase tolls more regularly, but they do so in small increments.[56]

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[52] Frederic Blanc-Brude, Hugh Goldsmith, and Timo Valila, "A Comparison of Construction Contract Prices for Traditionally Procured Roads and Public-Private Partnerships," *Review of Industrial Organization* 25 (2009): 19–40; Pam Edwards, Jean Shaoul, Anne Stafford, and Lorna Arblaster, *Evaluating the Operation of PFI in Roads and Hospitals* (London: Certified Accountants Educational Trust, 2004), cited in Boardman and Vining, "The Political Economy of Public-Private Partnerships."

[53] See Peter Samuel, "Should States Sell Their Toll Roads?," Reason Foundation, May 2005, for several examples of large toll increases on bridges and highways between 1995 and 2005. For example, Ohio increased tolls by 82 percent between 1995 and 1999 but only increased tolls twice in the 50 years between 1955 and 2005, with total increases of much less than the rate of inflation. For details, see Ohio Turnpike Commission, *Report and Recommendations of New Toll Rate Schedules*, 2008.

[54] Governor Mitch Daniels, who presided over the sale of the Indiana Toll Road to private investors, noted that it had not made a significant profit since the 1950s. He believed that the legislature "did not have the resolve to pass regular toll increases." See Theodore Kim, "After Privatization, Indiana Toll Road's Biggest Difference Is the Price," *Dallas Morning News*, October 19, 2008.

[55] Celeste Pagano, "Proceed with Caution: Avoiding Hazards in Toll Road Privatizations," *St. John's Law Review* 83 (2009): 351–94.

[56] Samuel, "Should States Sell Their Toll Roads?"

Not all state toll agencies use "disruptive pricing." Some have raised tolls steadily and substantially over time, often as a source of revenue to spend on other priorities of the state government. For example, the state of Pennsylvania passed Act 44 in 2007, turning their turnpike into a cash cow to fund other state transportation initiatives.[57] Since that time, Pennsylvania Turnpike tolls have risen each year.

Privatizing Existing Highways

Several states have considered privatizing their turnpikes. The state of Indiana leased the Indiana Toll Road, and the city of Chicago leased the Chicago Skyway, to private concessionaires in the first decade of the 21st century.

Raising revenue seems to have been an important priority that motivated each decision.[58] In both cases, the government allowed the private partner to raise tolls to the level the market would bear, because a substantial percentage of users did not live in the city or the state that leased the highway. Owned by the city of Chicago, the Chicago Skyway primarily serves motorists who live outside the city but commute to work or travel to events in Chicago. Similarly, a large percentage of the users of the Indiana Toll Road are long-distance truckers from out of state, and the anticipated revenue from tolls provided revenue that was used by the Indiana Department of Transportation to maintain and improve other state roads and highways to benefit Indiana residents.[59] There is no such thing as a free lunch in business or politics. In both Chicago and Indiana, costs were imposed on adjacent routes and highways that saw an increase

[57] Nathan Benefield, "Turnpike Tolls Totally to Transit?," Commonwealth Foundation, July 12, 2011, https://www.commonwealthfoundation.org/policyblog/detail/turnpike-tolls-totally-to-transit.
[58] Craig Johnson, Martin Luby, and Shokhrukh Kurbanov, "Toll Road Privatization Transactions: The Chicago Skyway and Indiana Toll Road," unpublished manuscript, Indiana University, Bloomington, IN, September 2007.
[59] Germa Bel and John Foote, "Tolls, Terms and Public Interest in Road Concessions Privatization: A Comparative Analysis of Recent Transactions in the USA and France," *Transport Reviews* 29, no. 3 (2009): 397–413.

in traffic, creating costs for the neighbors of those adjacent routes in terms of higher traffic and congestion.

