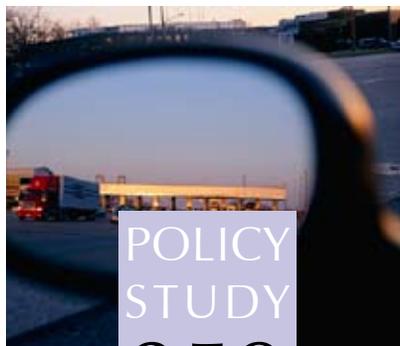




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# THE ROLE OF TOLLS IN FINANCING 21ST CENTURY HIGHWAYS

By Peter Samuel  
Project Director: Robert W. Poole, Jr.



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# The Role of Tolls in Financing 21<sup>st</sup> Century Highways

By Peter Samuel

Project Director: Robert W. Poole, Jr.

## Executive Summary

Traffic congestion in America is bad and getting worse. Our road system is not being maintained and expanded commensurate with our growth, despite being the most important means of moving goods and people from here to there. Because of a lack of proper investment in road capacity, congestion costs Americans at least \$168 billion each year. Worse, buried in those costs is the reality that congestion is clogging the arteries of our cities. If we don't solve the problem our cities will begin to die as centers of economic productivity, as centers of culture, and as pleasant places to live.

Federal and state highway budgets are determined by government grants and funded by taxes on gasoline. This "gas tax-and-grant" system, which was developed between the 1920s and the 1950s, is running on fumes. It does not generate enough revenue to properly maintain the existing highway system, let alone expand and modernize it for our growing population and dynamic economy.

As more and more fuel-efficient vehicles have allowed us to reduce gasoline consumption per mile driven, the revenues from gas taxes drop and the need for pavement construction and maintenance continues to grow. The tax-and-grant system does a poor job of targeting investment to where road capacity is truly most needed and where it would yield the greatest returns, resulting in an inefficient use of scarce capital. It is also unfair, as the discretionary grant element in the system indulges politically well-connected constituencies at the expense of others with less political clout.

The tax-and-grant system has largely become a public works program used by politicians to bring home the "pork." Alone, it is not able to solve the nation's growing congestion problem, and it has no chance of producing the high-performance roadways needed in the 21<sup>st</sup> century. The American

public has lost confidence in this outdated system, which funds “bridges to nowhere” while trucks with valuable cargoes sit in congestion amid frustrated commuters, delivery van drivers, and shoppers on deteriorating urban expressways.

Fortunately, there is a better way. The first key to reform is to begin to break free of the stifling pay-as-you-go doctrine embedded in the tax-and-grant system. Rather than make marginal improvements to the system as the funds become available, a better public policy would *finance* new highways and bridges, so that they can get built promptly today and then be paid for by their users over the useful life of these projects. This is the principle of toll finance that is being rediscovered in this country, as technical revolutions in toll collection technology have swept away the limitations of stopping at tollbooths or even slowing down.

The second key is to break free of the limitations of traditional government toll road agencies, which are subject to political influences that are often not in the best interest of highway users or the public at large. Also since government toll agencies bring little or no private equity capital and rely almost entirely on borrowing, they are unable to manage risks such as construction delays, cost overruns, and shortfalls in projected usage, thus unduly limiting the range of projects that can be financed with tolls. Toll authorities tend to be granted monopoly powers in a region and therefore experience no competitive pressure to improve performance. They are also geographically constrained to the boundaries of their jurisdiction, when many needed projects cross these boundaries, including state lines.

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The successes of tolls are so striking that they should rapidly become an important part of our transportation system.

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Alternate financial mechanisms promoted as innovative in the 1990s—such as shadow tolls (payments from the government to private road builders/operators based on the number of vehicles using the road), borrowing against future grants, and the creation of non-profit corporations to operate highways—have demonstrated that they offer little improvement over the traditional government toll agency model.

A more promising model is the long-term toll concession agreement, used extensively in Europe and Australia, and only recently introduced to the United States. In exchange for a long-term, franchise-type agreement (called a lease and concession agreement), a competitively selected private firm or consortium designs, finances, builds, operates, and maintains a tolled project for a long period (anywhere from 35 to 99 years). Because the private concessionaire is willing to invest its own money on a long-term basis, it is willing and able to manage risks that public toll authorities are ill-equipped to handle. Also, by being able to pool risks and deploy expertise across multiple jurisdictions and countries, the private concessionaire can operate more efficiently. The evidence from innovative jurisdictions that have introduced long-term toll concession agreements through public-private partnerships, such as Chicago, Indiana, Texas, and Virginia, suggests that

this model can deliver a substantially larger investment of resources for a given toll project than the conventional state or local government toll authority model. Private concessions operating within broad performance guidelines are also better suited for the management of “value-priced” electronic tolling for congestion relief.

Tolls can only answer part of the funding needs for our transportation system over the next 25 years. Toll finance is not the answer for all future highway projects, nor are long-term concessions the only model that can deliver such projects. But the successes of such models are so striking that they should rapidly become an important part of our transportation system.

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## Part 1

# Introduction

Traffic congestion in America is bad and getting worse. Our road system is not being maintained and expanded commensurate with our growth, despite being the most important means of moving goods and people. Because of a lack of proper investment in road capacity, congestion costs Americans at least \$168 billion each year.<sup>1</sup> Worse, buried in those costs is the reality that congestion is clogging the arteries of our cities, and if we don't solve the problem our cities will begin to die as centers of economic productivity, as centers of culture, and as pleasant places to live.

Roads in the United States are financed through a complex system of taxes, tolls, fees, and borrowing. They are funded by different levels of government, developers, and investors via inter-governmental grants, loans, and matching payments, and then built by another set of governments and private sector companies. Just following the money for roads is a bewildering exercise.

Roads range from little more than driveways and alleys to two-lane rural roads to various collector and arterial roads to major urban expressways<sup>2</sup> and long-distance Interstates. The smallest roads are important in providing direct access to people's homes, businesses, farms, schools, and recreational facilities. They constitute a huge mileage in aggregate but they are relatively simple to finance. Builders and developers often pay to build them, and landowners pay property taxes to counties and cities to maintain them. That those who benefit are directly responsible for funding these low-end roads ensures that these roads serve their customers specifically. They do not engender the policy problems of larger roads. The more complex higher-level roads—urban expressways, freeways, and intercity highways—are the focus of this paper.

The present state of road funding in the United States can be summarized as follows<sup>3</sup>:

- \$134 billion is spent each year to construct and operate roads, or \$1,199 per U.S. household, representing about one dollar in 37 of median gross household income.
- Highway user fees composed of state and federal fuel taxes, registration and license fees, tolls and other charges levied as a consequence of using public roads, generate \$104 billion a year or 77.5 percent of road spending. The remainder (mostly local roads) is financed by sales taxes, property taxes, and general fund appropriations.

- State and federal fuel taxes (on gasoline and diesel) are the largest single highway user fee at \$53 billion per year, but they provide less than half of total road funding.
- There has been a steady decline in the share of highway funds going to capital spending as operating and maintenance costs have risen.
- Within capital spending, less and less goes to new capacity, as more is needed for rebuilding old capacity.
- A source behind the rising costs of road construction has been the substantial, and often excessive, environmental review and mitigation measures aimed at reducing the environmental impacts of new roads.
- Fuel taxes that averaged about six cents (in 2001 dollars) per vehicle-mile traveled in the 1960s have declined to about three and a half cents today, due in large part to improved fuel efficiency.
- Tolls or fees for use of specific roads currently represent about \$7.3 billion, or 7 percent of total highway user revenues.
- Federal aid for highways gets much publicity, but at \$31 billion per year it constitutes less than a quarter of roadway spending, the balance of which is raised by states.

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Congestion is clogging the arteries of our cities, and if we don't solve the problem our cities will begin to die as centers of economic productivity.

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## Part 2

# Deficiencies of the Current Highway Funding System

### A. Not Enough Money

The Federal Highway Administration (FHWA) has made an effort to calculate the level of capital spending needed to maintain at current standards the nation's existing stock of highways and bridges, termed "Cost to Maintain," as well as the annual investment needed to improve them to keep pace with traffic growth, called the "Cost to Improve." The improvements are based on modeling of economically justified road projects, that is, those likely to have a benefit/cost ratio greater than one.

In 2002 dollars, the most recent estimate of the annual investment needed to maintain the current level of pavement conditions was \$73.8 billion a year, compared with actual capital spending of \$68.1 billion—an 8.3 percent shortfall.

The estimated cost to improve (as well as maintain) was put at \$118.5 billion a year.<sup>4</sup> Thus, a 74 percent increase in annual spending was judged necessary to improve the system in order to keep pace with the growth in driving and truck usage.<sup>5</sup>

You can see some of this in the *15th Annual Report Performance of State Highway Systems (1984–2004)*.<sup>6</sup> Over half of urban Interstates remain congested and one-fourth of bridges are rated deficient. Attention to road maintenance increased slightly but the effort was not enough to forestall declines in system performance. Congestion remained stubbornly resistant to improvement. Almost 52 percent of urban Interstates were reported congested in 2004, virtually unchanged from 2003. The condition of major rural Interstates and highways also worsened. According to FHWA, some 12.6 percent of the nation's pavement has a ride quality deemed "unacceptable."<sup>7</sup>

However, many of these measures are showing gradual improvement over time. Bridge deficiencies are declining slowly as the backlog of bridge deck repair is slowly worked off. The

same is true of pavement quality. The proportion of “acceptable” pavement tends to increase slightly each year.

The picture is quite different for roadway capacity, because of the political system’s bias against the long process of gaining approval for and funding new and widened roads. Roadway capacity has been falling far behind the demand for road space. Between 1993 and 2002, lane-miles of roadway were increased by just 0.2 percent annually while traffic demand, as measured by vehicle-miles traveled, increased 12 times as fast, by 2.5 percent annually. Of course this is a crude measure. Much of the mileage of American roads, especially the rural and lesser urban roads, has spare capacity. More travel is possible on many of the lane-miles without overcrowding them. However this is not true of most urban roads, or of an important and growing proportion of major inter-city highways. Between 1980 and 2004, travel demand increased by 168 percent on our urban highways, while the number of lane- miles increased by just 51 percent.

The inadequacy of revenue for capacity enhancement is manifest in the large and growing cost of congestion. This has been measured on a regular basis for urban areas by the Texas Transportation Institute (TTI) over the past 20 years.<sup>8</sup> The TTI congestion data for 85 metro areas show that congestion has gotten much worse. The real cost (in constant price dollars) has multiplied about five-fold in the past 20 years. In 2003 dollars the direct costs (wasted time and fuel) are \$63 billion per year. The figure was only \$12.5 billion in 1982. Fuel wasted each year by congestion has gone from 0.4 billion to 2.3 billion gallons, while hours of delay sitting in traffic jams have risen from 0.7 billion to 3.7 billion. Average delay per peak hour traveler skyrocketed from 16 to 47 hours. The peak hour travel time penalty, or the amount by which peak hour travel times are longer than free flow times, has increased from 12 percent to 37 percent.<sup>9</sup> The number of urban areas that experience more than 20 annual hours of delay per peak traveler has jumped from just 5 to 51. And the worst congestion—termed “severe”—has gone from 12 percent of peak period travel to 40 percent.

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## Over half of urban Interstates remain congested and one-fourth of bridges are rated deficient.

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Based on current trends, the number of people living in severely congested cities will multiply by five times over the next 25 years. By 2030, 154.1 million people will live in 40 urban areas with congestion levels equal to Denver’s today. That’s more than the population of Japan and more than the combined populations of the United Kingdom, France, and Canada. Put yet another way, 42.4 percent of the U.S. population will live in urban areas where congestion is as bad as or worse than Denver, the nation’s ninth most congested urban area in 2003.

These figures paint a picture of a major deterioration in the level of service of our urban highway system. The problem is pervasive and will take major changes to reverse. There is also a growing number of interurban or rural roads that need third lanes in each direction or need to justify

separate lanes for heavy trucks. These are major capacity enhancements needed outside the geographic scope of the urban TTI numbers. Indeed the distinctions between urban and rural areas and the boundaries between them are becoming increasingly tenuous.<sup>10</sup> However, the problem is most acute within the most developed areas. The TTI authors state it in a nutshell: “The problem can be stated simply—urban areas are not adding enough capacity.”

In the 1970s fuel tax rates were generally not increased and that decade’s serious inflation took its toll. Modest increases in fuel tax rates in the 1980s and early 1990s produced a slight increase in inflation-adjusted revenues. But in most of the 1990s and in the current decade there have been few inflation adjustments. Because of the discredit into which the financing system has fallen, politicians risk handing opponents a club with which to beat them if they support fuel tax increases. The federal fuel tax (gasoline 18.4 cents per gallon, diesel 24.4 cents per gallon) has not been increased since October 1, 1993. During that time the cost of living, as measured by the consumer price index, has risen 40.4 percent, which means that the purchasing power of the gas tax has declined 29 percent.<sup>11</sup> The weighted average of state gasoline taxes has also been steadily declining in real terms, and since 1997 has remained stagnant in nominal money terms at around 19 cents per gallon. State diesel taxes have stayed around 20 cents a gallon since 1998.<sup>12</sup> Fuel economy improvements, the start of hybrid gasoline-electric vehicles, and encouragement of “green” fuels with lower per gallon taxes are adding to the erosion of the yield of fuel taxes also.

