Using an innovative method for awarding franchise rights, states can entice more effective private investment in highways.

A New Approach to Private Roads

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During most of the twentieth century, highways, tunnels, and bridges were viewed as public goods that government must provide. By the end of the century, however, chronic budgetary problems had led governments to allow some participation of private firms in financing, building, and operating infrastructure projects. For example, worldwide private investment in transport infrastructure went from almost nothing before 1990 to $10 billion in 1990-91 and almost $30 billion in 1997-98. Massive projects like the Second Severn Bridge in Great Britain, the Guangzhou-Shenzen highway in China, or the 1,000 miles of upgraded Panamerican Highway in Chile have been financed and are being operated by private firms. Even in the United States, cash-strapped Orange County, Calif., resorted to private funding and operation when it was unable to provide for needed expansion of the Riverside Freeway in the early 1990s.

In light of those trends, it is remarkable that only two private toll roads were built in the United States during the twentieth century: the Dulles Greenway in Virginia and Orange County's State Route 91 Express Lanes. That contrasts with the early days of the United States; beginning in the 1790s and continuing throughout the nineteenth century, more than 2,000 companies financed, built, and operated toll roads with a combined extension of more than 10,000 miles in 1821.

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Are there any advantages to privatizing roads? Before comparing private and public provision of transport infrastructure, it is useful to clarify what is meant by those terms. Under public provision, the government designs, finances, and operates the infrastructure project. Private firms may participate in the building stage and may even be selected in competitive auctions. But once the facility is built, the government operates and maintains it. Taxpayers pay construction costs and, even when users pay tolls, the revenues are not directly related to construction costs. By contrast, when roads are privatized, a concessionaire finances, builds, and maintains the facility. The franchise owner collects tolls until the concession term ends, and the facility is transferred to the government — usually 20 to 30 years later. Such Build-Operate-and-Transfer (BOT) contracts can be awarded either through direct negotiations between the transit authority and an interested firm or through a competitive auction for the right to franchise a well-defined project.

Road privatization offers many potential benefits, including:

- No need for new taxes to finance the BOT projects.
- Having the same firm in charge of construction and maintenance provides better incentives to build a road that lasts longer.
- Private firms usually are better at managing and more efficient than state-owned companies.
- Cost-based tolls are easier to justify to the public when infrastructure providers are private.
- Those who benefit from the infrastructure pay for it.

■ In stark contrast to public provision, the BOT scheme uses the market mechanism instead of central planning to screen projects, which reduces the probability of white elephants.

Unfortunately, the advantages of private highways are not automatic. For example, in the early 1970s, France awarded four concessions, three of which went bankrupt after the oil shock and were bailed out by the government. Around the same time, several of the 12 highway franchises in Spain had higher costs than anticipated, while traffic was much lower than expected. Three highways went bankrupt and the remaining contracts required renegotiation. More recently, the "private" Mexican highway concession program cost Mexican taxpayers more than $8 billion after renegotiation of the initial contracts.

Those examples illustrate a common experience: Most private infrastructure concession contracts are renegotiated. J. Luis Guasch examined more than 1,000 concession contracts awarded during the 1990s in Latin America and found that, within three years, terms had been changed substantially in over 60 percent of the contracts.

The frequency of renegotiation is troubling because the contractual changes often are not desirable. In some cases, renegotiations allow governments to expropriate concessionaires after they have sunk their investments. In other cases, concessionaires renegotiate contracts in order to shift losses to taxpayers. The renegotiations thus void the public benefits of private highways by limiting investors' risk of loss, diminishing franchisees' incentives to be efficient and cautious in assessing project profitability, and advantaging firms with political connections.

Many of the problems with traditional highway concessions result from a combination of a front-loaded investment and substantial uncertainty about demand for the road. To resolve those problems, we propose a new type of auction that allows more flexibility to changing conditions, which will reduce the necessity of renegotiation.

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DEMSETZ AUCTIONS

Many highway projects, including the two cases in the United States, were awarded through negotiations between a firm and a transit authority. There is an alternative, proposed by economist Harold Demsetz, that is particularly suited for highway concessions. In a "Demsetz auction," firms compete for the franchise in a process that seeks to emulate competition. In the words of Edwin Chadwick, who proposed a precursor to Demsetz's idea in 1859, competition *for* the field substitutes for competition *in* the field. For example, a BOT highway project in Chile usually is awarded to the firm that makes a bid

that charges the lowest toll to use the road. If tolls equal average costs, no excess (monopoly) profits will be earned. Thus, if competition among bidders is sufficiently strong, the toll set by the lowest bid will equal average cost and eliminate any monopoly profits. Consequently, the projects will be run as efficiently as if highways were competitive, even though they are local monopolies.

Uncertainty But while a competitive auction is necessary to produce good outcomes, the Demsetz format, by itself, appears unable to resolve contemporary roadway concession problems because of demand uncertainty and large initial capital costs.

