How To Franchise Highways

By Gordon J. Fielding and Daniel B. Klein*

1. Introduction

Barcelona commuters receive a monthly highway bill, without ever having stopped at a tollbooth. Cars on the Autostrada, which connects Milan, Florence, Rome and Naples, whiz past roadside electronic readers that automatically deduct credit from prepaid smartcards which are similar to the copycards familiar to library users. Electronic toll collection is now used on the Esterel-Côte d'Azur; two toll-ring systems in Norway; the Dallas North Tollway; the Oklahoma Turnpikes; and two facilities in New Orleans. Reliability and accuracy rates run as high as 99.9 per cent. Unless there is successful labour resistance, by the year 2000 electronic toll collection will be operating on every major toll facility in the United States. Stopping at tollbooths will be obsolete for all but the infrequent traveller.[1]

The advance in technology is accompanied by a shift in policy. The franchising of highway services is now under way: California has four projects in progress; Virginia, one project; and planning is in hand in many other states. Furthermore, the Intermodal Surface Transportation Efficiency Act of 1991 will bring a tide of new projects, as it permits the commingling of federal and private funds. Different approaches to franchising have been used. This article investigates the alternatives and proposes a plan for highway franchising.

Although the policy shift is driven partly by fiscal constraints, technological advance allows appreciable changes in the nature of highway services.[2] Conventional toll collection (manual or coin-operated) means stopping to pay, queuing delays, increased fuel consumption and increased risk of accident. For the tolling authority, it involves constructing tollbooths, hiring cashiers and cash handling, and increased road deteriora-

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[1] For an excellent survey of tolling technologies, see Hau (1992) on electronic systems in use.

[2] Although highway franchising is considered a revolutionary policy shift, during the nineteenth century over 2,000 private toll-road companies operated in America; see Klein and Fielding (1992) and Klein (1990).

tion (Hau, 1992). Manual toll collection can account for 15 to 19 per cent of toll revenues, whereas the costs of collecting gasoline excise taxes are less than 1 per cent of tax receipts (Gittings, 1987). High transaction costs have been cited in arguing against pricing on highways. Most travellers consider highways to be a "public good", paid for by excise taxes on gasoline and related goods. Indeed, most highways in America, since the original Federal Aid Highway Act of 1916 and especially after the 1956 Federal Interstate and Defense Highway Act, have been built as unpriced public facilities. However, as electronic toll collection is expected to reduce transaction costs, highway services can now be viewed as an excludable, collective good — as excludable as a cinema or a golf course.

Like a cinema or a golf course, a highway is congestible, but unlike them, a highway does not face active competition. Many travellers cannot choose an alternative mode that is time- and price-competitive to the same destination. Highway services are like the provision of electricity, gas, water, telephone, or cable television. The appropriate framework is the natural monopoly/public utility, because provision of highway services, using electronic pricing, exhibits excludability, large fixed costs, declining unit costs, recurring dealings, and "the reliance of individuals on agents ... for gathering information, making decisions, negotiating contracts, [and] adjusting the terms of ongoing relationships" (Goldberg, 1976). Technology has changed the landscape of applied economics.[3]

When highway services are understood as a case for monopoly franchising, it is appropriate to ask what sort of franchise arrangement suits the case. Demsetz (1968) suggests that desirable agreements might be achieved by competitive bidding for the franchise contract, making subsequent regulation unnecessary. Williamson (1976) and Goldberg (1976, 1977) respond to Demsetz by saying that the realities of uncertainty, bounded rationality, and transaction costs dictate that extensive post-contractual monitoring and negotiation accompany any franchise arrangement. Their central point is that franchise bidding is not, in practice, distinct from supervision by a regulatory agency.

This paper does not evaluate the case for privatisation; rather we assume that highways are going to be franchised and investigate the appropriate methods for doing so. Poole (1988), Roth (1990), and Semmens (1987) argue for highway privatisation on the grounds of lower costs, greater innovation, and better consumer orientation of the private sector, the smaller distortion of user fees as compared to various forms of taxes, and the reduction of politics and unionisation in the funding, staffing and operating of facilities.

We discuss the competitive approach, with its subtleties and pitfalls — as elaborated by Williamson and Goldberg — while making use of the experiences of California and Virginia. We are optimistic about competitive bidding for highway franchises, but viability will depend on *how* the bidding is organised. We propose that, contrary to actual practice in California and Virginia, the public sector should proceed as follows: (1) identify and select the corridor; (2) define the project, by completing the preliminary design; (3) clear the project with the many layers of government; (4) receive bids to finalise the design, build and operate the facility; and (5) require that bids take the form of a marginal-return schedule.

[3] Even before electronic toll technologies, authors argued that highways could be made excludable at reasonable costs; see Haritos (1974) and Vickrey (1963). For an opposing view, however, see Walters (1968).

2. Toll Road Developments in the US

During the 1980s the number of vehicle miles driven increased by 31 per cent, but lane miles of expressway and arterial streets increased by only 14 per cent, in the 39 largest US urban areas (Downs, 1992). Although recent increases in gasoline taxes have raised federal expenditure on roads to the level of the 1960s, there is not sufficient revenue for both new construction and maintenance of the existing system. The fiscal constraints and the arrival of electronic pricing are leading state governments to authorise tolling as a means of expanding the highway system. California and Virginia provide the most advanced examples of what appears to be a national trend, but each demonstrates the same fundamental shortcoming: an absence of head-to-head competition.

