CENTER DISCUSSION PAPER NO. 866

PRIVATIZING HIGHWAYS IN LATIN AMERICA: IS IT POSSIBLE TO FIX WHAT WENT WRONG?

Eduardo Engel
Yale University

Ronald Fischer
University of Chile

Alexander Galetovic
University of Chile

July 2003

PRIVATIZING HIGHWAYS IN LATIN AMERICA:
IS IT POSSIBLE TO FIX WHAT WENT WRONG?

BY EDUARDO ENGEL, RONALD FISCHER AND ALEXANDER GALETOVIC[1]

July 21, 2003

Abstract

This paper reviews the Latin American experience with highway privatization during the last decade. Based on evidence from Argentina, Colombia and Chile, we find that private financing of new highways freed up fewer public resources than expected because public funds were often diverted to bail out franchise holders. Furthermore, many of the standard benefits of privatization did not materialize because of pervasive contract renegotiations. We argue that the disappointing performance of highway privatization in Latin America was due to two fundamental design flaws. First, countries followed a "privatize now, regulate later" approach. Second, most concessions were awarded as a fixed-term franchise, thereby creating a demand for guarantees and contract renegotiations.

This paper also extends our previous work on formal models of highway privatization. We relax the self-financing constraint which ruled out the public provision of highways by assumption, and show that whenever the privatization of a highway is optimal, government transfers are undesirable. Alternatively, if government transfers are optimal, it is always the case that the full public provision of the highway should be preferred over privatization. We also model the role of flexibility and opportunistic behavior in highway concession contracts, and show that, by contrast with its fixed term counterpart, a flexible term franchise provides flexibility without inducing opportunistic behavior.

Key words: build-operate-and-transfer (BOT), concessions, cost-of-funds, flexibility, franchising, government subsidies, present-value-of-revenue (PVR), regulation, renegotiation.
JEL classification: H21, L51, L91

1 Introduction

A revolution in the way highways are provided took place in Latin America during the nineties, when more than fifty projects, mainly in Argentina, Brazil, Chile, Colombia and Mexico, were privatized using build-operate-and-transfer (BOT) contracts. This paper draws some lessons based on the evidence accumulated so far. In particular, we show that policymakers face unpleasant choices when considering how to provide highways in the future.

The "lost decade" of the '80's led to low investment and inadequate maintenance of infrastructure, and created a major highway deficit across Latin America. This was the origin of the wave of infrastructure privatization, as this deficit, combined with chronic budgetary problems, led governments to embrace a scheme where the private sector financed urgently needed infrastructure investments, thereby freeing up public resources for projects in other priority areas.[2]

The evidence we present in this paper suggests that private financing of new highways freed up fewer resources than expected. In several cases, public funds were diverted to bail out franchise holders in financial trouble.[3] Government guarantees for private highway franchises also added to the fiscal burden. Making things worse, such guarantees were paid out mainly during economic downturns, when government budgets were under pressure.[4]

Before proceeding, it is useful to clarify exactly what we mean by public and private provision of roads. Under public provision (which we refer to as the *traditional approach*), the government designs, finances, and operates the road. Private firms may participate in the construction stage and may be selected in competitive auctions. But once the facility is built, the government operates and maintains it. Taxpayers finance the road and, even when users pay tolls, they are usually unrelated to construction costs. By contrast, when roads are privatized, a concessionaire finances, builds, operates and maintains the facility. The franchise owner collects tolls for a long time –usually between 15 and 30 years– and when the franchise ends, the road reverts to the government. Such BOT contracts can be awarded either through direct negotiations between the transit authority and an interested firm, or through a competitive auction for the franchise of a well-defined project.

Highway privatization not only promised to free up government resources, but to deliver some of the standard advantages expected from privatization.[5] First, a firm that is responsible

---

[2]Even though this is the main reason why roads were privatized, the economic validity of the argument is dubious if countries face an aggregate debt constraint. If the sum of a country's public and private debt must be lower than a given threshold, private investment in highways can crowd out investment (public and/or private) in other sectors.

[3]For example, Mexican taxpayers spent more than US$8 billion to bail out the franchise owners and the banks that lent to them.

[4]See for example, "World Bank warns of new debt dangers" *Financial Times*, May 30th, 1997.

[5]For example, an official 1999 document from ALIDE (Latin American Association of Financial Institutions for Development) states: *"The fiscal and financial crisis [...] of the eighties led to the end of the traditional model of infrastructure financing, that considered the state as the main investment agent, and opened space for important participation by the private sector [...] with the objective of not only bringing relief to the burden supported by public finances, but, more importantly, to improve the allocation of risk and improve the efficiency of management [...]"*

for construction and maintenance has the right incentives to invest in road quality (Tirole, 1997). Second, private firms are better managers than state-owned highway authorities. Third, BOT contracts may be desirable on distributional grounds, since roads are paid by those who benefit. In particular, cost-based tolls are easier to justify politically when infrastructure providers are private.[6] Finally, in contrast to public provision, under BOT, only privately profitable roads will be built, thus using the market mechanism instead of central planning to screen projects. This reduces the likelihood of building a white elephant, as is common in Latin America (and other continents).[7]

Our review of the evidence suggests that the promised benefits of highway privatization failed to materialize. The main reason for the failure were the continuous processes of renegotiation of franchise contracts. In most countries concessionaires renegotiated their contracts without public scrutiny. This facilitated shifting losses to taxpayers. Such renegotiations negate the public benefits of private highways by giving an advantage to firms with political connections, limiting the risk of losses and reducing the incentives to be efficient and cautious in assessing project profitability.

We argue that opportunistic renegotiations have been pervasive because of two design flaws which are present in all franchising programs we have examined. First, countries have followed a "privatize now, regulate later" approach. In the examples of Argentina and Colombia in Section 2, the lack of a clear contractual structure led to cost overruns and renegotiation of the conditions of the original contract. Moreover, the government agency interested in the success of the franchise program was usually the same as the agency that supervised the franchise contracts. Since the success of these agencies is often measured by the percentage of the program which they succeed in building, they tend to be lax in enforcing compliance with franchise contracts and are inclined to ease the conditions for franchise holders. This is clearly the case in Chile.

The second pervasive design flaw is that most concessions have been awarded using a fixed-term contract, which make franchise holders bear most of the demand risk and create demand for subsidies and guarantes. This is particularly troublesome, since demand risk is particularly large for highways (see Engel, Fischer and Galetovic (2001)). And since the franchise holder has little ability to influence demand, there is no point in having the franchise holder bear this risk. Fixed-term franchises allocated in competitive auctions make it almost certain that firms will lose money in low-demand states, which generates pressure for renegotiations and guarantees.[8]

It is important to note that the evidence we present in this paper does not imply that the tra-

---

[6]This is important, if trucks are ever to pay tolls that approximate the road deterioration they cause.

[7]We define a white elephant as a project whose net (of costs) social value is negative. For an extreme example of a white elephant consider the Túnel Las Raíces, still the longest tunnel in Latin America, built in the 1940s and never put to its intended use.

[8]Note that in the real world, the pressure for road expansion (and thus for highway franchise programs) usually occurs during upturns, making it likely that average conditions during the entire franchise are worse than those under which the program is conceived.

ditional approach is necessarily better. But in our view it does suggest that we cannot ensure that one option is Pareto-superior. For example, a cash-strapped government facing the urgent need to build infrastructure that is socially desirable may choose BOT contracts even if they are renegotiated later to the advantage of the franchise holder. Alternatively, the traditional approach may be best for a government that can finance the highway by incurring in debt and is unable to avoid renegotiations of BOT contracts.[9] More generally, our point is that so far highway privatization has not been well-designed. Without significant improvements, such as introducing variable-term franchises, imposing credible hard budget constraint on franchise holders and introducing independent regulatory and supervisory bodies, it is not obvious that privatization is better than public provision of highways.