To understand why that appears to be the case, consider the experience of the Dulles Greenway. Investors underestimated how much users disliked paying tolls, and initial revenues were much lower than forecasted. Two independent consulting companies had predicted that in 1996, with an average toll of $1.75, there would be a daily flow of 35,000 vehicles. But by March 1996, the average number of vehicles per day was only 8,500. What is more, investors did not count on the state of Virginia later widening the congested Route 7, which serves as a free alternate. After Greenway tolls were lowered to $1.00, ridership increased to 23,000, which was still far below predictions. Bonds that were issued to finance the project were renegotiated and investors wrote off their equity. More recently, the highway's prospects have improved because the alternative free roads have become congested. Senior bonds received a stable rating from Moody's and Fitch Ratings in 1999 and 2000.

Also consider the experience of Orange County's Route 91 Express Lanes — a 10-mile privately owned toll road, running from Anaheim to Riverside, that lies in the middle of the congested Riverside Freeway. Motorists can use the private lanes to get relief from congestion by paying up to $8 for a round trip. The concessionaire can increase tolls freely in order to relieve congestion, and they have been hiked seven times in five years. With 33,000 daily trips, the express lanes are close to congestion at peak time and the franchise is a financial success. Yet users of the freeway experience enormous congestion. Expansion is difficult because cash-strapped Orange County accepted a clause in the toll-road franchise contract that prevents any expansion in capacity until 2035.

Both examples demonstrate that demand-side risk (upside and downside) is a characteristic of private highways. The standard concession contract exacerbates that risk because it lasts a fixed number of years. A few bad years at the beginning of the franchise may not leave enough time with normal traffic flows to recover the initial investment. Conversely, a heavily used highway may bring the franchisee excessive revenue over the life of the BOT contract.

PVR AUCTIONS

The problems created by fixed-term franchises have an obvious solution: Franchise contracts should be lengthened whenever demand initially is sluggish or shortened when demand is higher than expected. Can such a contract be implemented without giving discretionary power to regulators?

We advocate what we call a Present-Value-of-Revenues (PVR) franchise. A PVR franchise solves the time uncertainty of the revenue stream and has some additional attractive features. In a PVR auction:

- The regulator sets a maximum toll.
- The firm that wins the contract is the one that bids the least present value of toll revenue that it will receive over the life of the contract.
- The franchise ends when the present value of toll revenue equals the franchise holder's bid.
- Toll revenue is discounted at a predetermined rate specified in the contract. The rate should be a good estimate of the loan rate faced by franchise holders.

Under the PVR design, the state conducts its franchise auction in a manner similar to a standard Demsetz auction except that bidders compete on the present value of revenue they would like to obtain from the project.

Great Britain was probably the first nation 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. In February of 1998, a franchise to improve the Santiago-Valparaíso highway was assigned in a PVR auction.

Advantages PVR franchise contracts are superior to traditional private franchise agreements because they reduce risk by incorporating the possibility of adaptation to shocks into the basic contractual framework. The major disadvantage of PVR contracts is that their risk-reduction features can make the franchise holder indifferent toward customer service and other demand-enhancement activities. Thus, PVR auctions should be used only for certain types of public infrastructure.

Risk reduction A PVR contract reduces risk: When demand is less than expected, the franchise period is longer, while the period is shorter if demand is unexpectedly high. Assuming that the project is profitable in the long run so that repayment eventually can occur, all demand-side risks have been eliminated. Even if that assumption does not hold and the project never collects enough revenues to equal the present value bid by the franchise holder, the revenue will still be larger than would have been collected by a franchise holder under a traditional fixed-term contract. PVR also reduces risk by placing the decision of whether to invest in a project in private hands. Private bidders are more likely than traditional transportation agencies to avoid projects with little possibility of paying for themselves.

PVR franchises should attract investors at lower interest rates than traditional Demsetz franchises. Toll revenues are the same under both, but the franchise term is variable under PVR.

If demand is low, the franchise holder of a Demsetz-awarded contract may default; in contrast, a PVR concession is extended until toll 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.

Adaptation and flexibility PVR franchises allow adaptation to changing circumstances that cannot be made easily to contracts awarded in standard fixed-term Demsetz auctions. Consider again California's Route 91 Express Lanes. As traffic has increased on the freeway, the congestion tolls in the private lanes have increased. The California Department of Transportation (Caltrans) would like to widen the freeway in order to accommodate the increased traffic. But it is hampered by the contract it signed with the owner of the express lanes, which prevents Orange County from raising the capacity of the Riverside Freeway without the franchise holder's consent. Given the experience of the Dulles Greenway (low demand because a free alternative road was widened), the Route 91 provision was reasonable at the time the contract was signed. But under current conditions, it allows the franchisee to price congestion as a monopolist.

Within the PVR framework, a solution to the problem is to include an option to buy out the franchise at the difference between the initial present-value bid and the present value of the revenue already received. That solves the problem of widening a highway in response to increased congestion because, after buying back the franchise, the transit authority can set up another PVR auction for operation of the tollway that would take into account the new, wider freeway as competition. As a numerical example, assume that the owners of the Route 91 Express Lanes had asked for $160 million in present value terms on the $130 million investment. Suppose they had already collected $65 million. Then, according to the PVR scheme, the Orange County Transportation Authority could have bought them out for $95 million, which is exactly what the owners would have obtained if the franchise had run to term. But because the existing franchise is not PVR and does not have a buyout provision, Caltrans has considered negotiations to buy out the private operator, only to encounter buyout prices as high as $274 million. Specifying a fair buyout price with a fixed term franchise is much harder than with a PVR franchise.

