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IMPROVING THE EFFICIENCY AND EQUITY OF HIGHWAY FUNDING AND MANAGEMENT
The Role of VMT Charges

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Abstract

Congestion problems that are becoming more serious, along with deteriorating roads and bridges, raise questions about the viability of the existing system for funding roads and highways in the United States. Using economic theory and evidence from the literature, this paper explores the role that vehicle mile charges could play in reforming highway funding and management. It discusses the advantages of such a system in comparison to the status quo as well as obstacles that might prevent the adoption or implementation of a system of charges for vehicle miles traveled. It also discusses options for addressing drivers' privacy concerns. Replacing fuel taxes with a comprehensive system of vehicle mile charges, especially if accompanied by a greater role for private firms in owning or managing roads, is a promising approach for achieving a more efficient and equitable solution for funding surface transportation infrastructure.

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Improving the Efficiency and Equity of Highway Funding and Management: The Role of VMT Charges

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A growing number of policymakers, highway user groups, and transit advocates are critical of the existing system for funding transportation infrastructure. State governments and the federal government collect fuel taxes each time motorists purchase fuel, with federal fuel tax revenue divided between highways and public transportation and allocated by formula to each state highway department and to transit agencies. In a recent article, Miller and Deignan (2013) critically analyze the role of the US Department of Transportation (DOT) in funding and regulating transportation. That article argues for a reduced federal role and a greater role for state and local governments and private firms in regulating transportation safety and funding transportation infrastructure.

Traffic congestion is a growing problem in major US cities. One reason is that fuel tax revenue has been rising very slowly. As cars become more fuel efficient, gas tax revenue declines relative to miles driven, and the federal gas tax has not been raised since 1993. Yet the cost of highway construction and maintenance has been rising rapidly, with the cost of important components, such as asphalt, rising faster than inflation (Simonson 2013; Puentes 2008). Although the federal government has used general fund revenue to offset declining fuel tax revenue since 2008, this tactic is not sustainable. With continued reliance on fuel taxes, revenue allocated for highways appears to be inadequate for expanding capacity or for maintaining existing bridges and highways, many of which are in poor condition. Due to these problems, both the federal government and various state governments have been promoting alternative methods

of funding highways. Options include public–private partnerships, greater use of tolls, and charges for vehicle miles traveled (VMTs). Of these approaches, a system of vehicle mile charges, which makes tolls almost universal and opens the door for greater private management and ownership of roads, may be the most promising way to use existing technology to more efficiently fund and manage highway capacity.

This paper is divided into two sections. The first section describes how an idealized, comprehensive system of VMT charges could lead to efficient funding of roads and efficient allocation of highway space. It discusses the advantages of decentralized management of roads and highways using VMT charges, including the possibility of a greater role for private firms. The second section discusses problems with implementing a system of VMT charges and ways to overcome those problems. It also discusses how a transition might occur, noting that uniform VMT charges may be much easier to implement than the idealized system where prices vary by time and location according to relative scarcity. The paper concludes by reviewing the problems with federal government control of highways and the advantages of combining a comprehensive system of VMT charges with a decentralized approach to managing and funding transportation infrastructure.

I. Characteristics of an Ideal Comprehensive System of VMT Charges

Concerns about inadequate maintenance of roads and bridges and about traffic congestion have led several states and the federal government to consider raising fuel taxes, with some states, such as Pennsylvania and Maryland, enacting higher tax rates. Raising fuel taxes, however, will do little to mitigate some important inefficiencies of the transportation system that increase the cost of mobility. Fuel taxes fall short in the following ways (Coyle et al. 2011):

- They do not provide observable or accurate signals to drivers of how costs differ depending on a trip's location and time. A lack of signals leads to excessive congestion, particularly on urban freeways, resulting in wasted time and wasted fuel for drivers.
- To the extent that fuel taxes deviate from the marginal cost of each particular trip, they do not provide accurate information or incentives to guide people in choosing between automobile travel and other modes of transportation, such as rail.
- Fuel taxes lead to inefficient allocation of highway investment funds because they do not provide information on how much drivers value one road compared to another. Agencies responsible for highway construction and maintenance need this information to make efficient decisions about highway investment.

Congestion may be the most pressing problem that we can blame on the fuel tax system, wherein drivers do not pay a price that depends on the relative scarcity of the highway they are using. Although aggregate congestion has not risen much since 2003 (see the figure on page 27), congestion in many cities results in commuters wasting gallons of fuel and hours each year stuck in traffic, and it may get worse when the economy recovers further from the recent recession.