Thus the evidence we present in this paper casts doubts on the proposition that privatization should always be preferred to the traditional approach. This motivates the theoretical part of the paper, where we report progress in building theoretical models to analyze highway privatization, and use them to explore a basic question: when is privatization socially desirable?

In our previous work (Engel, Fischer and Galetovic [1997, 2001]) we ruled out, by assumption, government transfers to the franchise holder (the 'self-financing constraint') and found the franchise contract that optimally trades off demand risk and toll distortions. We also showed how to implement the optimal contract using a competitive, variable term auction.

By imposing the self-financing constraint, however, we ruled out the possibility that the traditional approach —or any approach that requires government transfers to the franchise holder— could be optimal. In this paper we formally derive conditions under which the traditional approach is better than BOT, and also characterize the conditions under which our earlier results extend to the more general setting considered here. We show that if the optimal contract involves government transfers, then BOT is suboptimal and the traditional approach should be preferred. By contrast, when BOT is optimal, no government guarantees are needed. In general, BOT contracts that involve government transfers for risk sharing purposes are always suboptimal.[10]

We also use our theoretical framework to debunk the 'cost-of-funds argument' often used in favor of privatizing highways. According to this argument, privatization is better than the traditional approach because private firms have a lower cost of financing projects, as government revenue is collected through distortionary taxes. This argument ignores that a publicly owned highway can also collect revenue via tolls, and that under congestion conditions tolls reduce distortions (the well known *double dividend*). Since this potentially efficient source of revenue is unavailable to the government in the case of a BOT contract, the cost-of-funds argument does not justify private highways. On the other hand, the government's highway agency manages and

---

[9]Of the many purported advantages of the private approach, the only robust argument seems to be that the franchise holder has better incentives to invest in the quality of the road.

[10]If the highway produces externalities which are not internalized by users, it may be desirable to subsidize the socially valuable road under a BOT contract. This case is considered in Engel, Fischer and Galetovic (2003).

spends fewer resources under BOT programs than under the traditional approach, and this may well provide an argument in favor of privatization if the agency is inefficient or corrupt.

The central role that opportunistic renegotiations play in our review of the regional experience is captured only partly by the theoretical framework described above. Indeed, the likelihood of renegotiations increases with the degree to which the franchise holder is forced to bear (uninsurable) demand risk.[11] This motivates modelling explicitly the renegotiation of a BOT contract. In doing so we show that a variable-term contract can be used to eliminate demand risk while, at the same time, allowing the regulator to renegotiate contracts when socially desirable. Thus variable term contracts are also more flexible than fixed-term franchises.

The remainder of the paper is organized as follows. Section 2 discusses the experience with highway franchising in Argentina, Colombia and Chile, concentrating on the issues most relevant for policy implications. Section 3 presents our new formal results. Section 4 concludes.

2   Country Studies

The so-called "lost decade" of the 1980's left several Latin American countries with severe infrastructure deficits. Lack of maintenance and increases in traffic flows meant that transportation bottlenecks were becoming costly, and could become a major obstacle for future growth. Governments in straightened conditions could not afford vast plans of public works, and lacked the human resources needed to undertake the major investments needed in transportation infrastructure. Highway franchising seemed to promise a solution to these problems, by allowing the private sector to complement the meager resources of the public sector. Moreover, if competition for the franchises worked, roads would be less expensive and would be well built.

In this section we examine the experience of highway franchises in Argentina, Colombia and Chile.[12] As these country studies suggest, there are many pitfalls that weaken the arguments for highway privatization. In Colombia, investment targets have not been met, some projects were awarded but never started and the government has paid large sums in cost and traffic guarantees. In Argentina, the main problem has been that franchises have been expensive for the government and for highway users. There have been repeated contract renegotiations, which usually seem to favor franchise holders. It is conceivable that in some specific cases, most users ended up worse off. Chile seems to have been somewhat more successful at avoiding the major pitfalls of highway franchises, having completely renovated its road system in time at a reasonable cost. Nevertheless, even in Chile contract renegotiations are common, and in average these have increased the budget of the projects by 15% of their original estimates. The regulation of concessions contracts has been

---

[11]We present some evidence on the relevance of this connection in Section 2.1.

[12]The case studies that follow are far from exhaustive. Their objective is to provide some stylized facts about the Latin American experience, from which we draw observations and motivation for the models developed in Section 3, and the conclusions in Section 4.

lax and there are signs of future renegotiations, to the detriment of users and taxpayers.

2.1 Argentina

The Argentine franchise program began in 1990 and was the second major franchise program in Latin America, after Mexico's.[13] In 1989-90, the first stage of franchises, the government auctioned twelve twelve-year intercity franchises. Traffic levels on these roads were sufficiently high (2,000 to 2,500 vehicles/day) for the private viability of maintenance, rehabilitation and capacity improvements, but were not high enough to build totally new roads (see Estache, 1999).[14] There was no toll revenue guarantee nor a profit sharing mechanism. Tolls were indexed to inflation to protect franchise holders. Service quality was measured by a quality index which was supposed to improve over the life of the concession. It was estimated that the service quality requirements would demand large investments in paving during the first few years of the franchise. Among other things, concessionaires were required to make the improvements before collecting tolls. This first round of auctions was very successful in attracting bidders, with more than a hundred bids for the simultaneous auction of the twelve franchises. The most important bidding variable in this first round of auctions was the rent (or *canon*) that would be paid to the government.[15] The total amount bid in canons was US$890 million a year in 1990 dollars.

However, in the first instance of a pattern that was to repeat itself regularly, after only five months the government decided to renegotiate the contracts.[16] The main reason was the new policy of *convertibilidad*, which declared illegal all indexing provisions in contracts. A further reason to renegotiate the contracts was that several concessionaires were collecting tolls before performing the investments required in their contracts. After the renegotiation, tolls were reduced by 50% and in exchange, the canon was eliminated. In fact the government granted subsidies totalling US$57 millions per year to the firms. The program of road improvements changed. Though the road franchises became less attractive as business propositions, firms were receiving money rather than making payments.

In 1995 another round of renegotiations began, because higher than expected traffic led to congestion and the need for new investments. The government threatened to auction the expansion projects in order to force the franchise holders to accept extensions of the franchise term in ex-

---

[13]At this time, highways franchises consist of 9,500 "equivalent km", a large fraction of Argentina's main highway system of 38,000 equivalent km. (see "Financing the Road Sector in Argentina: Lessons from the Past", World Bank). An additional 12,000 km are managed by the private sector which takes care of maintenance and rehabilitation in exchange for toll revenue. Furthermore, 6,000 km are maintained privately, but funded by the state. In the initial stage, only financially viable intercity roads, that is, roads between major cities, were franchised. The access routes to Buenos Aires belonged to the second stage of franchises.

[14]Tolls were set uniformly across all concessions on the basis of distance and type of vehicle. Tolls were set as multiples of the basic toll for cars of US$1.50/100km.

[15]Other variables like lowest toll, highest quality or investment were also used, but only occasionally.

[16]For details, see Annex 1 to the World Bank Seminar on Asian Toll Development in an Era of Financial Crisis, "Financing the Road Sector in Argentina: Lessons from the Past.", World Bank.

change for the required investment. The negotiations were direct.[17] Nevertheless, it appears that at least US$900 million in improvements agreed to in the 1995 renegotiations will not be built before the franchises end, in 2003.[18]

There was another renegotiation in December 2000, which specified additional government grants for the franchise holder, mainly because previous grants had not been paid. In exchange, the franchise holders agreed to more investment, but again, the grants were not paid consistently. It is interesting to note that contracts contained a *trigger clause* that limited the profit rate. When the target profit rate was reached, either tolls would have to fall or the franchisee would have to undertake additional investments. Since these investments were not auctioned competitively, franchisees—which frequently included construction firms—chose to make additional investments, so as to avoid sharing profits with the government, keeping the extra revenue within the firm.[19]

In the second round of franchises, the government had learned from experience and set better rules for the Buenos Aires access road concessions. Franchises were awarded to the bidder that asked for the lowest toll, franchise terms were set at 22 years, and in general the contract was comprehensive and included no guarantees. The number of bidders was small, with two per franchise at the most. As in the first-round franchises, contracts were amended frequently, five times since 1996, due to the trigger clause.

