

PUBLIC POLICY FOR THE

# Private sector

The World Bank Group

May 1997

Note No. 112

## Privatizing Roads—A New Method for Auctioning Highways

*Eduardo Engel,  
Ronald Fischer,  
and Alexander  
Galetovic*

**This Note argues that many of the problems that have plagued highway privatization stem from the combined effects of special features of the highway business and the type of contracts—fixed term franchises—that have typically been used. The Note proposes a new mechanism, the least-present-value-of-revenue (LPVR) auction, that corrects some of the shortcomings of the fixed term franchise. The new mechanism endogenously adjusts the duration of the franchise to the realization of demand: the term lengthens if traffic grows more slowly than expected and shortens if it grows more rapidly than expected.**

There is widespread agreement that most developing countries urgently need massive highway construction programs. Traditionally, highways have been viewed as public goods that must be financed and operated by the public sector. But in recent years many governments have neglected maintenance because of chronic budgetary problems, and traffic has grown well ahead of capacity. So, it has become increasingly accepted that highways should be built, financed, and operated by private firms and that users should pay for using them. Several advantages are claimed for privatized roads. Private firms build highways faster because they face fewer financing constraints, and they are more efficient than state-owned firms. Users are more likely to accept the concept of paying for roads owned by the private sector. And franchising should prevent the building of “white elephants,” since private firms do not want to lose money.

Despite these avowed advantages, the experience with highway franchising has been far from happy. Three of the four franchises that France awarded in the early 1970s went bankrupt after the oil shock and were taken over by the government. Several of the twelve fran-

chises awarded by Spain before 1973 had building costs four to five times higher than expected, but traffic about a third of original projections. As a result, three firms went bankrupt, two firms were absorbed by stronger franchise holders, and the government granted toll increases and term extensions. In Mexico, excessively high tolls have led to empty highways and the renegotiation of the original franchise agreements. The duration of some of the toll road franchises has more than doubled, and the government has had to pump in US\$2 billion to save firms (and the banks that made loans to them) from bankruptcy.

This Note argues that many of the problems that have plagued highway franchises stem from the combined effects of special features of the highway business and of the type of franchise contracts that have typically been used. First, traffic forecasts are notoriously imprecise; it is difficult enough to make accurate traffic predictions for the short run and much harder for the long run (box 1). Moreover, demand for a highway is largely beyond the control of the franchise holder. Second, most franchises have been awarded for a fixed term (say, twenty years) that is independent of demand realization. In





**BOX 1 DEMAND FLUCTUATIONS—VEHICLE FLOW ON TOLL ROADS NEAR SANTIAGO**

The demand risk faced by the holder of a fixed term franchise is illustrated by the table below. The table shows the rate of growth in the number of motor vehicles paying tolls during the past decade at the three busiest tollbooths near Santiago, Chile. Even though Chile's economy has been more stable in the past decade than in any other decade this century, with no recessions and GDP growing by an average 6 percent a year, traffic growth rates have fluctuated considerably—both across years and across roads in a given year.

Annual rate of growth in vehicles paying tolls (percent)

Tollbooth	1987	1988	1989	1990	1991	1992	1993	1994	1995
Angostura	8.8	15.0	11.7	4.5	8.7	12.4	6.7	7.8	9.4
Zapata	21.5	14.4	13.1	8.1	7.2	5.2	2.9	3.9	4.9
Lampa	3.8	13.4	15.9	8.9	6.8	18.0	8.8	16.2	12.5

Source: Ministry of Public Works, Chile.

what follows, this Note describes the main shortcomings of fixed term franchises and then presents a new mechanism, the least-present-value-of-revenue (LPVR) auction, that endogenously adjusts the duration of the franchise to the realization of demand. The Note argues that this mechanism is far better than current systems.

**Fixed term franchises**

Fixed term mechanisms typically are one of two kinds. In the version now used in Chile, the regulator fixes the term and the franchise is awarded to the firm that bids the lowest toll in a competitive auction. In the version used in Mexico, tolls were fixed by the regulator and the franchise was awarded to the firm asking for the shortest term.

The main defect of fixed term mechanisms is that they create unnecessary risk for the franchise holder. Since demand is uncertain and competitive bidding dissipates ex ante rents, the winner of the franchise chooses a franchise term (or toll) such that it faces significant losses if traffic turns out to be considerably below expectations. This may happen even when traffic flows are sufficient to pay for the road in the long run. Faced with high risk, the franchise holder will demand a risk premium, which

is paid by users (or, through government guarantees, by taxpayers). For Chile, this risk premium is estimated at about a third of the investment cost; for most developing countries, it can be expected to be even larger.

Because of the high risk associated with highway franchises, lenders have refused to grant franchise holders loans unless governments guarantee the debt (as in Spain) or provide generous minimum toll revenue guarantees (as in Chile). Guarantees reduce the incentives for lenders to screen projects and monitor their performance, one of the basic arguments for highway franchises. A second consequence of high risk is that when demand turns out to be lower than expected, contracts are renegotiated and losses shifted to users or taxpayers. The expectation of renegotiation prompts firms to bid artificially low tolls (to lowball), expecting better terms after the contract has been awarded. It also implies that firms that excel at renegotiating contracts can compete with firms that are considerably more efficient at building, financing, and operating highways. Thus, with fixed term franchises, the advantages of privatizing roads are easily lost: taxpayers and users pay for roads that are bad investments, inefficient firms win franchises, and firms do not mind building white elephants.