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The number of people living in severely congested cities will multiply by five times over the next 25 years.

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The five-year federal highway and transit bill (SAFETEA-LU), passed after much delay in mid-2005, provided no new sources of revenue, so federal spending remains pretty constant in inflation-adjusted terms. Nor have states found extra revenue, so the governmental funding system approximately maintains the status quo—of providing slightly less money than needed to maintain conditions at their present inadequate level and of providing far less than is needed to improve conditions to cope with expected growth in travel.

## **B. Poor Targeting of Investment**

A second major problem of the dominant tax-and-grant system is that it fails to provide any guidance on whether particular projects are justified or the best use of taxpayers’ limited transportation dollars. When a good or service is paid for directly by consumers they render a judgment (by how much they buy and by what they will pay) on how they value the service provided. If what they will pay exceeds what it costs to provide (taking into account both capital and operating costs), then the good or service will be produced. If, on the other hand, the total costs outweigh what customers will pay, then the good or service will not be produced (or the producer will go under). The lack of such a market test for tax-and-grant transportation projects means that it

is not clear which ones are sound investments. Decision-makers are seldom asked to estimate whether the project yields benefits greater than costs, and after the opening of a new facility, there is often an insufficient assessment of and accountability for performance.

The problem of unwarranted or wasteful projects is exacerbated by an excessive concentration of fund raising and dispensing at the federal and state levels. Most congested highways predominantly serve short trips within metro areas. When that metro area itself levies taxes or charges, and votes those new charges for new facilities, those facilities are likely to be subjected to more intelligent political scrutiny than when the money is raised at a higher level of government and passed down to officials with no responsibility for imposing the charges that make it possible. When the federal government provides most of the money for a new facility, local officials tend to treat it as free money. For instance, excessive funding and grants at the federal level made it much easier for Boston's "Big Dig" to cover endless cost overruns, with few of the usual pressures for value engineering to keep costs within budget constraints.

Under the tax-and-grant system, the power to choose projects tends to devolve to strategically positioned political constituencies and activists. Non-transportation agendas often intrude. Facilities tend to be shaped according their ability to generate local jobs and contracts, facilitate land-development opportunities, support tourism, reinforce supposedly "smart growth," or reduce pollution, with scant attention on how well the project actually moves people and goods or relieves congestion. The central purpose of a highway—to promote mobility and accessibility—gets lost in the many political agendas that come to bear on taxes and grants.

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Facilities tend to be shaped with scant attention on how well the project actually moves people and goods or relieves congestion.

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### C. Fairness Issues

The current highway funding system fails several tests of fairness. Fuel taxes bear little relationship to the cost of providing road space. For a given vehicle, they tend to work out about the same rate per mile, regardless of the road being traveled or the time of the travel. Providing road space in rural areas and on local urban roads is not very expensive. By contrast major urban highways and expressways are hugely expensive to build and operate and even more expensive to expand. Peak hour travel on urban highways is the most expensive to provide for. It is only justifiable and financeable if those obtaining the more costly service are willing to pay those costs. That means urban peak-period drivers should pay a lot more than rural drivers, on average.

As long as there is primary reliance on fuel tax financing, there is no way enough funds can be generated to pay for expensive capacity additions needed to accommodate peak-hour traffic on urban expressways. Through fuel taxes, rural and off-peak urban travelers generally pay too much,

subsidizing some of the costs of urban peak travelers, though the latter suffer a terrible level of service due to the breakdown of flow.

Fuel taxes are unfair in another way as well. They bear more heavily on owners of older vehicles, which tend to get lower gas mileage. Higher-income people are able to buy, for example, hybrid vehicles, whereas low-income people may have to make do with older gas-guzzlers. Under fuel tax funding, the poor may pay more per vehicle-mile than the rich. Tolls are often criticized on equity grounds even though they charge the rich driving fuel-efficient cars as much as the poor in their gas-guzzlers.

License fees and sales taxes have been growing as a source of funding for roads but they involve inequities too. Sales taxes are a burden on purchasers of goods regardless of the extent to which they create a demand for road space. Small, light goods that involve almost no road use get taxed at the same rate as heavy and bulky goods that involve major road use. Sales taxes are also unfair to local business, and they tend to steer consumers to buy, at least larger items, from further afield where sales taxes are lower. They may even generate unnecessary extra travel in pursuit of lower after-tax prices.

When used to fund roads, drivers' licenses, vehicle registration, and title transfer fees are unfair to people who make modest use of a vehicle and who make little demand on the roads. Senior citizens, for example, who may keep a car for the odd trip to the supermarket or a Sunday drive, spread their license fee costs over very few trips compared to car commuters and professionals.

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Fuel taxes are unfair to the poor. Under fuel tax funding, the poor may pay more per vehicle-mile than the rich.

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#### **D. Loss of Trust**

The existing system has been steadily losing political support. Highway trust funds were established to ensure that monies raised from motorists would be used for their benefit; they were central to the initial success of highway user taxes. But trust in the trust funds has eroded.

Public support has not always been low. When the initial federal Highway Trust Fund was authorized in 1956 to launch the Interstate system, there was considerable national enthusiasm. There was a clear program: 100 percent of the fuel tax revenues in the trust fund were to be used for highways. The nation was going to get some 40,000 miles of Interstate expressways spanning the country—all at least four lanes, divided, with no at-grade intersections, and design speeds of 60 to 70 mph—at a cost of \$25 billion over 16 years. The law provided for fuel taxes to be halved (from 3 cents per gallon to 1.5 cents per gallon) in 1972 on completion of the Interstate system.<sup>13</sup>

The system actually cost \$115 billion, \$90 billion over budget, and took over 40 years, 24 years more than scheduled, to achieve substantial completion, so there was some disillusionment with the federal government's ability to deliver.<sup>14</sup> Worse than that, the federal fuel taxes continued, and federal money was dispersed over an increasing array of little-understood and increasingly diverse road and transit programs.<sup>15</sup> Also for several years after 1990, some fuel taxes even went into the federal government's general fund for deficit reduction.

With the end of construction of the Interstate system, the emphasis in federal spending has shifted to a "National Highway System," including the Interstates and many other principal highways. But almost no one outside the federal and state departments of transportation has any idea what the National Highway System is. Whereas the Interstate System was a model of clarity with a unique look, clearly defined standards, identifying signage, and maps showing routes, its successor is an almost totally unpublicized collection of different routes without any common standards or even any plans.<sup>16</sup> The Interstate system captured the public imagination, whereas the successor has barely registered in the public consciousness.

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When tax-and-grant has no tests of efficacy or public utility to pass and is seen as purely political pork, then public trust is lost.

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The state level has a similar problem of declining public support for the tax-and-grant system, though the situation varies from state to state. In California, there is so little support for statewide programs that it has been made official policy that counties should take major initiatives for new transportation infrastructure, and for setting the priorities for spending federal and state monies. The state DOT is nearly down to a maintenance-only mode. In Texas the state plays a major role in advancing mobility. However it does not do that by attempting to expand taxes and grants, which it recognizes as offering little opportunity. Instead the Texas DOT acts as facilitator and coordinator of local efforts. It insists that every major project be assessed for toll feasibility, works with local toll authorities and the private sector, and is actively pursuing self-funding intercity projects. Most states are somewhere between the models of Texas and California. In few states is there support for an expanded program of taxes and grants.

Earmarks, projects specified for appropriations, are a major cause of loss of public trust in transportation financing and demonstrate the need to reform the our road finance system. The federal tax-and-grant process has become unaccountable to taxpayers: the federal highway bill specifies \$400,000 for "Construction of Bike and Pedestrian Paths along K-10 between Douglas and Johnson Counties" in Kansas, \$4 million for "Construction of Snowmobile Trails and Accommodations for the Route 116 Bridge" in Medway, Maine and \$20 million to plan a "Magnetic Levitation Transportation System between Las Vegas and Primm, Nevada." In all, the current reauthorization law (SAFETEA-LU) contains 5,700 such earmarks costing a massive \$21.1 billion. When it is perceived that tax-and-grant has no tests of efficacy or public utility to pass and is seen as purely political pork, then public trust is lost. In the early days of federal aid for

highways, earmarks were quite small. As late as the 1982 transportation bill, there were 11 projects costing \$700 million. The growth has been exponential to the present 5,700 projects costing \$21.1 billion.<sup>17</sup>

The result of these abuses of the tax-and-grant system of transportation funding is that pushing for an increase in the fuel tax is considered politically impossible in most states and in particular at the federal level.

### **E. Goods Movement and Other Business Travel**

Within our metro areas the roads carry virtually all the freight and a great variety of what may be called service travel—maintenance people, emergency services, utilities workers, house moving, trash collection, building equipment and supplies, medical samples and supplies, and store deliveries. And outside the metro areas, where it has competition, trucking is still the dominant transport mode as measured by value. Rail only competes seriously with trucking in low-value bulk commodity movement, especially coal and wheat, in near-transcontinental container and trailer movement (especially LA to Chicago) and in so-called unit trains (a full trainload of car body assemblies going to a distant assembly plant.) Barges likewise compete in bulk commodities like gravel and grains, but routes are obviously limited to a geographically defined set of navigable waterways. Air competes at the high value end, especially in packages. But trucking is dominant. Trucking handles \$6.2 trillion or 88 percent of total single-mode freight and an even higher percentage when intermodal freight, packages, the posts and courier activity are included. The value of freight carried by trucks is 20 times that carried by railroads, 23 times the value of air freight, and 70 times the value of waterborne freight.<sup>18</sup>

Once upon a time, railroads were able to give door-to-door service to many of their customers. Those were the days when the trunk lines were supplemented by tens of thousands of short-haul lines and a network of in-road rails that extended to plant sidings. The railroads have been steadily abandoning all but long-haul routes over the past hundred years and today only rubber-tired vehicles have access to the full hierarchy of routes—from expressways down through arterials, collectors, local streets, driveways, alleyways, yards and loading docks.

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When freight and service travel are mired in congestion, higher costs are passed on to consumers in higher prices, and that is reflected in lower real incomes.

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Freight is even more dependent on the roads than passenger travel because while a fraction of people can walk to a rail transit stop, freight and services need to move door to door and are therefore bound to the roads for a portion of their journey. Thus even New York City, with the largest transit usage in the country, is utterly dependent on roads (and their bridges and tunnels) for movement of goods and services. Unlike people, freight can't walk.

Freight can't vote either. For that reason it is poorly served by political mechanisms for allocating funds. People can see some tangible personal benefit from a mode that moves them, but few voters see connections between freight facilities and their personal welfare. Therefore in political discussion of transportation, especially in the metropolitan planning arena, bicycle paths and pedestrian walks—really more recreation and health than transportation—often get more consideration than freight.

Goods movement is becoming an increasingly important part of road traffic. Between 1998 and 2020 the percentage of urban Interstates carrying 10,000 or more trucks per day is projected to increase from 27 percent to 69 percent, according to experts at FHWA.<sup>19</sup> Those 10,000 trucks per day occupy the road capacity of the equivalent of 25,000 to 30,000 cars. This argues for special consideration of freight, if only for its impact on other road users. But the major argument for treating freight more seriously than politics allows is that its vehicles have a higher value of time than other traffic.<sup>20</sup> When that time is wasted in congestion, those costs get passed on to consumers in higher prices, and that is reflected in lower real incomes. And that translates to a less competitive, less productive economy.

## Part 3

# The Basics of Tolls for Highway Funding

### A. Rationale

Why use tolls rather than pay-as-you go fuel taxes to build major highway projects? The main rationale for tolling has usually been that it is the best way to assemble the large initial lump sum needed to build an expensive road facility quickly and get it into service expeditiously. Tax-based grant money tends to come in dribs and drabs. The reality of politics is that the money generally has to be spread around all the regions of a state. As a result, it is difficult to concentrate grant funds sufficiently to get a single, major highway project finished and open in three or four years.

Governments can sometimes borrow the large sums needed to build a major highway project. Voters are increasingly wary of government borrowing, seeing it as encouraging extravagance and leaving debt behind for future generations. In many jurisdictions voter approval is legally or constitutionally required to authorize borrowings via general-obligation bonds. In other cases rating agency concerns that the jurisdiction will have trouble servicing the new debt because of an already large debt burden inhibits borrowing. Officials are then faced with rating agencies downgrading their debt rating, and consequently incurring higher interest charges to sell the bonds. Covenants in existing debt may include limits on total debt service coverage required, so they may be fully borrowed already. The federal government has encouraged state governments to borrow against future grant revenues with GARVEE (Grant Anticipation Revenue Vehicles<sup>21</sup>). However with federal grants growing modestly because of political limits on taxes, there are limited funds against which to borrow. GARVEE bonds have been a minor source of borrowing.