Clearly the quality of roads has improved as a result of the franchise program. Intercity traffic increased from 73 million to 106 million traffic equivalent units from 1991 to 1998 (see the World Bank Seminar on Asian Toll Development in an Era of Financial Crisis, "Financing the Road Sector in Argentina: Lessons from the Past."), though it remained approximately constant between 1996 and 1999 and has probably declined since due to Argentina's economic crisis. Intercity toll revenues were approximately US$300 million a year (pre-crisis), plus an additional promised US$75 million in grants from the central government. This is a large sum, considering that the franchises only had 821 km of two lane intercity highways. As a comparison, the budget for public expenditures in roads was only around US$500 million of which 35% went to pay interest. In the four Buenos Aires access routes, there were investments for $1.7 billion, and revenues that also came to US$300 million.

The Argentine experience also shows the social costs that may be caused by franchise contracts that overlook important issues. Indeed, since the location of the toll booths was not specified, the franchise holder placed them strategically so as to maximize revenue, by charging relatively high

---

[17]According to Estache (1999), who quotes the Public Works Secretary, the franchises were extremely profitable, at least until 1998, with rates of return between 26 and 38%.

[18]One of the reasons being that not all the government payments agreed upon in the last renegotiation were made.

[19]It is well known that trigger clauses like the one described above may lead to inefficiencies. On the one hand, if the road generates large revenues, it is probably close to congestion so lowering tolls may be inappropriate. On the other hand, unlimited expansion due to the trigger program may lead to overcapacity or congestion at the points at which the franchised highway interconnects with the rest of the road network, as there is no coordination with the rest of the highway network.

tolls to users of small sections of the franchised highway. This led to an average cost per travelled kilometer that is much higher than the established rate of approximately US¢1.5/km, because the average trip is short but pays the full toll. In fact, it has been shown that for the average 25 km car trip, users are worse off than before the franchises.[20]

Another remarkable fact is that reported operating costs of the inter-urban franchises range between 45-60% of net-of-VAT revenues. What is most surprising is that a large fraction, which has been estimated at around 40% of expenditures, is spent on administration and collection, and of this fraction, more than two-thirds are spent collecting tolls. In fact, 21% of gross toll revenues are spent on administration and collection, as much as is spent on maintenance.[21] A possible explanation for these costs is that many intercity roads have low traffic densities, which means that collecting tolls can be expensive. An alternative explanation is that profits are being diverted in order to delay the application of the trigger clause. This is consistent with the large gap that exists between profit rates estimated by the association of concessionaires (12.4%) and independent estimates (26-38%, see footnote 17).

Summing up, the Argentine concessions program has succeeded in providing a major upgrade to the country's highway network. Yet this upgrade appears to have been expensive, in particular because of the incentives to pad costs in maintenance, administration and collection, and the continuous process of renegotiations that have benefited concessionaires at the expense of toll users and tax payers.

2.2 Colombia

The first generation of highway franchises, with investment of US$1,076 million in 13 projects, was awarded during the mid-nineties. It is clear in retrospect that this first wave of highway privatization had severe problems. Seven out of 13 projects were not awarded in an auction, but assigned in direct negotiations after no bidders showed up at the auction.[22] A partial list of the additional problems detected in the first round of franchises is as follows:[23]

1. Invías did not define the definite route of the roads in detail.[24] This meant that Invías was unable to expropriate the required land in time. This led to construction delays.

---

[20]See Seminar on Asian Toll Development in an Era of Financial Crisis "Financing the Road Sector in Argentina: Lessons from the Past.", World Bank.

[21]Recall that these franchises did not require new construction, but rather rehabilitation, maintenance and capacity improvements. An estimate cited in "Financing the Road Sector in Argentina: Lessons from the Past", claims that investment levels for the years 1-9 of the intercity franchises were US$1,448 million.

[22]In addition, many projects started out late due to lack of financing. In fact, by 1999, one project awarded in 1995 and one awarded in 1996 had still not obtained financing.

[23]From "Evaluación de las Concesiones Viales," Contraloría General de la República de Colombia, 2001.

[24]Invías is the Spanish acronym for Instituto Nacional de Vías, the government agency responsible for highways of national importance.

2. The auction process was short and Invías had no international "road shows" to attract international bidders. This meant that most auctions had no bidders and most projects were handed to Colombian firms directly.

3. Projects were franchised on the basis of feasibility studies, before the final project was defined. Moreover, traffic studies were preliminary.

4. Invías did not assess the financial health of bidders. Some winners (or firms that negotiated directly with Invías) could not obtain financing, which led to delays.[25]

5. Contracts were incomplete: there were no conflict resolution mechanisms, nor rules for payment of guarantees, or *step-in* procedures for possession of the franchise by lenders.

Because of these mistakes, the first round of franchises was plagued by contract renegotiations, delays, large payments for traffic and cost guarantees, and cost overruns in plot expropriations. On average, traffic was 40% lower than predicted by Invías, while costs were, on average, 40% above contracted costs. More than 40% of cost overruns were due to higher expropriation costs.[26] A further 58% of cost overruns were due to design changes and the addition of additional features to the project.

The second round of franchises, which included only two projects, improved the design somewhat, but not enough: the first project was cancelled due to breach of contract, while the second was late and financially weak. It is interesting to note that, in contrast to the first round, variable franchise terms were used. The franchise ends when a predetermined level of accumulated revenue is collected. This is similar to the PVR mechanism considered in Section 3, unfortunately without discounting revenue flows, which means that some of the incentives to renegotiate remain, since the franchise owner bears more risk than under a standard PVR franchise.

Any evaluation of Colombian highway franchises, however, must consider that the benchmark should not be perfection but rather government-mandated construction. Even though contracts were renegotiated, and in many cases projects were delayed, the average delay was about two years less than before the program. Similarly, most contracts had cost overruns, but they were about one third of the amounts under government mandated construction.

Summing up, the main shortcomings of the Colombian approach to highway franchising have two origins. First, lack of experience with auctions and undue haste in preparing the first round of auctions. Haste led to constant changes in the projects, which increased costs. The lack of experience shows in not having promoted competitive auctions via "road shows", which led to

---

[25]Despite this difficulty, the average delay of the first round franchises was 17 months, against the average of 3.5 years for similar government projects. Hidalgo, Darío. "Los impactos en las concesiones viales en Colombia: Vamos por buen camino?", *Estrategia*, June 30, 1997, cited in Pérez and Yovanovich, "Información Sectorial Sector Carreteras", Corporación Financiera del Valle S.A., February 1999.

[26]Note that there were construction cost guarantees offered by the government.

auctions with few bidders. Another facet of the inexperience is the lack of concern for financial guarantees, so there were no penalties for firms that could not finance the project.

A second source of problems has been the inattention to incentives, which coupled with traffic and construction guarantees, meant large contingent claims on the Colombian government (we consider this issue in more detail in Section 3).[27]

2.3 Chile

In 1991 congress passed a law that allows the government to franchise most public works, including roads, ports and airports.[28] Franchises must be awarded in competitive auctions open to any firm, national or foreign. The law is quite flexible, leaving ample room to adapt the franchise contract to the requirements of each project. In particular, the tendering variables can include the following: user fees, subsidy from the state, duration of the concession, income guaranteed by the state, revenue paid by the franchise holder to the state for preexisting infrastructure, risk assumed by the bidder during the construction and/or operation stages, quality of the technical offer, fraction of revenue (beyond a certain threshold) shared with the state (or users), and total income from the concession. By the end of 2002, the most important highways, seaports and airports had been franchised, with cumulative investments of around US$5 billion.