The Chicago Skyway and Indiana Toll Road illustrate both the advantages and the disadvantages associated with privatizing existing toll highways. Private firms may have reduced the costs of managing those highways, but in the case of the Skyway, one tradeoff was lower wages for toll collectors. It does not appear that selling either highway was for the benefit of users. Taxpayers of Indiana and the city of Chicago, the original owners of each asset, seem to have benefited from the sale of those highways.[60] The approach and motivating factors influencing the outcomes of those transactions might work for a few other toll highways that currently serve lots of out-of-state traffic but would not be appropriate for most existing interstate highways, which were heavily subsidized by the federal government to benefit residents of all states, not just the state where the highway is located.

Making Better Use of Private Firms in Managing and Operating Highways

A big concern with PPP arrangements is that the private firm may charge higher tolls than necessary to cover its costs. Although some states have responded to this concern with revenue-sharing agreements, the problem, as discussed earlier, is that with a higher toll, the loss to drivers who do not use the highway because of the toll would exceed the gain to the private operator. This loss of social welfare could be prevented by implementing a policy similar to public utility regulation, where the firm is not permitted to charge a price higher than the average cost. The problem with this approach is information asymmetry between the government and the firm concerning costs (another manifestation of the principal-agent

[60] Bel and Foote, "Tolls, Terms and Public Interest in Road Concessions Privatization."

problem). The firm has an incentive to overstate its costs, thus justifying higher prices. This problem is more serious if the government has only a contractual relationship with the private partner than if the relationship is truly a partnership, where the government retains access to information on cost structure and operational details of the project, which would reduce the likelihood that the PPP would inflate its costs.[61]

Another way to keep the price close to the average cost is to give firms an incentive to reveal costs through a bidding process. To maximize social welfare from the availability and use of the highway, tolls should be set just high enough to give firms an incentive to build and maintain the highway. With enough bidders, competition between firms bidding for the tolls that they would charge could reveal the breakeven toll.[62] Government could give the franchise to the lowest bidder who meets the specifications.

Some flexibility should be built into the contracts to the benefit of all parties. Since tolls can serve a dual purpose—providing a revenue source and rationing highway capacity—the firm that operates the highway could use variable tolls. In this manner, the manager could reduce rush hour congestion, enhancing the welfare of highway users, and raise some additional revenue by charging a higher toll. The bidding for the contract could thus ask firms to bid for an average toll level, allowing them to use variable tolls to manage congestion.

Promoting the Public Interest through Transparency of Contract Terms

The more complicated the arrangement between a government agency and a private toll operator, the more difficult it is to monitor and enforce. The problem is not just government's

[61] Judy Johnston, "Examining Tunnel Vision in Australian PPPs: Rationales, Rhetoric, Risk and 'Rogues,'" *Australian Journal of Public Administration* 69, no. S1 (2010): S61–S73.

[62] This approach may not work in practice because, as one reviewer pointed out, highway PPPs usually attract only a few bidders. If PPPs were to become more common, the number of firms competing for concessions might increase enough that prices could be driven down close to average costs.

monitoring of the private firm but also how well citizens are able to monitor the government. It is thus important that some information about PPP arrangements be disclosed to the public and that additional information be disclosed to their elected representatives before agreements are finalized.

Lack of transparency has been a problem with many PPP agreements. To improve transparency and accountability without sacrificing legitimate needs for confidentiality of certain details of an agreement, Matti Siemiatycki suggests the following procedures:

- Appoint an independent information commissioner to conduct hearings that are open to the public on the merits of withholding specific information from the public.
- Project planning documentation should not be withheld from any elected official directly responsible for deciding whether to approve or reject a project.
- Oversight responsibility of auditors general and comptrollers should be expanded to make sure summary reports clearly and accurately represent the full range of issues contained in confidential documents and to determine "whether any assumptions or parts of the proposal could incur harm to all or part of the community in which the project is being delivered."[63]

More generally, the public should be informed about specific goals a project is intended to accomplish, including whether a toll project is intended to earn revenue for the government in excess of its costs and, if so, any plans concerning how that revenue would be spent.

[63] Matti Siemiatycki, "What's the Secret? Confidentiality in Planning Infrastructure Using Public/Private Partnerships," *Journal of the American Planning Association* 73, no. 4 (2007): 388–403.