California's four private toll roads

Highway construction has not kept pace with increasing travel in California because of environmental constraints and opposition to increasing gasoline taxes. The California Department of Transportation (Caltrans) advocated privatisation as part of the solution, and despite formidable opposition the legislature passed Assembly Bill 680 in 1989 authorising up to four franchise projects. Ownership — that is, tort liability — would remain with the state, but the franchised private party would propose, design, assemble, clear and construct the facility, and then operate it for 35 years (Cohen, 1991).

With the enabling legislation in place, Caltrans issued a *Request for Proposals* to a pre-screened set of ten consortia. Each was free to propose any transport project in the state, bearing in mind the broad criteria Caltrans had announced. Eight proposals were submitted. Two consortia proposed extensions of Route 125 in San Diego County, while each of the other six proposed separate projects. In choosing among the eight proposals, therefore, Caltrans was making comparisons between completely separate projects. There was not head-to-head competition for each project (even on Route 125 the two proposals were for different segments).

Of the eight, Caltrans had to choose four: it chose three in southern California and one in Northern California. (The northern California project was not actually placed in the top four on Caltrans' point scale, but the enabling legislation required that at least one project be located in northern California.) Only then, having placed the winners in a secure position, did Caltrans begin negotiating the franchise agreements. Negotiations were intense and frantic: "Typically there would be as many as ten lawyers representing a single consortium, and sessions often lasted 20 hours per day in the last two weeks" (Gomez-Ibañez and Meyer, 1991). After three months of negotiation, all four agreements were signed by January 1991.

The agreements specify the basic service options and mandate state design and construction standards. They set base rate-of-return ceilings (from 17 to 21 per cent) and leave toll rates completely unregulated. Incentive bonuses to increase vehicle occupancy, throughput and other objectives allow the returns to exceed the base rate.

With the agreement in hand, each operator faces the gruelling task of completing the project. Each needs to assemble the right-of-way, design the project, shepherd it through the environmental review process, and construct it, all at a cost that will be remunerated

by toll revenues. The most formidable obstacle is environmental review. Environmental impact categories include takings and land use, neighbourhood consequences, visual conditions, noise and vibration, ecosystems, endangered species, wetlands, air quality, water resources, parklands, historic and archaeological sites, and hazardous waste, and each category is divided into long-term, primary, and secondary impacts (ARTBA, 1991). Franchise-holders must submit environmental impact statements to satisfy both the California Environmental Quality Act and, if connecting with an interstate highway, the National Environmental Protection Act. In addition to documenting adverse impacts they must offer mitigation measures. Both review processes are undertaken subject to public agency approval after numerous public hearings. Even after environmental statements are approved, they are apt to be contested by suits challenging whether the operator and public agencies have fully complied with the laws. Facing opposition from environmentalists and slow-growth interests, the projects must run a lengthy, expensive and high-risk gauntlet of public opinion and bureaucratic politics. By June 1992, only one of the projects had made significant headway: the project to develop the median of an existing freeway where the negative environmental effects are minor and the state had already completed the preliminary environmental documents. For the other three projects the gauntlet still has to be run.

Uncertainty hangs over a project until it obtains full approval. The uncertainty applies to whether the project will survive, when it will be approved, its magnitude and its final design. These uncertainties make *ex ante* franchise bidding less competitive and *ex post* outcomes less efficient. The expenditures on route assembly and environmental clearance are especially significant because they are made in advance and sunk (Price Waterhouse, 1990). According to a report of the California Engineering Foundation (1990): "The biggest obstacle to financing is the cost incurred between the start of a project and its environmental clearance".

Virginia's toll road (Leesburg to Dulles Airport)

In contrast to California, the Virginia Highway Corporation Act of 1988 leaves the door open to new private toll-road proposals. To obtain a franchise an applicant must obtain approval from the state Transportation Board, local jurisdictions, and the State Corporation Commission which regulates utility corporations. Finally, the operator and the Department of Transportation enter into a franchise contract that specifies standards, inspection procedures and oversight. During these steps, the applicant would work on environmental review and route assembly.

Intending to build a 14-mile highway between Dulles Airport and Leesburg, the Toll Road Corporation of Virginia began the process in March 1989. After arguments with several state agencies and the airport authority, it emerged two years later with its franchise. The environmental and local opposition were not severe. From its inception, the Toll Road Corporation has enjoyed support from citizens and local governments. The Corporation gained the support of local residents by an outgoing strategy of "aggressive compliance". The State Corporation Commission will regulate the project like a utility, approving toll rates and aiming at fixed rates of return.

The Virginia model involves ongoing regulatory control. This can entail excessive use of resources in producing and operating the service ("gold plating"), inefficient labour contracts, inflexible pricing strategies, and political influence (Goldberg, 1976). Also, the Virginia model precludes competition for a particular project.

Other states and ISTEA

Besides California and Virginia, enabling legislation has been passed in Arizona, Florida, Texas and Puerto Rico. Arrangements in these states resemble those in California and Virginia. Enabling legislation and specific projects are being introduced in Colorado, Georgia, Illinois, Minnesota, Missouri, Nevada, North Carolina and Ohio.

