What Are the Prospects for Privatizing Infrastructure? Lessons from U.S. Roads and Solid Waste

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Interest in the private provision of infrastructure has been increasing in recent years. The Bush Administration's proposed fiscal year 1991 budget document, for example, touted a proposed private toll road in Virginia as an example of the kind of creative public/private partnership needed to address the nation's transportation problems. The Environmental Protection Agency (EPA) has launched a major initiative designed to foster public/private partnerships in environmental infrastructure, such as water and wastewater treatment plants. Proposals to sell airports to the private sector have been seriously discussed in Los Angeles, Albany, and Peoria.

The increased interest in privatization is driven by a number of factors. A primary motivation is the belief that the private sector is inherently more efficient than the public sector and can therefore build and operate facilities at less cost than the public sector. Also, the public sector, facing increased taxpayer resistance, may simply be unable to finance facilities that the private sector would be willing and able to undertake for a profit. Privatization proponents contend that federal tax laws have often distorted decision-making to favor the public sector in the provision of infrastructure.

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This paper explores the prospects for the privatization of infrastructure by examining two categories of infrastructure: toll roads and solid waste disposal facilities. Both are capital intensive, but in the United States they historically have had different levels of private sector involvement. Roads, although normally built by private contractors, are typically planned, owned, and operated by state transportation departments or state authorities. By contrast, the private sector has historically been a major owner and operator of solid waste disposal facilities such as landfills and, more recently, resource recovery plants. Furthermore, in solid waste the structure and role of private industry has substantially changed in the last two decades.

Missing Dimensions in the Privatization Debate

The current debate over the potential cost advantages of the private sector and the concurrent attempts to modify the federal tax code to encourage privatization (or at least level the playing field for the private sector), while certainly relevant, may also divert attention from other major dimensions of the privatization decision. First, while the private sector may be able to build facilities faster and operate them at lower cost, particularly when competition is present or potentially available, cost is neither the only important barrier to infrastructure provision nor the only consideration in the choice between public and private providers. Local neighborhood and environmental opposition to the siting of new roads or solid waste facilities, for example, is often as much of a bar to infrastructure investment as cost. Although the presence of a private operator can change the dynamics of such siting processes, it is unclear whether the private sector offers any major advantages in siting. Additionally, siting, equity, and other considerations may lead to direct or indirect public regulation of the prices charged by private operators, particularly in situations where private operators do not face much competition. The regulation, as well as the regulatory process itself, could conceivably undermine many of the advantages of private involvement in infrastructure provision. At any rate, the *total* advantages of the two options, public or private, must be weighed, rather than simply construction, operating, or financial costs.

The debate over the cost advantages of privatization also often fails to distinguish between those savings that are net efficiency gains to society as a whole and those that represent transfers from one sector of society to another. The debate over the federal tax code and financing costs commonly focuses only on the net return that must be paid investors, for example, without considering the extent to which federal taxpayers win or lose under either public or private financing or the cost

to state or local taxpayers of the equity they often contribute to public projects.

To investigate these issues, this paper first reviews the evolution of private sector involvement in the provision of highways and solid waste disposal facilities in the United States. The advantages of the public and private sectors are then compared, not only for the conventional concerns of costs and financing but also for the often neglected dimensions of siting, pricing, and government regulation. In this discussion, an attempt is also made to distinguish the net efficiency savings of privatization from the transfers. Finally, an overall assessment is offered of who wins and who loses from privatization as well as the circumstances under which privatization might prove an attractive public policy.

Trends in the Privatization of Roads and Solid Waste

Interest in privately owned and operated toll roads has undergone a revival recently in the United States, after being a rare phenomenon for 100 years or more. By contrast, private toll roads have been comparatively common in Europe for the last two decades. The best known example is the cross-channel tunnel (using auto on rail) now being built by a private Anglo-French consortium. Nine-tenths of the expressways in Italy are privately owned and operated, as are a significant portion of the expressways in Spain and France.[1] In most cases these private roads are based on a "build-operate-transfer" model under which the private firm builds the facility, operates it for twenty-five to forty years, and then transfers title and control back to the public.

Although private toll roads are not without historical precedent in the United States, virtually all of the U.S. highway system is publicly owned and operated today. The few exceptions include approximately a dozen bridges over major rivers in rural areas; these are either special development promotions of local business groups or historical remnants of the more extensive private toll road system of the eighteenth and early nineteenth centuries. Other exceptions include private toll roads inside major resorts built by a single developer, such as "Seventeen Mile Drive" in the Carmel, California development owned by Del Monte Properties or the road through the Avery Island Resort in Louisiana (U.S. Federal Highway Administration 1987).

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[1] See Poole (1988, p. 509). Many of these European private toll roads, it should be noted, receive some public assistance in the form of equity investments, low-interest loans, or tax benefits; see European Conference of Ministers of Transport (1990, pp. 16–21).

Publicly owned and operated toll-road initiatives are also relatively rare in the United States, although this also was not always the case. The Northeastern states embarked on an extensive program of building publicly owned toll expressways in the late 1930s. This lasted, except for wartime interruption, into the early 1950s. By 1956, toll-road enthusiasts could boast that one could drive from New York to Chicago without stopping for a single traffic light: but, of course, one did have to stop for several toll booths (Rae 1971, pp. 171–183). The construction of tolled public highways fell off sharply after 1954 when Congress authorized construction of the 42,000-mile Interstate and Defense Highway System on which tolls were largely forbidden. The only major exceptions, undertaken as a compromise to capture Northeastern political support, were 2,447 miles of pre-Interstate toll expressways incorporated into the Interstate System. The remaining 40,000 miles or so of Interstate highways were 90 percent financed by grants from the federal government (raised, in turn, by increased federal excise taxes on motor fuels and vehicles) and 10 percent by the states (raised largely from state fuel taxes).

The Revival of Private Toll Roads

The recent revival of interest in both tolls and private highway provision was stimulated in large part by government budgetary pressures. While the Interstate System is largely complete, federal funds can still be used to widen existing Interstate routes. Congress has not agreed to expand the eligible Interstate route network, however, which hurts the unserved areas that have experienced growth in the thirty-six years since the Interstate System was designed. Federal aid remains available for some non-Interstate roads, as are the states' own tax revenues. But in many fast-growth areas, such as the South, the West, and the outlying suburbs of major metropolitan areas, the growth in traffic has been so rapid that available public funds seem inadequate.

Of the 902 miles of new toll road projects that are now being planned in seventeen states, most would be publicly owned and operated.[2] In 1987 Congress relaxed its ban on the use of federal aid for publicly owned toll highways and authorized seven demonstration toll road projects (two more were added in 1988) on which up to 35 percent federal funding could be used to match toll receipts.[3] The State of Texas

[2] Estimates from the International Bridge, Tunnel and Turnpike Association cited in U.S. Office of Management and Budget (1989, p. 172).

[3] Prior to this Congress had authorized some specific exceptions to the prohibition on collecting tolls on highways built with federal aid. Only seventeen facilities had been

completed one of the first of the new crop of public toll roads without federal aid in 1987, an expressway on the outskirts of Houston, and is scheduled to open a second in 1990. The State of Colorado has established a public authority to build a new fifty-mile toll road on the eastern fringe of Denver. California created a similar authority to build three toll roads in Orange County, and Pennsylvania, Delaware, and Georgia are participating in the federal demonstration project. In several of these cases private landowners or developers along the route are donating rights-of-way to help make the projects financially feasible, but the facilities will remain under the control of state and local governments.

Of the several serious proposals for private toll roads that have emerged in the last few years, the most advanced is the Toll Road Corporation of Virginia (TRCV) proposal to build a fifteen-mile private toll road connecting Dulles Airport with Leesburg, Virginia.[4] The private road would be a western extension of the present state-owned Dulles Toll Road, which connects the airport and nearby communities with one of Washington's circumferential beltways. The State of Virginia and Loudoun County have already approved the extension's alignment, although they still must review the detailed roadway and structure designs and the State Corporation Commission has not yet approved the financial plan and the proposed toll rates. If the financial plan and rates are approved in the summer of 1990, the TRCV hopes to begin construction soon after and open the road by March 1993.

In 1989, the California legislature passed a law allowing private companies to build up to four privately funded, for-profit toll roads, bridges, and tunnels in the state over the next ten years. Ten consortia of private construction and finance companies have been qualified to propose projects. The state's present schedule calls for conceptual proposals to be submitted by August 1, 1990 and for the state to select the four best and sign exclusive development agreements by the end of the year. Among the schemes being discussed are a new San Francisco Bay bridge and the double-decking of a thirty-mile stretch of an existing Los Angeles freeway.

Proposals have emerged in other states as well, although they are either less advanced than Virginia's or on a less ambitious schedule than California's. In Colorado, the private Front Range Toll Road Company

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exempted, however, mainly toll bridges, tunnels, and approach roads to the Interstate System. See Sandlin (1989, pp. 49–50).

