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Enterprising Roads: Improving the Governance of America's Highways

by David Levinson

Project Director: Adrian T. Moore, Ph.D.



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Executive Summary

Most roads in the United States are owned and managed directly by government, with funding for construction and maintenance derived primarily from taxes on gas. For many decades, this system worked well enough, despite widespread problems with congestion and road quality. Recently, however, rising maintenance costs and falling fuel tax receipts have begun to call into question the sustainability of this model.

At their current levels, gas taxes will not provide the revenue needed to maintain America's roads satisfactorily, let alone to rejuvenate and extend the network where necessary. Yet, direct political management hinders the development of new revenue streams, leads to operational inefficiencies and hampers innovation. Put simply, the organizations that built the U.S. highway networks are no longer suited to running them.

A better approach is urgently needed. Ideally, the organizations that manage roads should be able to finance road construction and maintenance through the sale of bonds, without requiring direct consent from higher political authorities. And they should be able to cover the costs of those bonds by charging for road use. More generally, they need to be capable, energetic, ingenious and ready to act. And for all those reasons, they need greater autonomy.

This paper argues that roads should be managed by independent enterprises, with a clear mission of providing service to customers. One way to achieve this, while maintaining overarching political control—and thereby prevent abuses of monopoly power—is to convert existing government operated road management organizations (such as the state Departments of Transportation) into regulated public utilities.

Within such a framework, a wide variety of ownership structures are possible, ranging from municipal- or state-ownership to mutual- and investor-ownership. Each structure has its own set of

advantages and disadvantages, but all are superior to the existing system in one crucial respect: they clearly orient the road enterprise away from day-to-day politics and toward providing value to their users.

The regulated public utility model is already well-established in other important sectors in the U.S., including water, energy and telecommunications. Indeed, around 10% of wastewater utilities, 20% of water utilities, most pipelines, electric utilities, natural gas utilities, and virtually all telecom and cable utilities are investor-owned.

Internationally, the regulated public utility model is already operating successfully in transportation. The New Zealand Transport Agency, for example, has an independent board of directors who appoint the CEO, and works in accordance with a performance agreement negotiated with the New Zealand Ministry of Transport. Management is separated from governance, and service delivery is separated from policy. New Zealand's approach has delivered large efficiency gains without compromising service levels.

Australia's state road enterprises, meanwhile, demonstrate the benefits commercialization could bring to state Departments of Transportation in the U.S. By contrast with their American equivalents, Australian road enterprises—like New South Wales's Roads and Traffic Authority or Victoria's VicRoads—are innovative and highly business-like.

The United States should follow Australia and New Zealand's lead, and transform its state Departments of Transportation (or the highways divisions thereof) into separate, publicly regulated, self-financing corporate entities. Full-cost accounting—as already performed by Arizona's Department of Transportation—constitutes a necessary first step in this direction. In making the transition, policymakers should strive to impose regulation only where absolutely necessary, to minimize the anti-competitive effects of any such regulation, and to leave social objectives to the government, thereby freeing road enterprises to focus on economic ones. Accordingly, road enterprises should be permitted to pursue cost-effective contracting and public private-partnerships as they see fit.

The new road enterprises should also be given latitude to make greater use of user fees—as opposed to general revenue—for funding their activities. Such charges are not just more efficient and equitable than traditional funding sources; if properly designed and implemented, they are also better suited to reducing congestion through effective pricing. Vehicle-miles-traveled charges, weight-distance charges and electronic tolling are all options that road enterprises should be free to pursue.

There is no single formula for success. Road enterprises will learn by doing, and by trialing alternate strategies. The U.S. has 50 separate laboratories of democracy in which road enterprises and state authorities can experiment to find out what works and what doesn't. There will be successes and failures along the way: successes will be replicated; failures will be eradicated. It is only by establishing a learning process like this that innovative progress in surface transportation can be made.

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Part 1

Introduction

Throughout the United States, road networks remain under government control. Yet the typical institutional structure of state highways departments—reporting directly to the governor and legislature and providing all major roads—is very much a 20th century phenomenon. As mobility has risen, so has government control of the road network.¹ Historically, the choice between public and private ownership of roads, as well as toll vs. tax financing, has changed several times, with private, toll-funded turnpikes much more common in the 19th century than the late 20th, and most of the current state-owned turnpike systems emerging in the decade between the end of World War II and the Interstate Act of 1956.² It may now be time for that choice to change again.

For many decades, the existing system worked well enough in providing a connected network that greatly enhanced mobility—albeit subject to long-standing complaints about congestion, crashes, unreliability, pollution, noise, land use effects and decaying infrastructure. Recently, however, rising costs and falling receipts from fuel taxes have undermined the viability of this system. Given stiff resistance to tax increases, the prospect of further revenue losses due to improved fuel efficiency, and the aging of existing infrastructure, the U.S. faces a stark choice: do we reinvest in existing highways as they wear out, or do we slowly allow them to deteriorate to rubble before abandoning them? Lest the reader think this is hyperbole, allowing rural roads to return to gravel (dubbed “gravelization” or “unpaving”) is being practiced in some economically stressed parts of the United States and Canada.³ Clearly there is a level of funding below which the quality of roads decreases, as maintenance is deferred or never undertaken. To be fair, the economic argument in favor of abandonment is that paved road at every mile (common in the rural Midwest and Plains) may be excessive for current population and demand, while unpaved roads are less expensive to build and maintain. The argument against is that reducing the amount of paved roads will increase the cost of travel and vehicle maintenance. The question of where to draw the line is an economic efficiency one, but it is not being addressed in an economic way.

The simple fact is that the organizations that built U.S. highway networks are ill-suited to the task of maintaining them, let alone rejuvenating them. This is both a problem of organization and a problem of money, though the two are not unrelated. A different approach is called for.

This paper lays out the essentials of one alternative to the current system: a regulated public utility model, similar to those that already exist in the energy, telecommunications and water sectors. The title of this paper, *Enterprising Roads*, plays on two ideas: first, that the organizations that manage roads need to be capable, energetic, ingenious and ready to act; second, that in order to achieve

this, state bureaucracies must be transformed into independent enterprises with a clear mission of providing service to customers. Moving from our current, *political* model to an independent, *public utility* model may be a way of meeting these objectives.