Improving Risk Management

Since government policy may have a big impact on demand, government could share demand risk by letting the length of the concession be a decreasing function of the realized demand so that the firm can achieve a target present value of net revenue. This approach is called a "least present value of revenue" auction. It was used for a highway expansion project between Santiago and Valparaiso, Chile, and though an auction was not involved, a variable-length concession was also used for two bridge projects in the United Kingdom.[64]

With a "least present value of revenue" auction, the private partner could solicit bids that combine a revenue cap with a minimum revenue guarantee. The winning bid would be the combination of the two that minimizes the expected cost to the government.[65] The government would pay a subsidy if the toll revenue collected by the firm over the life of the agreement were less than the minimum. If there were several competing bidders, the lowest bid would reveal how much private firms would need to be compensated for bearing part of the risk. With more limited competition, the revenue cap and minimum revenue guarantee could be set by negotiation. This could involve considerable cost to the government in hiring a skillful negotiator.

One drawback to this approach is that a private firm operating a toll highway may have some ability to influence demand based on the quality of service it provides. If the contract is designed to offset greater demand with a shorter concession length, then the private firm would not be directly rewarded by customers for providing better service. Instead, government would monitor the quality of service.

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[64] Eduardo Engel, Ronald Fischer, and Alexander Galetovic, "Privatizing Highways in the United States," *Review of Industrial Organization* 29 (2006): 27–53.

[65] For a discussion of how to structure PPP agreements that optimally balance user fees, concession length, revenue guarantees, and caps to manage risk in light of the opportunity cost of public funds, see Eduardo Engel, Ronald Fischer, and Alexander Galetovic, "The Basic Public Finance of Public-Private Partnerships," *Journal of the European Economic Association* 11, no. 1 (2013): 83–111.

Another cost of having a private firm bear all the risk, as is the case with long-term lease agreements, is the lost flexibility to make changes that may better satisfy the public interest in the future.[66] A minimum revenue guarantee (with the government agreeing to compensate the private partner or extend the lease if the net present value of revenue falls short of some target value) would retain flexibility for the government while reducing risk for the private partner.

Public-private partnership contracts often include compensation clauses in case government builds parallel highways that were not anticipated at the time of the original agreement, but what criteria should they use to determine whether compensation is fair? With a minimum revenue guarantee, government must extend the lease or compensate the private partner just enough to offset any shortfall. This would keep compensation costs affordable for government, especially in cases where new highways are built because of an unanticipated increase in demand, which also benefits the private partner. A minimum revenue guarantee combined with a revenue cap also enables government to benefit from actions it takes to increase demand for the toll highway, such as expanding feeder highways.

Accounting for Network Effects

How well new toll highways have done financially has depended on location. New highways, as well as express lanes and high-occupancy toll lanes, built in densely populated urban and suburban corridors have generally attracted almost as many vehicles as forecast, while those in less developed areas have not done as well.[67] The tendency for new toll highways in undeveloped areas to have limited demand and produce limited toll revenue is partly the result of a lack of tolls on nearby existing highways that are more congested.

[66] This includes reducing tolls as well as building or improving parallel highways.
[67] State of Texas, *Legislative Study Committee on Private Participation in Toll Projects*.

Building new highway capacity that is financed by tolls might not do much to relieve congestion on parallel roads and highways unless it follows the same route as the existing highway, as would be the case with express lanes. Fully financing the new capacity with tolls does not account for the fact that an important benefit of building new highways is reduced congestion on existing roads and highways. It is or should be in the interest of state DOTs, if they are seeking to maximize social welfare, to subsidize new toll highways and limit the tolls that can be charged to the extent that building them contributes to reduced congestion on nearby tax-financed highways.