[4] In addition to the private toll road proposals, one private toll bridge has already been constructed. The $2 million bridge, which opened in June 1988, connects Fargo, North Dakota with Moorehead, Minnesota and was developed after voters had rejected a special assessment to finance a publicly owned and untolled bridge.

has proposed to build and operate a 210-mile toll highway between Pueblo and Fort Collins. The States of Illinois and Missouri are in the preliminary stages of evaluating the feasibility of a 400-mile private toll road between Chicago and Kansas City.

The Evolution of Private Solid Waste Disposal

Solid waste disposal was mainly the responsibility of private citizens and scavengers until the mid-1800s, when the emergence of large industrial cities greatly increased urban waste problems.[5] Many cities responded by assuming the responsibility for the collection and disposal of waste. A 1913 survey of 25 major cities conducted by the Civil Service Commission of Chicago found a variety of waste disposal practices and a variety of public/private relationships for waste collection and disposal (Hering and Greeley 1921, p. 106). At that time, labor was the largest disposal cost because cheap land was available near the city and waste disposal systems were relatively simple.

Disposal practices changed little through most of the first half of the twentieth century. However, many cities stopped contracting out for waste collection and disposal just before and after World War I, an outgrowth of the Progressive movement which believed that providing services publicly would reduce opportunities for graft and mismanagement. After World War II a number of cities began contracting out again, in part because they wanted to avoid the high costs of collection equipment and the political difficulties of siting waste disposal facilities.[6] Both public and private operators generally disposed of garbage in open dumps or burned it at incinerators.

The rise of the environmental movement in the late 1960s dramatically changed waste disposal practices and, in the process, transformed private waste disposal from a labor-intensive industry made up of many small firms into a capital-intensive industry, dominated by a handful of giants. Emissions limits from the 1970 Clean Air Act forced many communities to close their incinerators. The Resource Conservation and Recovery Act (RCRA), passed in 1976, established strict controls over the design and operation of landfills, required separate hazardous waste disposal facilities, and encouraged the development of resource recovery facilities. Drafters of the bill believed that by increasing the cost of landfills, they would make resource recovery a more viable option,

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[5] For an excellent history of solid waste disposal in the United States, see Melosi (1981).

[6] Telephone interview with Rita Knorr, Director of Research, American Public Works Association, May 14, 1990.

particularly if energy prices continued to rise (Clunie 1987, pp. 2–4). The Public Utilities and Regulatory Policy Act (PURPA) of 1978 made prospects for waste-to-energy plants even more attractive by requiring utilities to buy energy from the plants if their costs are lower than the long-run marginal costs of providing power from new utility facilities.

As a result of stricter standards in RCRA, more than 70 percent of the approximately 14,000 landfills operating in 1978 were closed by 1988 (National Solid Wastes Management Association 1990, p. 7). In 1988, EPA estimated that about 40 percent of the remaining 6,000 or so landfills then operating would have to close by the mid-1990s (National Solid Wastes Management Association 1989a, p. 3). Concerns about groundwater pollution, odors, and increased traffic stymie the siting of new landfills. Resource recovery plants, which burn waste for energy, sometimes after sorting the incoming stream for recyclables, raise similar fears plus additional concerns about toxic air emissions and the disposal of the potentially toxic ash the facilities generate. As a result, the nation is closing landfills at a faster rate than the added capacity through new landfills and resource recovery plants. At the same time,

in even fewer hands with two firms, Ogden Martin Systems and Wheelabrator, accounting for close to 45 percent of the business (Cook 1988, p. 102). For both hazardous and solid waste, these companies are estimated to have annual revenues in excess of $8 billion (Wingerter 1990, p. 282).

The private firms operate under a variety of scenarios. At the risk of some simplification, private waste disposal is done on either a contract or a merchant basis. In the first case, a private firm agrees to design, build, and operate a plant for one or several municipal governments. The contract fixes the tipping fee per ton (often with provisions for inflation) and guarantees a minimum volume of waste to be delivered. The public sector often assists or takes responsibility for siting. Actual ownership, private or public, is usually dictated by advantages offered by the tax laws in effect when the plant is built. Under the usual contractual scheme, the private company absorbs the risk that the plant will work correctly and can be built and operated within budget, while the public sector absorbs the risk that open-market tipping fees might decline or local trash volumes fall below contract minimums. Many communities choose the contract route because they are not prepared to build or operate today's technologically sophisticated disposal technologies and they do not want to be exposed to the risk of ever-increasing tipping fees.[7]

The merchant plant, by contrast, is generally built and operated without prearranged public or private clients and without siting assistance. These facilities, however, are free to charge whatever the market will bear for waste disposal. In terms of risks, merchant plants are closer to toll roads than contract plants, since the merchant plant operator assumes not only the risks of whether the technology will work and can be brought in under budget, but also the risks of fluctuations in market demand or prices.

Some communities remain wary of relying on private solid waste firms, whether on a contract or merchant basis. Many have instead banded together to form special districts to build and operate their own public waste disposal facilities. These districts can give communities some of the economies of scale exploited by the large firms emerging in the private sector.

On the whole, considerations of cost, risk, and expertise seem to be making the private sector an increasingly major player in solid waste disposal. More than half the cities surveyed in a recent American Public Works Research Foundation study rely on private waste disposal (1990).

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[7] Another risk communities often seek to avoid is the fluctuation in the prices utilities will pay for the electric energy produced by resource recovery plants.

Although private landfills represent only 14 percent of the total number in the country, they contain about half of the nation's existing disposal space. In addition, almost half of the nation's resource recovery plants are privately owned.[8] Whether these trends continue will, in large part, be driven not only by issues of efficiency and cost, but also by siting ability and regulation.

The Conventional Concerns: Cost and Financing

A common argument in favor of privatization is that private involvement will help alleviate the infrastructure crisis by increasing the total investment in infrastructure and the quality of the projects selected. Privatization might increase infrastructure investment above the levels possible with limited public budgets by tapping a new source of funds: the private capital markets. And as Robert Poole (1989), one of the leading proponents of privatization, argues, "When projects must meet [private] investors' rate of return expectations, only economically sound, high-priority projects are likely to get selected."

Aggregate Investment and Project Selection

While private involvement might increase total infrastructure spending, privatization does nothing (at least directly) to increase the pool of private savings from which private capital markets must draw; therefore privately financed infrastructure is likely to displace some other investment. Publicly provided infrastructure, by contrast, at least has some possibility of increasing total investments made by society (in infrastructure and all else), to the extent that the public programs are funded by current user charges[9] or taxes rather than by debt, and these charges or taxes are borne (at least in part) by a reduction of private consumption rather than private saving. Privatization would offer an advantage, then, only if there were little chance of increasing public funding and if the additional infrastructure investment were more worthwhile than the investments it displaced.

Private investment is also no guarantee against economically unsound infrastructure projects, since private investors may be perfectly willing to invest in unsound projects if the construction of those projects

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[8] Government Advisory Associates, *Resource Recovery Yearbook* (New York: 1986–1987), p. 72 as cited in NSWMA 1989b, p. 5.

[9] In other words, if user charges are employed to pay capital expenses on a current or "pay-as-you-go" basis rather than to pay the interest and principal on debt.

is linked with implicit or explicit public subsidies or guarantees. Some governments have attempted to reduce this risk by specifying that privatization receive no government subsidies. California's Department of Transportation has announced, for example, that no public subsidies will be granted to private highway projects; presumably in California these projects must depend entirely on toll proceeds or revenues from other private ancillary activities, such as the development of adjacent land owned by the private road company or its financial backers.[10]

State and local governments may believe that some infrastructure projects warrant public subsidies because they generate important social and economic benefits that are not easily captured by private (or public) operators. A private toll road might reduce congestion on parallel untolled roads, for example, and rural expressways might provide important social benefits by stimulating the development of promising but otherwise undeveloped areas (much as the western railroads were thought to have done in the previous century) or areas with laggard economies and high unemployment rates. A recent financial analysis of the proposed Kansas City to Chicago private toll road commissioned by the States of Illinois and Missouri, for example, concluded that toll proceeds would be inadequate to fund the road and recommended that the two states purchase the rights-of-way for the private operator with proceeds from special tax assessments on neighboring land, in the expectation that the road will stimulate development (Price Waterhouse 1990).

Subsidies to private companies might receive closer scrutiny, of course, simply because the companies are private and not public. Nevertheless, as long as public officials believe, for better or worse, that the social benefits of some infrastructure projects are real or warrant public subsidy, that enhances the possibility that some unwise or unsound projects might be built, whether publicly or privately. In a sense, that risk is the unfortunate reverse of the possibility of the subsidies enabling some worthwhile projects that might otherwise be ignored.