In 1947, the Maine Turnpike pioneered a new form of bond financing which avoided all these problems—non-recourse toll revenue financing. It pledged prospective future toll revenues to service the debt, based on a traffic and revenue projection through the life of the bonds. The investors in these bonds are betting on the revenues being sufficient to service the debt because there is no recourse to any other state revenues. Most of the toll roads built in America in the past half century used such toll revenue bonds. The covenants usually oblige the toll authority to take certain actions to address the rights of bondholders if revenue comes up short. These may require

toll increases, and in case of default a court can often appoint an administrator to manage the toll road in place of the normal directors appointed by the state. Governments wanting to lower toll rates or institute toll holidays or to provide toll exemptions are constrained by the terms of bond covenants. Those covenants create a legally enforceable fiduciary responsibility to protect the revenues needed to service the debt.

In summary, the major positive aspect of traditional toll revenue financing by public toll authorities is that by generating a dedicated revenue source in tolls, it has allowed over 5,000 miles of major highways and some of the nation's major bridges to be built and maintained without demands on taxpayers.

## **B. A Brief History of U.S. Tolling**

Although the United States made extensive use of toll roads (“turnpikes”) in the 19<sup>th</sup> century, tolling suffered when it came to building the paved roads needed by the early auto era. Motor vehicles brought a major increase in travel speed over horse-drawn vehicles. Having to come to a complete stop for a tollbooth when traveling at automobile speed is obviously more onerous than when traveling at horse-drawn speed. For half a century of the automobile era (1915 to 1965), until the invention of the automatic coin machine and magnetic stripe cards in the 1960s, toll collection changed little from medieval times: the traveler had to stop at a toll booth that housed a toll collector and pay cash and receive change from a hand at the window. Even the 1960s innovations hardly sped up toll plaza operations, since most motorists had to come to a stop to throw coins in a basket or to pluck a magstripe ticket from a ticket dispenser. Only since the late 1980s, with the use of wireless radio frequency toll transponders (and cameras with pattern matching computing powers capable of automatic reading of license plate numbers), has it become possible to modernize toll collection by conducting it on the fly, even at full highway speed (called open road tolling). In the interim, toll collection was a cumbersome and expensive way of collecting revenue and a nuisance to motorists.

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**It was standard operating procedure to build major bridges and tunnels with tolls.**

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As automobiles became more common, the dominance of gasoline and diesel-fueled internal combustion engines made for simple revenue-raising from drivers. Taxing these petroleum-based fuels was relatively straightforward because they were supplied from a limited number of large oil refineries and distribution centers. So fuel taxes became the lowest-cost way to fund the need for paved roads.

Despite the advantages of fuel taxes, there was still the problem of assembling the large sums of capital needed for major projects such as bridges and tunnels. New York City set the pace in using tolls for this purpose. Charters of joint stock toll companies had a long 19<sup>th</sup>-century history, but in

New York this form of finance became associated in the public mind with corruption, due to the malfeasance of the New York Bridge Company, which set out to build the Brooklyn Bridge in the late 19th century. This was a spectacular project in such a bright media spotlight that revelations of wrongdoing by bridge company officials and their friends in government produced a fierce reaction.<sup>22</sup> The established political order represented by Tammany Hall was swept out and a new progressive movement identified chartered companies as inevitably self-serving and corrupt. Public authorities were proposed as the answer.

A young civil service lawyer named Robert Moses wrote the articles of association of the first state toll authority. He rose to the top of various public authorities and became the dominant figure in the construction of whole networks of parks, parkways, roads, bridges and tunnels from 1924 to 1962.<sup>23</sup> New York also spawned the multi-state government authority with the founding in 1921 of the Port Authority of New York (later renamed the Port Authority of New York and New Jersey). As well as ports and airports, it built, and to this day operates, the toll crossings of the Hudson River that connect New York City to northern New Jersey, including the world's most heavily trafficked bridge (the George Washington Bridge) and the Holland and Lincoln Tunnels.<sup>24</sup> The public authority form modeled on the New York agencies was designed to be self-financing by issue of bonds on the security of future toll revenues, and to be accountable via directors appointed by the state governor. Because of the manifest accomplishments of the New York authorities, this model was replicated around America and became the normal way of building toll roads, bridges, and tunnels.

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## Tolling boomed in the years before 1956.

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Tolling boomed in the years before 1956. Following the 1940 opening of the Pennsylvania Turnpike (Irwin to Carlisle), state toll roads blossomed with some 3,000 miles or about half the initial mileage of the Interstate system consisting of toll roads grandfathered in by the states of Maine, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Kansas, Oklahoma, Texas, Maryland, Virginia, West Virginia, Colorado, and Florida. Before the federal government started financing roads in 1956 with grants covering 90 percent of the cost, over 8,500 miles of toll roads were planned in the states.<sup>25</sup> And it was standard operating procedure to build major bridges and tunnels with tolls. Many of the toll roads were long-distance "turnpikes," organized to put many of the toll collection points on the exits where traffic had to slow or stop anyway because of a transition to local streets. Some major urban systems were built also to address needs not covered by the new Interstate system in northern New Jersey, Chicago, and later in Dallas and Houston, Texas, and Miami, Orlando, and Tampa, Florida.

The tolling boom predictably slowed considerably when Congress decided to make all new parts of the Interstate system toll-free. But the urban systems continued to expand, as did state systems in fast-growing states such as Florida.

### C. Why *Finance* Major Highway Projects?

There is an important issue of intergenerational fairness in financing large-scale highway projects. Long-lived infrastructure yields benefits over a period of many decades, and it is only fair that those benefits should be paid for over a similar stretch of years as the benefits are received. Toll financing does just that. By contrast fuel-tax funding (“pay-as-you-go”) attempts to put the whole capital cost on the generation that lives through the construction, providing a subsidized good to succeeding generations.

Very few people purchase a house with cash. Most use a mortgage loan to stretch the payments out over time and pay for the house each year as they benefit from living in it. Toll revenue financing has many similarities, creating a way to finance new roads when there are not sufficient funds to pay for them up front or the ability to borrow with bonds.

In practice the fuel tax was only politically viable for building the Interstate system for about two decades when there was a sense that “our turn will come.” When the program was a discrete and well-defined series of new roads mapped across the country 40,000 miles long, it was widely supported, probably on the thinking that sacrifices now by our section of the country will be rewarded later when motorists elsewhere fund our roads. But the pooling of cost broke down with the completion of the Interstates.

In these circumstances it is little wonder that tolling is seen by an increasing number of people as far preferable to the gas tax and the fairest way to fund new roads.

- An American Automobile Association (AAA) survey in late 2006 found 52 percent of people favor tolls to fund transportation. Just 21 percent favor the gasoline tax and 19 percent prefer a general vehicle miles charge.<sup>26</sup>
- A *Washington Post* opinion survey in 2005 asked: “In general, which of the following do you think is the better way to pay for highway expansion?” Charging tolls garnered 60 percent; raising taxes 30 percent, neither got 9 percent, and no opinion received 1 percent.<sup>27</sup>
- Also in 2006 an opinion survey conducted for Colorado Department of Transportation (CODOT) found very strong support for toll express lanes (TELS) in a survey of people within two miles of existing toll roads or planned TELS: 78 percent see TELS as a good way to reduce congestion on Denver area highways, and 66 percent approve of them as a means of facilitating traffic flow, and 68 percent of those surveyed see tolling as a good way to finance extra capacity, whereas there is a strong majority opposition to raising taxes to fund extra capacity.<sup>28</sup>
- A 2005 survey of Californians by the Mineta Transportation Institute at San Jose State University found that when asked to rank various means of funding transportation, four of the five top choices of those surveyed were a form of tolling.<sup>29</sup>
- The *Star Tribune* in Minnesota in 2004 found that 69 percent of those surveyed would rather finance new highway construction with tolls than by increasing the gas tax.<sup>30</sup>

- A survey of Texans in 2004 found a majority preferred funding roads with tolls to increasing the gas tax.<sup>31</sup>

#### D. Tolling is Not Just Revenue Raising

Sometimes toll financing is discussed as if its only role is raising money to pay the bills: to service the debt, and keep the roadway in good condition and safe from debris, snow and other hazards. Like any price, a toll also serves other functions. It creates a link between the customer and the road service provider. The provider depends on voluntary transactions with motorists for income. In this way, the provider's self-interest makes him attentive to customer demands. Employees of toll roads, like those of other self-financing businesses, know that in the end, satisfying customers is what affects the ability of the enterprise to maintain jobs. Customers pay directly for road service every time they enter the toll road; they expect to get service, or they want their money back. This relationship between customers and service providers is built on the fact that the enterprise's income is based on voluntarism. (This is true for government and investor-owned toll roads alike.) The toll road is in the business of selling a quicker, more reliable and less stressful trip. Customers will only use the toll road if the value to them of the trip exceeds the toll. Therefore the enterprise's continuation depends on providing value to customers, or they will go elsewhere.

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The toll road is in the business of selling a quicker, more reliable and less stressful trip.

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Second, prospective toll revenues are a guide to investment. If prospective revenues more than cover a project's costs, then the project is likely justified. If the prospective revenues won't service the capital and discounted operating costs, then the value to customers is less than the costs, and you have a real question as to whether the road is justifiable. Maybe it needs to be rethought. Can it be trimmed down in cost while still generating most of those revenues and developed into a viable project? Is there some special justification for subsidies? Toll financing generates that kind of intelligent discussion better than the "wish lists" that planners and politicians produce under the tax-and-grant system.

The constraint of toll financing and the need to compare prospective revenues with costs tends to focus more attention on the justification for projects and to produce a sense of priorities. It also opens the way for innovative thinking and entrepreneurial initiatives. The successful 91 Express Lanes in Orange County, California with their variable (and often high-priced) tolls were only made possible by the combination of tolling and a private sector initiative.

This brings up a third reason for tolls. Variable tolls can be used to better manage traffic flow. Untolled roads regularly get overloaded in peak hours. When drivers find themselves uncomfortably close to the car ahead they hit their brakes, then others behind them do the same, right back down the line. Flow has broken down, and motorists find themselves in various kinds of

constricted driving, crawling for a while, then speeding up, and crawling again. This makes average speeds drop sharply. And along with lower speeds there is a drop in throughput, from about 2,000 vehicles per lane per hour to 1,200 or fewer vehicles per lane per hour. Just when motorists need more capacity, the road can only carry a third fewer vehicles per hour. And once traffic flow breaks down into stop-and-go, it can take a long time to recover.

Variable pricing, as on the 91 Express Lanes (or other high-occupancy toll or “HOT” or “managed” lanes) prevents the breakdown of flow into stop-and-go conditions. The higher prices during peak periods limit the number of vehicles whose drivers choose to enter the priced lanes during the peak hours. Traffic engineers can optimize the pricing so that it keeps the throughput at between 1,700 and 2,000 vehicles per lane per hour—busy, but not congested in the ordinary sense of the term. Some of these priced lanes have pre-published rate schedules with different toll rates for every hour or half-hour period of each day of the week (based on study of traffic demand). Others adjust the toll rates in real time, adjusting it upward or downward based on the measured vehicle density and imminence of flow breakdown—so-called “dynamic pricing.” In those cases, the toll rate per mile is posted on changeable electronic message signs, enabling people to make a decision whether or not to make use of the priced lanes as they approach the entry point. The 91 Lanes represent just one-third of the capacity of the 91, but carry nearly half of all rush-hour traffic because of their free-flowing conditions.



## The Power of Variable Pricing

In 2006 Washington State Secretary of Transportation Doug MacDonald announced the \$1,000 Doug MacDonald Challenge, sponsored by the national *Transportation Research Board*. In his challenge, carried by the *Seattle Times*, Secretary MacDonald said he would give \$1,000 of his own money to the person who could best communicate to the public the concept of throughput maximization, which means moving the maximum number of cars through a stretch of highway at the maximum speed.

After reviewing 90 serious contenders, MacDonald selected Paul Haase, a science writer with an interest in funnels, as the winner. To perform his demonstration, you need:

1. Two funnels
2. Two liter-sized containers to place under the funnels
3. One liter of rice
4. One stop watch

Haase dumped one liter of rice all at once into the funnel and started the timer. Forty seconds (and several rice-sized traffic jams) later, all the rice was in the receiving container. Then, he took the same liter of rice, the same funnel and the same stop watch, but this time he poured the rice slowly and evenly into the funnel. Can you guess what happened? Twenty-seven seconds later, all the rice was in the receiving container. He shaved 13 seconds off his old time through gradual, controlled pouring.