The usual procedure to finance a highway franchise in Chile involves several stages:

- Bidders must offer call bonds (*bonos de garantía*) that can be called in by the government if the bidder cannot finance the project. Moreover, similar bonds are callable if construction targets are not achieved by predetermined dates or quality maintenance standards are not met.

- Banks lend money for construction of the road. The law stipulates that banks are the only financial institutions that may lend to finance construction.

- After the road is built, the franchise owner can issue bonds backed by toll revenues (securitization). These coupon bonds are usually bought by private pension funds and insurance companies.

- The law stipulates that the franchise owner cannot securitize more than 70% of the debt in order to induce good behavior in the maintenance and operational phase of the franchise.

The law states that the concessionaire must build the project within the time limits established in the contract, providing an uninterrupted service of a quality consistent with the terms of his

---

[27]The Colombian government has put a lot of conceptual effort into valuing the contingent guarantees it offered in the franchises, but less effort has been spent improving incentives, and avoiding renegotiation of contracts and financial arrangements.

[28]DFL 164 and DS 240, 1991.

bid. The Ministry of Public Works (MOP by its spanish acronym) supervises the construction and operation of the project, and is allowed to fine, suspend or even terminate the concession should the franchise holder fail to meet his obligations. The law also establishes a dispute resolution mechanism to review conflicts between the state and franchise holders.

The original list of roads and timetable of auctions has been changed repeatedly. Nevertheless, the highway projects that have been put to tender or have already been built can be classified into four groups:

- The Pan-American Highway (Ruta 5) from La Serena in the north to Puerto Montt in the south, which was divided into 8 double lane segments and extends over approximately 1,500 kilometers (only two segments remain under construction);

- Several highways joining Santiago with nearby cities (Los Andes, San Antonio, Valparaíso);

- A number of local roads (e.g., Camino de la Madera, Nogales-Puchuncaví, Acceso Norte a Concepción);

- Four urban highways in Santiago: the Americo Vespucio Beltway, the Costanera Norte highway, the North-South General Velázquez axis and the Acceso Sur – Las Industrias highway.

The program was launched in 1993 with the 23-year long El Melón tunnel franchise. The auction mechanism used was unnecessarily complex (see Box 2.1), but this can be forgiven as the initial test of a new system.

BOX 2.1 (El Melón Franchise) *The Chilean concessions program was launched in 1993 with the 23-year long El Melón tunnel franchise. The auction mechanism used was unnecessarily complex. Firms bid on a weighted average of seven variables: annual subsidy by or payment to the state, toll level and structure (composed by six different tolls, with different weights for different classes of vehicles), term of the franchise, minimum income guarantee, degree of construction risk borne by the franchise holder, score on the basis of additional services and CPI adjustment formula. While only two of these variables (toll rate structure and payment to the state) were given weights that would have an effect on the final outcome, the result of the tender was unexpected. Four firms presented bids for the franchise and they all demanded the maximum toll and franchise term allowed by the auction. The selection was decided solely based upon the annual payment to the state. This outcome was inefficient, since a lower toll and a smaller annual payment to the state would have been better. Apparently, the weights on the toll rate variable were set incorrectly. Another surprise was that the winner outbid the second-highest bid by almost a factor of three.* ∎

Subsequently, MOP experimented with other mechanisms. For example, the Acceso Norte to Concepción, the Nogales-Puchuncaví Road, and the Santiago-San Antonio (Ruta 78) highways were awarded to the firm bidding the lowest toll. On the other hand, since the government wanted

similar tolls per kilometer in all of the Pan-American highway, most segments of this route were auctioned using a mechanism that made firms compete first on tolls and then, when a lower bound was reached, on either the shortest franchise term or a yearly payment to the state (which was described as a "payment for preexisting infrastructure"). Moreover, some segments, which were thought to be privately unprofitable, were awarded subsidies, which were supposed to be similar in volume to the amounts collected as payments for existing infrastructure.

Route 68, which joins Valparaíso with Santiago, was franchised using a flexible term PVR auction (see Box 2.2).

BOX 2.2 (First PVR auction) *The first road franchised with a PVR auction is the Santiago–Valparaíso– Viña del Mar concession, which was auctioned in February of 1998. The project contemplated major improvements and extensions of the 130 kilometer highway and the construction of three new tunnels. Five firms presented bids, one of which was disqualified on technical grounds. A government minimum traffic guarantee was optional and at a cost. That the pricing of guarantees by the government was not way off the mark can be inferred from the fact that two of the bidders chose to buy a guarantee, while the winner declined. Bidders could choose between two real rates to discount their annual incomes: either a fixed (real) rate of 6.5% or a variable (real) rate given by the average rate of the Chilean financial system for operations between 90 and 365 days. A 4% risk premium was added to both discount rates. Three firms, including the winner, chose the option with a fixed discount rate. Somewhat surprisingly, the present value of revenue demanded by the winner turned out to be* below *construction and maintenance costs estimated by MOP.*[29] *One possible explanation for this outcome is that the regulator set a risk premium (and hence the discount rate) that was too high, neglecting the fact that PVR auctions substantially reduce risk faced by the franchise holder. A return on capital in the 10–20% range is obtained if a more reasonable risk premium (in the 1-2% range) is considered.*

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

It would seem that in most cases tenders were reasonably competitive, since with few exceptions, the number of bidders was between three and six. One of the main virtues of the Chilean concessions program is that legislation has been effective at dispelling fears of expropriation, a

---

[29] The former was US$374 million while the latter was US$379 million.

key feature of any successful franchising program. An important part of the credit for this feature can be attributed to reforms implemented in Chile since the mid-seventies which considerably strengthened property rights. Perhaps the most evident indicator that there is little fear of expropriation among franchise holders is that they have been quite happy with the "build now, regulate later" approach followed by MOP (more on this shortly).

A second merit of the Concessions Law is that it specifies that all concessions must be awarded in competitive auctions, open to foreign firms. This proviso limits the scope for regulatory capture and outright corruption, providing some transparency.

A third merit of the Chilean toll roads program is that there are no cost sharing agreements between the state and the franchise holder (though they were used early in the concessions program). Thus, in principle, though perhaps not in practice, cost overruns are paid in full by the franchise holder. There are limited exceptions in the cases of tunnels and bridges, where cost estimates are more uncertain.

One of the main shortcomings of the Chilean concessions program, however, is the lack of an external regulatory framework. MOP has been in charge of designing, implementing and supervising contracts. Each project has been designed independently and its rules are defined by the specific contract. The tension between the pressures for the success of a concessions program measured in terms of construction and the enforcement of contracts is evident. MOP, as most sectoral ministries do under such circumstances, has chosen development over regulation.

For example, after signing the concession contract for Route 78, MOP required additional works that were not included in the original contract. The franchise holder asked for a compensation for the additional construction and the ministry decided that tolls would increase by 18.1% during a five year period to compensate the franchise holder. No further explanation was given (public opinion learned of the agreement only after it was signed), and the calculations that defined the compensation were not made public.[30] It is undesirable that the ministry renegotiates the contract in order to correct the deficiencies in its own projects, since MOP will be reluctant to expose its own mistakes in designing a concession contract. The public interest would be better served if an independent agency had determined fair compensation and publicized the social welfare computations.