Private toll roads will proliferate under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Robert Poole (1992) of the Reason Foundation says that ISTEA "contains the most sweeping privatisation provisions ever enacted by Congress". Since 1916 federal policy has forbidden federal funding of toll roads, although Congress has made exceptions. ISTEA reverses that policy and even permits the use of federal funds on private facilities. For highway projects the federal share may be as high as 50 per cent of the costs (for tunnels and bridges, 80 per cent). ISTEA sheds the old requirement that federal funds be repaid if a highway is privatised; it permits tolling to be retained after the debt is retired; and it allows federal rights of way to be used for tolled expansion of existing highways. These provisions represent a major policy shift. America is entering a new era of highway management where franchised operators take responsibility for projects. The pioneering states have rushed through plans shaped by immediate political circumstances, and other states are following their lead. The question of how highways should be franchised has never been carefully examined.

3. Demsetz and His Critics

Where scale economies exist, a natural monopoly may emerge and enjoy monopoly power in the absence of regulation. In the simplest case the monopolist supplier chooses the price-quantity combination where marginal revenue equals marginal costs — yielding combination (P_1, Q_1) in Figure 1. To prevent such an exploitative outcome, one view is that the service should either be operated by the government or franchised to a private operator and regulated by a public agency that approves prices based on rate of return.

With an ever-sceptical eye towards government, Demsetz proposed that, instead of regulation, the government should conduct a competition in which private contestants bid for the right to be the monopoly. A bid would take the form of the price that the contestant would charge users. The bid promising the lowest price would win the franchise. In a certain world where contestants had identical cost functions and knowledge of demand, the winning bid would be P_2, and the operator would just break even. Regulation would be superfluous; the government would only need to enforce the contract that emerged from the bidding competition.

Demsetz's audacious proposal provoked several responses. Telser (1971) pointed out that Demsetz had not found an optimal solution, since first-best optimality would entail

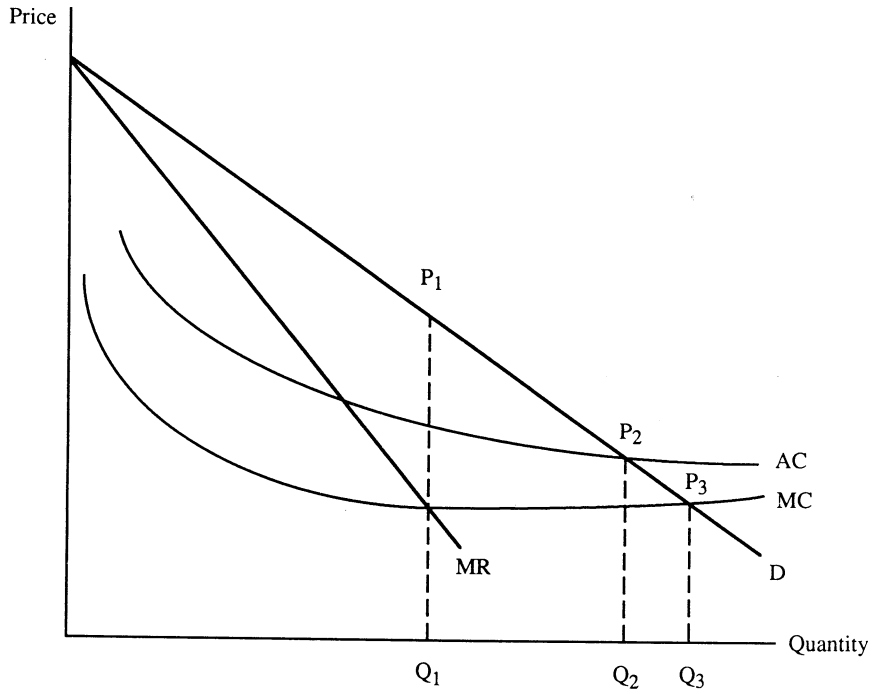

Figure 1
A Monopoly Service Auctioned by User-Price Bids

an output of Q_3. In the case of highways this incremental increase may be important because the marginal social cost of uncongested travel is virtually zero.[4]

Williamson (1976) and Goldberg (1976, 1977) independently developed more telling criticisms, some of which Demsetz himself anticipated (1968, 1971). They said that Demsetz's result depends on so many dubious assumptions that his message is misleading. Their points include the following:

- With uncertain cost and demand conditions, the winning bid may turn out to be quite inefficient — especially if the operator finds that by adhering to the contract terms it must shut down.
- For a variety of reasons, the government's threat to enforce the letter of the contract will not be credible.
- Both quality and performance are variable, so specifications would be in order, and monitoring and enforcement required.
- Some quality dimensions will be unforeseen.
- With the multiplicity of quality dimensions, the initial award criterion becomes

[4] The marginal social cost of uncongested car travel is nil, while it varies greatly for trucks by axle load and road type. See Small, Winston and Evans (1989).

complex and somewhat vague, as each firm may propose a different package of services.

- The initial operator is likely to enjoy a bidding advantage at the renewal date. Also, if renewal is unlikely, the initial operator may fail to maintain the facility properly.
- Contestants may require assurances against the introduction of new competition, and this may freeze technology.
- Since contestants have different technologies and services packages, they may be reluctant to place their exclusive access to valuable ideas at risk by public bidding.