Cost or Technical Efficiency

The most commonly cited advantage of private operators is that they can build and operate infrastructure facilities at lower cost than their public sector counterparts. Numerous studies of the relative costs

[10] If these ancillary revenues are more readily captured by private but not public projects, then private projects may have an advantage. This advantage is not likely to stem from a real saving in resources to society, however, as we shall explain later.

of public and private services suggest that private operations do cost less, as long as competition is present to ensure that the private operators remain efficient.[11] Most of these studies deal with labor-intensive services, such as garbage collection or building maintenance, however, with few careful studies of capital-intensive services.[12] As a result, any comparison of private and public infrastructure costs must rest to a considerable extent on a subjective assessment of the claims of various supporters and detractors, with only limited empirical evidence for guidance.

Some of the cost advantages claimed by proponents of privatization are also clearly transfers from one group to another rather than real savings in resources for the economy as a whole. Private companies may be able to pay lower wage rates than public authorities, for example, although this will not always be allowed. (California has specified that private toll road builders must pay the same prevailing union wages as public authorities are required to pay.) Lower wage rates would reduce the budgetary costs of the project, but (absent productivity differentials) would not reduce the amount of labor resources required. Of course, to the extent that the lower factor prices paid by private vendors were closer to "true" free market prices, as presumably they often would be, then a more efficient combination of factors should be achieved by the private than by the public sector. In short, working with "better" factor price signals, the private supplier should be more productive than a public sector counterpart, all else equal.

Similarly, landowners and developers may be more likely to donate rights-of-way to private than to public road projects. Most of the land for the Dulles Toll Road Extension, for example, would be donated by neighboring landowners who stand to benefit. Landowners often donate land to public projects as well, where donations might encourage public highway authorities to give the road project higher priority. Nevertheless, the threat that the project might not survive without donations may be more credible where a private rather than a public operator is involved. But whether the project is public or private, donations of land represent a transfer from landowners to road users or investors, and generally do not reduce the total land required for the

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[11] John D. Donahue, in reviewing these comparative cost studies, concludes that the critical factor is not the form of ownership but the presence of competitive markets. "Public versus private matters, but competitive versus non-competitive usually matters more," he writes (1989, p. 76).

[12] One exception is the literature on the comparative costs of publicly and privately owned electric, gas, and water utilities. There is no consensus in these studies as to which form of ownership has lower costs. The privately owned utilities are usually publicly regulated, however, and public regulation can reduce the potential efficiency advantages of private ownership. (See Donahue 1989, pp. 73–76.)

project. Furthermore, if the land input is fixed, then no productivity gain would be expected even if the private sector faced more realistic market prices for land.

While many private sector "savings" may simply be transfers, private firms do appear to have a number of real cost advantages. These are created in part by the incentives provided by the profit motive, in part by avoidance of some cumbersome public sector bidding and contracting requirements, and in part by achieving efficiencies of scale, scope, and experience that might elude public operators. Private operators, for example, may have a stronger incentive and more flexibility to use resources, such as labor, productively. Comparisons of labor-intensive public and private services, such as garbage collection, often show that private firms have higher labor productivity than public agencies because they have more freedom to structure compensation, promotion, and other incentives to encourage worker productivity and are less constrained by cumbersome workrules.[13] While no comparative studies of productivity are available for waste disposal or roads, these industries probably offer similar opportunities. Some private landfill operators, for example, reportedly use their sites and labor more efficiently by giving managers and employees strong incentives to compact trash more thoroughly and to grade and cover it more carefully.[14]

Private firms may also achieve real cost savings by building facilities more quickly. The public sector generally plans, designs, bids, and builds major facilities such as roads in a sequential process, completing each stage before starting the next. Private firms may have more flexibility to use design-build or fast-track parallel processes, in which design engineers and private contractors are selected simultaneously and the planning, designing, bidding, and construction phases overlap. By using such an approach, for example, proponents of the private Dulles Toll Road Extension assert that they can plan, receive approval for, finance, and build a road several years faster than the Virginia Department of Transportation.[15] The use of such procedures need not be

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[13] In a comparison of public and private provision of eight different labor-intensive services, for example, Barbara Stevens found that the cost savings stemmed in large measure from higher labor productivity and not just from lower wage rates in seven out of the eight cases (1984, pp. 395–406).

[14] Interview with Ronald Jensen, Director of Public Works, City of Phoenix, Arizona, April 19, 1990, at Cambridge, Mass.

[15] Lauren Walters, chief operating officer of the Toll Road Corporation of Virginia, claims that their company can plan and build a road in four to five years while the public sector would take at least six to eight years to build a similar facility. The history of the Dulles Toll Road Extension, however, so far has been marked by delays from the corporation's original schedules. In April 1988, the toll road backers estimated that the

limited to the private sector, of course, but faster construction would save on the capital required for a project by bringing the investment into service more quickly.[16]

Most intriguing is the possibility that the private sector may be better able to exploit economies of scale, scope, and experience than the public sector. For example, building or operating plants in a variety of locations, private firms may be able to achieve greater specialization of labor by hiring experts in specialized technical or managerial areas while smaller public agencies often must hire generalists who will oversee a number of such areas. Multiple plant operation may also allow the private operator to achieve economies in administrative or overhead functions and to offer staff more opportunities and incentives for career advancement (thereby enabling the recruitment of a better work force at less cost, all else equal). Private operators may also be better positioned to exploit their experience, or the learning curve, because by building larger plants or building plants more often, they do not have to learn about the practical and technological problems anew each time.

Many of these advantages appear to have contributed to the rapid growth in the last two decades of large waste disposal firms. Increasing technological complexity has undoubtedly made economies of scope and experience more important in waste disposal. But some of these same advantages appear to be present in road construction as well, which is also dominated by large firms, particularly for major road projects with sophisticated design or engineering problems. If private toll roads became more common, large companies might emerge that managed as well as built roads, much as is the case in solid waste disposal.

The public sector may encounter difficulties in achieving these economies of scope and experience on its own (or, more precisely, without contracting with the private sector). Even banding together on a regional basis, for example, local communities are unlikely to build or operate more than one large waste recovery plant or landfill every ten or twenty years. The public sector's appreciation of these potential economies is reflected in the near universal practice of contracting with private firms to construct complex infrastructure facilities (even when they are

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road would be open in the fall of 1991, but that schedule has been extended several times and the latest forecast (as of May 1990) is for the road to open in March of 1993. These delays are due in part to public regulatory oversight, however, which will be discussed later in this paper. Testimony of Lauren Walters of the Toll Road Corporation of Virginia, "Supplemental Testimony and Exhibits in Response to State Corporation Commission," May 2, 1990, pp. 10–13 and exhibits.

[16] The public sector could of course use similar procedures. For example, many states use design-build procedures to speed the construction of prisons.

publicly owned) and the growing practice of contracting for private management as well, particularly in the case of solid waste.

The Financing Issue

In the early 1980s, private firms providing infrastructure could issue debt through both government and industrial revenue bonds, whose interest payments were exempt from federal individual income taxes. The 1981 federal tax bill also gave generous depreciation allowances and investment tax credits to investors in privately owned infrastructure. In a sharp reversal of policy, however, the federal tax bill of 1986 restricted the use of tax-exempt bonds to finance privately owned projects and eliminated many of the accelerated depreciation allowances and investment tax credits.[17]

Privatization proponents contend that private firms are now unable to compete fairly with the public sector because public entities have access to tax-exempt debt while private firms do not. As a result, some privatization proponents have argued for changes in the tax code to make the private sector more competitive with the public sector, either by giving the private sector access to tax-exempt debt for public purpose projects or by giving the private sector generous depreciation allowances.

The debate over the tax treatment of public and private financing seemingly has little to do with efficiency as economists conventionally define it. Efficiency would be involved only if the choice between public and private financing affected either the total amount of capital required or the degree or nature of the risks involved in the infrastructure project. Neither of these factors is likely to be affected substantially by the choice of public or private financing *per se*. However, public or private financing may affect the nominal financing costs to the investors by transferring some of the financing costs to other parties, such as federal or state taxpayers.[18]

Privatization proponents may be wrong, moreover, in arguing that

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[17] Exceptions were limited to some energy-producing facilities, including resource recovery plants and a few other very special circumstances.