There is growing evidence that MOP has been lax in enforcing concession contracts. For example, a report issued by the National Comptroller in October of 2002 concludes that the ministry relies solely on traffic data provided by franchise owners, having neglected to set up independent procedures.[31] This is worrisome, since government guarantees are triggered by low traffic flows, so that firms have incentives to underreport traffic.[32]

It is also likely that MOP has developed projects with low social returns. Chile has had a social

---

[30]See "Estado compensará a privados por concesión", *El Mercurio*, July 15, 1997, page C8.

[31]"Contraloría critica sistema de control de concesiones", *La Tercera*, April 22, 2003.

[32]Moreover, in the case of Route 68, the concession length is inversely related to traffic flows.

evaluation program of government financed projects for more than two decades. This procedure, which is performed by the Ministry of Planning, ranks projects according to their social return and screens projects with low returns. MOP seems to have subverted this procedure, by removing parts of the projects submitted to the Planning Ministry. These components were reincorporated after the approval and adjudication of the project, via so-called *complementary contracts* with the franchise holder, which are renegotiated in private.[33] MOP has often mentioned that it has estimated the expected outlays generated by traffic guarantees, but these have never been made public. In those cases in which subsidies have been provided, the social project evaluations that justify the subsidies have not been made public either.

During the early years of the franchise program, the government avoided renegotiations even in those cases in which they would have increased welfare, as in the case of the El Melón Tunnel, so as to build a reputation for not renegotiating (see Box 2.1). More recently however, many highway projects have been renegotiated during the construction process. Twelve out of the sixteen highway projects awarded by 1998 had been renegotiated by May 2002. There were 31 modifications to the original contracts, with total value of US$518 million. These projects were valued at US$3,374 million, that is, there was an average cost increase of 15.4%.

The aforementioned average hides significant variations: in some cases the renegotiations were negligible, while the budget for one franchise increased by 112.7%. Even now, the conditions under which the contracts were renegotiated are secret. Additional construction work or early completion of sections of the highways were repaid with extensions of the franchise length, direct payments from MOP, higher tolls, early operation of toll booths and reductions in other construction work. There was no external supervision to ensure that the renegotiation process was fair.

It has been fortunate that MOP's objective of attracting bidders conflicted with those of the Ministry of Finance, which is responsible for the budgetary process. This has forced a more independent evaluation of the toll road program. Indeed, press reports suggest that on more than one occasion the Ministry of Finance successfully stopped MOP from offering particularly generous government guarantees to franchise holders. The Ministry of Finance worries that the budget will be affected if guarantees become effective. More generally, however, MOP can transfer rents to franchise owners via favorable regulations. These transfers are unlikely to worry the Ministry of Finance if the budget is not affected.

There are signs that things will get worse with the Chilean concessions program. The first symptom was the case of Tribasa, a large infrastructure company from Mexico, which had been an important participant in the first stage in Mexico's franchise program. At the time, it was saved from bankruptcy by the Mexican government. Notwithstanding that experience, it became an important and aggressive participant in Chile's infrastructure program and was awarded three major franchises: Acceso Norte a Concepción, Chillán-Collipulli and Santiago-Los Vilos (which

---

[33]See "Informe de la U. de Chile revela suerte de embaucamiento del MOP a Mideplan," *La Segunda*, May 13, 2003.

had complementary contracts worth almost 50% of the original project).

After completing the Acceso Norte a Concepción it ran into liquidity problems and sold Chillán-Collipulli in July 1999. Moreover Acceso Norte a Concepción has been plagued by unconfirmed rumors of deficient construction and supervisors of the projects at MOP are under investigation. In the year 2000, Tribasa was late in completing the stages of the Santiago-Los Vilos section of the Pan American highway. MOP was surprisingly willing to allow the delays to accumulate without collecting the guarantees Tribasa had posted.[34] Eventually, public pressure forced MOP to acknowledge there was a breach of contract. The franchise was transferred from Tribasa and given to another concessionaire, without a formal auction procedure.

In recent months, the Chilean government has decided to provide the franchisees with an "ex post insurance contract". It has offered franchisees a contract by which it insures a traffic flows (higher than the minimum guaranteed traffic flow of the original contract) in exchange for additional works. MOP has argued that since it is more optimistic about future growth rates of the economy than are franchise holders, there is room for a mutually beneficial agreement. The problem with this argument, of course, is that by *believing* in a sufficiently high rate of growth, MOP can grant the franchise holders any subsidy they desire, i.e., there is no limit (and no independent assessment) to the "space for a mutually beneficial agreements". A further problem is that the franchise holder pays for the insurance by building additional works which will probably not be assigned competitively. Hence the franchise owner may be receiving an additional subsidy from MOP.

2.4 Some conclusions from country evidence

This small sample of countries does show recurring problems in highway franchises. First, there have been pervasive renegotiations of contracts. This should not be surprising after all. As Williamson (1976) has pointed out, franchise contracts are inherently incomplete. Moreover, by their nature, the possibility of open-ended renegotiations tend to attract bidders that specialize in negotiations rather than in the operation of the contract.

Second, the system has no governance structure: regulation and supervision has been entrusted to the same agency that designs the projects.

Third, fixed term franchises exacerbate the problems of long term contracts by needlessly increasing demand risk and by their lack of flexibility.

At the very least, the evidence casts doubts on the proposition that privatization is always better than the traditional approach. It seems clear that for privatization to succeed there should be a well-structured regulatory framework in place, and regulators should be independent of the agency in charge of promoting franchises.

---

[34]At the time Tribasa was going bankrupt in Mexico, and later went bankrupt in Chile.

In the next section we step back and ask the basic question, when is privatization desirable? It turns out that if government subsidies and transfers to the franchise holder are required on grounds other than externalities, then the traditional approach is unambiguously better. Moreover, if the government decides to go ahead with privatization, a variable-term contract should be used.

3 Highway Franchising: When and How

In our previous work (Engel, Fischer and Galetovic [1997, 2001]) we ruled out by assumption government transfers to the franchise holder (the 'self-financing constraint') and found the franchise contract that makes the optimal trade-off between demand risk and toll distortions. We also showed that this contract can be implemented with a PVR auction and we briefly review these results in Sections 3.1–3.3.

But by imposing the self-financing constraint, our previous work ruled out the possibility that the traditional approach —or any approach that requires government transfers to the franchise holder— could be optimal. Nevertheless, pervasive renegotiations and government guarantees indicate that there is a tendency to privatize profits but socialize losses. Hence, it is realistic to relax this constraint, allowing the government to subsidize (at a cost) the franchise holder. We do this in sections 3.4 and 3.5.

Relaxing the self-financing constraint allows us to formally derive conditions under which the traditional approach is better than BOT. We show that, with the exception of a knife-edge parameter configuration, if the optimal contract involves government transfers, then BOT is suboptimal and the traditional approach should be preferred. By contrast, when BOT is optimal, neither government guarantees nor subsidies are desirable. Hence, BOT contracts that involve government transfers are always suboptimal.[35]

We also use our extended theoretical framework to debunk the 'cost-of-funds argument' often given in favor of privatizing highways. According to this argument, the private approach to highway provision is better than the traditional approach because private firms have a lower cost of financing projects, as government revenue is collected through distortionary taxes. This argument is incorrect because it ignores that governments can collect tolls on publicly owned highways, and if there is congestion, these tolls can reduce distortions, thus providing a double dividend. On the other hand, an apparently unnoticed advantage of privatization is that the government highway agency manages fewer funds, and we show formally that this may be an argument in favor of the BOT approach if the agency is corrupt or inefficient.

---

[35]This does not exclude the possibility of subsidies for the construction of socially desirable projects that are not privately profitable (see Engel, Fischer and Galetovic, 2003), but it excludes subsidization of projects where all the benefits are internalized by users.

The central role of opportunistic renegotiations uncovered in our review of the regional experience is captured only partly by our theoretical framework. Indeed, the likelihood of renegotiations increases with the degree to which the franchise holder is forced to bear (uninsurable) demand risk. In Section 3.6 we model renegotiations and the related concept of flexibility of a franchise contract directly. We show that, by contrast with its fixed term counterpart, a PVR franchise grants flexibility to the regulator without inducing opportunism.