The conclusion is that long-term utility contracting is so fraught with uncertainty that neither vigorous competition nor complete contracts are possible, and even reasonably efficient outcomes are not assured. Any franchise arrangement must include extensive post-contractual monitoring and renegotiation, activities that resemble the tasks of a regulatory commission. As Goldberg (1976) says: "private explicit contract inevitably blends into implicit social contract of which regulation is but a special case." Goldberg (1976) refers to the various post-contractual activities — facilitating, overseeing, monitoring, enforcing, renegotiating — as the "administering" of the contract.[5]

Although these stumbling blocks apply to highway franchising, many could be mitigated prior to bidding. Once the route has been selected and environmental clearance obtained, there is a narrow range of choice in design and construction concerning safety, convenience and aesthetics. Even on these matters, the operator must follow agency standards. These attributes are of minor concern to the traveller when choosing a route; the more important dimensions of service are cost and travel time. The possibilities of unforeseen quality dimensions emerging are small. Compared to cable television, which is the focus of Williamson's discussion, the case of highways is straightforward. Even in cable television, the record on franchise bidding has been less problematic than Williamson originally suggested (see Zupan, 1989, and Prager, 1990). Furthermore, the record suggests lower prices where competition prevails (see Hazlett, 1986).

Also, since the investment is non-liquid and immobile, there is little fear that the operator will capriciously discontinue service or engage in opportunistic hold-up. For these reasons, participation assurances by each side are not a significant obstacle. Finally, the investment is long-lasting, so long-term agreements (of, say, 35 years, or even in perpetuity) would be appropriate to reduce problems surrounding contract renewal.

Points against the idea of franchise bidding are the cost and demand uncertainties, the sheer enormity of the costs, possible government assistance to competing routes and modes, and changes in government policy that would require compensation for the holder of the franchise. These problems are likely to necessitate some administering of the contract. However, the seriousness of these stumbling blocks depends on the method used to produce the contract and award the franchise. Here transport officials can learn from Williamson and Goldberg, and from the experience of the American states that have franchised highways.

We develop a proposed method for contracting highway services in a modified Demsetzian manner.

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[5] For an introduction to franchise bidding, see Viscusi, Harrington and Vernon (1992).

4. Clearing the Project Before Awarding the Franchise

Suppose that the public sector facilitator has identified a corridor for development and determined the basic design of the facility. (We will return later to the issue of identification and selection.)

Our proposal is that the facilitator should divide project development into two phases: *clearing* and *awarding*. First the facilitator would clear the project by assembling the right of way, completing the preliminary design and satisfying the environmental requirements. Second, the facilitator would award the franchise to the winning bidder to complete the final design and to finance, construct and operate the facility. This strategy of *clearing-before-awarding* reduces the Williamson-Goldberg stumbling blocks to competitive bidding.

The facilitator would be auctioning a prepared project. Uncertainty regarding the costs, timing and dimensions of the project would be significantly reduced; hence the contract would require far less administering. Also, the investment schedule would be less front-loaded, because clearance would have been attained before the operator entered. Reduction in uncertainty and preliminary costs would make for a much less precarious project, encouraging competitive bidding among numerous contestants.

Franchise contestants would be forced to compete head-to-head. They would enter bids with much lower expected rates of return, leaving more of the social surplus for users. In addition, the incidence of project failure would be reduced.

Since quality and performance standards would be well-defined in advance, the award criteria could be more rigorous, post-contractual administering would be reduced, and the threat of enforcing the contract would be more credible. The facilitator (the developer of the project) would be in a firm negotiating position if ambiguities were to arise. And having head-to-head competition for a single project would reduce the chance of political considerations influencing who won the franchise.

Clearing-before-awarding shows major advantages over the California and Virginia methods, and mitigates many of the problems raised by Williamson and Goldberg.

Developing a constituency for toll roads

There are numerous other points in favour of clearing-before-awarding. First, there is reason to believe that awarding a pre-approved project would reduce the opportunity for post-contractual political involvement. Shortly after the California agreements were signed, for example, State Senator Lockyer introduced a bill to prevent any government agency from making funding or right-of-way contributions to any of the projects. The issue was ambiguous in the enabling legislation, and some of the franchise-holders were soliciting contributions from local governments. Lockyer, opposed to private toll roads, saw an opportunity to undermine the projects (Gomez-Ibañez and Meyer, 1991). He based his challenge partly on the claim that the agreements "were negotiated in secret, with no review by the Legislature or any other agency" (Lockyer, 1991; see also Gomez-Ibañez and Meyer, 1991). Lockyer's swift assault sent a tremor through the financial community. In a similar fashion, two toll road projects in Arizona were squashed by the Governor.

Investment advisers question whether the government will keep to its side of the

agreement. Investors are very concerned, as Caltrans Director Robert Best said, "that the next time the winds shift a little bit, the government side of the deal will immediately begin to welch" (Reinhardt, 1991). The clearing-before-awarding method, with full and open public sector involvement in the approval and awarding phases, would be much less vulnerable to political tampering. Projects of questionable merit would be abandoned and those clearly beneficial would develop a constituency of support. In consequence, private parties would participate on more certain and more competitive terms.

Another point in favour of clearing-before-awarding is that a public facilitator may be able to assemble the route and navigate it through environmental review at a lower cost than a private consortium. The public facilitator would enjoy more authority and influence; would have rapport with other public sector agencies; and would be vested with eminent domain powers. It has been suggested that Loudoun County (Virginia) asked for more design changes from the private Dulles project than it would have from a public project, because the private project enjoyed less power and was perceived to have more resources (Gomez-Ibañez and Meyer, 1991). Also, the public sector has an advantage in that it is viewed with less suspicion than a private corporation. "Caltrans has no vested interest in obtaining a positive environmental review and therefore is more objective than a private developer" (California Engineers Foundation, 1990; see also Gomez-Ibañez and Meyer, 1991).