[18] It is conceivable that private financing might typically require less capital because private ventures use a combination of debt and equity while some public ventures are financed entirely out of debt. The use of some equity might reduce total capital requirements if bondholders in 100 percent debt-financed projects required that more capital be tied up in the form of higher debt reserves or coverage ratios. It would be difficult to determine whether or not this was the case and, in any event, the advantages (if any) do not depend on tax laws or even public or private financing per se but only on the willingness of the investors (whether public or private) to use equity for a portion of the financing.

even the nominal financing costs to private investors are much higher than those to public investors under the current tax laws.[19] On the one hand, the public agency can issue debt whose interest is exempt from federal individual income taxes, which reduces the nominal interest rates the public agency must pay. On the other hand, interest payments on a private company's debt are a deductible business expense, which reduces corporate income taxes the company pays, presuming it is profitable. Even if the private company is not profitable (as is the case in the early years for many long-lived, capital-intensive projects), the company may be able to get another profitable company to build or buy the facility and then lease it back, thereby effectively capturing (in the lower lease payments) a portion of the tax advantages derived from the deductibility of interest. These tax advantages of public and private debt may be roughly equivalent, given that the present marginal rates for federal individual and corporate income taxes are approximately the same (28 and 34 percent, respectively). Indeed, for the past several years the yield on A-rated municipal tax exempt bonds has been higher than the after-tax cost of A-rated corporate bonds (Gurwitz 1989, p. M3). Nevertheless, it seems that if two projects, one private and one public, were otherwise identical (and in particular generated the same cash throw-off before interest, taxes, and all book charges such as depreciation), the chances of collecting income taxes from the private vendor's cash flow would be much greater; state and local government operating entities not only can issue tax-exempt debt but also are largely tax exempt on their own operating earnings, whether paid out or retained.

The nominal financing costs may also sometimes appear lower for public than private projects, either because the public sector is able to borrow a higher portion of the project costs or because it uses some public equity on which it requires little or no return. In the former case, while the average interest rates may be lower in the public than the private case, the total financing costs may not be, because revenue bondholders often will require larger coverage ratios or debt reserves for projects with little equity (which, in turn, increases the total amount of capital that must be financed). In the latter case, financing costs may also be comparable to those of the private sector if the public equity (which is sometimes provided, for example, by paying for project planning, design, and engineering costs out of general government budgets) is properly valued and is accorded a fair return on its opportunity cost.

To the extent that the nominal costs of public and private financing do differ, it is usually only because some transfers are effected between

[19] Many of the arguments in the following two paragraphs have been made by Gurwitz (1989, especially pp. M1-M6).

the facility's investors or users and other parties. If the nominal cost of public debt is lower than private debt under current tax laws and market conditions, then the use of public rather than private debt will simply transfer some burden to the federal taxpayer (and the state taxpayer as well, in an area with state corporate income taxes). In essence, tax realizations will be reduced to the extent that the total amount of tax shields has been increased in the economy. The tax loss commonly will be captured either by investors, in the form of higher returns, or by facility users, in the form of lower tolls or tipping fees. If nominal public financing costs are also lower because the public agency contributes equity which is undervalued or earns no return, then the state or local taxpayer loses (from not receiving a fair return on that equity) while the facility user usually benefits (in lower tolls or tipping fees).

All these issues are illustrated by the Dulles Toll Road Extension. At the time of its initial (1990) application to the Virginia State Corporation Commission, the private toll road corporation proposed to build the road for $199 million and then sell it to another private company that could take advantage of the tax benefits.[20] The other private company would lease the road back to the toll road company for payments with an equivalent cost of 10 percent interest. The toll road corporation would contribute $30 million in equity needed to cover losses in the early years (when lease payments plus operating expenses would exceed toll revenues because of the slow build-up of traffic). On its 15 percent equity stake the toll road corporation projects an average annual pre-tax return of 20 percent, so the total financing cost (lease plus equity) would average around 12 percent per year. The private toll road corporation plans to charge a toll of $1.50 per car for the first eighteen months of operation, with toll rates rising in two increments thereafter to reach $2 per car three and one-half years after opening.

The Virginia Department of Transportation's (VDOT) counterproposal is to build the toll road as a public facility for a cost of $236 million, with much of the higher cost apparently due to the public authority paying for some of the land that would be donated by landowners to the private corporation. VDOT proposes to finance the project by issuing $218 million in tax-exempt debt and $18 million in surplus toll revenues generated by the existing state-owned Dulles Toll Road. VDOT also believes the state would need a $70 million line of credit at 7.5 percent interest to cover early-year operating deficits and debt coverage require-

[20] The public proposal is as described in hearings before the Virginia State Corporation Commission and summarized in Commonwealth of Virginia, State Corporation Commission (1990).

ments. VDOT proposes to charge a toll of only $1 per car, which would not be raised over the life of the project.

Putting aside the issue of whether the private company's and VDOT's cost estimates and timetables are realistic (which both parties dispute), the possible substitution of 7 to 8 percent public debt for the 10 percent private debt implicit in the lease payments would represent a transfer from federal and state taxpayers (in lower individual and corporate income tax payments) to road users (in the form of lower tolls). The possible substitution of $30 million in private equity at 20 percent for $18 million in public equity (in the form of the excess revenues on the existing road) with no apparent return also represents a transfer from a combination of federal and state taxpayers (in the form of the forgone return on the state's equity and, to lesser extent, lower federal and state corporate income taxes) to road users (in lower tolls). Indeed, if VDOT charged the same tolls as the private company proposes, it would earn approximately the same return on its equity (20 percent) as the private company is projecting. Put another way, if VDOT acknowledged that the risks of its project were similar to those of the private proposal and therefore required a similar return on its equity, it would have to charge approximately the same tolls.

The Dulles Toll Road Extension raises other issues besides financing costs. The private company claims that VDOT cannot build the road as fast or as cheaply as it can, for example, while VDOT argues that the private cost estimates and construction timetable are unrealistic and that VDOT will enjoy some operating and toll collection economies from operating the extension as well as the existing toll road. The case illustrates, however, that the nominal costs of financing may not be so different if the private company uses leases and other devices to take full advantage of tax shelters and if the public equity is properly compensated. To the extent that nominal financing costs differ and all else is equal, moreover, the differential represents largely transfers rather than real cost savings to society.

Additional Considerations: Siting, Pricing, and Regulation

Some of the cost advantages of the private sector may be offset if extensive public oversight and regulation of private siting or pricing decisions are required. Siting infrastructure facilities is often at least as much of a problem as cost containment, especially in built-up areas.

The Siting Problem

In the case of highways, new facilities are sometimes welcomed as spurs to development, particularly in rural or outlying areas. But these cases may now be the exception rather than the rule, as each decade has added new sources of concern and opposition, and new government regulations controlling highway siting decisions. Land assembly for highways has always been difficult if only because a long continuous right-of-way is required, and governments have usually had to resort to condemnation proceedings, which are governed by constitutional and other safeguards.

By the 1960s, neighborhoods in the path of new highways learned to mobilize politically, and their opposition eventually led to the cancellation of some of the proposed inner-city extensions of the Interstate System in major metropolitan areas and to federal requirements that highway planners provide relocation assistance and consider "no build" and mass transit alternatives to federally aided highways. By the 1970s, concerns about the destruction of parks and sensitive environmental areas and automobile air pollution led the federal government and many states to require environmental reviews and public hearings on highway and other major project proposals. The 1980s brought a renewed concern that new highways would stimulate too much development, particularly in suburban areas where growing traffic congestion and development densities seemed to threaten the quality of life many residents had moved to the suburbs to enjoy. The highway extensions now being planned in most major metropolitan areas are located on the outermost periphery, where neighborhood and environmental opposition is generally less intense and development is more likely to be welcome.[21]

Opposition to the siting of solid waste facilities is based on similar concerns. A landfill or waste recovery plant does not require a continuous right-of-way, so condemnation may not be as necessary. But such facilities have long generated neighborhood opposition because of heavy truck traffic and, more recently, fears of groundwater contamination or air pollution. Local community dumps and municipal incinerators are increasingly being replaced by large regional facilities because environmental regulations have increased the technological complexity and minimum efficient scale of disposal facilities. These larger facilities intensify the feeling of nearby local groups that they are being unfairly singled out to bear regional costs and risks, and strengthen the now familiar "not in my back yard" (NIMBY) syndrome.

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[21] For a description of the evolution of public concerns and government regulations governing highway siting decisions, see Altshuler (1979).

Private ownership or operation does not eliminate the pressures or opportunities for government oversight or public involvement in siting decisions. Private facilities will typically require zoning or other local permits as well as state and federal environmental approvals and other related requirements. In the case of the Dulles Toll Road Extension, for example, Virginia's Commonwealth Transportation Board had to pass on the "public need" for the project and approve the alignment; both Loudoun County and the Virginia Department of Transportation must still approve the final roadway and interchange designs. The Dulles Toll Road may need Loudoun County to exercise eminent domain on its behalf as well since, although most of the right-of-way is being donated, the owners of a few parcels are still holding out. Such permits and approvals give affected governments and citizens a variety of opportunities and grounds to modify, delay, or conceivably stop private projects.