3.1   A simple model

For simplicity assume that demand for the road is constant and completely inelastic.[36] Demand may be high (Q_H), with probability π_H or low (Q_L), with probability π_L, where $\pi_L = 1 - \pi_H$ and $Q_H > Q_L$. The cost of building the highway is the same for all firms and equal to I. There are no maintenance or operation costs and the toll is equal to P, which is constant across demand states given our assumption of completely inelastic demand.[37] After the franchise ends, toll revenue goes to the government. All firms are identical, risk-averse expected utility maximizers, with preferences represented by the strictly concave utility function $u(\cdot)$.[38]

3.2   The planner's problem

We begin with the problem solved by a benevolent planner who knows I. Denote the present value of toll revenue received by the franchise-holder with high demand by PVR_H and with low demand by PVR_L. Then

$$\mathrm{PVR}_i \equiv \int_0^{T_i} PQ_i e^{-rt} dt = \frac{PQ_i(1 - e^{-rT_i})}{r}, \qquad i = H, L; \tag{1}$$

where r is the discount rate, common across firms and the planner, and T_H and T_L denote the length of the franchise when demand is, respectively, high or low.

The maximization problem assumes that the planner wants to transfer the fewest resources to the project.[39] It also assumes that the planner can collect toll revenues after the franchise ends,

---

[36]This follows Engel, Fischer and Galetovic (1997). All the results in sections 3.1–3.5 can be extended to the more realistic case of incompletely inelastic demand. See Engel, Fischer and Galetovic (2001) for the results in Sections 3.1–3.3 and Engel, Fischer and Galetovic (2003) for those in Sections 3.4–3.5.

[37]There are two reasons why ignoring maintenance and operations costs is not a serious limitation. First, these costs usually are much smaller than the cost of building the highway. Second, and more important, if maintenance and operations are proportional to road usage, which often is a good approximation, then our framework extends trivially to the case with maintenance and operations costs, as follows: The regulator estimates per-user maintenance and firms bid on the PVR of toll revenue, net of maintenance costs. Since maintenance costs are roughly proportional to road usage, the only residual source of risk will be errors in the estimates of maintenance costs and operational costs, both of which are minor.

[38]This should be interpreted as a reduced form for an agency problem that prevents the franchise-holder from diversifying risk. See Appendix D in Engel, Fischer and Galetovic (2001) for a model along these lines.

[39]A more general objective function results when demand is not infinitely inelastic, see Engel, Fischer and Galetovic

using this revenue to reduce taxes that generate distortions $\lambda_\tau > 1$ per dollar in the rest of the economy. Since private participation is voluntary, the planner solves the following problem:

$$\underset{\{T_H, T_L\}}{\text{Min}} \quad \sum_{i=H,L} \pi_i \left[\text{PVR}_i - (\lambda_\tau - 1) \left(\frac{PQ_i}{r} - \text{PVR}_i \right) \right] \qquad (2)$$

$$\text{s.t.} \quad \sum_{i=H,L} \pi_i u_i (\text{PVR}_i - I) = u(0),$$

where $u(0)$ is the level of utility attained by a firm not undertaking the project.

It is easy to see that $\text{PVR}_L = \text{PVR}_H = I$ solves the planner's problem. Since the franchise-holder is risk-averse, it is efficient to insure her completely. To do so the planner fixes any toll that ensures that the franchise-holder loses no money when demand is low (that is $P \geq rI/Q_L$).[40] Since $Q_H > Q_L$, it follows from (1) that the planner chooses $T_H < T_L$, so that the term of the franchise is shorter when demand is high. Note that users pay the same amount in both states of nature and thus face no risk.

3.3 The optimal auction

With the model defined above we can study highway auctions. Consider first the standard auction mechanism where the government sets a fixed franchise term, and firms bid tolls. Under competitive conditions, the winning bid P satisfies:

$$\sum_{i=H,L} \pi_i \pi_i u \left(\frac{PQ_i(1 - e^{-rT}) - I}{r} \right) = u(0), \qquad (3)$$

which means that $PQ_H(1 - e^{-rT}) > I > PQ_L(1 - e^{-rT})$. Hence the winning bid does not reproduce the planner's solution, since the winning bidder is required to face risk.

An alternative auction mechanism is to have bidders compete on the present value of toll revenue they require in order to finance the highway. In this case the winning firm bids PVR such that

$$\pi_L u \left(\text{PVR} - I \right) + \pi_H u \left(\text{PVR} - I \right) = u(0),$$

so that the winning bid satisfies $\text{PVR} = I$. It follows that a PVR auction implements the social optimum derived in the preceding subsection. Furthermore, the planner can implement the optimal contract using a PVR auction even if she does not know the values of I, π_i or Q_i.

(2001).

[40]There is no loss of efficiency given that demand is totally inelastic. As mentioned earlier, this assumption can be relaxed.

3.4 Subsidies and the cost-of-funds argument

It is often claimed that highway franchising is desirable because private firms have access to funds at lower cost. By contrast, governments must resort to distortionary taxation to finance highways. Is that enough to make the case for highway franchising? We now relax the self-financing constraint and allow for transfers from the planner to the franchise-holder. In this way we extend the model to allow for traditional contracts, where governments finance roads, as well as BOT contracts.

Assume that the government subsidizes the project in amounts S_H, $S_L \geq 0$ depending on the state of demand. Then (2) extends to:

$$\min_{\{T_H, T_L, S_H, S_L\}} \quad \sum_{i=H,L} \pi_i \left[(\text{PVR}_i + \lambda_\tau S_i) - (\lambda_\tau - 1) \left(\frac{PQ_i}{r} - \text{PVR}_i \right) \right] \tag{4}$$

$$\text{s.t.} \quad \sum_{i=H,L} \pi_i u_i (\text{PVR}_i + S_i - I) = u(0).$$

It can easily be shown that any combination of T_H, T_L, S_H and S_L such that the franchise-holder's income in both states is equal to I, that is, $\text{PVR}_i + S_i = I$, $i = H, L$, solves this problem. Thus, on one hand the planner's optimum can be attained with no subsidies at all, by setting $\text{PVR}_i = I$ and $S_i = 0$, $i = H, L$. On the other hand, the road can be financed only with subsidies, setting $S_i = I$ and $\text{PVR}_i = 0$, $i = H, L$. The former solution can be attained via a PVR auction, while the latter corresponds to the traditional approach. This multiplicity of possible subsidy-toll combinations indicates that distortionary taxation ($\lambda_\tau > 1$) is not sufficient to make BOT contracts preferable.

The standard line of reasoning points out that subsidies are a more expensive means of financing roads, because they are paid from distortionary taxes. This argument suggests that the franchise-holder should finance the road's construction cost by resorting to subsidies (and the ensuing distortions needed to finance them) only when strictly necessary. But this ignores an essential aspect of highway franchising, namely that the highways may also be used to collect public funds, which can be used to reduce distortionary taxes elsewhere.[41] Hence, under the assumptions we made above, one additional dollar of government subsidy generates one additional dollar of toll revenue for the government. This becomes apparent if we rewrite the objective function (4) as:

$$\sum_{i=H,L} \pi_i \lambda_\tau (\text{PVR}_i + S_i),$$

where we have ignored a term that does not depend on the planner's choice variables.[42] It can be

---

[41] For example, under the franchise contracts considered in sections 3.1–3.4, the government collects all tolls after the franchise ends. More generally, the government could also obtain a fraction of toll revenue during the franchise.

[42] It then follows that the problem at hand is analogous to the one faced in the case without government transfers, with $\text{PVR}_i + S_i$ in the role of PVR_i.

seen that social welfare depends on *total* transfers to the franchise-holder, no matter whether these come in the form of a subsidy or toll revenue.