Project identification and selection

We have assumed that the public-sector facilitator will identify potential projects and select the best ones for development. However, private firms may be better able to identify viable projects. Their flexibility and entrepreneurial mission lead them to find the relevant knowledge to disclose profit opportunities (Hayek, 1978). It is difficult for state agencies to simulate the genuine entrepreneurial spirit (Reinhardt, 1991). One of the losing California proposals, for example, was to replace San Francisco's Embarcadero Freeway, which had been damaged in the 1989 earthquake. The new facility would be toll- free, with revenues coming from the development of new office buildings on the excess right-of-way. Private enterprise has an eye for those services that augment returns.

Nevertheless, having private enterprise identify projects does not dovetail well with holding head-to-head competition once the facilitator has cleared a project. The facilitator may try to get the best of both worlds by proceeding as follows:

(1) conduct a competition for the identification of attractive projects;
(2) select the best projects and reward their proposers;
(3) clear each project;
(4) conduct a head-to-head bidding competition for each project franchise.

The difficulty with combining steps (1) and (4) is that the reward for project identification has to be something *other than* the franchise to operate the facility. The US Department of Defense, for example, often encourages innovation by choosing two or more firms to develop a prototype weapon, and the winner is rewarded with production contracts. This method avoids cash outlays for project identification by coupling the identification stage with the production stage (Cohen and Noll, 1992). To preserve head-to-head competition on a selected and cleared project, the Department of Defense model would not suit our

highway franchising system. Alternatively, the reward for identification of selected projects may be a cash prize or a promised interest in the eventual revenues of the facility. Another interesting and appealing possibility is to grant the identifier of the selected project a bidding advantage, say of ten per cent of the best rival bid, in the head-to-head franchise competition (that is, in the competition at step (4)), and to make this bidding advantage freely *tradable*, so the winning identifier can reap a reward even if it does not participate in the franchise competition.

Further thought must be given to how effective schemes for identification and selection can be grafted on to our main proposal without spoiling its principal virtues. The default approach is simply to leave identification and selection to the staff of the facilitator, who should have knowledge of the viable corridors and facilities. This is debatable. In California, for example, substantial portions of all four selected projects were already identified in the long-term state plan (West's Annotated California Codes: Streets and Highways Code (1990), Sections 253.5-426). However, three of the unselected projects had not been identified by state officials. Many have suggested to us that the public sector is significantly inferior in project identification and design. It has been pointed out that (a) the design of the facilities for the Caltrans competition varied and enriched already identified projects; (b) many already identified projects were *not* proposed; and (c) "the tight timetable to which the competition was run, was largely responsible for the bidders falling back on already identified plans" (anonymous referee).

5. Bidding

We now turn to the second main part of our proposal, head-to-head competition for the franchise. A toll road promises a continuing stream of revenues, similar to tracts on the US outer continental shelf for oil and gas drilling. Such projects entail high preliminary investment and a future stream of revenue. The Department of the Interior clears a tract and announces that an auction will take place at a particular time and location (Mead *et al.*, 1985). Three types of bidding are used to select the winning lessee. The most common is *bonus bidding*, which requires a large initial payment (the "bonus") and places the bulk of the risk on the lessee. Bonus bidding promotes economic efficiency by awarding the lease to the most efficient firm and does not distort decision making at the margin. Under the second type of arrangement, *royalty bidding*, the initial bonus payment is fixed and is lower to encourage participation by smaller firms. A minimum royalty (for example, 12.5 per cent) is established, and bidders are asked to make offers in terms of a percentage of the value of resources recovered. The firm offering the highest royalty is chosen. The third type of arrangement is *profit-share bidding*, where each bidder offers a percentage of the net profit on a lease as payment to the government for the right to explore and develop the resource. Royalty bidding has an advantage in terms of risk-sharing and reduction of the initial payment. It is less costly to administer than profit-share bidding, because only revenues need to be monitored. Both are deficient, however, when compared to bonus bidding because the bidder offering the higher overall return will not necessarily be identified and bids may not promote economic efficiency.

Just as shelf tracts are auctioned in a competitive manner, so can highways be. The challenge is to specify a form of bidding that will encourage competition and minimise the stumbling blocks to franchise bidding elaborated by Williamson and Goldberg.

The Demsetz bidding scheme

In a simplified world, Demsetz's scheme for franchise bidding shows almost every virtue: it dispenses with regulation and requires only enforcement of the contract; it provides the operator with strong incentives for cost control and internal efficiency; and it avoids monopoly power and under-use of the facility, although it does not deal perfectly with use at the margin.

Regrettably, the world is not so simple and uncertainties will persist. The chief problem is that a highway is a large structural change, taking years to complete, so user-demand levels are difficult to predict. Not only does demand change over the years, but it fluctuates during each day. At peak periods there is a hazard of *over-use* as well as monopoly-induced *under-use*. And, even with clearing-before-awarding, uncertainties on the cost side will persist. In attempting a Demsetzian user-price auction, the facilitator could perhaps take bids for the *average* toll to be charged, leaving the operator free to make vehicle or time-of-day variations. But it seems to us that a Demsetzian user-price auction would necessarily entail some combination of a complex award criterion, post-contractual administration and troublesome pricing constraints. For these reasons, we reject the idea of bidding taking the Demsetzian form of user-price schedules. Our proposal retains much of the Demsetzian spirit by keeping head-to-head competition, encouraging cost control and selecting the most efficient contestant. However, it would permit pricing flexibility while avoiding extensive administration.[6]

Marginal return bidding

Our proposal is that franchise bidding should take the form of marginal-return cap schedules. The idea is best explained by an example.