Another feature of the PVR auction is more flexibility in setting tolls. Under Demsetz, bidders typically compete on the lowest fixed toll they can set. The problem is that, unless traffic forecasters are unusually fortunate in their estimates as to the sensitivity of traffic to prices, the resulting tolls are likely to be incorrect — either so low that they create congestion or so high that the highway is underutilized. One possibility is to allow fees to respond directly to congestion so they are never too low. But the result can be monopoly pricing, as in the case of the Orange County 91 Express Lanes.

Under PVR, transit authorities could include toll flexibility in the PVR auction contract. The guiding principle of the PVR franchise is to allow the winning bidder always to collect its required present value. In order to induce the franchise holder to accept toll flexibility, however, the contract has to recognize that lower tolls not only increase the time required to earn the desired revenue, but also increase traffic and therefore increase maintenance costs.

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Because maintenance costs are roughly proportional to road usage, the original PVR contract could be specified so that the revenue target is net of maintenance costs. With that adjustment, the only effect of a change in tolls is a change in the total operational costs over the length of the contract — costs that are predictable and represent a minor fraction of total costs. PVR franchises then allow the transit authority to change tolls to the efficient level without harming the franchise holder. Of course, a lower limit must be set for tolls because, otherwise, the franchise holder might never obtain the revenue stipulated in the winning bid.

Opportunism The efficient flexibility provided by the PVR method reduces the likelihood of opportunistic behavior. Requests to alter traditional franchise contracts often reflect opportunistic behavior by one of the parties. For example, the government could try to expropriate the franchise holder (a regulatory taking) or, alternatively, the franchise holder may pressure the transit authority to change the conditions of the contract at the expense of the public.

Traditional contracts are renegotiated by extending the length of the franchise, increasing tolls, or providing a government transfer. Extending the franchise term with a PVR contract is not possible because, by definition, the term is variable. Increasing tolls is ineffective because it shortens the franchise term without increasing overall income. Government transfers are not logically impossible under PVR but, because the franchise holder cannot claim that it will receive less toll revenue than expected, a government transfer would be difficult to rationalize to the public.

Consider Mexico, where the franchise procedure awarded concessions to the firm that consented to build the road

and operate it for the shortest time period. The result was highway tolls as high as $35. Because parallel (although congested) freeways were available, the toll highways had little traffic. The government was pressured into bailing out the franchises (and the banks that lent to them), at a cost of at least $8 billion.

Fixed-term franchises often obtain government loan guarantees. Guarantees weaken the market test that privatization is supposed to provide and escape the usual scrutiny that accompanies specific appropriations in the budget. PVR schemes reduce the need for guarantees because the risk to investors is much smaller. For example, when the Chilean government used PVR to auction the Santiago-Valparaíso highway, it did not have to offer guarantees, in contrast to previous highway franchises using traditional fixed-term auctions.

Caveat While PVR schemes have a big advantage in terms of reduced risk, the downside is that the franchise holder has no incentive to increase demand for the infrastructure project because any action that increases demand will shorten the term of the franchise. Projects earn their income regardless of efforts of the franchise holder. By contrast, demand-increasing investments are more attractive under fixed term franchise. That suggests that the PVR method is applicable only in cases in which demand does not respond to the actions of the franchise holder. Bridges, tunnels, water reservoirs, and roads are examples for which PVR seems appropriate because, other than maintenance (for which standards can be set and checked fairly easily), the franchise holder can do little to increase demand. On the other hand, PVR would be inappropriate for projects for which service quality is essential and demand responds to performance — seaports, airports, and public utilities. In those cases, a traditional Demsetz auction on minimum price seems more appropriate. In some cases, an infrastructure project can be unbundled into separate parts, with different responses to demand-enhancing activities. For example, an airport franchise can be divided into a PVR-auctioned franchise for the landing strip and franchises for all other services that would be awarded via a standard auction.

CONCLUSION

Private highway franchises can lead to large improvements in infrastructure provision. But the experience accumulated so far suggests improvements are necessary. We suggest a variation to the classic Demsetz auction, which awards the franchise to the bidder that asks for the lowest toll. Our proposal is that firms compete on the basis of the minimum toll revenue (in present value terms) requested by bidders — a PVR auction.

This modified Demsetz auction has a number of advantages: It reduces risk and thus lowers the return required by bidders. It reduces the need for guarantees and the scope for opportunistic renegotiations. Moreover, the franchise is flexible because it can incorporate a buyout option that leaves both parties satisfied, so that widening the road itself or allowing free competitors to widen the road in response to increased traffic is not an issue. In addition, the transit authority can adjust the tolls in response to changed conditions without harming the franchise holder.

The PVR auction solves most of the common problems that occur with highway franchises. In particular, the serious problems encountered by both private highway franchises currently operating in the United States would have been avoided with a PVR contract.

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