Since the rest of the network of roads and highways is not tolled but instead funded by taxes, drivers have an incentive to overuse those highways relative to toll highways. Advocates of tolling interstate highways argue that drivers should get fuel tax rebates for the miles they travel on toll highways. The transaction costs of such an arrangement may, however, be too high to justify. A better way to remove the distortion would be to replace fuel taxes with mileage-based user fees so that drivers pay directly for all road use, not just selected toll highways. Those fees would limit diversion from tolled expressways to nearby arterial highways and roads (see box 3). Total social welfare is likely to be greater when private toll roads compete with each other than when a toll road competes with a free road.[68]

Box 3. Truck Lanes from Kansas to Ohio: How Technology Can Eliminate Traffic Diversion from New Toll Roads

Since interstate highways were built to promote mobility, any attempt to privatize or impose tolls on these highways should be done in such a way as to avoid diverting traffic to parallel roads and highways. Proposals to

[68] In a model of two competing roads with the same origin and destination, de Palma and Lindsay modeled two roads under alternative ownership regimes. When both were managed privately—firms charged tolls that maximized their profit—total social welfare was considerably greater than when having one road tolled and the other free. See Andre de Palma and Robin Lindsey, "Private Toll Roads: Competition under Various Ownership Regimes," *Annals of Regional Science* 34 (2000): 13–35.

toll interstate highways, including a recent proposal to create dedicated truck lanes on Interstate 70 from Ohio to Kansas, financed by a toll, do not give enough attention to the problem of traffic diversion. A feasibility study suggests that if tolls are imposed for trucks using I-70, as many as 50 percent of trucks could be diverted from the interstate to alternative nontolled routes.[69] Although the study estimates that fatalities on I-70 could decline, fatalities on parallel highways would increase. Many truckers and auto travelers could benefit from dedicated truck lanes, but social welfare might not improve unless traffic diversion could be prevented.

One way to prevent or at least manage and limit traffic diversion from dedicated truck lanes would be to change the way commercial trucks pay for their road use. Allowing or requiring them to pay mileage-based user fees could reduce or eliminate the advantage of using an alternate route instead of dedicated truck lanes on interstate highways. Without charges for competing roads and highways, privatizing existing interstates and imposing tolls could reduce social welfare by keeping motorists from using the interstate system fully.

Mileage-based user fees open the door to selling an entire road and highway network to private firms. If the government no longer owned or managed any roads or highways, then highways could be fully privatized, with private firms owning each road or highway. Competition between private owners would constrain prices. Although owners of some well-traveled highways in the most desirable locations would have some monopoly power, that power would be limited in the long run by the expansion of competing transportation modes, telecommuting, and competition between jurisdictions for residents and businesses.

Conclusion

Public-private partnerships have a number of advantages but also some drawbacks. It is costly for the government to monitor PPPs and devise incentives to motivate private partners to

[69] Mid America Association of State Transportation Officials, *I-70 Dedicated Truck Lanes Feasibility Study* (Cincinnati, OH: Wilbur Smith Associates, July 22, 2011), http://www.maasto.net/2011presentations /024.I70MAASTO.pdf.

pursue goals that are consistent with the public interest. In particular, in determining how to structure a PPP agreement, the government must consider the tradeoff between cost or revenue to taxpayers and the benefits and costs to drivers, not only from the road to be managed by the PPP but also from the effects of the agreement on the performance of parallel and connecting roads and highways. Public-private partnerships are likely to work better on highways where demand is less constrained by the availability of competing free highways, so that tolls can be set high enough to cover most operating and capital costs without causing major problems of traffic diversion to parallel roads and highways. This is more likely to be the case if tolls are imposed on already congested highways, especially on existing HOV lanes or newly constructed express lanes.

For a PPP to lower costs effectively, risks should be allocated in a way that reflects who can best manage them. Contracts that have built-in flexibility, such as concessions that end when the private partner has earned enough revenue to cover its amortized costs, may be an affordable way for the public to limit the financial risks of the private partner. Also critical is transparency about goals that are to be accomplished by the private partner and the terms of the agreement so that voters or their elected representatives can judge the welfare effects of PPP agreements compared with public-sector alternatives. In each case, how well the public sector devises incentives, informs the public, and monitors agreements is critical.