3.5 When is franchising desirable?

We have shown that the cost-of-funds argument is not sufficient to justify franchises in our model. But we have not modelled other alleged advantages of BOT contracts. One of the main arguments in favor of franchises is that governments are unable to induce the public works ministry to spend efficiently, perhaps because of political economy considerations. This argument can be captured, in an admittedly simplified manner, by letting the shadow cost of subsidies differ from the tax distortions the planner avoids by collecting toll revenue.

Thus, we let $\lambda_S \geq 1$ be the cost of ensuring that one dollar of subsidies received by the public works ministry reaches the franchise holder's pocket. This leads to the following planner's problem:

$$\underset{\{T_H, T_L, S_H, S_L\}}{\text{Min}} \quad \sum_{i=H,L} \pi_i \left[(\text{PVR}_i + \lambda_S S_i) - (\lambda_\tau - 1) \left(\frac{PQ_i}{r} - \text{PVR}_i \right) \right] \tag{5}$$

$$\text{s.t.} \quad \sum_{i=H,L} \pi_i u_i (\text{PVR}_i + S_i - I) = u(0).$$

Note that S_i is multiplied by λ_S in the planner's objective function, but not in the franchise holder's participation constraint. In Engel, Fischer and Galetovic (2003) we show that the solution to this problem depends on the whether λ_S is larger, equal or smaller than λ_τ:

- If $\lambda_S > \lambda_\tau$, the optimal contract involves no government subsidies and the same present value of toll revenue, I, for the franchise holder in all states of demand. This contract can be implemented with a PVR auction.

- If $\lambda_S = \lambda_\tau$, which is the case considered in Section 3.4, the planner's optimum can be implemented via any combination of T_i and S_i, $i = H, L$, such that $\text{PVR}_i + S_i = I$, $i = H, L$. This includes, in particular, the BOT contract associated with a PVR auction, and the traditional approach to highway financing, where the road is financed with general funds.

- Finally, if $\lambda_S < \lambda_\tau$, the optimal contract is such that all income received by the franchise-holder comes from subsidies. Direct government financing is to be preferred to a BOT contract in this case.

It follows from this result that there is a close connection between the desirability of franchising highways and the self-financing constraint: when $\lambda_S > \lambda_\tau$ the planner would prefer to avoid transferring money to the franchise holder, and this imposes the self-financing constraint. A corollary is that guarantees, which are transfers contingent on traffic being low, are undesirable

whenever privatization is optimal (except for a borderline case). Furthermore, and again except for a borderline case, profit sharing arrangements are never optimal even if we ignore their negative effect on incentives.

Our result raises the question of whether one of the three parameter configurations considered above ($\lambda_S > \lambda_\tau$, $\lambda_S = \lambda_\tau$ or $\lambda_S < \lambda_\tau$) is more likely to prevail in practice. We argue next that the most relevant case is $\lambda_S > \lambda_\tau$. Indeed, λ_τ in (5) captures the distortions associated with distortionary taxation. These distortions are also part of λ_S, since government transfers to the franchise-holder are generally financed with tax revenue. Yet λ_S also includes any source of additional inefficiency associated with the highway agency's management of resources. Even the slightest inefficiency —and Section 2 suggests the presence of inefficiencies— leads to the conclusion that $\lambda_S > \lambda_\tau$. It then follows that, highway privatization indeed should be preferred over the traditional approach. The reason is that with the traditional approach, the government agency manages more money than with the BOT approach, thereby increasing the scope for inefficient management by this agency (for example, in the form of regulatory capture or outright corruption). Privatization is better because it limits resources managed by the government. Of course, our model does not consider elements that may point in the opposite direction, such as the fact that under BOT contracts there is more opportunity for opportunistic behavior than under the traditional approach.

3.6 Modelling flexibility

An attractive characteristic of a franchise contract is that it should be easy to calculate fair compensation for breach of the original contract. Consider the case in which the project must be expanded or rates must be increased for efficiency reasons. How should the expansion costs be divided between the franchise holder, the government and users? How much of the additional income from user fees is to be appropriated by the franchise holder?

In such cases, two options are open to the planner. One is to renegotiate the original contract, which carries with it all the problems of bargaining in a situation of bilateral monopoly. The second option is to cancel the concession and pay a fair compensation for the profits foregone by the franchise holder. The problem with the second option is that the fair compensation is the expected present value of future profits had the concession continued under the *original terms*. This amount cannot be deduced from accounting data and is highly subjective, so endless disputes are possible.[43]

The issue of flexibility also arises when setting user fees. In the case of a fixed term franchise, it is advisable to reduce risk by specifying the schedule of user fees (in real terms) before the franchise begins. Yet this often leads to fees that are *ex post* inefficient. For example, consider an

---

[43]The case of Orange County's State Route 91 Express Lanes is a vivid illustration of this problem, see Engel, Fischer and Galetovic (2002) for details.

urban highway which is franchised for a 20 year period. The high demand uncertainty discussed earlier implies that user fees set in advance will almost surely lead to either inefficiently high levels of congestion, or to politically untenable levels of under-utilization.

PVR franchises are more amenable to changes in user fees in response to changes in demand than their fixed term counterparts, since tolls may vary substantially without affecting the franchise holder's present value of user fee income.[44] In the urban highway example, a PVR contract could stipulate that tolls will be reset by an independent agency/commission every year in response to demand conditions, so that users internalize congestion costs.[45]

A useful definition of "flexibility" is that one party can act as if the original contract does not exist.[46] The problem, of course, is that flexibility may be misused. On the one hand, giving a regulator the right to cancel the contract wherever he sees fit may lead to opportunistic expropriation. This is particularly serious for infrastructure projects, in which most of the costs are sunk, so investors are exposed to regulatory takings if contracts are flexible. On the other hand, renegotiation may allow firms to obtain opportunistic benefits.

To formalize this, let θ_i be the per-period flow of *additional* social benefit obtained in state i when the original contract is not carried out and an additional investment ΔI is made. We assume that when the contract is cancelled this happens at time $t = 0$. We also assume:

$$\frac{\theta_L}{r} - \Delta I \; < \; 0 \; < \; \frac{\theta_H}{r} - \Delta I, \tag{6}$$

so that it is socially convenient to cancel the contract and invest ΔI only in the high demand state. Also, let $R_i \equiv PQ_i$ denote the flow of revenue per period in state i if the contract is executed and the additional investment is not made. As before, we assume that all uncertainty dissipates just after the road has been built. Also as before, the planner's objective is to transfer as little resources as possible to the franchise holder.

Clearly, the contract should be renegotiated and ΔI invested if and only if $\theta_i/r - \Delta I \geq 0$, that is when the present value of the social benefit obtained by investing, θ_i/r, exceeds its cost, ΔI. From (6) it follows that an optimal complete contract allows the regulator to buy back the project only in state H paying the franchise holder PVR_H, the amount that she would have received, had the contract not been modified. Nevertheless, demand states are not verifiable in practice, as PVR_i is difficult to estimate, implying that such a contract cannot be enforced.[47]

---

[44]Profits are affected, since the franchise term determines maintenance and operational costs. Yet the PVR contact can be modified to incorporate maintenance costs, see footnote 37.

[45]Discretion in toll setting may be limited by fixing a lower and upper bound (in real terms) on possible tolls.

[46]Also note that for flexibility to be socially desirable, it should incorporate the objectives of the theory of contract remedies: "…a key objective of an enforcement system is to induce a party to comply with its obligations whenever compliance will yield greater benefits to the promisee than costs to the promisor, while allowing the promisor to depart from its obligations whenever the cost of compliance to the promisor exceeds the benefits to the promisee." Schwartz and Sykes (2002).