Suppose that the preliminary design and environmental approval of a project are in hand, and the facilitator estimates the cost of completing the project to be $500 million. Assume for the present that the operating costs are zero. The facilitator has written the contract and only needs to determine its holder. The facilitator presents the sold lines shown in Figure 2, which we call the *format* portion of the rate-of-return cap schedule. The format schedule permits 30 per cent earnings on the first 200 million, 10 per cent on the next 100 million, *is undefined* on the next 300 million, and 5 per cent on anything more than 600 million dollars. The unidentified portion — $300 million to $600 million — is filled in by the winning bid. A contestant's bid takes the form of a straight line segment connecting point *d* to the vertical line at $600 million (*MN*). Let *z* be the signed vertical distance on *MN* from point *g*. Therefore, for example, at point *f* the *z* value is 0.10; at point *g* it is zero. Bids are essentially *z*'s, and may go below zero. The lowest *z* wins the franchise.

[6] It should be noted that Demsetz explores some of the shortcomings of his user-price auction and mentions management contract options (Demsetz, 1968, 1971).

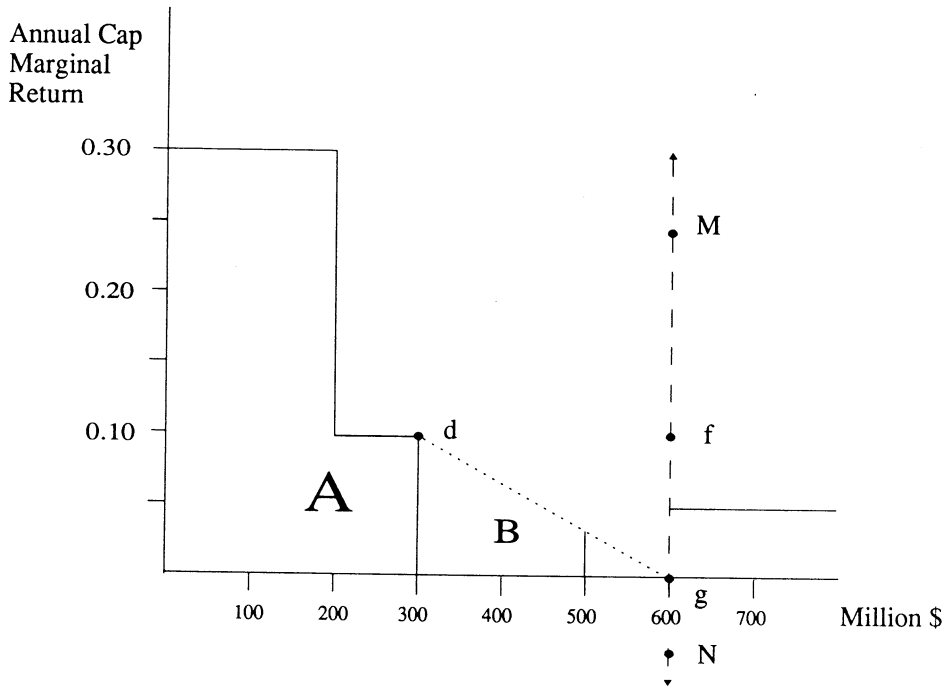

Figure 2

Marginal Return Bidding

The solid line is the format return schedule given by the facilitator. The dotted line is an example of a bid.

Suppose a contestant wins the franchise with a bid of z equal to zero. Its return schedule would be the format schedule plus the dotted line. If costs turned out to be \$500 million, its annual cap return would be area A plus trapezoid B (which sum to \$83.3 million, or a 16.7 per cent return). The return cap on the marginal dollar (the 500 millionth) would be 3.3 per cent, a rate significantly below what that dollar could earn in an alternative investment. On the margin the operator is discouraged from inflating costs. And as costs increase this discouragement becomes more severe. For example, if costs were \$550 million, the average return would drop to 15.4 per cent and the marginal return to 1.7 per cent.

Calculation of returns caps can be expressed as follows: for any winning bid z, with actual cost C (between \$300 million and \$600 million), annual cap return equals \$70 million (that is, area A), plus Area B:

$$\$(C-300) \times [0.10 - (0.10 - z) \times (C-300)/600] \text{ million.}$$

If C is greater than \$600 million, it is necessary to include another $\$(C-600) \times (0.05)$ million and replace C in the calculation for area B with 600. The average cap return rate is annual cap return divided by C. The marginal cap return rate (for C between \$300 million and \$600 million) is $0.10 - (0.10 - z) \times (C-300)/300$.

The format return schedule shown in Figure 2 is only an example.[7] In any actual case, the facilitator would draw the format schedule based on the conditions of the project in question. The beauty of the bid component is that the competitive framework will utilise knowledge that is dispersed among the contestants (Hayek, 1945), and will adjust the *total* return cap appropriately.