Importantly, *enterprising* is distinct from *privatizing*, as these new road enterprises need not be private, or profit-seeking. A wide variety of ownership structures are possible, ranging from state or municipal ownership to co-operative or mutual ownership to investor ownership. Investor ownership does have the advantage when it comes to raising capital and, given an appropriate regulatory framework, driving down costs. On the other hand, co-operative ownership may help to align the interests of customers and suppliers, while municipal ownership may benefit from greater political acceptability. All utility ownership structures, however, are superior to the existing public agency model, in that such enterprises will be clearly oriented away from politics and toward providing value to their users.

Part 2

International Experiences

The first step in exploring this model is to garner evidence of its past use. The most interesting international experiences for our purposes emerge from New Zealand and Australia.

A. New Zealand

During the 1980s, New Zealand underwent a period of radical economic reform as the newly elected Labour government sought to streamline New Zealand's public sector, liberalize its markets and boost its international competitiveness. As leading British economist John Kay put it, "If ever a country has been run by economists, it was New Zealand."⁴ One aspect of these reforms was the replacement of many traditional civil service departments with autonomous Crown entities. This shift was based on the theoretical foundations of public choice and agency theory, which applies economic analysis to political decision-making and posits that bureaucrats and politicians should be viewed as self-interested economic actors, rather than purely benevolent public servants. The aim was to ensure that individual agencies had clear missions and strong accountability for managers. According to Robin J. Dunlop, a high-ranking transportation official in New Zealand, the reforms were driven by the following objectives:⁵

- To improve accountability and better delineate liability for errors and mistakes;
- To place as much work as possible into a competitive environment;
- To separate government policy and legislative development from service delivery in order to minimize vested interest manipulation;
- To require government agencies to write proper briefs defining and detailing the work required;
- To require the client to manage consultants and contractors against a brief and contract documents;
- To improve innovation;
- To reduce the risk to the government of having a large workforce and under-utilized construction machinery and other plant.

The Crown entity relevant to this discussion is the New Zealand Transport Agency (NZTA), which was formed in 2008 through the merger of Land Transport New Zealand and Transit New Zealand. NZTA is a government-owned enterprise that operates under a corporate performance model that

separates *management* from *governance*, and draws a distinction between *service delivery*, for which the agency is responsible, and *policy*, which remains the purview of the government. NZTA has its own board of directors, who appoint a CEO. It works in accordance with a performance agreement negotiated with the New Zealand Ministry of Transport. This agreement specifies the agency's objectives, the criteria for measuring performance, and accountability provisions. The Ministry of Transport, which had 5,000 staff in 1986, had just 50 by 1995, and is now responsible for policy and management of contracts with the Crown entities.

While New Zealand has undergone a second generation of reforms, which somewhat undermine the agency autonomy envisaged in the 1980s and 1990s, its governance model is very different from the highly politicized one currently in use in the U.S. The different approach appears to have paid dividends. As Dunlop observes, "The reforms in New Zealand have resulted in large efficiency gains, with no measurable lowering in level of service."⁶ Among his findings are that annual highway maintenance costs dropped by 17% in the 1990s and that the costs of professional services fell by 30%.

Moreover, New Zealand provides a useful guide to the inherent tradeoffs between autonomy and centralization. The risk with autonomous agencies is that they may form silos that can fixate on single issues, and thus blind decision-makers to problems of the whole of government. Integration, on the other hand, can make dealing with individual problems prohibitively cumbersome and costly because everyone has to coordinate with everyone else.

Some types of decisions (e.g. pavement type and thickness) are far more technical and amenable to straightforward efficiency judgments than others, such as the location of a new road in a developed area. One lesson of New Zealand's experience is that governance structures should give more autonomy to agencies on technical or delivery decisions, while retaining political oversight for clearly contentious decisions where multiple value systems are at play.

When it comes to funding, the system in New Zealand resembles the one in the U.S. New Zealand primarily funds roads and other land transportation (public transit, walking and cycling routes, rail and sea freight facilities, etc.) through a motor fuel tax on light vehicles, additional road user charges on diesel and vehicles heavier than 3.5 tonnes (7716 lbs), and other fixed fees on vehicle registration and licensing.⁷ Such revenues flow into the National Land Transport Fund (similar to the U.S. Highway Trust Fund), which pays for investment in maintaining and improving roads. In addition, transportation funding benefits from some central government subsidies, some local government support for national facilities, and some developer contributions.

Yet even technical decisions, like pavement thickness, have policy consequences. By charging trucks for their pavement damage and needed bridge upgrades, New Zealand provides a stream of revenue to strengthen roads, and thus allows heavy duty trucks to compete with railroads in domestic markets more fairly. Recently NZTA has allowed longer and heavier "high productivity motor vehicles" to be permitted on selected routes (for a charge), reducing the number of truck trips, and thereby increasing productivity in the freight sector. This is similar to existing practice

for overweight and oversized vehicles (like the trucks carrying extra-wide Mobile Homes), which are currently allowed to purchase permits.

While New Zealand Transport Agency is not as entrepreneurial as the Australian states described below, it has developed some unusual niche markets. One for instance is the Bailey Bridge Service, which provides temporary, standardized bridge structures to other public sector agencies as well as private firms. Bailey Bridges were developed by the British during World War II as way of quickly replacing destroyed bridges and crossing rivers and other chasms with a structure strong enough to carry tanks, using interchangeable parts that could be easily delivered to site. The longest such bridge is 788 m (nearly ½ mile). Bailey Bridges are invaluable in emergency situations, such as bridge washouts, and help with planned construction of replacement permanent structures.