Private firms may have some advantages over public agencies in resolving these siting problems, however, such as the ability to avoid the public spotlight until relatively late in the siting process, after many of the concerns of local residents and government regulations have been resolved. For example, a private waste disposal firm in Phoenix was able to negotiate agreements with surrounding property owners and meet with state environmental regulators before the site of their proposed new landfill became public knowledge, so that by the time the required public hearings on environmental impacts were eventually held, many of those who initially might have been opposed were already supporters of the proposal.[22] In contrast, a public agency is more likely to have to conduct a search for a new site openly from the start, so that local opposition have more chance to become mobilized and intransigent before their concerns can be met.

Private firms also may have more flexibility than public agencies in the compensation they offer objectors, or they may be more skilled both in marketing the benefits and minimizing the risks of proposed projects. Private solid waste firms are increasingly seeking out poor and thinly populated counties as host communities for landfills, and compensating these communities with a share of the tipping fees, new deep wells and water supply systems for surrounding houses, and new neighborhood facilities such as parks, golf courses, and even a baseball stadium (Katz 1990). Public agencies can adopt the same practices, of course, and have in some cases. Some local public authorities have recognized that large profits may be made in opening their landfills to other communities, for example, especially in the Northeast where tipping fees are high. Still,

[22] Interview with Ronald Jensen. (See footnote 14.)

more parties will be involved in the negotiation and agreement may be more difficult if, instead of a single private firm, a consortium of neighboring communities must initiate and approve the compensation plan for the host community or a local city council must design the compensation scheme for its immediate neighbors.

These potential siting advantages of private firms, nevertheless, may be offset by disadvantages, such as public apprehensions that private firms will not take their environmental and other community responsibilities seriously. Mistrust is probably more of a problem for solid waste than for highways, both because the environmental risks are perceived to be greater and because the solid waste industry suffers, fairly or not, from past associations with organized crime, price fixing, and environmental neglect.[23] The degree of public mistrust has led one of the dominant private waste recovery firms, Ogden, to specialize in building and operating plants under contract to municipal authorities rather than merchant plants for the spot market. Ogden has managed to site more new plants than its nearest competitor, Wheelabrator, because, in acting as the agent for municipalities, Ogden is less vulnerable to attacks from environmentalists and those who simply do not want a plant nearby.[24]

In the case of highways, private involvement may intensify siting problems by increasing local concerns that the new highway will bring too much new development. Private toll road proposals are often motivated in part by the development prospects they offer and, as with the Dulles Toll Road Extension, made financially possible by donations of rights-of-way by the landowners who stand to gain. In the case of the Dulles Toll Road, Loudoun County welcomes development, in part because it still has not experienced either the benefits or the problems of rapid growth of counties closer to Washington, D.C. But developer interest and support of private road projects may only heighten fears of development opponents in communities where too much development has become an issue.

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[23] Whether the apprehension is warranted or not is difficult to say. On the one hand, even one of the largest and most reputable private landfill operators, Browning-Ferris, has been convicted of price fixing and fined for serious environmental violations. See Novack (1988); Cook (1985). On the other hand, the private landfills are much more likely to be equipped with liners, leachate collection systems and groundwater monitoring equipment than their older public counterparts they may be replacing. The equipment may be better in part because the average private landfill is newer than the average city or county landfill and in part because state environmental inspectors may be tougher on private than public operators. See Hamilton and Wasserstrom (n.d., especially p. 5).

[24] Wheelabrator is gambling that the profit at the spot market rates will be higher on the plants that it can site (Cook 1990, p. 49).

Finally, public agencies may have an advantage simply because they have more established institutions and proceedings for dealing with the types of equity issues involved in siting. The private sector, almost by definition, has to rely on bargaining to reconcile conflicting interests. Where the parties involved are very numerous or the conflict is so polarized that mutual agreement seems difficult if not impossible, public institutions, with their established procedures and authority, may be quicker or their involvement unavoidable.

It would be difficult, therefore, to assess whether the involvement of a private firm, on balance, reduces or increases the problems of siting. Such a judgment probably varies according to the particular circumstances, such as the type of facility involved, the reputation of the private firm and its skills at negotiation and compromise, and the strength and nature of the local opposition. If private firms have an advantage it is probably a modest one, however, and private ownership per se probably will do little to overcome the serious obstacles to siting new infrastructure facilities that exist in many communities. In those cases where the siting disputes are so intolerable or complex that government agencies must become deeply involved, moreover, some of the private sector's potential advantages in faster construction are likely to be offset.

Pricing and Rate Regulation

A related issue in the privatization debate is whether private firms are more likely to charge users of their facilities the socially appropriate or desirable prices and, if not, whether public oversight or regulation of their rates is required and what the consequences of that regulation might be. Of course, user charges or prices, such as tolls or tipping fees, are not the only potential revenue source to finance infrastructure facilities. Revenues from ancillary activities are often used as well, such as the sale of energy or recyclables from waste recovery plants or the profit from the development of neighboring land parcels that a private toll road company or its backers might own. Government revenues also may be made available, including the proceeds from broad-based taxes (for example property, income, or sales) or special taxes such as gasoline excises or assessments on neighboring landowners.

A large literature is available on the circumstances in which user charges, supplemented perhaps with ancillary revenues, are more appropriate than general government revenues as the means for paying for infrastructure or other public services. Most economists agree that user charges are more appropriate when the users are the primary beneficiary of the services provided by the facility; when the level of use affects the costs of building and operating the facility; when the prices

charged affect the level of use; and when the administrative costs of collecting the user charges are not too high.

All these conditions favorable to user charges seem to apply to solid waste disposal and, with two important exceptions, to expressways as well. One of these exceptions is that collecting tolls may be costly and pose safety problems on some high-density urban expressways. The other is what transport economists call the "two road problem": when two parallel roadways are, from the motorist's perspective, relatively close substitutes for one another, the imposition of tolls on one road but not the other can seriously distort the distribution of traffic between the two facilities and cause undesirably high levels of congestion on the untolled facility.[25]

Of course no theoretical or practical reason requires that the choice of a private firm dictate the use of user charges or preclude government tax revenues or subsidies. Private firms can build or operate facilities under government contracts that provide for some or all of the costs to be paid out of tax proceeds rather than user charges or ancillary revenues (as the proposed Kansas City–Chicago toll road illustrates). The interesting question is whether a private firm or a public agency is the more likely to charge the appropriate or socially desirable prices in a situation where both would rely on user charges and ancillary revenues to the same degree.

One argument in favor of the private firm is that it may be more likely to price its services at marginal cost rather than at average or historic costs. If the capacity of the existing facilities is limited, and new facilities will cost more than the old ones, marginal costs may exceed average or historic costs. Pricing at marginal cost sends signals to users about the true cost of adding more capacity, and users, in turn, may choose to change their behavior, for example, by recycling, using mass transit, or carpooling. A potential political problem with marginal cost pricing in such cases is that it will produce revenues in excess of the costs of existing facilities. Public operators may be less willing or able to produce such "windfall" profits for equity or legal reasons, despite the fact that the pricing signals would, in the long run, produce more efficient behavior on the part of users. Of course, public authorities may also be reluctant to let private operators reap such windfalls and may regulate rates to prevent their realization.

The private firm may have more incentive to apply marginal cost pricing atomistically, moreover, so that fees for different types of users

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[25] For a discussion of the "two road problem" theory see Meyer and Straszheim (1971, pp. 44–59). For a discussion of the practical impact of this problem in Britain see Button (1987).

are more closely aligned with the different costs they impose. A private toll road operator might be more willing than his public counterpart to charge peak-hour motorists more than off-peak motorists, for example, much as private airlines charge travellers to Europe more during the peak summer season than during the winter. Higher peak period charges might be socially desirable because the peak-hour traveller may be responsible for more of the capacity costs in the long run and (in the absence of a surcharge) imposes socially undesirable congestion on other roadway users in the short run. Similarly, a private waste disposal firm might be motivated to charge tipping fees that varied with the density or the combustibility of the refuse, if the disposal costs so varied. In contrast, public authorities might be more inclined to charge different users the same price because equal charges seem fairer at first glance (ignoring the fact that different users may impose different costs) and because a public agency may have less incentive than a for-profit firm to distinguish between cheap and costly users.

The key potential disadvantage of a private firm is that it may be more tempted than a public agency to exploit any monopoly or market power it might enjoy by pricing its services well above costs. As long as a market is competitive, of course, private firms cannot price above their marginal costs in the long run; they may be able to do so in the short run if demand temporarily outstrips supply, but only for as long as it takes the industry to build additional capacity. If the market is not competitive, however, a firm may be able to sustain prices in excess of marginal costs even in the long run. As a consequence, some users could be discouraged from using the facility even though they valued its use at least as much as it would have cost to serve them.