Marginal-return bidding combines the virtues of Demsetz's scheme with the virtues of traditional rate-of-return regulation, while avoiding their worst vices. Like Demsetz's scheme, it preserves head-to-head competition for the field and tends to select the most efficient contestant. Also, it discourages gold plating and internal inefficiency — serious problems with traditional rate-of-return regulation. The operator has the incentive to achieve performance specifications at the lowest possible cost. Unlike Demsetz's scheme, it leaves pricing flexible, so appropriate and innovative toll practices can be developed in response to demand. Furthermore, it requires little administering of the contract. Whereas traditional rate-of-return regulation requires careful monitoring to guard against gold plating, marginal-return bidding only needs to document costs. The facilitator could simply audit the operator's books. Determining whether certain expenditures were in fact made is a much simpler task than determining whether they were *good ones* to make.

This presentation of marginal-return bidding has ignored several important factors: (i) arrangements for annual costs; (ii) excess earnings and bonus incentives; (iii) monopoly power and the marginal user; (iv) earnings from value capture; (v) reimbursing the facilitator for clearing the project; and (vi) collusion in bidding. These are considered below.

(i) Arrangements for annual costs

Operating expenses would include maintenance, tolling, billing, policing, cleaning and lighting. In addition to regular maintenance, a reserve fund must be accumulated for major occasional maintenance. All these expenses are treated as annual costs. The Congressional Budget Office (1985) has estimated that annual costs for toll roads are about 18 to 20 per cent of annual outlay (annual costs plus debt service), and 3 to 3.5 per cent of total building costs. On an electronically equipped toll road, these percentages should be smaller.

There are two ways to deal with annual costs. One is to make the operator responsible for covering them *out-of-returns*. In our example of a 500 million dollar project with a z bid of zero (see Figure 2), suppose the year's revenues are $100 million. The operator is permitted only $83.3 million, and the excess revenues ($16.7 million) go to the state. Annual operating costs and debt service would come out of this $83.3 million.

A second method is to take operating cost *off-the-top*. Suppose also that annual costs are $15 million. The annual costs would first be paid out of the $100 million, leaving $83.3 million as earnings for the operator and $1.7 million for the state. (Debt service would still

[7] Our example is guided by Price Waterhouse (1990), which suggests that a rate-of-return cap between 17 and 23 per cent would be required to induce private firms to assume the risk of building toll roads in California.

come out of the $83.3 million.) The operator would of course prefer the off-the-top arrangement, and this is the arrangement in California.

The advantages of the out-of-returns arrangement are that it strongly discourages gold plating in operations (a dollar spent in operations is a dollar lost), and it encourages the operator to construct a facility that can be operated at low cost. The disadvantages are that it may discourage proper maintenance, and it increases risk at the outset since operating costs would have to be estimated in advance of bidding. An off-the-top arrangement could encourage gold plating in operations where return caps are binding, though this perverse incentive could be mitigated either by giving the operator a portion of the excess revenues, or by specifying a declining allowance schedule for annual costs (akin to the declining format return schedule). Compared to out-of-returns, off-the-top entails less uncertainty at the bidding stage, but it does increase post-contractual administration since it requires the auditing of annual costs by the facilitator. Off-the-top will increase the likelihood of proper maintenance, which will be an important incentive if enforcement of maintenance specifications is costly and ineffective.

Neither approach clearly dominates. But whatever the arrangement for annual operating costs, competition at the bidding stage will work to adjust *total* returns to a normal level and to select the most efficient operator.

(ii) Excess earnings and bonus incentives

If earnings in excess of the return cap are turned over to the state, the operator may neglect traffic management. It is better that the operator should divide excess earnings with the state according to some formula, as has been done in Puerto Rico. Another approach is to give "bonus" incentives for specific performance goals. Among the California projects, incentives are provided for operating effectively: a return-on-investment bonus is awarded for increasing peak-period capacity and mean vehicle occupancy, and decreasing accidents (Reinhardt, 1991). Franchise contestants, hopeful of receiving the bonuses, would adjust total returns by driving down the z bids.

(iii) Monopoly power and the marginal user

Suppose the facility is located in an area that experiences rush hour congestion. Monopoly pricing (that is, under-use) is not a problem for the peak periods since the congestion externality makes reductions in use desirable. The congestion externality makes it desirable for steep price increases to shift travellers to other modes, other routes, or other times. Social welfare is compatible with profit maximisation (Small, 1992).

At off-peak periods the congestion externality is minimal and monopoly pricing is a threat. The operator's marginal cost of service is virtually zero, so profit maximisation may well mean high prices and significant under-use. Guarding against monopoly pricing is the reason for rate regulation, but regulation itself is a problematic proposition. If the facilitator approved off-peak toll rates it would decrease pricing flexibility, increase administration, and increase *ex ante* uncertainty. A limited form of regulation may, however, be worthwhile.

Economists recognise that multi-part pricing can be an effective way to price monopoly service (Oi, 1971; Demsetz, 1971). The facilitator may wish to mandate such

multi-part offers. For example, the contract may specify that travellers be offered the option of buying a quarterly "toll-cutter" pass, at a price of 20 times the standard off-peak rate, that permits the holder to make 20 off-peak trips at no charge and additional trips at half the standard rate. Pass-holders would pay a fixed fee and discounted marginal charges, and anyone making more than 20 off-peak trips during the quarter would save by buying the pass. The pass would give frequent travellers opportunity to make low-value trips during off-peak periods.

Mandating a specific formula runs the risk of being far off the mark, but there is no way to leave terms open without widening the scope of monopoly power and contract administration. Perhaps the terms of the toll-cutter pass could be expressed in the franchise contract as a function of throughput and the standard off-peak charge.