What does this prove? According to Secretary MacDonald, it proves systems like ramp meters, which regulate the number of cars entering the highway at once, save drivers time. It also proves future systems, like high occupancy toll lanes and transponders that speed drivers through toll lanes, will make the most of our limited lanes. As the *Seattle Times* put it:<sup>32</sup>

*"I am fascinated by how we are going to get the public's enthusiasm about the fact we can keep highways moving so we actually get more use out of highways. In a line of stalled traffic, you don't get much production [out] of the highway. Everyone wins when the lanes move."*

*"I'm not trying to promote an agenda," he added. "We always solve problems with a little circle of people, consultants, and I'm not sure it always works. It seems an interesting idea to throw out bait. It was worth my while to write a check."*

*It's as simple as rice flowing through a funnel. If you dump it in the funnel all at once, the funnel clogs and the pan that catches the rice fills up slowly. But pour it at a slower, more even pace and it flows more smoothly.*



Doug MacDonald dumps all his rice into the funnel on the left. Katherine Boyd slowly pours her rice into the funnel on the right,



The rice passes through the right funnel much faster.

\*Pictures and captions from Washington State DOT-- <http://www.wsdot.wa.gov/Traffic/Congestion/Rice/Default.htm>

## Part 4

# Traditional Toll Authority Funding

## A. Rationale

Traditional public authority tolling has worked well to fund many major bridge, tunnel, turnpike, and toll road projects. Given the obvious greater popularity of untolled facilities, toll financing has occurred when resources were so limited that there was simply no prospect of funding the project with fuel tax grants. The choice normally was not toll road or free road, but toll road or no road.

Such bond financing relies heavily on a traffic and revenue study and solid cost estimates. The traffic and revenue (T&R) study is based on modeling of likely traffic using the road each year. This starts with projections of population and land use in the corridor and the trips that this will generate. Then modeling assigns traffic to different roads within the corridor based on origins and destinations and the times on different routes. Next estimates are made of typical values of time saved (in \$ per hour) and likely toll rates are used to estimate a toll “diversion factor.” Applied to the no-toll traffic volume, the diversion factor generates a forecast of volumes willing to pay the toll to use the new road. From annual volumes, potential annual revenues are calculated. Annual operating costs are estimated, to arrive at a set of net revenue numbers.

On the capital cost side all the upfront costs (design, permitting, land, construction, environmental mitigation, legal and financing fees, etc.) are estimated. Bond financing usually has to cover all these plus provide some kind of contingency and reserve fund to cover some uncertainties. Sometimes it covers bond insurance against default in order to raise the rating of the debt and enable it to be sold at a lower interest rate.

Public financing experts these days work to devise a mix of different kinds of debt so the time profile of the debt service obligations (repayment plus interest due) fits the profile of forecast net revenues. Usually the lenders will want a cushion between net revenue and debt service obligations, typically a 1.3 ratio, called a “coverage ratio.”

Traditionally public toll roads were funded with 25- or 30-year bonds with a fixed interest rate. Nowadays they are funded more with a complicated mix of debt, some of it shorter term and some

with variable interest rates, which may be hedged (matched with instruments which compensate for higher interest rates).

The initial notion in many of these financings has been that toll rates can be set based solely on debt service requirements and kept constant through the term of the loan and the life of tolling. However that only works in non-inflationary times with rather stable interest rates. And it only works if traffic and revenue forecasts are realized or found to be conservative in their projections.

## B. Forecasting Problems

In the early days of 20<sup>th</sup> century toll roads, T&R projections usually underestimated traffic. The Pennsylvania Turnpike opened with nearly twice the traffic its own consultants had projected and eight times the estimate of the federal Bureau of Public Roads.<sup>33</sup> The Dallas-Fort Worth Turnpike, which opened in 1957, removed its tolls in 1977, some 17 years ahead of the business plan, because the bonds were paid off so much faster than expected.<sup>34</sup> In Northern Virginia the Dulles Toll Road, when financed in the late 1970s, was projected to have 56,000 vehicles per weekday through the mainline toll plaza by 2000. But when 2000 arrived, it was getting over 100,000.<sup>35</sup>

More recently, however, T&R forecasts have more often than not erred on the high side compared to actual traffic. A recent study of 104 forecasts by bond rater Standard & Poors found that they have a “systemic tendency toward optimism bias.”<sup>36</sup> Actual first-year traffic was on average only 77 percent of forecast. By year five of operations this had improved, but only slightly to 79 percent. The range of errors in the forecasts was also quite large.

Projected population growth that did not occur, assumed development in the corridor that did not occur, or overestimation of time saved are the kinds of faulty assumptions that can lead to traffic and revenue well short of forecasts. Another important concept is called “assumption drag” in which a new road (or for that matter any other transport project) is likely to be initiated for study in a period of boom and to be based on the assumption that recent economic conditions can be projected forward.

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A road is never really “paid for.” It is always a work in progress.

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## C. Other Problems with the Traditional Toll Authority Model

The tendency of forecasts to overestimate traffic and revenues creates problems for the traditional toll financing model. The uncertainty creates pressure for larger reserve funds, reduces credit ratings, and increases the cost of capital as bond buyers want a larger risk premium in interest charges. This rules out some projects for full toll financing, and often calls for tax money to share in funding.

Another problem is that the old public sector model of paying off bonds and then removing tolls no longer works. Traditional toll financing has sometimes been based on the notion that the tolls are just to finance the road construction, and once the road is paid off, the tolls should be removed. “Paid off” means the original long-term bonds are liquidated, as in a home mortgage being paid off. But many components of a road need replacement before the bonds are paid off. Especially in those parts of the country with ice, bridge decks deteriorate and need to be rebuilt at about 15 years. Pavement needs overlays every 10 or 15 years and complete rebuilds at 30 to 50 years. Standards change, making old formats obsolete. Truck heights have risen steadily from about 12 feet 50 years ago to 14 feet now requiring greater overhead clearances on bridges. Motorists have become used to slowing less on curves as most now have a larger radius, so interchange loops that were acceptable several decades ago now see frequent truck rollovers. Safety demands that they be brought into line with larger radius loops or high direct connector ramps. When toll roads are first built they often omit interchanges with certain cross roads, to hold down costs. There is soon pressure to add these entries and exits. Advances in safety require expenditures for rumble strips to alert drowsy drivers, new forms of barriers to catch errant vehicles and give them a chance to recover a safe trajectory, clear zones, better traction pavement surfaces, reflective signing of the roadway edges, etc. Traffic volumes build, requiring lane additions. And always there are operating costs—clearing debris and snow, maintaining signs and illumination, cleaning drains, mowing grass, restriping lanes, controlling wild vines and self-sown trees, repairing cracks and holes... endless housekeeping and occasional expensive renovations and extensions. The weather and traffic are always quietly aging components of a road, wearing them out, as well as gradually corroding metals and silting drains, while extremes of temperature expand and contract and eventually break structures. Concrete itself weakens over the decades from an inherent chemical decomposition, and asphalt loses its vital elasticity. Like a house, a road goes on costing money.

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### The old public sector model of paying off bonds and then removing tolls no longer works.

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In short, a road is never really “paid for.” It is always a work in progress, being developed further, rebuilt here and there, and maintained—all under new traffic that can make the rebuilding more expensive than the original construction.

An interesting case study is the Tacoma Narrows Bridge in Washington State, which was financed with tolls and opened in 1950.<sup>37</sup> Traffic and revenues were ahead of forecast, and the bridge bonds were paid off in 1965 and tolls removed, some 13 years ahead of the plan of finance. The state’s taxpayers have had to pay for maintenance and operation of the bridge since then, and of course there has been no revenue stream to support extra capacity. By the 1980s the four-lane bridge was becoming congested. But it has taken two decades more to construct extra capacity—a second span will open for traffic in the summer of 2007—and tolls have had to be reimposed to finance the new bridge.

## Part 5

# Innovative Finance Alternatives

As problems with the traditional public-authority model of tolling became more evident during the 1990s, transportation policy analysts searched for alternate ways of financing needed projects. We have already mentioned one such attempt: GARVEE bonds, which are a way that state DOTs can borrow money to develop big projects by pledging a portion of their future federal highway grant receipts to service the debt. As noted previously, while such bonding is a method of *financing* highway projects, it does not address the underlying shortfall in the amount of *funds* available for highway investment. It merely shifts the timing of when existing funds get spent.

Two methods of providing a greater role for the private sector in highway project development are addressed in this section: shadow tolls and non-profit corporations. Both are forms of public-private partnerships (PPPs). We will turn to another form of PPP, the long-term concession, in Part 6.

## A. Shadow Toll and Availability Payments

Shadow tolls are a way to enlist the private sector in financing, building, and operating improved roads without having to use “real” tolls charged to motorists.<sup>38</sup> The basic idea is for the government to commit to a stream of payments, over many years, to a company or consortium. That group will finance, build, operate, and maintain the roadway, based on the government’s pledge of revenues over the life of the agreement. “Shadow tolls” is the name given to the payments by the government agency involved. From the standpoint of project finance, this stream of annual revenues fulfills the same function as a stream of real toll revenues does in conventional toll road financing. Shadow toll payments are based on a pre-defined amount per vehicle or vehicle-mile of traffic attracted to the roadway.

Shadow tolls are in use on about 10 roads in Britain. There have also been shadow toll projects in Spain, Portugal, and Finland. Texas has a legislative provision for them under the name “pass through tolls,” the sense being that motorists can pass the tolls through to the state to be paid.

Shadow tolls can be helpful where there is strong public opposition to real tolls and a major road project needs to be financed. This is likely to be strongest where a major existing non-tolled road is

to be improved. Several British shadow toll projects involved adding grade separations to major (A-level) roads at their existing intersections and making other improvements to allow safe higher speeds—in effect, making them motorways (M-level roads in British parlance). Another situation favoring shadow tolls is where real tolls would divert too much traffic onto a parallel free road located close by.

A major advantage of shadow toll projects, the British say, is that they deliver cost savings of about 15 percent, compared with the costs of having the projects built by traditional contractors and maintained by state employees. These projects take advantage of the incentives for better performance provided by the design-build method of project delivery, as well as the company's incentives to design the roadway to be maintained cost-effectively (since the company itself will be responsible for maintenance, as well as design and construction). There is also some cost saving from not having to collect physical tolls, although extensive traffic sensing, counting and vehicle classification equipment are still needed for an accounting of payments due to the concessionaire.

The British have argued that shadow tolls can be seen as a first step toward having the private sector take full responsibility for providing road service, by developing an industry with experience in developing and managing roads. Another benefit is that some of the traffic risk is taken by the shadow toll concessionaires.

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With unsound structuring of responsibilities and rewards it is little surprise that the not-for-profit model has a 100 percent failure rate.

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The only shadow toll road in North America is the Fredericton-Moncton Highway in New Brunswick, Canada. That project was under construction as a regular private sector toll road concession when a new government came to power committed to abolishing the proposed tolls on the road. The new government was unable to revoke the toll concession and could not afford to buy out the concessionaire, so it negotiated a conversion of the toll concession into a shadow toll concession.

The major drawback of the shadow toll approach is that it generates no new revenue to invest into the transportation system. In financial terms, shadow tolls are similar in effect to GARVEE bonds. That is, they make it possible to finance a highway project up front, but they do not add any new highway revenues—in sharp contrast with real tolling. But shadow tolls do force some consideration to be given to the economic viability of a new roadway. Firms that will be paid based on traffic counts are not likely to be able to finance such a road if the traffic projection shows low usage.

Portugal has seven shadow toll concessions, (known by the acronym SCUTs) several of them major highways. But they are an endangered species, precisely because of their cost to the state. In November 2004 the finance minister announced that the shadow toll roads were threatening to

impose “an unbearable weight on the state budget” and proposed that they be converted to real toll concessions.<sup>39</sup> Late in 2006 the government announced that it would begin negotiations with the shadow toll concessionaires early in 2007, to introduce electronic tolling on the first three of the seven shadow toll roadways. It will cost the government several hundred million dollars of compensation payments, prior to toll revenues “ramping up” to the point where they can replace the government’s shadow toll payments.<sup>40</sup>

Shadow toll projects and GARVEE bonds can be politically expedient because the current elected officials receive credit for opening popular new roads, while leaving it to future governments to find the revenue to pay for them. Critics of the program in Portugal say the shadow toll program is political pork and unfair since it puts the burden of paying on all taxpayers for the benefit of a few users. Many shadow toll roads in Spain and Portugal have relatively low traffic counts because they have been built in areas where real toll roads were unlikely to be viable.

A variant on the shadow toll concept is Availability Concessions. In this version, the payments by the government to the concessionaire are based not on the amount of traffic but on the availability of the project to carry out its purpose (e.g., all lanes open and in good repair, good safety performance, etc.) Such contracts are becoming increasingly common in Europe not just for roads but a variety of building complexes including offices, hospitals, prisons, schools and the like. Under these availability concessions the investor designs, builds and finances the facilities making them available for, in effect, a long-term rental payment by the government road authority, hospital service, school district, etc. However, as in shadow tolls, the government is billed, not the users. And as in the case of shadow tolls, there is no increase in investment in the kinds of infrastructure being financed. The first such use of an availability concession for a U.S. highway project is the forthcoming Miami Port Tunnel project.