B. Australia

Each of the Australian states has a road enterprise that provides road services to residents and businesses in exchange for a fee paid by the state.⁸ While the functions of these Australian road enterprises are similar to those of state Departments of Transportation in the U.S., these organizations differ in significant ways. Like a private company, each enterprise produces an annual report that indicates its revenues and expenditures. More importantly, these independent entities are much more business-like than their U.S. counterparts. For instance, the Roads and Traffic Authority (RTA) of New South Wales (NSW) sells services, land, advertising (it owns and raises funds from billboards), and software systems.⁹

The Sydney Coordinated Adaptive Traffic System (SCATS), for example, is widely used outside New South Wales—at 34,105 intersections in 146 cities in 24 countries.¹⁰ This software, which evolved from early traffic control computers developed from the mid-1960s on, now takes in real-time data from traffic cameras and inductive loop detectors in roads, processes them, and then adapts traffic signal timings to reduce delay. NSW RTA is rewarded for continuing software development because it receives payment from other transportation agencies that use it. Perhaps as a result, it has expanded into other areas of traffic software development.

The roads and fleet services branch of NSW RTA also provides services to transportation agencies in other parts of Australia. It has achieved economies of scale in certain functions, such as the manufacturing of electronic signage, that make it cheaper for those agencies to purchase the products out-of-state than to develop them in-house. Accordingly, NSW RTA has developed specialized equipment to meet its own needs (such as automated line markers) and subsequently sold them to other agencies.

VicRoads in the state of Victoria grew out of a conventional roads agency. Today, in addition to the typical functions of a road agency, it has a consulting arm that provides a variety of services internationally. In particular, VicRoads helps developing countries to establish effective transportation systems, advising on issues ranging from road safety and traffic management, to driver and vehicle licensing.

In Queensland, RoadTek is a commercial business within the Department of Transport and Main Roads that is responsible for “Asset Services” (delivering projects), “Network Services” (traffic signals and markings) and “Plant Hire Services” (construction equipment). Other commercial entities of the Department include an organization selling personalized license plates, another—Queensland Motorways Limited—operating toll facilities, and another offering driver training and education.

Australia's roads are mature.¹¹ As a result, the gains available from simply expanding the system to serve new markets have declined (as in the U.S.), and most increases in productivity are likely to come from innovation and improved management. Commercialization appears to be a successful way of bringing those things about.

David Hensher, a professor of management at the University of Sydney and founder of its Institute of Transport and Logistics Studies, argues the rise of road enterprises in Australia was due to the “dominance of rational economics (encouraged by hard fiscal times) and the general lack of desire to privatize assets”.¹² He further suggests that it exemplifies a *constructivist* approach to the market, where the applicable test of a given system is whether it solves the central planner's problem of maximizing social welfare.

This raises an interesting theoretical point. There is an alternate view, grounded in the Austrian school of economics, which instead asks whether the market provides the right incentives for private actors to discover new and better ways of allocating scarce resources. According to this view, the role of government is to ensure freedom of entry and appropriate property rights, so that markets can serve consumers effectively. Yet the U.S. has created a transportation world based on state ownership, subsidized decisions and an absence of real, market prices. Moving from this world to the one Austrian economists envisage will not be an easy shift.

In light of this, Hensher concludes that “progress is being made, but slowly” in Australia's road sector, as commercialized enterprises providing road services drives a shift from a political culture of road provision to one that more closely resembles private firms operating in the marketplace. Questions remain open as to whether economic deregulation, with free market entry or competitive tendering, should form the basis of service delivery in the future. Accordingly, any move toward road enterprises should be seen as beneficial in and of itself, as it will encourage better management and more innovation, and the kinds of efficiencies Australia and New Zealand have realized. Such reforms need not preclude further steps toward more market-led provision.

Part 3

Governance Options

There are several objectives in designing or selecting a governance structure for roads. The system should:

- Raise sufficient (and stable) revenues to maintain or improve the quality of service on current road networks.
- Charge users an amount approximately equal to the costs they impose (including external costs). Such a system is both efficient, in that it incentivizes optimal use of resources, and fair, in that users get out what they put in.
- Be administratively simple and inexpensive.
- Manage and operate the road network cost-effectively.¹³
- Finance network expansion. While user charges can be used to fund existing facilities, expansions of the road network may initially need to be financed through selling bonds.¹⁴
- Innovate to improve existing services, create new services and lower costs.
- Create value for customers so that they keep using the system.

Any reform of road governance will need to address three key issues—ownership, regulation and funding—in the context of satisfying the above objectives.

A. Ownership

As noted in the Introduction, *enterprising* differs from *privatizing*. Whether road enterprises should be owned by the public or private sectors depends on the particular case and on how the road enterprises in question are organized. Undoubtedly, there are some roads that, as individual links, could never be privately owned and profitable without subsidy. As a network of multiple links however, and given the right funding structure, many alternate ownership patterns are possible.

In the U.S., existing utilities adopt this model. For example, most pipelines, electric utilities, natural gas utilities, and nearly all telecom and cable utilities are investor-owned, while most transit agencies, around 80% of water utilities¹⁵ and roughly 90% of wastewater utilities are government-owned. Roads, needless to say, currently fall in to the latter category.

There are strong critiques of unfettered private provision of infrastructure. It is often argued, for instance, that most facilities of this sort are natural monopolies with a high fixed cost. This makes competition difficult and leaves few checks on pricing power. Moreover, the construction and use of infrastructure often create externalities, which might not be accounted for in a free market system.

On the other hand, it is clear that state-owned or managed facilities may not be as efficient as private sector ones, for a variety of reasons:

- In the private sector, incentives can be aligned and risk-taking rewarded (and punished) if competition exists. Monopoly government agencies will likely be less innovative due to lack of incentives;
- Tolls collected by private firms may be easier to justify to the public compared to new taxes or user fees, especially when general revenue is used and taxpayers who do not benefit from a particular piece of new infrastructure still pay for it through taxes;
- Decisions are less likely to be politicized in the private sector, whereas political control inevitably leads to lobbying for “white elephant” projects;
- Private firms may have more effective labor relations than their public sector counterparts;
- Private provision lowers public costs and public borrowing.