A few states have decided to regulate the tipping fees or tolls charged by private operators out of concern about such potential abuses of market power. New Jersey is the only state that systematically regulates the tipping fees of private waste disposal firms so far, although other states have considered doing so. New Jersey imposed regulations because of allegations that private waste carting companies were colluding to fix prices, and tipping as well as transport fees were regulated because some of the private companies owned disposal sites as well as carting companies. The state is reportedly considering abandoning regulation of transport fees because state price controls are perceived to have been so stringent that they reduced the availability of carting services. New Jersey's regulation of tipping fees is likely to be maintained, however, because the number of disposal sites in the state is so limited.[26]

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[26] Interview with Allen Blakey and Edward W. Repa, Director of Public Affairs and Director of Technical and Research Programs, respectively, of the National Solid Waste

Private expressway tolls are perhaps more likely to be regulated, although the experience to date is limited. Virginia's 1988 law authorizing the construction of private toll roads specifies that the State Corporation Commission, which regulates public utility rates, will regulate the tolls and rates of return on private roads as well, including those on the proposed Dulles Toll Road Extension. California's 1989 law authorizing the construction of up to four private toll roads does not require that the state regulate tolls. The California Department of Transportation plans to approve only those projects where motorists have alternative routes, however, and to review whether the rate of return generated by the proposed toll is fair.[27]

As to whether concerns over market power are justified and warrant public regulation of rates, the situation appears to vary slightly between solid waste and toll roads. In the case of solid waste, more reason exists to fear that private firms might enjoy and abuse market power in the short run than the long run, but even in the short run, regulation may be unwise. In the short run, the closing of many old landfills and incinerators because of more stringent environmental regulations and the difficulties in siting new facilities have greatly constrained waste disposal capacity, particularly in the Northeast and around major metropolitan areas. The tipping fees of $75 to $100 per ton now charged in some areas are probably several times the cost of operating a modern and environmentally responsible landfill and perhaps as much as twice the cost of a new waste recovery plant (presuming a new landfill or plant could be sited). In some areas, such as New Jersey, Chicago, and Philadelphia, private waste disposal firms are alleged to be using the shortage of disposal capacity not only to raise tipping fees well above long-run disposal costs, but also to squeeze out rival firms that are engaged in carting but do not own their own disposal sites (Cook 1985, p. 130).

The ability of private waste disposal firms to maintain charges above costs is probably very limited, however, especially in the long run. Even in the short run, tipping fees are somewhat constrained by the possibility of transporting wastes to more distant facilities. Transport costs (of roughly one dollar per ton mile) are now comparatively small relative to tipping fees in the Northeast, for example, which increases the distance it is worthwhile to transport waste to enjoy a lower tipping

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Management Association, Washington, D.C., April 20, 1990. Also see Hamilton and Wasserstrom (n.d., pp. 11–12).

[27] See "Private Roads Get Go-Ahead From California Government," *Public Works Financing*, August 1989, pp 5–7.

fee.[28] In the long run, high tipping fees will be further constrained by the strong incentives they create to organize more effective waste recycling programs and to overcome the opposition to the siting of new landfills and waste recovery plants. Such considerations led the state of Minnesota to conclude that regulation of tipping fees was probably unnecessary, despite the fact that Browning-Ferris and Waste Management together had a near monopoly on local private waste disposal facilities.[29]

Regulation of tipping fees may be unwise even in the short run, moreover, simply because it might reduce the incentives to increase long-run disposal capacity. It is hard to imagine that public or private operators would ever overcome the present capacity constraints and siting problems without the stimulus of the high profits some disposal firms are now earning. Regulation of these profits might reduce the incentives of private firms to find new sites, for example, or the compensation they could offer to host communities.

The case for regulation of private toll roads is more complex because of a possible trade-off between achieving financial feasibility and avoiding excessive congestion on any parallel untolled facilities. The proposed private Dulles Toll Road Extension will compete for traffic with Virginia's Route 7, a parallel highway that is untolled but not built to expressway standards. Similarly, motorists could avoid the tolls on the proposed Kansas City to Chicago private toll road by using one of two slightly more circuitous and untolled routes: Interstates 70 and 53 (to the south of the toll road) or Interstates 35 and 80 (to the north). Too many parallel untolled or lightly tolled facilities can make toll operations both financially infeasible and socially undesirable. On the one hand, it may be difficult or impossible to collect tolls sufficient to finance a new road, while on the other hand, high tolls might aggravate the "two road problem" by keeping the level of congestion on the competing untolled roadway too high.

The case for government control of private toll rates is therefore strongest at either competitive extreme. In the case of too little competition, it might take the form of conventional public utility rate regulation such as is applied to local electric, gas or telephone rates. In the case of too much competition, government regulation might take the form of the imposition of tolls on the parallel public facility, with the public tolls set at levels that make it possible for the private operator to charge rates

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[28] In the Northeast, however, long-distance transport usually means that garbage is crossing state lines, which creates some difficult political problems.

[29] Interview with Allen Blakey and Edward W. Repa. See also Hamilton and Wasserstrom (n.d.).

sufficient to earn a fair return and balance the allocation of traffic and congestion between the two roads.

The decision as to whether government regulation of toll rates is necessary will probably vary according to the particular circumstances. In many cases it is possible that parallel roadways will provide just enough competition to limit the market power of a private operator, but not so much as to make toll operation unworkable. State governments will probably feel obliged at least to review the competitive circumstances of each private toll road proposal before granting a franchise, as California proposes, even if they do not require continuing public regulation of rates during the operation of the facility, as Virginia has done.

Government regulation of rates and returns to investors may reduce the advantages of private ownership and operation by increasing delays and other risks that investors face. Government review of the proposed rates and returns during the initial franchise application may slow the procurement process considerably and offset some of the potential advantages that private operators may have in faster construction. Virginia's State Corporation Commission did not approve the initial application of the backers of the Dulles Toll Road Extension, for example, and has asked them to supply additional information about their costs and proposed toll rates. Continuing regulatory review of rates after the initial franchise is approved will provide an additional element of risk for investors, moreover, for which they may require higher rates of return as compensation.[30]

Government regulation may also create incentives that reduce the technical or cost efficiency of the firm. Regulatory economists have long worried about regulatory authorities' ability to set the appropriate rate of return on investments when approving rates: too high a return can lead to wasteful overinvestment or gold-plating of the facility, while too low a return may lead to underinvestment. Setting the appropriate rate of return involves difficult and controversial assessments of the nature and degree of risks to which the investors are exposed.[31]

An Overall Assessment

Any overall public policy assessment of infrastructure privatization must deal not only with efficiency issues but also with the questions of

[30] Such a possibility is suggested, for example, by Kolbe and Tye (1990).

[31] See Averch and Johnson (1962) and the reviews of the literature in Kahn (1988, vol. 2, pp. 49–59) and Baumol and Klevovick (1970).

transfers and who wins and loses from privatization. The transfers of costs from one party to another, which may not be too important from the perspective of society as a whole, are obviously of great concern to the parties involved. And knowing who captures any net efficiency gains of privatization is obviously also important to the parties involved. The actual incidence of gains and losses from privatization depends to a considerable extent on the particulars of the individual cases. Only some broad tendencies can be identified, and these only very tentatively.

Winners and Losers

The most likely losers from the privatization of a proposed facility would seem to be organized labor and, to a lesser degree, landowners. Labor will lose to the extent that private sector operation results in lower wage rates or less protective workrules than public sector operation. Landowners surrounding a private road may also lose if a private operator is more successful than the public sector in extracting land donations or other contributions to advance the enterprise. In both cases, the losses come from the private sector's greater incentives to seek out and capture economic rents.[32]

The clearest winners from privatization would usually be federal, state, and, in some cases, local taxpayers. Taxpayers potentially gain in several ways. First, federal and state taxpayers usually would gain from higher individual and corporate income tax payments made by the private facility owners and bondholders, using taxable rather than tax-free financing. If a state-owned facility were as efficient as a private operation and set rates at the same level, for example, privatization would transfer income from the state to the federal government because the state-owned operation (and its surpluses) would have been tax-exempt. Second, to the extent that private equity or debt replaces public equity that received little or no return, the state or local taxpayers who would have contributed that equity would gain from not having to make that uncompensated contribution, while federal and state taxpayers would gain from higher income tax payments on returns realized by the private equity. Finally, state or local taxpayers might capture some of the efficiency gains of private sector operation or the transfers of economic rent from labor or landowners (particularly if the facility, though privately owned or operated, could not be supported from user charges

[32] Economic rents are payments or other benefits that owners of land, labor, or capital receive that are in excess of those that would be required to induce them to supply those services or factors.

alone and the efficiency gains or transfers were used in part to reduce the required government subsidies).