While they may be helpful in special cases, both shadow tolls and availability concessions are in essence a government procurement method. They don’t raise any new money and are not a *funding* mechanism (although they are a method of financing a large project).

## **B. Non-Profit Corporations**

Not-for-profit corporations were vigorously championed in the late 1990s as an alternative to traditional public authority tolling. Another form of public-private partnership, they were also known as 63-20 corporations, named after the numbering of a ruling of the Internal Revenue Service which defined the conditions under which they would be eligible to issue tax-exempt debt.<sup>41</sup> The concept was promoted by engineering and construction firms interested in using their expertise in major design and construction projects, mostly in states without established state toll authorities. The non-profit corporation would be able to issue tax-exempt toll revenue bonds, which private for-profit companies were not permitted to do. However, IRS rules meant that the non-profit corporation had to be at arm’s length from both state DOTs and the for-profit building

construction companies, making for serious problems of accountability. A board of directors was normally selected from prominent local personalities and retired professionals.

A fundamental weakness in the concept is that the project is developed based on two key interests: that of the state in getting a roadway it might otherwise not be able to afford and that of the developer/builder in getting a large design-build contract. The developers get their fee out of the proceeds of the bond financing when the project opens, and have no further interest in whether it is viable. By their nature not-for-profit corporations have no equity and no shareholders. In this regard they are like public toll authorities. As with public toll authorities the financing relies heavily if not totally on debt. And although the bondholders are concerned that the revenues should be sufficient to service the debt, they have no concern for the overall return on investment. There is no one who can be held accountable for the project turning out to be a financial failure. The directors of the not-for-profit were selected after the project was fully developed. If it is a dud, it was a dud by the time they arrived on the scene. The state isn't responsible, because the project has been at arm's length under IRS rules. As for the developers they are long since out of there with their full fees because their job was merely to deliver the finished piece of infrastructure.

With this unsound structuring of responsibilities and rewards it is little surprise that the not-for-profit model has a 100 percent failure rate. Both toll roads developed under it—the Pocahontas Parkway in Richmond, Virginia and the Southern Connector in Greenville, South Carolina—have been clear financial failures; with traffic and revenue dramatically lower than forecast. The first of these has been saved from default by a takeover by Transurban, an investor-owned toll operator from Australia, under a long-term lease/concession. The second is likely to default on its debt, and it will then be up to the bondholders to dispose of their interest in the operation on the best terms they can negotiate.

It is unlikely the not-for-profit model will be attempted again.

## Part 6

# Long-Term Toll Concessions

## A. Rationale

Toll concessions, sometimes referred to as franchises, leases, public-private partnerships, privatization, or sales, cause considerable public confusion. “Sale” is almost always a misnomer in that it implies a transfer of full rights including title to the property, in perpetuity. Whether it is leasing a road like the Chicago Skyway or building new toll roads in Texas, the state maintains ownership of the infrastructure. The essence of the concession arrangements being discussed now in the United States is the right to operate the toll business under specified conditions and for a specified long-term period. This is analogous in many ways to the long-term franchises granted to investor-owned utilities of various sorts (typically for 99 years in the case of electric utilities).

Traditional 19<sup>th</sup>-century road or bridge charters involved similar rights to conduct a toll business on a public right of way under conditions specified in the charter, but in perpetuity. The only major U.S. toll facility operating under a charter is the Ambassador Bridge over the Detroit River from downtown Detroit to Windsor, Ontario. The bridge was constructed with private capital in the late 1920s under a charter issued by the city of Detroit; it has been a family or private business ever since. This four-lane suspension bridge is the largest-volume trucking route between the United States and Canada, and is a major roadway for tourists and people driving for business. Most people using the bridge probably have no idea it is a private toll operation in perpetuity.<sup>42</sup>

Today’s toll concessions are a refinement of charters. They grow out of the notion that organizing the construction and management of a road facility (a road, bridge or tunnel) in return for fees from users is at root a business undertaking, and that business is generally best performed by investor-owned entities.

A toll facility is a business in that it offers customers a specific service—use of the road—in return for a fee (the toll). As a business it has to price and market the road that provides service, and to manage it to cover its costs and provide a competitive rate of return on investment, so that it can attract and maintain capital.

The general reason for having the private sector (rather than government) run a business is that it can devote itself single-mindedly to serving the customers (the road users) and thus the bottom line: to maximizing business and revenues and minimizing costs. A business' survival and prosperity depends on its ability to yield a return on investment for its owners in a competitive environment. It can only do that by serving the wants of the people who use and pay for the product, in this case the roads. Governments, being politically controlled, get distracted by the need to cater to political demands. Hence the record of governmental businesses being staffed by political appointees who change with changes at the state capital, as well as staffing and contracting that may be influenced by patronage.

## **B. U.S. Precedents for Private Toll Roads**

The idea of private enterprise as a major factor in owning and operating highway infrastructure has a long history in the United States. The great era of U.S. private turnpikes began following our independence from Britain. Independence coincided with a push to develop the interior, and there was a major expansion of travel and trade among the states. Most histories of roads in America tend to focus heavily on government-sponsored roads like the Cumberland or National Road<sup>43</sup> and on constitutional arguments about whether the states or the federal government had jurisdiction, implying that governments played the major role in financing roads. Recent historical research, however, shows that the private sector dominated the financing of highways in the 18<sup>th</sup> and 19<sup>th</sup> centuries in America.<sup>44</sup>

Most early bridges were financed privately, often by established private ferry operators. Between 1786 and 1798, 59 toll bridge charters were granted in the northeast, producing the first bridges in place of ferries or fords on major routes. Turnpikes were chartered from 1792 on, the first being between Philadelphia and Lancaster, Pennsylvania. But the scale of investor turnpike operation in the 19<sup>th</sup> century was quite staggering, totally dwarfing governmental efforts at road-building. Unlike many of the British turnpikes, which were not-for-profit trusts, the American turnpikes were for-profit joint stock companies. In many states, turnpikes corporations were a third or more of all incorporations. Records are dispersed but about 3,000 turnpike companies built and operated in the range of 30,000 to 52,000 miles of turnpike through the 19<sup>th</sup> century, approximately the mileage of the modern Interstate system (though its geographic distribution was quite different). Like all kinds of business some turnpikes prospered, others struggled, and all eventually succumbed to competition from railroads or were taken over by governments. Turnpike companies "built roads at a pace previously unheard of in America," write economic historians Daniel Klein and John Majewski. They calculate expenditures in the eastern states by turnpikes were equivalent to 6.1 percent of the Gross Domestic Product (GDP) in 1830. In terms of the economy of the time this was more than comparable with the 4.3 percent of GDP cost of the Interstate system from 1956 to 1995.<sup>45</sup>

Private investors were vigorous innovators, but innovations don't always pay off. There was a short-lived boom in the late 1840s in wooden plank roads, but instead of their expected life of 12

years or more they lasted only about five years before rotting. No fewer than 1,388 plank road turnpike companies were incorporated 1845 to 1855 and built some 9,000 miles of plank roads. The strong smooth riding surface of wood had been seen as a way to make roads competitive with rail, but the innovation was doomed by miscalculation of asset life. Most of the turnpikes in the east went out of business, unable to compete because the wood did not last as long as expected and neither asphalt nor Portland cement concrete were available to produce a strong durable pavement, and because the load-spreading pneumatic tire was not yet invented. Raising tolls high enough to pay for repeated replacement of the planks would make the roads uncompetitive.

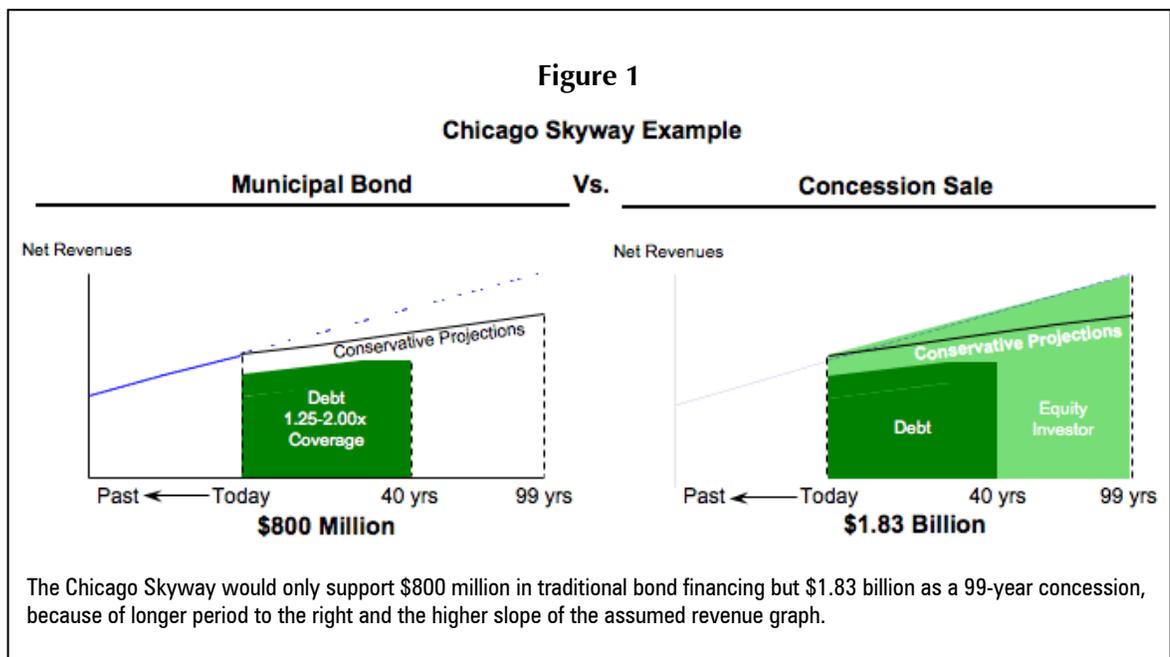
In newly developing California and the more mountainous west there were many places the railroads couldn't feasibly reach, and private toll roads continued to thrive through the rest of the 19<sup>th</sup> century. Toll regulation was also more accommodating than in the east. From 1850 to 1902 there were 1,127 toll road incorporations in the west, the largest number in California and Colorado. Colorado, in particular, was opened up by toll road companies; some built by stage coach or haulage firms for their own convenience, but seeking toll revenues from others to contribute to their costs.

Klein and Majewski estimate that combining the eastern turnpikes 1792–1845, eastern plank roads 1845–1860, and western toll roads 1850–1902, there were over 5,000 incorporations that produced the 30,000 to 52,000 miles of toll roads operated nationwide during the 19<sup>th</sup> century.<sup>46</sup> None of this accounts for unincorporated roads and bridges operated by families and partnerships. Bridges in particular were especially suited to being operated as a family business. In those days the private companies, many of which owned bridge charters in perpetuity, operated without the vast paperwork we see today, making their history difficult to report.

## C. Advantages of Long-Term Concessions

### *1. Greater Access to Capital*

A major reason for involving a broader group of investors in the highway business is that they can raise a lot more capital than public authorities alone based on a given projected traffic and revenue stream. Goldman Sachs, the large New York-based investment banking firm that is involved in both traditional toll-authority financing and concessions, has called this the “growth wedge” advantage—illustrated in Figure 1. The firm notes that traditional public finance is limited by historical growth of revenues. Bond investors get no *upside* advantage because they cannot share in profits and are therefore only concerned about the *downside* risks of their fixed debt service entitlements not being met.



Traditional toll road financing is very conservative. In order to obtain an investment-grade rating on the bonds, municipal bond investors require that annual revenue be significantly more than annual debt service. The ratio between the two is called the debt coverage ratio. It is usually in the range of 1.25X to 2.0X (i.e., annual revenues that are between 25 and 100 percent more than annual debt service). That significantly reduces the amount of capital that can be raised for actual construction costs in the tax-exempt debt markets. Either the size of the project is limited or else governments have to provide donations of land or taxpayer money to fill the gap.

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Private concessionaires can fill that gap with equity money, provided either by themselves or by outside investors.

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Private concessionaires, by contrast, can fill that gap with equity money, provided either by themselves or by outside investors. Some recent toll road concessions in Australia have carried out large initial public offerings (IPOs) of stock to help finance construction. Concession companies are flexible in their use of leverage—the amount of debt in relation to equity. Capital markets also have blends of equity and debt, for example “stapled securities.” Further, whereas bond financing aims to recover capital entirely over the term of the bonds at 25, 30 or at most 40 years, concessions can be structured for 75 or more years. The stream of potential income in the years beyond the term of bonds is extra capital-raising capability for the concessionaire.