In this context, it is important to remember that U.S. state governments are under no obligation to adopt an “all of one, none of the other” approach to reform. Indeed, different ideas can be tried simultaneously on different types of roads. For example, freeways are by their very nature limited access facilities. As such, traffic can be monitored easily, and users can be required to pay tolls. This makes a private sector-led approach relatively straightforward. Similarly, only people with business in a given neighborhood (residents, visitors, deliveries, etc.) are likely to be found on local streets in an appropriately designed network. Neighborhoods and homeowners associations may also, therefore, maintain their own private roads without causing any problems.¹⁶ On the other hand, technological constraints make it prohibitively expensive to toll urban and suburban arterials roads—for now.

This suggests two things: first, that new governance models such as the regulated utility should be considered by policymakers; second, that in introducing a utility model, policymakers should strive to minimize the anti-competitive effects of regulation. We need to recognize that this is a fast-developing area, and that technological advances may one day make even more economically efficient approaches to road ownership available. As noted in the previous section, the introduction of road enterprises need not preclude further market-based reforms in future.

1. Road Privatization

Road agencies with existing, separate toll authorities can “privatize” them, as Indiana did with its Turnpikes and Chicago did with its Skyway (in both cases government agencies negotiated long-

term contracts with private organizations for the management and operation of the facilities). The same goes for agencies building new toll facilities. Such privatization may range from a full-out sale, to a lease or contract, or even a public offering of stock. In the modern world, privatization is most common for freeway-class facilities, where traffic is easily excluded due to the limited access nature of such roads, where trips are likely to cover longer distances and so have multiple competing paths, and where congestion occurs (in the absence of pricing) if demand is high.

2. Public Private Partnerships

One modest reform would be for the state to maintain ownership and management of the road network, while contracting for as many services as possible. This is already happening in many U.S. states and other jurisdictions, which currently contract for a variety of services, ranging from engineering to construction to sign installation and even to traffic control.

A slightly more radical approach would be to embrace Public Private Partnerships (PPPs), which are joint ventures between a government entity and one or more private companies to fund and operate a service. These business enterprises involve a contract that states which party is responsible for various risks related to the project, and how the service will be funded and managed. One type of transportation PPP is a Build-Operate-Transfer (BOT) contract, where a private concessionaire finances, builds, maintains and operates a facility, collecting toll revenues for a fixed term before transferring the facility back into state ownership.

The hope is that PPPs of this sort will reduce the need for public funding by using private capital, save time by expediting project delivery, and allocate certain risks to the private sector. Furthermore, PPPs may induce innovation from the private sector, improving the quality of construction or management of operations. These partnerships are politically palatable because policymakers can fill the gap in public financing without having to raise the gas tax.

Other types of transportation PPPs are more appropriate for existing facilities or roads that are difficult to toll. For example, government entities could transfer the management, maintenance and operation of parts of their road network to a private contractor for a set period of time. That private contractor would then be paid a contractually agreed fee and be obliged to meet contractually specified performance targets.

3. Road Enterprises

A third approach—which is recommended here—is to transform entire state departments of transportation (or the highways division) into a separate, publicly regulated, self-financing corporate entity, as was done in Australia and New Zealand.¹⁷ This new road enterprise could pursue contracting and PPPs for the inputs into the production of roads and the provision of services that can be more cost-effectively gained in that fashion.

Full cost accounting, as performed in Australia, New Zealand and Arizona,¹⁸ is a necessary first step in the movement of the roads sector toward a public utility model. If user revenues are sufficient to pay for the full costs of operating the system including depreciation, the system can be transferred directly, with user fees set by an authority tasked to ensure continuity of existing quality of service, if not improvement. If user revenues are insufficient, new sources of user revenue need to be established. If road agencies charge the public the full amortized cost of road construction, operation and maintenance, and states pay for any equity-related subsidies out of general revenue or some other budget, provision of transport services would be profitable.¹⁹

To ensure a smooth transition, road enterprises would probably initially be government-owned. Nevertheless, it may be feasible to privatize them at a later date.

B. Regulation

To study the feasibility of the road enterprise model, transportation economists David M. Newbery and Georgina Santos considered regulated road privatization in the UK, learning from the previous UK privatization of telecom and rail.²⁰ In their model, road networks are managed and maintained by a regulated public corporation. The government operates a regulatory oversight agency. This is very similar to the public utility/road enterprise model envisaged in this paper.

The foremost purpose of regulating a private natural monopoly is to ensure that prices remain politically acceptable—that is, they should be closer to competitive prices than to monopoly prices. Regulation can be limited to the monopoly component of the road enterprise's operation. Other aspects that remain competitive need not be regulated. For instance, the charge for using the road may be regulated, but other sources of revenue (billboards, rest stops, etc.) that are competitive need not be. Safety regulations will likely remain in any case.

In their study, Newberry and Santos explore many strategies for price regulation and find that five-year price caps can be set to mimic competition. They assert that such regulations provide an incentive for firms to reduce costs and earn profits, and after five years price caps can be reset to allow consumers the benefits of increased efficiency and lower costs.

Yet all price regulation poses a problem—a danger that it will impact investment and thereby undermine one of the key benefits of private provision. Underinvestment, it must be remembered, can have dangerous consequences. As a result, price regulations are sometimes accompanied by investment requirements. These, however, have their own drawbacks—how is the regulator to know how much road enterprises should invest? Experience with private roads in Europe suggests that a hybrid system combining rate of return and incentive-based regulation would be worth considering for new road enterprises.²¹

More broadly, the road enterprise regulator's objectives may include some or all of the following:²²

- Financial viability of the operator;
- Productive efficiency (maximizing output per unit input);
- Allocative efficiency (ensuring rates equal marginal costs);
- Dynamic efficiency (thinking about future users and investing for those users);
- Distributional efficiency (ensuring tariffs are consistent with users' ability to pay).

Clearly there is unlikely to be one solution that optimizes all these objectives, so any regulator would have to balance these goals. For example, while distributional efficiency is likely to be demanded by powerful political lobbies, it does not necessarily make sense from an economic perspective. Road policy should not be social policy; if the government has social objectives, it ought to fund these directly, rather than imposing regulations on road enterprises and their pricing structures.