[47]It may be argued that one could write a contract where the government can expropriate only after paying PVR_H.

To ensure that ΔI is invested only when it is socially desirable, one may allow the regulator to cancel the contract at will with no compensation, under the condition that it invest ΔI. The problem is that this arrangement makes it attractive for the regulator to cancel the contract not only in the high demand state, but also in the low demand state, and therefore is not optimal. To see this, note that when the low demand state materializes, the incremental benefit of cancelling the contract and investing is equal to the difference between the planner's benefit with and without the expansion:

$$\left\{\int_0^\infty (\theta_L + R_L)e^{-rt}dt - \Delta I\right\} - \left\{\int_{T_L}^\infty R_L e^{-rt}dt\right\} = \frac{\theta_L}{r} - \Delta I + \text{PVR}_L.$$

It follows that the planner expropriates the franchise owner in order to cash in PVR_L as long as

$$\frac{\theta_L}{r} + \text{PVR}_L > \Delta I,$$

a condition that holds when the franchise holder's original revenue exceeds the cost of the expansion.[48]

Next consider a PVR auction coupled with the following clause: the regulator can cancel the contract at will but only after paying the winning bid, denoted by B, to the franchise holder. Contrary to a fixed term franchise, where PVR_i differs across states, with a PVR auction PVR_i is the verifiable outcome of the auction, B, and is the same across states. Hence this amount can be written in an enforceable contract.

We now show that the government has the right incentive to cancel the contract, that is, that it cancels only in the high demand state. In the low demand state the incremental benefit from cancelling and investing ΔI is:

$$\left\{\int_0^\infty (\theta_L + R_L)e^{-rt}dt - \Delta I - B\right\} - \left\{\int_{T_L}^\infty R_L e^{-rt}dt\right\} = \frac{\theta_L}{r} - \Delta I,$$

where we used the fact that no expansion takes place if the contract is not renegotiated. We also used that under PVR we have $\int_0^{T_L} R_L e^{-rt}dt = B = I$. It follows from (6) that the regulator does not cancel the contract in the low demand state.

Consider next the high demand state next. In this case the incremental benefit from cancelling the contract is:

$$\left\{\int_0^\infty (\theta_H + R_H)e^{-rt}dt - \Delta I - B\right\} - \left\{\int_{T_L}^\infty (\theta_H + R_L)e^{-rt}dt - e^{-rT_H}\Delta I\right\} = (1 - e^{-rT_H})\left[\frac{\theta_H}{r} - \Delta I\right],$$

While true in this model with only two states of nature, this is no longer possible in a model where terminating the contract is efficient in at least two states, since the scope for opportunism by one of the parties remains.

[48] In particular, for PVR, the condition above simplifies to: $\frac{\theta_L}{r} + I > \Delta I$.

22

where we used the fact that the regulator expands the road at the end of the franchise should he not cancel the contract (see the second term in the second bracker on the left hand side). Also, we again used the fact that, under PVR we have $\int_0^{T_H} R_H e^{-rt} dt = B = I$.

The key point in the optimality result derived above is that the value of the concession for the franchise holder, B, is the same in all states of demand. By contrast, with a fixed term contract this value is state contingent because $\text{PVR}_H > \text{PVR}_L$. A single quantity will not replicate the complete contract.

4   Conclusion

The promise of highway franchising is to combine the benefits of privatization with the advantages of competition. To achieve this goal, franchises should be periodically reauctioned letting competition *for* the field substitute for competition *in* the field. Just as Demsetz (1968) argued for utilities, competition should yield tolls equal to average costs, no excess profits will be earned and projects will be run efficiently even though highways are local monopolies.

In practice, so far these avowed benefits of franchising have not materialized because government guarantees and pervasive contract renegotiations have allowed firms to shift losses to taxpayers. It has been a privatization of sorts, as profits remain in firm's pockets and losses are socialized. This is not limited to highway franchises. Renegotiations in Argentina, Colombia and Chile illustrate the common experience with franchising in Latin America. Guasch (2001) examined more than 1,000 concessions awarded during the 1990s and found that, within three years, terms had been changed substantially in over 60 percent of the contracts.

Pervasive renegotiations should not be surprising after all. Williamson (1976) pointed out that franchise contracts are inherently incomplete. He argued that unless franchises are regulated more or less like standard monopolies and a governance structure is set up, opportunistic behavior will inevitably emerge. Does the Latin American experience with highway franchising suggest, then, that countries chose the wrong model?

By now the international experience has shown the inadequacies of the "privatize now, regulate later" approach that governments have followed. The root of the problem is that almost always, the government agency that promotes franchises is also in charge of monitoring compliance with the incomplete contract. Hence we can expect lax enforcement because these agencies are usually embedded in the ministry in charge of building public works, whose objective function is to build as much as possible. This probably explains why governments subsidize firms that have made incorrect decisions. It is surprising however, that renegotiations occur even *after* roads have been built and sunk. Nevertheless, if a government wants to franchise new projects, it will be easier to attract bidders if they are seen to be soft on current concessionaires, which might also be the participants in future franchise auctions. The desire of future investment softens the attitude

of the regulator and makes him more likely to renegotiate a contract. Of course, an alternative (or complementary) explanation is a rather more direct form of regulatory capture. For example, in Chile there were irregular payments by concessionaires to MOP (and to façade companies closely related to MOP) that suggest that franchise owners obtained financial favors in exchange for such payments.[49]

Experience suggests that, independently of the means by which countries choose to privatize highways, a separate regulatory authority should be set up to monitor compliance with contracts. Should countries do away with temporary franchises? Our formal analysis suggests that if they deem subsidies (and guarantees) desirable or unavoidable, they should consider seriously returning to the traditional model of state-financed highways. On the other hand, if they are convinced about the advantages of privatizing roads, they should impose credible self-financing constraints on the projects.[50] If privatization is chosen subject to the previous caveats, we believe that temporary franchises that are periodically reauctioned can be useful to introduce competition, provided that fixed-term franchises are abandoned in favor of present-value-of-revenue auctions. As we have shown, present-value-of-revenue contracts reduce the motivations behind opportunistic renegotiations and guarantees, because they reduce demand risk and allow considerable flexibility to modify contracts for the right reasons.

---

[49]These transfers are currently being investigated by the judiciary.

[50]At least, for those projects in which users internalize all benefits.

References

[1] Demsetz, H., "Why Regulate Utilities," *Journal of Law and Economics* **11**, 55–66, 1968.

[2] Engel, E., R. Fischer and A. Galetovic, "Highway Franchising: Pitfalls and Opportunities," *American Economic Review Papers and Proceedings* **87**, 177-214, 1997b.

[3] ————————, "Least Present Value of Revenue Auctions and Highway Franchising," *Journal of Political Economy*, **109**(5), 993-1020, 2001.

[4] ————————, "Privatizing Highways in the United States," mimeo, November 2002.

[5] ————————, "Franchising Highways with Subsidies," Work in progress, 2003.

[6] Estache, A., "Argentina's Transport: Privatization and Re-Regulation," Policy Research Working Paper 2249, Washington, DC: World Bank, 1999.

[7] Guasch, J.L., "Concessions and Regulatory Design: Determinants of Performance—Fifteen Years of Evidence," Washington DC: World Bank, 2001.

[8] Schwartz, W.F., and A.O. Sykes, "The economic structure of renegotiation and dispute resolution in the World Trade Organization," *Journal of Legal Studies*, **31**(1, part 2), 179–207, 2002.

[9] Tirole, J., "Comentario a la propuesta de Engel, Fischer y Galetovic sobre licitación de carreteras," *Estudios Públicos* **65**, 201–214, 1997.

[10] William son, O., "Franchise Bidding for Natural Monopolies: in general and with respect to CATV", *Bell Journal of Economics*, **7**(1), 73–104, 1976.