### How Much More Can a Concession Approach Raise for a New (Greenfield) Toll Road?

Even though brand new toll roads are a riskier investment than leasing an established toll road, the same principles that lead to significantly greater financing capability via a long-term concession apply. A good case in point is the forthcoming extension of Austin, Texas's Central Texas Turnpike, SH 130. The urban portion, in and around Austin, was conventionally toll-financed by the Texas Turnpike Authority, a division of Texas DOT. The 40-mile southward extension to San Antonio was projected as having lower traffic, and when Texas DOT did their traffic and revenue assessment, they concluded that conventional toll finance could cover, at best, \$600 million of the project's \$1.3 billion cost. When the project was offered as a long-term concession, however, Cintra-Zachry offered to finance the entire \$1.3 billion project. Not only that, it agreed to pay the state a \$25 million up-front concession fee and to share in profits over the 50-year term of the deal.

Where does this huge difference come from? For one thing, the concessionaire is less conservative in its projections of future traffic (and it is important to note, it alone bears the risk of being wrong on this). Second, the longer term (50 years versus the traditional 30-year tax-exempt financing) permits it to take into account longer-term development, new interchanges, and traffic growth. Third, the concessionaire is willing to set tolls at a level keeping pace with economic growth over the life of the 50-year period. While governments could, in theory, plan to do likewise, political constraints would make this highly unlikely—and the financial markets recognize this and act accordingly. But under a concession agreement, the concessionaire has a legally enforceable contract that permits toll increases, under an agreed-upon formula, for the duration of the agreement.

Thus, there is no magic in these different outcomes. It's simply that the concession model takes a truly commercial approach to the business of developing and operating a toll road.

A financial structure combining debt with equity is especially important for new (startup or "greenfield") toll projects, like the Texas SH-130 project discussed in the box. The almost complete reliance of public toll authorities on fixed-interest borrowing makes those projects quite vulnerable to shortfalls in revenue, which are especially likely during the early years of new toll roads when the uncertainty in traffic and revenue forecasts is at its greatest. If 100 percent of the capital is provided by bondholders, that debt service must be met, regardless. Because of this, the bond market demands that traditional toll roads devote large amounts to reserve funds. By contrast, the providers of equity can be denied dividends entirely, if revenues are tight, for a period of years. Thus, a concession toll road funded by a reasonable mix of equity and debt is better able to survive the potentially risky "ramp-up" years during which revenues are the hardest to predict.

The financial industry now has an amazing array of different financial instruments available. Investor groups are generally better placed than public authorities to take full advantage of changes

in markets, for example in refinancings, in part because the equity option is more readily open to them.

No one knows the quantity of private capital willing to invest in toll roads, except that it is huge. Goldman Sachs estimates the capital available globally in 2006 as \$250 billion.<sup>47</sup> A British report was of the same order of magnitude, finding that about \$100 billion was raised globally for infrastructure deals in the first half of 2006, a 71 percent increase over a year earlier.<sup>48</sup> A large fraction of this capital is available to the United States, since there is great respect internationally for the strength of the U.S. economy and confidence in the rule of law in enforcing contracts.

International toll concession groups like Spain's Cintra and Australia's Macquarie were the first into the U.S. market. There are many other international infrastructure investors and funds. Major U.S. banks, construction companies and a number of specialist funds have followed. Pension funds are especially interested in toll road investments since they offer secure long-term prospects. The problem is lack of investment opportunities, not any foreseeable limit on capital available.

## *2. Toll Rate Flexibility*

Setting toll rates around their market level is accepted of private sector operators. People expect a toll concession to strive to maximize its profit within the limits set by the concession agreement. Public toll authorities often start out by setting market rates. Otherwise they won't be able to finance the project. But over the years, as long as they can service debt with existing tolls, they are expected by politicians and the public to forgo the opportunity to raise tolls along with the market. The value of time savings to customers may increase because of congestion on alternate free routes, but toll agencies don't reflect that in higher tolls the way a business would. They usually don't even adjust tolls to reflect inflation. They tend to keep tolls frozen in dollar terms (which means declining in real terms) for long periods. The Indiana Toll Road hadn't increased its tolls in 20 years at the time of the lease. This means that over time even the toll road becomes congested, because prices do not adjust to keep the traffic flowing with the most cars able to use the road.

In what is sometimes called "crisis pricing," governments tend to avoid any toll increase until a financial crisis occurs. When the government is unable to fund needed improvements, is being forced to cut back on maintenance, or faces the prospect of defaulting on bond covenants, it pushes for a huge increase in tolls, perhaps one-third, one-half or even more, after which (again with fixed-dollar tolls) they lapse back into slowly declining real toll rates for an extended period of years until the next crisis arises. Drivers usually balk at these staggering one-time toll increases, whereas annual inflation-based increases do not draw similar levels of protest.

### Can the public sector match private concessions?

Several critics have emerged in the wake of the long-term leases of the Chicago Skyway and Indiana Toll Road claiming that the public sector could have refinanced those roadways and raised just as much money as was obtained via the long-term leases. The most outspoken critic is NW Financial Group LLC in Jersey City in its paper “Then There were Two.. Indiana Tollroad vs. Chicago Skyway”.<sup>49</sup> The study first criticizes the caps on toll rate increases in the concession agreements, arguing that using GDP per capita (one of three alternatives in the agreements) would lead to unconscionably high toll rates in the later years of the concessions.

There are two problems with this criticism. First, although the report on the Skyway concession mentions potential toll increases of up to 7 percent a year, the actual maximum based on GDP per capita data for 1990 to 2005 would have been 4.04 percent. Second, the author’s calculations ignore that people won’t pay just any price, no matter how high, to use the toll road, naïvely assuming that the toll company could and would implement the maximum allowable toll rate each year. In reality such a policy will not maximize toll revenue. The price has to be attractive to the customer for the value they get from using the road.

The study also assumes that state toll agencies and investor-owned concessionaires will operate similar businesses with similar costs and similar tolls. It criticizes the State of Indiana’s valuation study, which assumed toll increases every seven years at 22 percent—which works out to an average of 3 percent per year. Yet given real-world political constraints, that is a perfectly reasonable assumption for a public toll authority.

What really drives the value difference between private and public toll road operators is the former’s ability to operate more efficiently to keep costs down and to increase tolls on a commercial basis, in a way that cannot subsequently be second-guessed politically. The financial markets value this significantly greater certainty of steady toll revenue increases over time.

Think of the things a public authority has trouble doing that are everyday matters for private businesses:

**Adopting new technologies.** Electronic tolling technologies change about every seven years as new innovations occur. Private firms unhesitatingly upgrade if the new technology will pay for itself with better service. Public authorities have a very hard time raising the capital for technology upgrades. The Chicago Skyway implemented electronic tolling shortly after the concession began.

**Flexibility.** Public authorities cannot easily adjust staffing levels as technology and needs change, and cannot afford to send staff to the latest training. They tend to be overstaffed and under-trained, while private firms suffer from neither of these problems.

**Revenue protection and maintenance.** Toll revenues can sometimes be diverted from one public agency to another through loans or other accounting gimmicks, shortchanging the maintenance of the road. Even without revenue diversion, deferred maintenance is often the first recourse of public authorities when money is tight. Private concessions have terms that do not allow deferred maintenance.

**Congestion.** Because public authorities are reluctant to raise tolls as more people use the road, they become congested and of less benefit to the users. Private firms will set the toll at levels that prevent congestion and that balance maximum throughput with demand, based on what the customers actually want and are willing to pay for.

Private operators are far more willing to adjust tolls modestly, at least annually.<sup>50</sup> And the public is more accepting of that from them, knowing it is a business. Public authorities are heavily handicapped by the widespread notion that low toll rates are a virtue in themselves. They are indeed a virtue if they reflect limited demand, moderate competition, low costs, and a return on investment, but in public toll authorities they often merely mask high costs, a failure to make proper depreciation allowances, and other financial practices that allow future problems to accumulate. Public toll authorities are not subject to nearly the same accounting and reporting requirements as private businesses. Some don't even produce annual financial reports. And without a publicly traded price for their stock and without independent shareholders, any scrutiny they receive is episodic at best.

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No one knows the quantity of private capital willing to invest in toll roads, except that it is huge.

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### *3. Cost Savings*

At the Massachusetts Turnpike the base pay rate for toll collectors is \$52,239 a year or about \$26 an hour.<sup>51</sup> On top of that are generous public-sector benefits including health and pension entitlements, overtime opportunities, automatic pay increases by seniority, and job security. Privately operated parking garages can recruit attendants to collect parking fees—a similar job—for about half the cost. Apart from debt service, toll collector payroll is by far the largest operating expense of toll roads, so the inflated pay of toll collectors—reflected in the fact that positions are never advertised but filled by word of mouth and connections—is a manifestation of pervasive overpayment for goods and services at many state toll authorities. It is commonplace, too, for legal services, engineering consulting, janitorial services, and security to go to politically connected firms. That is because top staff and board members are political appointees. There are important exceptions to this. Some large state toll authorities such as Florida Turnpike Enterprise and many small and newer state or local toll authorities have a core management staff on salary and contract out most of their operations to private sector companies that pay market wages and benefits. However, over time there are pressures on state and local toll authorities to evolve in the direction of the Massachusetts Turnpike model.

Toll concessions offer opportunities to significantly reduce costs by moving from politically dictated to competitive market-based purchases of goods and services. They have also led the way in automating toll collection, phasing out tollbooths and toll collectors in favor of electronic toll collection and open-road tolling.

Concessionaires are not caught up in these problems. State and local toll authorities in some states tend to be locked in with labor contracts that rigidly demarcate work between different trades and departments. At the Chicago Skyway, when the city of Chicago operated it, maintenance was

broken up between different city departments, and Skyway management had to fill in requisition orders to the relevant department of the city. So a pothole on the Skyway was added to an enormous work list of potholes elsewhere around the city. Management had no idea when the streets and sanitation department would get around to its pothole.<sup>52</sup>

#### *4. Geographic Diversity and Specialization*

Concession toll road operators also have greater ability to spread risk and to pool expertise. Most public toll authorities are constrained geographically in their operations. Thus the Pennsylvania Turnpike can only operate within the state of Pennsylvania. Sometimes county agencies will negotiate with an adjacent county to operate just outside their home territory.<sup>53</sup> But they still keep close to home. By contrast, investor-owned toll operators can go where the business is, and an increasing number are now operating globally. The Pennsylvania and Ohio Turnpikes have never been able to operate so much as a ticket-issuing machine in the other's territory.<sup>54</sup> By contrast the Cintra-Macquarie partners in the Chicago Skyway and Indiana Toll Road plan to operate across the Indiana-Illinois state line with integrated management, and they plan to take advantage of the synergy of two toll roads that feed one another.

The ability to do multi-state projects will be particularly important if the United States moves forward with dedicated heavy-duty truck lane projects along Interstate routes.<sup>55</sup> The high cost of such projects means they will have to be financed with tolls. But their inherently multi-state nature—and the lack of state toll agencies in many states—makes them an excellent candidate for long-term toll concessions.<sup>56</sup>

The investor groups doing concessions in different regions and different countries can take advantage of self-insurance. A downturn or setback in one region, which might be fatal to a project of a geographically constrained public authority, may be offset by prosperity elsewhere in the wide portfolio of projects of an investor group.

Public toll authorities by their nature do very few major projects. For example in New Jersey there was a huge surge of activity in the mid-1950s when the two major toll roads of the state were built. Everything since then has been small by comparison. The megaproject expertise gained in the 1950s within those authorities was not transferred and used in other states as it can be by a concession company operating free of geographical bounds. A Macquarie, Cintra, Autostrade, or Cofiroute can assign experienced staff from one region to another as new opportunities arise. By contrast, staff have to resign from one state toll authority and be recruited by another for expertise to be transferred—putting a career and benefits in jeopardy.

## D. Concession Agreements

### 1. Overview

The details of concessions are contained in long-term contracts called concession agreements. They tend to be hundreds of pages in length, covering every detail from maintenance requirements to the amount of time in which snow or road kill must be removed from the road. As such, these contracts are not the blanket handover of control to investor interests that critics sometimes suggest. We can only briefly list the main issues covered.<sup>57</sup>

In contrast to the 19<sup>th</sup>-century charter process, in which an applicant was simply granted (or denied) a charter, modern toll concessions are awarded as part of a competitive process. This starts with hiring consultant expertise in this subject, and spelling out a selection process with deadlines, to demonstrate seriousness and attract the best bidders. The next step is to assemble comprehensive information including the history of the corridor and data relevant to the prospects of the project. Simultaneously with this, a request for qualifications should be issued. There needs to be a winnowing process that drops from competition those judged less capable of fulfilling the contract due to limited expertise or resources. This leads to an invitation to the best-qualified parties (the “short list”) to submit detailed proposals. From here there are various paths. If one proposal is clearly the best, it can be accepted. More likely, more than one will have valuable ideas. The government may take the best features from each (by purchasing intellectual property rights) to synthesize a revised proposal and ask the contenders for their best and final offers on that common synthesized project.

There are many trade-offs to be made in a concessioning process. Controls and limitations placed on the concessionaire will usually reduce the value of the concession. That is not to say they are wrong. Many controls will be deemed necessary in the public interest. Others will be borderline. They can be costed-out in bids or negotiations, and decisions made with price tags attached.