C. Funding

The issue of funding is separate from, but related to, the issue of governance. Independent road enterprises may have more latitude—and need—to employ user fees of some sort rather than relying on general revenue for funding. Several strategies for funding may be appropriate, and these should be assessed against the following criteria:

- *Adequacy* – generating enough revenue to cover the facilities it is supposed to support, including depreciation.
- *Efficiency* – not adversely affecting economic welfare or distorting other expenditures.
- *Equity* – ensuring users pay for their own costs, rather than the costs of others. This is violated when a user is overcharged or undercharged.
- *Administrative Feasibility* – minimizing the costs of implementing the taxes and the costs of ensuring user compliance. Ideally, implementation costs should be low for the organization, and simple and transparent for users.²³

In the U.S. today, user charges are the primary source of revenue for transportation facilities, but there are different classes of such charges.

The first class of charges may be flat, per-vehicle fees, or they may be differentiated by vehicle class, weight or age.²⁴ Driver's licenses may also be considered a first class charge.

The second class of charges are fees—for example on fuel, tires, parts and other accessories—associated with vehicle usage. Most state fuel taxes are flat fees based on gallons of fuel consumed, but they can be indexed to retail or selling prices, wholesale prices, average costs of motor fuel, or other factors.

Fuel taxes are roughly proportional to transportation facility usage. Under similar driving conditions, a vehicle that drives more consumes more fuel. However, fuel taxes do have some distortions embedded within them: heavier vehicles consume more fuel than lighter vehicles, driving on congested roadways burns more fuel than on uncongested roadways, and alternative fuel or electric vehicles pay much less than those using gasoline-powered engines. Yet despite these distortions, the fuel tax as practiced in the U.S. does not fully capture congestion or pollution externalities or differential road damage by vehicle weight. As such, it leads to *overconsumption* of road space. Nevertheless, the fuel tax is administratively very efficient and is broadly efficient and equitable.

The third class of charges is more accurately proportional to use. Vehicle-miles-traveled (VMT) charges and weight-distance charges are the standard here.²⁵ Technologies such as Global Positioning Satellites (GPS) allow for more accurate measures of roadway use. An in-vehicle GPS device can apply the VMT charge rate to the miles being traveled in a particular jurisdiction, allowing users to be charged by location. This value can be cross-referenced with the vehicle's odometer in order to compensate for lost GPS signals. In addition, as the GPS logs time, charges may vary by time-of-day, with higher charges in peak periods, which helps to allocate scarce resources more efficiently. The idea is that mileage-based charges replace the fuel tax as the means of paying for the roads. As a transitional step, it has been suggested that VMT fees could be phased in with hybrid and electric vehicles, which pay little or no gas taxes, while drivers of other vehicles would continue to pay the gas tax. Further transition would occur after lessons are learned from the first stage.

Weight-distance fees, which are already used in Oregon, hold some promise for U.S. road funding as they could reverse the trend of heavy vehicle underpayment for infrastructure damage. New technology could reduce implementation costs and overcome the evasion losses experienced when weight-distance fees were introduced in late 1970s New Zealand. It would probably be politically easier to apply weight-distance fees to trucks than to introduce widespread VMT fees applied to all vehicles. Weight-distance fees can also be structured to reduce infrastructure damage by incentivizing the use of vehicles with more axles (which reduces pavement damage, though it does not help bridges). As such, weight-distance fees may offer a simple first step toward more efficient road pricing.

Overall, it should be clear that the third class of charges is more efficient and equitable than even the second class of charges. However, such charges have historically been much more difficult and costly to administer, which is why we have not seen widespread adoption. As the costs of electronic revenue collection continue to drop, one would hope to see more widespread use of the third class of charges. It should be up to individual road enterprises to decide which mix they go for.

A fourth class of charges involves tolls that are facility- or area-specific. The U.S. has longstanding experience with toll roads, bridges, tunnels and more recently HOT lanes, and congestion cordons are beginning to be deployed in large cities such as Singapore, London and Stockholm. These

differ from broader system charges, as identified in the first three classes, as they are localized and may be complementary or layered on top of other charges. Local tolls enable special charges if costs are higher on some facilities due to extraordinary construction costs (e.g. bridges and tunnels) or congestion costs (e.g. dense urban centers).

Another potential source of revenue for road enterprises is a transportation utility fee (TUF), variations of which are already in use at the local level in several states, such as Oregon.²⁶ TUFs serve as a useful precursor to independent governance for local roads, because they provide a clearly delineated stream of revenue that is not intermingled with general funds, which typically come from property taxes. TUFs are generally based on some characteristic of each land parcel—such as street frontage, square footage by building type, and/or acreage—which are believed to correlate with use of the road network.²⁷

While TUFs are clearly a second best solution compared to road user fees, the advantage of TUFs is their relative administrative simplicity compared with fees based on VMT. Moreover, moving toward a user-benefit principle in local road finance, however imperfect that may be, could make future transitions to direct user-payment smoother.

Part 4

Recommendations

Based on the international examples offered by Australia and New Zealand, and the domestic examples offered by ports, airports,²⁸ and other regulated utilities, this paper recommends that U.S. states should replace their departments of transportation with new “road enterprises”—independent, self-financing road providers that would be free to pursue service contracts and public private partnerships as they see fit. These road enterprises would be regulated by state authorities and would receive funding from the sources outlined above. They would also be free to enter into other road-related, revenue-generating fields—such as land development, billboards, transportation technology and so on—at the discretion of their independent boards of directors. These boards of directors would be responsible for ensuring that their enterprises meet desired performance targets and efficiently maintain the physical capital of their networks. Perhaps most crucially, the customers of these road enterprises would be their users—not state officials and politicians.

Moving to a road enterprise model, and adopting the political separation it entails, has many operational advantages. Just compare the Australian and U.S. models for highways agencies: the entrepreneurial activities of the Australian agencies are *enabled* by their enterprise structure, while those of U.S. agencies are *constrained* by their political bureaucracy. There will always be tradeoffs, of course, and decisions that must be made politically, rather than technically. The creation of new facilities on the network may be an example of this: whereas electric and gas utilities serve new development as a matter of course, the provision of other utilities, such as water, sewerage and transportation, is often used to regulate the amount of permissible new development. Regardless of whether or not such a system is desirable, this is likely to remain a matter of policy for the time being.