Finally, monopoly power is checked by competition. In metropolitan areas a toll highway competes to a certain extent with other highways, arterial routes and other modes of transport. An example is the Route 91 project in California, where four toll lanes will be constructed in the median area of an existing freeway. California legislation requires, in fact, that untolled alternatives are available before a tolled facility is approved (Section 143, California Street and Highway Code, 1(f)).

(iv) Earnings from value capture

One of the losing proposals in the California competition was a plan to replace San Francisco's Embarcadero Freeway. The proposal was to make the facility *toll-free*, with revenues coming from the right to develop new buildings on the excess right of way. Although this project is an extreme example, every toll road project involves value-capture opportunities. Where possible, the California projects will lease out development rights to fuel stations, restaurants, hotels and so on. This arrangement is like the land grants made to railroads in the nineteenth century.

Value capture is often an important financial impetus to highway development. The returns from such activities should be kept separate from the return agreement and left unregulated, since the services in question would be provided in a competitive field. The anticipated value capture should, however, influence how the facilitator draws the format return schedule, and no doubt would influence the bids.

(v) Reimbursing the facilitator

Metropolitan toll roads cost between 4 and 10 million dollars per lane mile. This includes right-of-way, preliminary design and clearance. We have recommended that the state carry out the developmental steps of the project, but have not mentioned recovery of public outlays.

Three alternatives stand out. The first would require a large specified payment made before or during operation. A second method, somewhat analogous to royalty arrangements, would reimburse the state with a fixed share of the profits. Although preliminary bonus payments are common in oil and gas leasing, there is too much financial uncertainty surrounding toll roads. When financial success is demonstrated, such payments may be useful.

The third method is to write off the state's outlays as public service. The public is

served by the facility. Aschauer (1989) has advanced the idea that investment in infrastructure has been important in determining productivity growth in the US between 1949 and 1985, and Lewis (1991) has shown how retail firms use transport improvements to reduce capital investment in warehousing and improve efficiency. Investment in clearing a project need not be recovered from the operator because the state recaptures investment from economic prosperity. In addition, all states and many metropolitan areas collect taxes on gasoline and related items. Investing some of these revenues in clearing highway projects, to be constructed and operated by private companies, advances the goal of improving transport.

(vi) Collusion in bidding

Collusion among the bidders would spoil much of the appeal of marginal-return bidding, but collusion is unlikely. With the project cleared, it would be comparatively inexpensive for many firms — both domestic and foreign — to estimate the value of the franchise. There would be no proposal to develop, only a z bid to submit. The low cost of participating would mean that any collusive ring would be vulnerable to outside competition. Furthermore, the facilitator could guard against perverse outcomes by setting a maximum z bid or by reserving the right to nullify and repeat the competitive tendering procedure if foul play was suspected.

A variety of fine points can be built into our plan. One of the niceties of the competitive component of our proposal is that, however the facilitator specifies the contract, the bids will *automatically* adjust to ensure that caps on *total* returns are reasonable.

Marginal-return bidding combined with clearing-before-awarding presents an attractive alternative to the California and Virginia models of highway franchising. It is a franchise method that would simplify the development phase, heighten competition in the award decision, discourage gold plating, and reduce administration of the contract and the need for regulation. It would accelerate highway improvement by encouraging the investment of private capital.

6. Conclusions

Highway franchising is no longer a free-market fantasy. It is happening and its occurrence will accelerate. Yet little scholarly attention has been given to how to privatise highways. This paper reviews recent practice and develops proposals to improve procedures. The two main components of our proposal are:

1. *Clearing-Before-Awarding.* The environmental approval process is long, expensive and uncertain. The public-sector facilitator should select, define and clear the project before putting it out to tender. Clearing-before-awarding would permit contestants to bid on a well-defined project with greatly reduced risk. Competition in the bidding would be enhanced, and post-contractual administration reduced.

2. *Marginal-Return Bidding.* In the spirit of Demsetz's proposal, contestants would be competing head-to-head for a single project (unlike current practice). Bids would take the form of a marginal-return schedule that would provide strong incentives for cost control and internal efficiency, leaving pricing flexible, and require little post-contractual administration.

Although our proposal is outlined for new highways, it would serve usefully for other services as well. Clearing-before-awarding is valuable for projects that entail a long, expensive and high-risk public approval process. Marginal-return bidding may apply to a facility with a large initial cost and a future stream of revenue from users.

Tunnel and bridge projects are very similar to highway projects and are well suited for our proposal. Another development of highway franchising would be the privatisation of commuter or truck lanes when existing facilities are reconstructed. As metropolitan freeways reach the end of their design life, reconstruction could offer the choice of tolled and untolled lanes where operators of electronically equipped vehicles would use exclusive lanes to save time.

Both clearing-before-awarding and marginal-return bidding may be worth considering also in the context of franchising (or contracting out) rail service, airports and harbours. Marginal-return bidding may be valuable in the leasing of public lands for the extraction of oil, gas, timber, and so on, or for the franchising of traditional public utilities.

But would any public-sector facilitator faithfully carry out a plan that passes the baton to a private operator, who crosses the finish line and wins all the glory? Would a facilitator show the high-minded leadership that our plan demands? In government agencies there is often animosity towards privatisation, and considerable inertia. Influence by construction and engineering firms is another hazard. Perhaps our plan needs also to address how the facilitator can be organised so as to minimise special interest but maximise flexibility and alacrity.

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