Bidding in U.S. concessions for existing toll facilities has usually been based on who offers the maximum up-front concession fee. A second approach is to get bids in terms of the lowest toll rates over the term of the concession.<sup>58</sup> Another approach is for the government agency to garner a share in annual revenues, which are usually specified as a percentage of profits beyond a baseline rate. For new toll roads, the competition may be to see which investors will fund the most improvements (or for some projects, with the smallest state contribution). Yet another variation is to link the term of the concession to a defined payback plus an agreed rate of return.

### 2. Provisions

Concession agreements spell out the obligations of the concessionaire and the owner (the government agency granting the concession). The contract spells out monitoring and compliance mechanisms and defines the concessionaire’s responsibility to grant access and to make regular

reports. There is usually an arbitration mechanism for disagreements about whether the provisions of the concession agreement are being met, a process for remedying deficiencies, provisions handling default by either party, and finally hand-back requirements that come into play if the concession is terminated prematurely or at the end of the concession term.

Among the standards to be met may be maintenance standards, response times to accidents and other problems, and levels of service on the traffic engineers' scale of A through F, measuring the seriousness of congestion. Many concession agreements require the concessionaire to add capacity or make other improvements to avert a deterioration of service through congestion. For example the Indiana Toll Road concession agreement requires the concessionaire to obtain independent forecasts of traffic conditions and to take action by way of capacity enhancement so as to maintain a minimum Level of Service C in rural sections and LOS D or better in the urban segments.

Toll rates to be charged under the concession may be controlled by "caps" on tolls for specified periods and a formula, often related to a price index or GNP per capita, for increases. There are cases where parallel facilities are considered to provide sufficient competition to the concession and where no toll rate controls are needed.<sup>59</sup> In other concessions an independent adjudicator or adjudicating agency hears applications for toll increases.<sup>60</sup> In others there are no direct controls over toll rates as such but limits on the rate of return and increasing pass-back of profits to the government owner beyond a specified rate of return.<sup>61</sup>

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Good long-term partnerships have mechanisms for working out changes and dealing with new issues that arise in ways agreeable to both parties.

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Another possible provision would address the issue of limits on state-provided competitive roadways. In many cases, new toll roads (or even old ones being modernized via new financing) are given some degree of protection from unlimited competition provided by new, non-tolled, taxpayer-provided roadways serving the same market. Such "non-compete" provisions arose as a way of reassuring toll revenue bond-buyers that the state would not take actions that might divert so much traffic away from the toll road as to make it incapable of servicing its debt. Such provisions can be politically difficult, so when they are considered necessary in order to make a new toll road "finance-able," they should be drawn up as narrowly as possible, to avoid giving monopolistic power to the toll road provider. The recent tendency has been to have the toll road developer stipulate that it takes the risk of any traffic diversion resulting from the completion of any project included in the region's official 25-year long-range transportation plan, but that it is entitled to compensation for lost toll revenue, based on a pre-defined formula, for other projects within a narrowly designed competition zone on either side of the toll road. A procedure would need to be established for an independent estimate of the extent to which the non-tolled roadway actually diverted traffic from the toll road.

One novel concession agreement provision being used in Texas is a schedule of concession fees or profit sharing related directly to different posted speed limits. Posted speed limits are under the control of the state. The higher the posted speed limits—assuming enforcement and safety—the greater the time savings motorists will stand to gain by using the concession road, and the more they will be attracted to the road, and the higher its revenues will be. A concession deal can garner some of the benefits for the state if the concession agreement explicitly recognizes this.<sup>62</sup>

Perhaps the most important thing is to recognize that these are long-term arrangements, and not all possible issues can be anticipated. Good long-term partnerships have mechanisms for working out changes and dealing with new issues that arise in ways agreeable to both parties. Likewise, they lay out conditions for ending the agreement if both sides agree it is no longer working.

Changes in the concessionaire's operating procedures or ownership, and proposed capital improvements, will often require consultation and agreement with the owner. There will usually be provisions for adjudication, in case of disagreement, that limit unilateral powers to order actions.

### *3. Transparency vs. Confidentiality*

The question often arises as to how public the concession selection process should be. Pundits and critics often characterize any closed-door meetings as sinister. However, some level of confidentiality is required during the process itself to assure bidders that their unique ideas won't be stolen by others. Also, to get the best price the owner will want bids by each competitor to be made in ignorance of what the other competitors are prepared to bid—the well-established concept of sealed bids. Further, during negotiations frankness cannot be expected if every statement is subject to instant publicity. Having made those reservations in favor of a level of confidentiality, secrecy should be kept to a minimum and only maintained as long as there is a good reason for it.

Respect for the selection process will revolve heavily around the personalities and reputation of the people doing the selecting. Is the selection team balanced? Is it sufficiently expert? Is it reasonably impartial? Is it insulated from political pressures? Can it explain its scoring? Once the selection has been made, there should be full disclosure of the factors that led to that decision. And the entire concession agreement should be made public, as was done in the Chicago Skyway and Indiana Toll Road cases.

### *4. Concession Term*

Concessions are usually distinguished from 19<sup>th</sup> century charters in that the right to run the business is granted for a specified term. These tend to vary between 35 and 99 years. Different length of term allows different financing options and capital improvement plans. The California toll concessions under the AB 680 law of June 1991 provided for 35-year concession terms. The 91 Express Lanes and the South Bay Expressway (SR 125) were agreed to on these terms. The first was terminated after seven years in a negotiated buyout with the county, while the second is being

negotiated for a longer term while still under construction.<sup>63</sup> The Dulles Greenway in northern Virginia was a concession originally granted for 40 years but renegotiated recently to 60 years. In Texas the first toll concession under recent law has been for 50 years on Texas State Highway 130 Segments 5 and 6.<sup>64</sup> The Toronto 407-ETR, the Chicago Skyway, and the Pocahontas Parkway in Richmond VA were all concessioned for 99 years, while the Indiana Toll Road concession runs for 75 years.

The concession term may be set to begin from date of signing, from a required opening date, or from actual opening.

Long-term concessions (those beyond 35 or 40 years) enable the project to capture revenue potential beyond the typical term of long-term bonds of 25 to 30 years. A public toll authority financing, since it provides no equity beyond the term of the bond, assumes (de-facto) that the roadway is worthless on repayment of all the debt. By contrast a concessionaire looking at a 99-year concession sees approximately three times the nominal income, though of course the distant years' income must be discounted heavily to present value.

When the term of the concession ends, control of the road reverts to the owner (the state) which can choose to re-concession the roadway or operate it itself.

## Part 7

# Conclusion

Highway finance appears to be coming full circle—from tolling and private turnpikes to fuel tax and government provision back to tolling and the private sector. Prior to the gasoline-powered automobile, inter-city roadways and major bridges were usually financed with tolls and developed and operated as state-chartered businesses. That made sense, because the cost of such projects was more than could be covered out of either government's or a business firm's current cash flow, and because tolling allowed the users who benefited from the road or bridge to pay for it to the extent of their use, over its full useful life. These projects were also rightly viewed as utility-type business enterprises, and were regulated as such.

The 20<sup>th</sup> century's development of motor vehicles made paved roads necessary, and the invention of fuel taxes dedicated to highway purposes made it inexpensive to pay for paving roads on a pay-as-you-go basis. Nevertheless, the need to construct very costly large-scale bridges and super-highways led to the development of state toll authorities, which could take advantage of governments' access to tax-exempt debt. Had it not been for the Eisenhower administration's decision to use fuel taxes and a federal trust fund to pay for building the Interstates, the state turnpike model may have spread to most of the country, creating a national network of toll roads.

As we begin the 21<sup>st</sup> century, the development of low-cost, non-stop electronic tolling technologies has made it far less costly to use tolling to finance large-scale highway, bridge, and tunnel projects. And the debt/equity long-term concession model that has been proven in Europe and Australia has recently been introduced into the United States. We now have an opportunity to re-invent the 19<sup>th</sup> century private turnpike in 21<sup>st</sup> century form.

It makes sense to *finance* major highway projects, that is, to raise the capital costs up front and repay the investors based on payments made by customers as they use the roadway over its useful life. And once we see the limitations of the traditional public toll authority model—reliance solely on debt, conservative coverage ratios, limited geographical scope, and various political constraints on pricing, hiring, compensation, etc.—we can appreciate the advantages of contracting long-term with private firms to develop, own, and operate major roadways as business enterprises.

In some circumstances, cities or states may be persuaded to retain full ownership and control of toll facilities. There are a few toll authorities that do behave like businesses, with a history of

professional management and board of directors prepared to minimize costs and to raise tolls on a commercial basis, as the market dictates. The Transportation Corridors Agencies in California have been prepared to raise tolls nearly every year, and their rates appear close to market levels. In Texas, the public toll agencies in Houston and Dallas seem to have a history of competent and innovative management resistant to pressures for patronage or service to political interests. And the Florida Turnpike Enterprise operates in a very businesslike manner. But these tend to be the exceptions.

In the 20<sup>th</sup> century, America showed the world that investor-owned electric, gas, and telecom utilities worked better than the state-owned utilities carrying out these functions nearly everywhere else. Late in that century, nearly every developed country privatized those utilities. This report has sought to explain why major roadways also make sense as investor-owned utilities, as pioneered in Australia, France, Italy, Portugal, Spain, and elsewhere. The global capital markets have recently discovered the U.S. highway market as an untapped business opportunity just as consensus was developing that we have a major shortfall of highway investment.

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### Legislators and transportation agencies must remove the obstacles to private investment.

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Within just the past two decades the development of low-cost electronic tolling and other automatic vehicle identification technologies has made it far less costly to use tolling to finance roads, and less nuisance to motorists. Stopping to pay tolls has been made obsolete by technologies that allow tolls to be collected at full highway speeds. The harnessing of these new toll technologies to impose flexible market pricing in the form of toll rates which vary according to road space available has made possible management of roads to flow smoothly and fast even under peak-hour conditions. Dynamic pricing allows road service providers to offer a valuable new service to motorists, something they will pay previously unheard of tolls rates to take advantage of.

Now that the equity-based long-term concession model has been introduced into the United States, we have an opportunity to re-invent the 19<sup>th</sup> century private turnpike in 21<sup>st</sup> century form. The challenge for legislators and transportation agencies is to remove the obstacles to private investment and devise the regulatory guidelines that will make it possible to take full advantage of this opportunity.

## About the Author

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## Related Reason Studies

Peter Samuel, *Leasing State Toll Roads: Frequently Asked Questions*, Reason Foundation Policy Brief No.60, March 2007, [http://www.reason.org/pb60\\_leasing\\_state\\_toll\\_roads.pdf](http://www.reason.org/pb60_leasing_state_toll_roads.pdf)

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Robert W. Poole, Jr. and C. Kenneth Orski, *HOT Networks: A New Plan for Congestion Relief and Better Transit*, Reason Foundation Policy Study No.305, February 2003, <http://www.reason.org/ps305.pdf>

# Endnotes

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- <sup>1</sup> Jack Wells, Chief Economist, U.S. Department of Transportation, “The Role of Transportation in the U.S. Economy,” presentation to the National Surface Transportation Policy and Revenue Study Commission, June 26, 2006.
  - <sup>2</sup> We use the eastern and southern term “expressway” to describe the top-tier highways, namely those that are fully access-controlled and grade-separated from cross roads. This term clearly characterizes the road form, whether tolled or priced or free to the user. “Toll freeway” or “priced freeway” are oxymorons.
  - <sup>3</sup> Numbers are from *The Fuel Tax and Alternatives for Transportation Funding*, Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance, Transportation Research Board, Washington DC, Special Report 285, 2005, (hereafter Fuel Tax and Alternatives Report) chapter 2. They are for 2003, the latest year for which comprehensive estimates were available.
  - <sup>4</sup> Chapter 7 of Conditions and Performance Report 2004.
  - <sup>5</sup> Exhibit 8-1 in Chapter 8 of Conditions and Performance Report 2004.
  - <sup>6</sup> David Hartgen, and Ravi Karanam, *15th Annual Report Performance of State Highway Systems (1984–2004)*, Reason Foundation Policy Study No.350, (Los Angeles: Reason Foundation, 2006).
  - <sup>7</sup> “Status of the Nation’s Highways, Bridges, and Transit: Conditions and Performance,” FHWA, the latest is 2004 from which we will cite.
  - <sup>8</sup> Texas Transportation Institute’s David Shrank and Tim Lomax have published annually updated Urban Mobility Reports for several years. Their latest is the “2005 Urban Mobility Report” with the numbers we cite—see <http://mobility.tamu.edu/ums/report/>
  - <sup>9</sup> A 1.37 “travel time index” as TTI terms it means that a journey which takes, say, 100 minutes in free-flow conditions, takes 137 minutes or 37 percent more in peak hours.
  - <sup>10</sup> Joel Kotkin and Robert Bruegmann make this point in their writings.
  - <sup>11</sup> See <http://data.bls.gov/cgi-bin/cpicalc.pl>
  - <sup>12</sup> see <http://www.fhwa.dot.gov/policy/ohim/hs03/htm/mf205.htm>
  - <sup>13</sup> “The Federal Excise Tax on Gasoline and the Highway Trust Fund: a Short History,” Pamela Jackson, Congressional Research Service, April 4 2006. See <http://ncseonline.org/NLE/CRSreports/06May/RL30304.pdf>
  - <sup>14</sup> Technically the interstate system will not be complete until a planned interchange is built at I-95 and I-276, the Pennsylvania Turnpike between Trenton NJ and Philadelphia to enable I-95 to be continuous between Maine and the Everglades in Florida.
  - <sup>15</sup> Transit spending has grown in constant 2001 dollars from \$7.4 billion in 1961 to \$38.8 billion in 2002, most of the growth being in subsidies from taxation, 14 percent of it from motor fuel taxes, according to the Fuel Tax and Alternatives Report, Table 2-4, pages 2-10.