The Australian experience suggests that we can expect these new road enterprises to specialize and develop expertise in aspects such as road technologies, which could then be exported to other states and other countries, if the incentives and legal institutions were favorable to such activity. Clearly, not all enterprises can or should specialize in the same areas—on the contrary, establishing them is a first step toward more dynamic and bottom-up provision of transportation services, as opposed to the top-down, standardized approach that prevails today.

On a similar theme, the economies of scale in current highway transportation are not clear. It is unlikely, for example, that state departments of transportation varying in size between California and Rhode Island are equally efficient. Moving to a system based on road enterprises would allow for the exploration of alternate institutional arrangements, reconfiguring current organizations up

and down the hierarchy of roads, across functions and between neighboring jurisdictions. One could imagine Delaware, for instance, deciding to contract with Maryland's road enterprise in order to take advantage of economies of scale in the provision of some services. On the other hand, Maryland, which contains many disparate and geographically diverse regions, may itself wish to contract with neighboring states to provide roads and services in outlying areas such as the eastern shore or mountainous Western Maryland.

The same principle applies to ownership structures. While road enterprises will probably at least initially be state-owned, this may evolve over time as enterprises experiment with mutual, cooperative and investor-ownership. Even regulation should be subject to this discovery process, as different states try different approaches and learn from each other's successes and failures.

Ultimately, the crucial point is this: there is no single formula for success and the best formula for a certain location cannot be known in advance. This paper has aimed to outline what is possible, but it cannot address every imaginable aspect of a new system. Road enterprises will learn by doing, and by trialing alternate strategies. The U.S. has 50 separate laboratories of democracy in which road enterprises and state authorities can experiment to find out what works and what doesn't. There will be successes and failures along the way: successes will be replicated; failures will be eradicated. It is only by establishing a learning process like this that innovative progress in surface transportation can be made. So long as we prevent this exploration, this trial and error, this process of learning from experience, we cannot reasonably expect to arrive at an optimal outcome.

Part 5

A Hypothetical Example

It is 2020 and a new road enterprise, Minnesota Mobility (M2), which was spun out of the old state Department of Transportation (MnDOT), has recently taken over the operations and maintenance of the state's main roads. This new organization emerged from the local culture of Minnesota and has quickly become a popular institution, responsive to the needs of its citizens, who now see clear value for their transportation-related payments.

A. Revenue

M2 has the authority to raise revenues from road users via fees assessed at the fuel pump (for older vehicles), or by using special, in-vehicle equipment that charges according to mileage and axle weight (for newer ones). In both instances, fees are subject to regulatory approval by the state's Public Utility Commission (PUC).

In urban areas there is a peak period congestion surcharge on all roads. This has reduced congestion, but has not eliminated it. For those who require reliable transportation and guaranteed travel times, there is a complete network of MnPass managed lanes throughout the Twin Cities.²⁹ These also contribute revenue to M2. All trucks pay a new weight-distance charge that varies by axle loadings and the route used. Automatic Vehicle Identification has improved considerably, dramatically reducing collection costs, and all in-state cars have an account with M2 for their vehicle license. For those that don't drive in the peak period, don't use MnPass, and don't pay at the fuel pump, a monthly bill is issued. Out-of-state drivers are billed too, thanks to a cooperative agreement among all the state road enterprises, and the few remaining DOTs in states still using the old model.

In addition to conducting normal road operations, M2 exports services related to ramp meter control and snowplow technology, where it has expertise. This gives it an additional source of income. It manages traffic data collection and freeway management from a multi-state traffic management center in the suburb of Roseville, using the most advanced technology available. Neighboring state transportation organizations, as well as counties within the state of Minnesota, contract with M2 to manage their traffic using ramp meters. They find this less expensive and more effective than doing it themselves.

M2 clears snow from major local roads (under contract to counties and cities) and from freeways in adjoining states. They do this using advanced technologies such as largely autonomous snowplows,

which through advanced GPS technologies can traverse and clear snow-covered roads despite the absence of visible road markings. With recent improvements in weather forecasting, M2 is able to pre-deploy snowplows along corridors likely to be hit hard and make better use of its expensive capital-intensive equipment.

B. Regulation

“The Minnesota Public Utility Commission's mission is to create and maintain a regulatory environment that ensures safe, reliable and efficient utility services at fair and reasonable rates.”³⁰

The PUC has an important role. By regulating rates, it in effect determines the quality of service on the roads. M2's natural instinct is to push for higher revenues and to produce a higher quality service, for instance by resurfacing roads more frequently, making lane markings more visible, or clearing snow-covered roads more quickly. The PUC's job is to compare the rates and quality of output in Minnesota with other states and to determine whether its residents are getting value for money. M2's board of directors plays an important oversight role, but its main responsibility is to the road enterprise and its shareholders. The PUC, by contrast, explicitly serves the interest of service users. While M2's users and shareholders are similar groups, they are not necessarily identical.

C. Responsibilities

M2 provides a number of services related to infrastructure, traffic, seasonal operations and licensing. The major categories are listed below.

Infrastructure Services:

- Pavement maintenance, repair and reconstruction;
- Bridge maintenance, repair and reconstruction;
- Sidewalk maintenance, repair and reconstruction.

Traffic Operations:

- Traffic enforcement (police services);
- Parking enforcement;
- Traffic control (signs, signals and markings), including monitoring.

Seasonal Operations:

- Snow removal;
- Street sweeping.

Licensing:

- Driver Licenses;
- Vehicle Licenses;
- Revenue collection.

D. Differences

Unlike MnDOT, but like some other state DOTs and the Australian road enterprises, M2 has the authority to license vehicles to use roads, and to license drivers. It has a special safety and security service that enforces its rules on road use. As a result, it also incorporates what used to be the Department of Driver and Vehicle Services and the Minnesota State Patrol (once part of the Department of Public Safety). M2 can also develop land adjacent to existing state roads, generating additional revenue by capitalizing on the accessibility benefits it creates. M2 has not yet done very much of this, but there is potential.