---

Fixed term franchises have additional disadvantages. First, they increase the likelihood that the franchise will be awarded to the firm with the most optimistic traffic projection (the winner's curse). Second, fixed term contracts are inflexible, which can be a serious problem if tolls turn out to be out of line or congestion makes it desirable to widen the highway. The problem arises because it is difficult to agree on the fair compensation—the expected income forgone over the remainder of the franchise—to be paid to the franchise holder in these cases.

### LPVR franchises

The least-present-value-of-revenue mechanism corrects several shortcomings of fixed term mechanisms. In this approach,

- The regulator sets a maximum toll.
- The franchise is won by the firm bidding the least present value of toll revenue.
- 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 franchise contract. The rate should be a good estimate of the loan rate faced by franchise holders.

As an example, consider an auction with two firms. The first firm estimates costs of \$100 million and bids \$112 million, while the second estimates costs of \$99 million and bids \$110 million. The second firm wins and operates the franchise until the present value of toll revenue is \$110 million.

### Advantages

The basic principle underlying LPVR auctions is that the franchise holder should not make losses when the long-run demand for the highway is sufficient to pay all costs. Thus, the term lengthens when traffic grows more slowly than expected, and it shortens when traffic grows more rapidly than expected. Revenues are the same even when demand realizations are different, so the risk borne by the franchise holder is far smaller than under fixed term franchises. For this reason, the franchise holder requires a

smaller risk premium, and users pay less on average. The lower risk for the franchise holder also means that the winner's curse is less likely, because bids are less dependent on demand projections.

With LPVR auctions, the franchise holder still bears the risk that the road may not be self-financing in the long run—that is, that it will turn out to be a white elephant. But since white elephants are usually the result of lobbying by pressure groups, they should be easily detected by potential bidders.

*The basic principle underlying LPVR auctions is that the franchise holder should not make losses when the long-run demand for the highway is sufficient to pay all costs.*

A further advantage of LPVR auctions is that competition for the franchise reveals, through the winner's bid, the income required to earn a normal return. This reduces the scope for opportunism after the contract is awarded, because the winning bid can be used as a benchmark. In the case of government opportunism leading to a regulatory taking, the franchise holder can go to court, asking for fair compensation equal to the difference between its bid and the present value of toll revenues already received.

Opportunistic renegotiations that favor the franchise holder are also less likely, for three reasons. First, because the term automatically lengthens if demand grows more slowly than expected, it is less likely that franchise holders will face financial distress and therefore demand renegotiation. Second, renegotiations in favor of the franchise holders are explicit wealth transfers: term extensions are impossible by definition, and the only effect of a toll increase is to



shorten the term of the franchise. Since explicit wealth transfers are easier for the public and the media to understand, they are less likely. Third, the government can discourage lowballing by bidders by threatening to end the franchise if the franchise holder asks for a renegotiation, compensating the franchise holder with whatever sum remains to be collected.

The winning bid determines the fair compensation for termination of the contract at any time as the difference between the present value of revenue earned and the original bid. This ensures flexibility in LPVR contracts. If demand exceeds expectations and requires an expansion of the highway, the franchise holder can be paid the fair compensation and the franchise reaucted. It is also easy to adjust tolls. If tolls need to be raised because of congestion, the only effect is that the franchise ends earlier. If demand for the highway is highly uncertain before it is built (as is often the case for new highways), the setting of tolls can be postponed until after construction.

### Limitations

The main limitation of LPVR franchises compared with fixed term contracts is that they provide fewer incentives to engage in demand-enhancing activities. Any expense that increases demand shortens the franchise and so increases profits less than it would under a fixed term contract. As a result, the franchise holder may underinvest in road quality or maintenance, speedy attention at toll booths, or swift cleanup of accidents. For this reason, LPVR auctions require regulatory institutions that set and enforce minimum quality standards for franchise holders. Regulation need not be complicated. For example, independent agencies could monitor waiting times at toll booths, and the waiting times could be published in newspapers to make the regulators accountable to users. (Even with fixed term franchises, it becomes necessary to monitor quality as the end of the term approaches.) This defect of LPVR auctions can be mitigated by rewarding franchise holders that achieve short franchises.

### Conclusion

LPVR auctions are a promising mechanism for privatizing not only highways but also other infrastructure projects. They are attractive for projects requiring large investments up front and in which demand is unresponsive to efforts by the franchise holder. They also require a low-cost capability to verify revenues, the quality of service, and the residual value of investments.

For further reading see Eduardo Engel, Ronald Fischer, and Alexander Galetovic, "Highway Franchising: Pitfalls and Opportunities," *American Economic Review* 87 (2): 68–72 (May 1997).

*Eduardo Engel, Ronald Fischer and Alexander Galetovic, Centro de Economía Aplicada, Departamento de Ingeniería Industrial, Universidad de Chile, Santiago (eengel@dii.uchile.cl, rfischer@dii.uchile.cl, or agaleto@dii.uchile.cl)*

Viewpoint is an open forum intended to encourage dissemination of and debate on ideas, innovations, and best practices for expanding the private sector. The views published are those of the authors and should not be attributed to the World Bank or any of its affiliated organizations. Nor do any of the conclusions represent official policy of the World Bank or of its Executive Directors or the countries they represent.

To order additional copies please call 202-458-1111 or contact Suzanne Smith, editor, Room G8105, The World Bank, 1818 H Street, NW, Washington, D.C. 20433, or Internet address [ssmith7@worldbank.org](mailto:ssmith7@worldbank.org). The series is also available on-line ([www.worldbank.org/html/fpd/notes/notelist.html](http://www.worldbank.org/html/fpd/notes/notelist.html)).

♻️ Printed on recycled paper.