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- <sup>16</sup> The National Highway System is described as approximately 160,000 miles of roadway important to the nation's economy, defense, and mobility: see <http://www.fhwa.dot.gov/hep10/nhs/> But it is not important enough to the federal government to have spawned any actual standards or plans as to how it should be improved.
- <sup>17</sup> See Fuel Tax and Alternatives Report, Table 2-8.
- <sup>18</sup> Numbers are for 2002, see Freight Activity in the United States, Table 1-52, Bureau of Transportation Statistics, [http://www.bts.gov/publications/national\\_transportation\\_statistics/html/table\\_01\\_52.html](http://www.bts.gov/publications/national_transportation_statistics/html/table_01_52.html)
- <sup>19</sup> see "National Freight Trends, System Flows and Policy: Status and Future Directions" Tony Furst, director Office of Freight Management and Operations, Federal Highway Administration, Powerpoint at [http://freight.transportation.org/doc/inter/Furst\\_FHWA.ppt](http://freight.transportation.org/doc/inter/Furst_FHWA.ppt)
- <sup>20</sup> For example non-commercial vehicle savings are put at \$15/hour, light commercial vehicles (vans and suchlike) at \$18/hour and heavy duty commercial vehicles at \$35/hour in "Feasibility of a Metropolitan Truck-only Toll Lane Network: The Case of Atlanta, Georgia" by Michael Meyer see <http://www.mettrans.org/nuf/documents/Meyer.pdf>
- <sup>21</sup> The second E in GARVEE bonds seems to be solely to make the term more easily pronounced.
- <sup>22</sup> Although construction of the Brooklyn Bridge began under a toll charter to the New York Bridge Company, revelations of wrongdoing during its construction led the legislature to revoke the charter and it opened as a city-owned bridge. The story is told with flair in David McCullough, *The Great Bridge: The Epic Story of the Building of the Brooklyn Bridge*, Simon & Schuster, 1972.
- <sup>23</sup> Although often hostile and unfair, the fullest account of his career is the splendidly written *The Power Broker: Robert Moses and the Fall of New York*, by Robert A. Caro (Vintage Books, Random House, New York, 1975).
- <sup>24</sup> The most comprehensive history is *Empire on the Hudson: Entrepreneurial Vision and Political Power at the Port of New York Authority* by Jameson W. Doig (Columbia University Press, New York, 2001).
- <sup>25</sup> In late 1954 when the Interstate System was being planned it included some 8,527 miles of toll roads, either in operation, under construction, financed, authorized or planned costing some \$8.7 billion. See page 15 of "A 10 Year National Highway Program, a Report to the President (Eisenhower)", The President's Advisory Committee on a National Highway Program, colloquially known as the Clay report after its chairman Lucius Clay, January 1955, House Document 93, US Government Printing Office, Washington 1955.
- <sup>26</sup> See [http://www.aaamidatlantic.com/safety/release\\_content.asp?id=3244](http://www.aaamidatlantic.com/safety/release_content.asp?id=3244) also [http://tollroadsnews.info/artman/publish/article\\_1638.shtml](http://tollroadsnews.info/artman/publish/article_1638.shtml)
- <sup>27</sup> Steven Ginsberg, "New Tolls, Not Taxes, Favored for Area Roads," *Washington Post*, February 16, 2005, page A01.
- <sup>28</sup> See [http://tollroadsnews.info/artman/publish/article\\_1336.shtml](http://tollroadsnews.info/artman/publish/article_1336.shtml)
- <sup>29</sup> Jennifer Dill and Asha Weinstein, *How to Pay for Transportation? A Survey of Public Preferences*, paper presented at the First International Conference on Transport Infrastructure Funding, 2006.
- <sup>30</sup> Laurie Blake, "Minnesota Poll: 69 percent Comfortable with Toll Roads" *Star Tribune*, January 28, 2004, 1A.
- <sup>31</sup> Podgorski, K.V. and K.M. Kockelman. *Public Perceptions of Toll Roads: A Survey of the Texas Perspective*. Paper presented at the 84th Annual Meeting of the Transportation Research Board, 2005.
- <sup>32</sup> Susan Gilmore, "Rice is nice when trying to visualize highway traffic," *Seattle Times*, December 29, 2006, [http://seattletimes.nwsourc.com/html/localnews/2003500083\\_macdonald29m0.html](http://seattletimes.nwsourc.com/html/localnews/2003500083_macdonald29m0.html)
- <sup>33</sup> *The Pennsylvania Turnpike: A History*, by Dan Cupper, Applied Arts Publishers, Lancaster PA, 2003, pages 22-23.

- <sup>34</sup> “History of the Texas Turnpike Authority,” by Jesse Sublett, published internally by Texas Turnpike Authority, Dallas Texas, 1993, page 20.
- <sup>35</sup> “Dulles Toll Road Study” JHK Associates 1979 cited in *Toll Roads Newsletter*, Number 52 December 2000, page 27 for projections and for 2000 actual see “Dulles Toll Road Rate Adjustment Review,” Wilbur Smith Associates, New Haven CT, February 2005, page 2-1.
- <sup>36</sup> “Traffic Forecasting Risk Study Update 2005: Through Ramp-up and Beyond” and is written by Robert Bain (London) and Lidia Polakovic (Madrid), August 2005 cited in [http://tollroadsnews.info/artman/publish/article\\_1030.shtml](http://tollroadsnews.info/artman/publish/article_1030.shtml)
- <sup>37</sup> An earlier Tacoma Narrows Bridge which opened in 1940 collapsed only months after it opened, due to serious errors in design. It was early in the days of long suspension spans. New York engineer Leon Moisseiff failed to provide sufficient torsional strength to the deck, while a solid girder design amplified wind pressures as compared to trusses previously used. In a moderate wind in November 1950 the deck twisted itself to destruction in a famous disaster recorded on film. Thereafter far more attention was given to torsional strength and deck girders of long suspension bridges were designed to minimize wind pressures.
- <sup>38</sup> FHWA has a good description of shadow tolls here <http://www.fhwa.dot.gov/innovativefinance/stchap2.htm>
- <sup>39</sup> see [http://tollroadsnews.info/artman/publish/article\\_678.shtml](http://tollroadsnews.info/artman/publish/article_678.shtml)
- <sup>40</sup> Bill Reinhardt, “Portugal Phasing Out Shadow Toll Roads,” *Public Works Financing*, November 2006.
- <sup>41</sup> see [http://www.fhwa.dot.gov/ppp/dbfo\\_6320.htm](http://www.fhwa.dot.gov/ppp/dbfo_6320.htm)
- <sup>42</sup> The history of the Ambassador Bridge is described in *The Ambassador Bridge: A Monument to Progress*, Philip P. Mason, Great Lakes Books, Wayne State University Press, Detroit MI, 1987.
- <sup>43</sup> Examples are “America’s Highways 1776 – 1976” U.S. Department of Transportation, Federal Highway Administration, Government Printing Office, no author or date but probably 1975 or 1976 (hereafter “America’s Highways 1776 – 1976”), and Dan McNichol, *The Roads that Built America*, Barnes & Noble, 2003.
- <sup>44</sup> Summarized in Daniel Klein and John Majewski, “America’s Toll Road Heritage: The Achievements of Private Initiative in the Nineteenth Century” Chapter 12, *Street Smarts*, edited by Gabriel Roth, The Independent Institute, hereafter Klein & Majewski.
- <sup>45</sup> Gerald Gunderson, “Privatization and the 19<sup>th</sup> Century Turnpike,” *Cato Journal* 9 (1), Spring/Summer 1989: 191-200.
- <sup>46</sup> Table 12.7 p296 Klein and Majewski.
- <sup>47</sup> Presentation by Mark Florian, Goldman Sachs to the National Surface Transportation Policy and Revenue Study Commission, Washington DC, 19 October 2006.
- <sup>48</sup> “\$100bn raised for infrastructure deals,” *Financial Times*, London, 17 July 2006.
- <sup>49</sup> Dennis J. Enright, “Then There Were Two . . . Indiana Toll Road vs. Chicago Skyway,” Jersey City: NW Financial Group, LLC, November 1, 2006.
- <sup>50</sup> Governor Mitch Daniels of Indiana said during debates over concessioning of his state’s toll road that state government was simply unwilling – on its record – to raise tolls as needed.
- <sup>51</sup> In the wake of the latest fatal ceiling collapse at the Big Dig project and charges of mismanagement of the project by the Massachusetts Turnpike the *Boston Herald* obtained the complete payroll which it published as a spreadsheet on its website 17 August 2006. See <http://www.bostonherald.com:80/galleries/20060817/payroll08162006.htm>. Based on 250 working days of 8 hours per day \$52,000 is \$26/hour.

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- <sup>52</sup> A famous story involves a new can-do chief manager of the Skyway frustrated at the lack of action by city workers in filling one nasty pothole who finding no one to hand willing to risk breach job demarcation rules, took it upon himself to fix it. The chief commandeered a Skyway pickup truck, went to a southside hotmix works, paid for some steaming asphalt to be placed in a barrel, drove to the neglected pothole and dumped the barrelful of asphalt into the hole. He overfilled it. Soon motorists were telling 911 on their cellphones of a “dangerous little mountain” on the Skyway that was causing motorists to swerve to avoid.
- <sup>53</sup> Harris County Toll Road Authority in Texas for example operates two toll roads in Fort Bend County its neighbor to the immediate south but it is almost unthinkable that it would operate a toll road in, say, Dallas.
- <sup>54</sup> When traveling between Pennsylvania and Ohio on the two state turnpikes a motorist stops to pay the Pennsylvania Turnpike toll just before the Ohio state line, then drives across the border into Ohio and has to stop again because the Ohio Turnpike’s ticket issuing machine cannot be located in Pennsylvania. The same absurdity applies in the opposite direction and between the Indiana Toll Road and the Ohio Turnpike.
- <sup>55</sup> Peter Samuel, Robert W. Poole, Jr., and Jose Holguin-Veras, *Toll Truckways: A New Path Toward Safer and More Efficient Freight Transportation*, (Policy Study No. 294, Los Angeles: Reason Foundation, June 2002).
- <sup>56</sup> Robert W. Poole, Jr. and Peter Samuel, *Corridors for Toll Truckways: Suggested Locations for Pilot Projects*, Policy Study No. 316, (Los Angeles: Reason Foundation, February 2004).
- <sup>57</sup> These issues are dealt with in more detail in *Should the States Sell Their Toll Roads?* (Policy Study 334, Los Angeles: Reason Foundation, June 2005) at [www.reason.org/ps334.pdf](http://www.reason.org/ps334.pdf).
- <sup>58</sup> The low toll bidding is sometimes called the Demsetz auction after economist Harold Demsetz of the University of Chicago and UCLA. Demsetz auctions were the basis for the East Link toll concession in Melbourne, Australia and one in Santiago, Chile.
- <sup>59</sup> Concessions without any direct toll rate controls include M6 Toll in the Birmingham area in England, the Ambassador Bridge, Detroit-Windsor, 407-ETR in Toronto (though toll rate limits are set there indirectly through a complex system of penalties for the effects of high toll rates such as failure to attract the traffic to the toll road).
- <sup>60</sup> In the United States the Dulles Greenway concession is administered by the State Corporations Commission which rules on toll rates. In Europe there are adjudicatory agencies for many concessions too.
- <sup>61</sup> Virginia’s Pocahontas Parkway and Texas State Highway 130 Segments 5 & 6 concessions both have provisions for increased profit share.
- <sup>62</sup> Texas draft concession with Cintra-Zachry to build State Highway 130 Segments 5 & 6 located between Austin and San Antonio contains charts showing different upfront fees, or profit sharing depending on whether speed limits of 75, 80 and 85 mph are allowed by the state.
- <sup>63</sup> See <http://www.dot.ca.gov/hq/paffairs/about/toll/ab680.htm>
- <sup>64</sup> [http://tollroadsnews.info/artman/publish/article\\_1414.shtml](http://tollroadsnews.info/artman/publish/article_1414.shtml)



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