M2 differs from MnDOT in several other significant ways. For example, it is not responsible for the construction of new roads. This responsibility now lies with land developers, newly chartered turnpikes, and local governments. After construction, some of these new roads are turned over to M2 for operation, management, maintenance and reconstruction. However, many remain as private turnpikes or toll roads, integrated into the network through individually negotiated interoperability agreements, which enable M2 to handle billing.

While it does have a voice on state and local transportation planning, M2 is not responsible for this. It plans for its own future, and makes decisions about the capacity required on its existing roads, but for the most part broader strategic planning takes a back seat to management.

Like MnDOT, M2 is not responsible for the operation of transit services, which the state has separately contracted out through the use of Public Private Partnerships. Aid to local governments for roads and transit is distributed directly by the Department of Finance. However, such funding has been considerably reduced, leading to ongoing discussion about the role of local vs. state government in the management of roads and other transportation services.

E. Ownership

Minnesota Mobility was chartered to provide road services to the people of Minnesota, and as such, the citizens of Minnesota are, collectively, its owner. Its board of directors is composed of members nominated by the state governor and approved by the state legislature. They serve staggered terms, which helps prevent M2 being overly swayed by the political process and ensures a degree of continuity in management. There have been suggestions that M2's board should be directly elected, but so far Minnesotans have been content to let their democratic representatives attend to personnel details. The board of directors selects a chief executive officer and has approval rights over the CEO's other 'C-level' officials. The board sets the CEO's salary through a compensation committee. It also approves M2's annual budget, revenue requests and major expenditures. Unlike MnDOT, M2's budget does not have to be approved by the legislature. Nor is the legislature responsible for the rates it charges.

F. Employees

The employees of M2 no longer work for the state of Minnesota, and therefore are not subject to the vagaries of state politics and the occasional state shutdown.³¹ Roads have become a public utility and they must be kept operating. When M2 was formed, MnDOT employees were allowed to apply for positions in the new organization, but they were not guaranteed jobs. About 10% did not apply (many choosing to retire) and about 15% were not rehired. The old unions did not carry over and, so far, employees have not chosen to form any new unions. The state absorbed the pension system of the old MnDOT, giving M2 a clean slate.

G. Reporting

Every year M2 publishes an annual report identifying revenue from users, from services and from other sources, as well as expenses. It also publishes an important time series of performance indicators demonstrating the quality of pavements, roads, lane markings, snow clearance, traffic congestion and so on. The organization has set goals for performance in each area, and budgets enough funding to achieve these goals. Nonetheless, every year, after it has invested funds and ensured sufficient capital for present operations and contingencies, M2 runs a small surplus. This comes in large part from the congestion surcharge, which earns money by charging more in the peak periods.

H. Dividends

Even after making deposits to a reserve fund, which helps smooth financial flows and ensures that long-term maintenance and reconstruction is properly financed, M2 is able to put part of its annual surplus toward paying a dividend to its owners—the people of Minnesota. M2 could probably run a larger surplus by raising user fees to “what the market will bear,” but that would be politically contentious and not in line with its public service mission (nor would it be approved by PUC, its regulator). As it is, there is no more chatter about how state roads are subsidized by taxes: the argument has moved on and everyone acknowledges that roads are paid for (and then some) by their users. The annual road dividend warms the heart of local taxpayers, coming as it does every April 15.

I. Future

There has been talk of M2 fully taking over the road and highway departments of counties and cities in Minnesota. Doing so would relieve the local governments of a major expense that must be paid out of property tax revenues, as local governments are unable to assess gas taxes under current law. Furthermore, just as phone companies and electric utilities own both “the last mile” and “the linehaul,” there is now a debate about whether there should be vertical integration in roads. Some argue that the economies of scale this would allow, and the professional management and specialization it would entail, could reduce costs and improve quality significantly. There is even discussion of M2 merging with road enterprises in neighboring states in order to achieve additional

economies, but these have not yet advanced very far. A few states have even begun to sell shares in their road enterprises on the stock market in an effort to raise additional capital and introduce private-sector efficiencies. However, most states, Minnesota among them, have resisted investor-ownership so far.

Clearly, some legal changes were needed to implement a dynamic, politically independent system like this. But they were neither unimaginable nor unfamiliar, as aspects of this approach were already in place on some U.S. highways and turnpikes. Once some states started down the path toward road enterprises, others quickly followed.

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In January 2005 he was awarded the CUTC/ARTBA New Faculty Award. He earned a Ph.D. in Transportation Engineering at the University of California at Berkeley in 1998. His dissertation “On Whom the Toll Falls,” argues that local decision making about managing and financing roads will most likely lead to direct road pricing, which will allow the efficient allocation of scarce road resources (and thus reduce congestion). He has also conducted research into travel behavior.

He received the 1995 Tiebout Prize in Regional Science for the paper “Location, Relocation, and the Journey to Work.” From 1989 to 1994, he worked as a transportation planner, developing integrated transportation and land-use models for Montgomery County, Maryland. He then applied those models for multimodal network planning and growth management.

Levinson has authored or edited several books, including *Financing Transportation Networks*, *The Transportation Experience* and *Planning for Place and Plexus*, as well as numerous peer reviewed articles. He is the editor of the *Journal of Transport and Land Use*.