Investors might also gain from privatization of a proposed facility if they were able to hold on to any of the economic rents (captured from labor or landowners) or the efficiency gains from privatization, instead of passing these on to facility users in the form of lower user charges or better services. The prospects for doing so would depend on how competitive the markets for the facility's services were or, failing that, how closely public regulators were able to monitor the private operator's costs and force them to price closely to their costs. In a competitive market or under perfect regulation (a perhaps unattainable ideal), the facility owners would be forced to pass these savings on to facility users and earn only a normal return on their investment. With a less competitive market and lenient regulation, the facility investors might be able to earn above-market returns. (With excessively stringent regulation the investors could lose by earning a below-market return in the short run, but would eventually withdraw their capital by underinvesting or not maintaining the facility.)

Whether facility users would gain or lose depends on the particular circumstances. Facility users might lose in two ways. First, if the nominal costs of private sector financing were greater than the nominal costs of public sector financing, the users are likely to bear the costs in higher user charges. In effect, the users are likely to pay in higher tolls or tipping fees for any gains taxpayers receive in higher income tax payments or in avoiding uncompensated contributions of public equity. Second, the users might lose if the private owners were more willing and able to exploit any monopoly or market power by charging users fees that exceeded the costs of building and operating the facilities. Facility users stand to gain, however, to the extent they realize, in lower fees, any transfers (from labor and landowners) or efficiency gains generated by privatization. If the private owners are forced to pass these savings on to facility users (by either competitive market or regulatory pressures), these savings might offset the users' other possible losses and leave them, on net, better off.

The Importance of Efficiency Gains and Competition

This discussion of winners and losers strongly suggests that privatization is a more attractive public policy where the potential efficiency gains are great and the private operator faces effective competition. The larger the efficiency gains from privatization, the greater the prospects that most parties will gain from privatization and few will lose. The prospect of greater efficiency gains may also mean less pressure to extract any economic rents from either labor or landowners. More

importantly, the larger the efficiency gains, the more likely that users will be net beneficiaries. Competition is important, both because it might help stimulate efficiency gains and because it will force investors to pass any savings on to facility users rather than retaining them in the form of above-normal returns.

Any assessment of the efficiency advantages of private provision of infrastructure must balance a variety of conflicting considerations and arguments. On the one hand, private firms probably have real cost advantages in many cases in the form of economies of scale, scope, and experience, in the incentives they can offer their employees and managers to be more productive, and in faster procurement. Private firms may also be better able to arrange the compensation needed to resolve siting problems, as long as the disputes are not too complex, and are more likely to tailor their prices to match the costs of different users. On the other hand, government involvement in siting may be quicker or even unavoidable where problems are complex and opponents intransigent. The fear that private operators might abuse their monopoly power also may be real enough to compel some form of public rate regulation, particularly in the case of roads. Either type of government involvement may undermine some of the normal cost advantages of the private firm, particularly in speedier procurement, or add significantly to other private sector costs by increasing investor risks or distorting investment decisions.

In this light, the potential advantages of privatization are probably greater in solid waste disposal than toll roads. In the case of solid waste, the technological sophistication and complexity of modern disposal facilities make the potential efficiency gains from both private construction and management large. Solid waste also raises fewer market power or anti-competitive problems, especially in the long run. The emerging practice of relying on the private sector to both build and operate disposal facilities, either on a contract or merchant plant basis, reflects these potential advantages.

In the case of roads, the largest or most obvious efficiency gains would seem to lie in private construction rather than private operation of the facility; however, the public sector probably already captures many, or even most, of these construction economies through the near universal practice of contracting with large and specialized private road building companies for the construction of major public roads (although they might do more, for example, by more closely emulating private sector "fast-track" procurement practices). Private sector operation of roads probably offers efficiency gains in some cases, but it may raise troubling competitive issues as well. A lack of competition may make private operation both less efficient (by constraining demand or reducing efficiency incentives) and politically less attractive (since users are

more likely to be made worse off), while corrective government regulation of rates may cause efficiency problems of its own.

Privatization and the "Infrastructure Crisis"

Finally, privatization, although often advantageous in other respects, will probably do relatively little to alleviate the real or perceived shortfall in infrastructure spending that has come to be known as the "infrastructure crisis." Privatization alone will not increase the pool of available capital for infrastructure spending as long as the public sector also is willing to tap private capital markets, by issuing revenue or general obligation bonds for similar facilities. The tapping of private capital markets (whether by the private or public sector) is likely to come at the cost of displacing other investments. By contrast, public funding of infrastructure out of taxes (although politically more difficult) might have a slightly greater chance of increasing aggregate investment (in both infrastructure and other facilities) to the extent these taxes were borne by consumption rather than savings.

Privatization also offers only moderate potential advantages in siting facilities, which is probably as much of a constraint on infrastructure spending as the availability of capital. The private sector may be able to arrange compensation more easily in some cases to overcome siting opposition, but, rightly or wrongly, it may heighten fears in others.

In sum, the limited experience thus far with privatization of waste disposal and highways in the United States suggests that privatization may be generally helpful but is no panacea. Some shortfalls in public investment may be well suited to a privatization solution while others may not be, with that suitability being very dependent on both the competitiveness of the markets served and the realizable extent of any efficiency gains.

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Discussion

*Sir Alan A. Walters**

It is difficult to disagree with the main conclusions of Jose Gomez-Ibanez, John Meyer, and David Luberoff. First, they conclude that privatization is most attractive when the potential efficiency gains are greatest and the private operator faces effective competition. Second, they conclude that privatization, however advantageous, will do little to alleviate the real or perceived shortfall in spending known as the "infrastructure crisis."

Gomez-Ibanez, Meyer, and Luberoff do not present an explicit "model" of the infrastructure supply and demand process, or, more pertinently, the privatization process and the public choice analysis. Yet an implicit framework is developed within which the evaluation takes place. They contend that private provision will be better than public provision if

(1) Rapid technological progress takes place in the industry (and their judgment is that more of such change is taking place in solid waste disposal than in highways).
(2) Privately owned competitive firms are feasible as an alternative to public sector provision (and again solid waste scores).
(3) "Depoliticization" of production activities is most likely under private ownership.

A fourth possible addition would suggest that a powerful case for privatization can be made if it were an effective way of reducing the

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overweening power of trades unions (and if that were the only way to escape from the provisions of the Davis-Bacon condition).

New versus Existing Facilities

Of course, most privatization in the West as well as in the Third World has been concerned with turning over existing state-owned assets and liabilities to the private sector. Gomez-Ibanez, Meyer, and Luberoff, however, are primarily concerned with the creation of *new* assets, and whether they are best financed, created, and owned by the private rather than the public sector. For example, they do not consider, even tangentially, the possibility of a complete privatization of the Interstate Highway System. And although selling existing roads or bridges to the private sector is discussed, this is clearly a marginal consideration.

Gomez-Ibanez, Meyer, and Luberoff are probably being quite realistic in eschewing the radical privatization solution. Political economy, like politics, is the art of the possible. (The contrast with Clifford Winston's paper is notable; Winston considers a radical rebuilding of highways, but he does not discuss a feasible program and its costs and benefits.) Nevertheless, it would have been interesting to have seen their view on the efficacy of a completely privatized road system. Would the standards of construction have been more efficient, would it have been possible to avoid the vast waste of overbuilt roads in rural America (the Ann Friedlaender thesis), would it have produced more urban highways, would the operation be more efficient, would pricing be more appropriate? —and so on.

Contractual Systems and Regulatory Systems

Gomez-Ibanez, Meyer, and Luberoff refer obliquely to various contractual arrangements but they do not discuss the vast variety of contractual systems that may be generated under private ownership. In solid waste disposal, one would expect to find many hedging arrangements—forward markets, futures, and options would be developed, operating (except for forward markets) with standardized contracts. Why cannot solid waste disposal markets develop like the traditional ones in commodities?

It is more difficult to see this developing in tolled facilities, yet the development of pricing and supply contracts in electricity (Britain has had a crash course in these matters) gives one pause before ruling it out. The modern methods of electronic pricing provide a wealth of opportunities for auctions in road-use rights. In many circumstances, compet-

itive supply, given the capital stock, is possible (such as on the four or five roads between Washington and Baltimore).

In the absence of competition, Gomez-Ibanez, Meyer, and Luberoff suggest that, while fully recognizing the criticisms, the traditional rate of return regulation be introduced. However, other methods are available which are likely to be introduced in the United Kingdom. Misleadingly called "price-cap" systems, they avoid at least some of the inefficiencies of rate of return regulatory systems. (Note it is a cap on *average revenues per unit of output* and it applies *only* over the part of the revenue with some monopoly power.)

Macroeconomics

Gomez-Ibanez, Meyer, and Luberoff make the curious claim that while privately financed infrastructure is likely to displace some other forms of private investment, publicly provided infrastructure, when funded by user charges or taxes rather than debt, is likely to generate additional savings. Thus a consequence of the increase in tax revenue would be some reduction of private consumption, rather than a reduction of private (non-road) investment.[1] I find it difficult to follow this argument. The authors are holding real income fixed in this comparison. Then, increasing taxes on a pay-as-you-go basis to finance the investment will be considered by the private sector as an expenditure occurring today which, other things equal, will increase future disposable income, compared with the alternative of paying the future interest on debt incurred today. The form of finance will affect the timing of savings, as people finance their chosen and unchanging consumption stream. Total investment should not be affected.