Endnotes

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 - ² D. Levinson, *Financing Transportation Networks* (Northampton, MA: Edward Elgar, 2002).
 - ³ T. Martin, "Rural Michigan counties turn failing roads to gravel," *Associated Press*, June, 2009; L. Etter, "Roads to Ruin: Towns Rip Up the Pavement," *The Wall Street Journal*, July 17, 2010; P. Louwagie, "Making a rural comeback: The old gravel road," *Star Tribune*, March 26, 2011. In addition, the Transportation Engineering and Road Research Alliance held a session on "Unpaving" in 2011: *A newsletter of the Minnesota Local Technical Assistance Program*, Technology Exchange (2011).
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 - ⁵ R. Dunlop, "The New Zealand experience in restructuring road administration," *Transportation*, vol. 26, no. 1, 1999, pp. 55–66. Also see L. Evans et al., "Economic Reform in New Zealand 1984–95: The Pursuit of Efficiency," *Journal of Economic Literature*, vol. 34, no. 4, 1996, pp. 1856–1902.
 - ⁶ Ibid.
 - ⁷ New Zealand Transport Agency, "How we fund New Zealand's transport system," 2010.
 - ⁸ That these fees are paid by the state and not the user is a result of the Australian legal system. A court case, *Ha v. New South Wales*, found that state-levied fuel franchise fees were unconstitutional. Instead, the federal government now imposes an excise fee that it returns to the state. While the fees in a sense pay for roads, they are in excess of what is required for roads, and the surplus fuel taxes are added to general revenue.
 - ⁹ Australia differs from the U.S. in another important area of transportation policy: third party vehicle insurance is provided by government-run "Accident Commissions" in several states. Other aspects of insurance (e.g. comprehensive vehicle insurance, covering property damage, theft, etc.) remain private. These Accident Commissions are funded by fees paid for licenses administered by road enterprises. They are, however, separate, distinct organizations.
 - ¹⁰ Statistics correct as of March 2011: <http://www.scats.com.au/>
 - ¹¹ J. Cox and M. Douglas-Crane, "Economic, Social, and Technological Forces Shaping Road Administrations," *Transportation Research Record: Journal of the Transportation Research Board*, no. 1812, 2002, pp. 99–105.
 - ¹² D. Hensher, "The transportation sector in Australia: economic issues and challenges," *Transport Policy*, vol. 1, no. 1, 1993, pp. 49–67.
 - ¹³ G. Zietlow and A. Bull, "Reform of Financing and Management of Road Maintenance a New Generation of Road Funds in Latin America," in *XXI World Road Congress*, 1999, pp. 3–9.

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- ¹⁴ Bond yields may in turn be paid from the revenue generated from new facilities, assuming forecasts bear out. This is a considerable assumption for toll roads, as Bain points out: R. Bain, “Error and optimism bias in toll road traffic forecasts,” *Transportation*, vol. 36, no. 5, 2009, pp. 469–482. An advantage of the regulated utility model is that in the case of overly optimistic forecasts, the regulated organization can go bankrupt, allowing the efficient redeployment of resources and potentially eliminating poor managers.
- ¹⁵ P. Mann, *Water Utility Regulation: Rates and Cost Recovery*, Policy Study No. 155 (Los Angeles: Reason Foundation, March 1993); P. Mann and J. Mikesell, “Ownership and Water System Operation,” *Journal of the American Water Resources Association*, vol. 12, no. 5, 1976, pp. 995–1004.
- ¹⁶ D. Beito and B. Smith, “The Formation of Urban Infrastructure Through Nongovernmental Planning,” *Journal of Urban History*, vol. 16, no. 3, 1990, p. 263.
- ¹⁷ While the focus here has been on states, the idea of road enterprises may be applied to all levels of government, from towns, townships and cities to counties and states.
- ¹⁸ N. Mansour-Moysey and J. Semmens, “Value of Arizona’s State Highway System: Corporate-Style Financial Analysis,” *Transportation Research Record: Journal of the Transportation Research Board*, no. 1747, 2001, pp. 3–11.
- ¹⁹ *Ibid.*
- ²⁰ D. Newbery and G. Santos, “Road Taxes, Road User Charges and Earmarking,” *Fiscal Studies*, vol. 20, no. 2, 1999, pp. 103–132.
- ²¹ A. Estache et al., “An Introduction to Financial and Economic Modeling for Utility Regulators,” *World*, 2003.
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- ²³ J. Berg, “Taxation and revenue policies for future federal highway programs,” *Transportation Research Part A: General*, vol. 24, no. 4, 1990, pp. 251–264.
- ²⁴ Differentiation by year serves, in part, to account for ability to pay. However, it also slows the turnover of the fleet, leaving less-fuel-efficient, dirtier, and less-safe vehicles on the road.
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- ²⁶ J. Junge and D. Levinson, “Economic and equity effects of Transportation Utility Fees,” *Journal of Transportation and Land Use*, vol. 5, no. 1, pp. 33–47, 2012; C. Springer and J. Ghilarducci, “Transportation Utility Fee: Oregon Experience,” *Transportation Research Record: Journal of the Transportation Research Board*, no. 1895, 2004, pp. 15–24.
- ²⁷ Most landowners in the U.S. are also drivers. However, roads do benefit landowners who may not drive in several ways: public utility right-of-way, emergency vehicle access, trash collection, school bus transportation, deliveries (including mail), and bicycle and pedestrian access. It is not, therefore, inherently inefficient or inequitable to levy some transportation fees based on land-ownership.
- ²⁸ Ports and airports are often functionally for-profit enterprises (even if not branded as such). They compete with ports and airports in other cities and states for business.
- ²⁹ Managed lanes are separate lanes on a freeway, which are limited to certain types of vehicles and operated to achieve higher performance than regular lanes. To prevent the lanes from becoming overloaded at rush hour, they are priced so that demand will equal the supply of uncongested road space. Having some lanes always operating under “free-flow” conditions is of great benefit to emergency

vehicles, buses, car-pools and anyone else who needs to get to their destination on time, and is willing to pay a price to do so.

³⁰ <http://www.puc.state.mn.us/PUC/aboutus/index.html>

³¹ As in the summer of 2011, when a budget impasse between the Minnesota's governor and legislature resulted in a three-week shutdown of state government, including MnDOT. It also shut down work by contractors on road construction projects.



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A green highway sign with white text is mounted on a silver metal post. The sign reads "CONGESTION FREE HIGHWAY" in large, bold, white capital letters, with "STRAIGHT AHEAD" in smaller white capital letters below it. The sign is set against a background of a city skyline silhouette, a road with a dashed white center line, and a blue sky with white clouds.

**CONGESTION
FREE HIGHWAY**
STRAIGHT AHEAD