Wages and Transfers

The authors are too dismissive of the effects of privatization (and, one may add, deregulation and competition) in eliciting lower wage levels, partly in lower wage costs per unit of output but also in lower real wages per hour. They claim that these effects are simply transfers from

[1] This, of course, denies the validity of the Ricardo equivalence theorem, where debt finance, in contrast with current tax finance, would induce additional savings by consumers to meet their future higher tax liabilities. No net effect on investment or capital stock would occur. It must be noted, however, that because of the discrete generation effect and the absence of perfect bequest motives, among other things, the Ricardo proposition has not been supported by empirical enquiries.

one group (labor) to another (owners and customers). But if the excess wage rate is due to monopoly power, whether formally or sanctioned by government, a reduction of those rates to competitive levels is, at least, an elimination of a *distortion* in the system and so will generate efficiency gains as well as transfers. It will result in an increase in employment and possibly a reduction in unemployment. Moreover, the process of privatization will also reduce more serious distortions generally associated with high unionized wage rates, such as issues of manning, seniority rules, work practices, and so forth.

Conclusion

On balance, one can find more achievable gains from privatization of the highways than Gomez-Ibanez, Meyer, and Luberoff offer. The only evidence as support, however, is anecdotal—such as the construction of Alliance Airport, the experience of the Channel Tunnel (compared with, for example, the Thames Barrage), and the management and maintenance of toll-ways. Clearly, more work needs to be done—and the authors have provided a most useful initial framework.

Discussion

*Gail D. Fosler**

Jose Gomez-Ibanez, John Meyer, and David Luberoff approach a sometimes passionate topic with a remarkably dispassionate view. Their paper provides a broad and extremely useful discussion of the advantages and limitations of privatization, and it adds important perspectives to the work of those who would advocate privatization as the solution to America's infrastructure problems.

Several important points in the paper should be emphasized. First, the privatization discussion has more to do with efficiency, pricing, technology, and shifting burdens among users, taxpayers, and wage earners and among economic and financial sectors, than with the total quantity of infrastructure. Privatization of some infrastructure services, such as solid waste disposal, has increased over the past decade. Yet infrastructure investment relative to GNP has shown little change or has even declined. Given the requirements of technology and systems management, the private sector can be an equal or even superior partner in the provision of infrastructure. Nonetheless, Gomez-Ibanez, Meyer, and Luberoff do an excellent job of identifying both the practical and the theoretical limitations to the privatization of infrastructure investment.

The second point, implicit in the selection of toll roads and solid waste disposal facilities as examples of privatization, is that privatization of infrastructure investment and of public services generally has not progressed very far. The paper cites the extensive privatization of solid waste disposal capacity. However, this is more the exception than the rule. The 4,128 miles of highly visible toll road projects represent only

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Table 1
Private Fixed Reproducible Tangible Wealth in the United States, 1982 and 1988
Billions of 1982 Dollars

	1982	1988	Percent Change 1982–88
Constant Dollar Gross Stock			
Local & Interurban Passenger Transit	9.6	8.5	−11.5
Transportation by Air	73.0	69.2	−5.2
Transportation Services	34.5	35.4	2.6
Sanitary Services	18.2	25.1	37.9
Total	135.3	138.2	2.1
Constant Dollar Net Stock			
Local & Interurban Passenger Transit	4.1	4.0	−2.4
Transportation by Air	39.8	34.0	−14.6
Transportation Services	18.1	16.8	−7.2
Sanitary Services	10.5	14.6	39.0
Total	72.5	69.4	−4.3

Source: U.S. Bureau of Economic Analysis, *Fixed Reproducible Tangible Wealth in the United States, 1925–85* (June 1987), and the Bureau.

0.2 percent of total highway miles in America. In the states of Virginia and California, toll roads account for less than 100 miles of highway. The American Association of State Highway and Transportation Officials estimates that only 200 miles of toll roads will be built in the 1990s. Similarly, privatization does not appear to be a major factor in water, sewers, urban transportation, or education.

To be sure, it is difficult to get a good measure of private infrastructure investment or of the private investment share by type of infrastructure service. The U.S. Bureau of Economic Analysis series on fixed reproducible tangible wealth provides a hint of the limited private involvement. The gross capital stock in local and interurban transportation, air transportation, sanitary services, and other transportation services is virtually unchanged since 1982 at $135 billion to $138 billion in constant dollars, and on a net stock basis it has declined. True, investment in private sanitary services is up almost 40 percent in real terms since 1982, but other types of private infrastructure investment are down (Table 1).

These trends raise the question of why the United States is not undertaking more of this investment if it is such a good idea, which raises a third point in the paper. The incentives required for private involvement in infrastructure activities appear from all indications to be extremely high. To the extent the private sector requires incentives or various forms of monopoly power, the efficiency gains from privatization are limited.

As the paper points out, the tax code before the 1986 reform provided substantial incentives for privatization of water, sewer, and solid waste disposal services. These incentives were justified on the basis that private companies should enjoy the same financial advantages that state and local governments have in the tax-exempt market. While the total federal tax expenditures dedicated to this purpose were not substantial, local bonds used for private purposes rose dramatically in the mid-1980s. From 1975 to 1980, bond issuance for pollution control averaged $2 billion to $3 billion. By 1984, with the explosion of private purpose tax-exempt finance for pollution control, total issuance jumped to over $8 billion. By 1986, the spread between tax-exempt bonds and taxable Treasuries was less than 100 basis points.

In 1986, tax reform eliminated or substantially curtailed private purpose tax-exempt financing. Last year, tax-exempt financing for sewage disposal, solid waste, and non-nuclear hazardous waste was only $1.9 billion, not very different from the amounts in the 1970s. The former incentives were important primarily for pollution control, and often served as a subsidy for private spending. Once these incentives were removed, privatization of other services simply has not progressed very far, even with the remaining incentives.

The experience (and incentives) in privatizing solid waste may provide a key to "why." The publicly traded solid waste companies are highly successful and highly profitable. The price-earnings ratios for many of these companies are 50 percent above the market, because of their spectacular profitability. The operating margin for the environmental industry is well over 20 percent, with a 12.5 percent return on capital. Indeed, the companies with the highest price-earnings ratios are those with near monopolies in waste handling and disposal.

In short, public infrastructure activities become private when they are profitable. And, they are often profitable where they enjoy noncompetitive market advantages, either in terms of market area or landfill capacity. Thus, while it is undoubtedly true that private services are more efficient in terms of cost "as long as there is competition to make sure that private operators remain efficient," as Gomez-Ibanez, Meyer, and Luberoff state, some evidence suggests that the private companies are successful precisely because they face limited competition and are unregulated.

I would like to make one final point on the paper itself and then conclude with some observations about the role of privatization in public infrastructure. The paper does a very good job of introducing the political problems associated with infrastructure spending. Problems associated with siting are a key limitation, as are decisions regarding who bears the cost burden. Local developers continue to press for development rights in advance of adequate public facilities; waste

disposal sites are huge local political issues; and local jurisdictions and states often battle over who should bear the cost of schools, roads, and other infrastructure. Indeed, a key question arises out of the siting discussion: If we had all of the funding necessary to build infrastructure, would the local politics of development and the environment permit it to be spent? In many instances, the answer is undoubtedly no.

Observations on the Role of the Private Sector in the Provision of Infrastructure

Along with the rapid growth in government in recent years comes the increasingly popular notion that the private provision of public services will substitute for the public provision of infrastructure and at lower cost while, at the same time, creation of a private market for public goods will somehow substitute for the political process. In a few remarkable instances the privatization of infrastructure has met both of these objectives; solid waste and toll roads are good examples. It is also true that the debate over the privatization of infrastructure has spilled over into human services, prisons, and more recently into education.

Nonetheless, the task of government is to determine which public goods should be provided and then to determine what can be done publicly and what can be done privately. With this said, it is equally clear that whatever the outcome on the debate on its rate of return, infrastructure spending, probably both for new construction and for maintenance, will have to rise substantially; and it will have to rise in areas in which neither the economics nor the political process will favor private solutions.

A key private role, beyond the provision of the service, must therefore be to help shape the political process in such ways that the required levels of taxes and spending are forthcoming from the public sector with the least distortions to the economy. This is proposed in other papers at this conference. Moreover, whatever favor infrastructure may find in the public process, it is also clear that the private sector—both individual and business—will bear higher direct costs through taxes and higher indirect costs through increased product prices for the infrastructure needs, especially environmental needs, as a consequence of public policies and regulations.