In many urban areas, spending money to expand highway capacity is not the best way to reduce congestion. Increasing highway capacity by enough to eliminate rush hour congestion would be costly and would require devoting scarce urban land to additional freeway lanes. Furthermore, capacity expansions never eliminate congestion problems. Instead, increased capacity lowers the cost of driving during peak periods, causing rush hour congestion to quickly return to its former level. The result is that highway lanes, though underused at off-peak times, continue to be gridlocked during rush hour. A solution to congestion should include a better method of allocating scarce highway capacity.

Congestion occurs because during peak periods, each motorist pays much less than the marginal cost of driving on a congested highway. The marginal cost of driving on a congested highway includes the impact of each additional vehicle on the fuel used by other vehicles and on the time it takes them to reach their destinations due to driving slowly or idling. The Congressional Budget Office (2011) estimates that congestion costs from each vehicle average about eight cents per mile in urban areas but are much higher during peak periods. The marginal cost to each driver from fuel taxes, by contrast, is only about two cents per mile for an average car. With fuel taxes, drivers are not paying a market price for using a particular highway. Below-market prices for highway services have the same effect as any other price ceiling: they lead to shortages.

Instead of fuel taxes, charging drivers for their highway use and raising prices during congested periods would be a more effective way of allocating scarce highway capacity to those users who value it the most. Variable pricing could play an important role in eliminating the wasted time and fuel caused by congestion without the massive expansion in highway capacity that would otherwise be required. According to the Federal Highway Administration, "widespread congestion pricing could reduce by nearly one-third the investment needed to sustain the operational performance and condition of the highway system" (US Department of Transportation 2011). With electronic technology, the transaction costs of charging people based on when and where they drive have come down and are likely to fall further.

The problems with continuing to rely on fuel taxes were evident to the National Surface Transportation Infrastructure Financing Commission (NSTIFC 2009), which Congress established under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in response to a perceived transportation-funding crisis. Although the

commission acknowledged the difficulty of pursuing a transition to mileage-based user fees for funding surface transportation, it unanimously recommended doing so.

The simplest mileage-based user fee would be uniform for all miles traveled, but it could vary by vehicle characteristics, such as weight per axle. Technology also makes it possible to charge different prices that vary with the specific section of a road that each driver is using as well as with the time of day. An ideal comprehensive system of charging people for VMTs, taking into account the time of day when congestion occurs, could accomplish three important goals:

- Earn revenue in proportion to how much people value each particular highway, thereby covering the costs of maintaining and expanding highways as demand warrants.
- Give drivers an incentive to drive less where and when there would otherwise be excess demand and severe congestion.
- Reduce or eliminate certain inequities in funding both within and between states, since revenue could be allocated based on how many drivers use each highway and how much they will pay to do so.

With a system of VMT charges, fees for using congested highways could vary by time of day. Charges could be varied like tolls vary on high-occupancy toll lanes on some busy urban expressways, such as California's 91 Express toll lanes. On that highway, tolls are adjusted by time of day and day of the week to limit traffic to 1,700 vehicles per lane, per hour (Samuel 2007). In 2008, tolls varied from 12 cents per mile at night to between 80 cents and $1.00 per mile for eastbound traffic during evening rush hour. The high tolls are evidence that many drivers value avoiding congestion, since every driver has the option of traveling on the adjacent free lanes that are part of the same highway. Tolls or other restrictions on

express-lane use, however, may result in more-congested free lanes. A comprehensive system of VMT charges could reduce congestion in all lanes. This system would give drivers a greater incentive to switch to public transportation, carpools, or driving at a less-congested time of day.

VMT charges would do more to promote efficiency if implemented as a price that varies with relative scarcity. If local governments or private firms with ownership rights to highways set the charges, it is more likely that they would be high enough to cover costs than if federal or state governments determined the level of the charges. Competition between firms or communities would keep owners from overcharging drivers to use their roads.

A major reason for the inefficient management of our transportation system is not how it is funded but that highways and public transportation are provided by governments rather than private firms. With a comprehensive system of VMT charges that vary by location, private firms could fund and manage roads and highways without government subsidies. Private firms make incremental investment decisions in response to market prices, which convey accurate information on the costs and benefits of alternative uses of resources. Although a government can get information about the costs and benefits of the goods and services it purchases or sells in the market, market incentives do not guide bureaucratic agencies as they do private firms competing in the marketplace.

Besides not having as much information as a private firm would have about costs and benefits, a government agency, lacking a profit motive, does not have the incentive that private firms do to utilize resources efficiently by comparing marginal benefits with marginal costs. For example, under the current regime, the complicated mix of subsidies and user fees makes it difficult to evaluate whether highway investment is too large or too small compared to public

transit investment. As Miller and Deignan (2013) note, when taxes fund transportation infrastructure, political considerations may lead the DOT to favor one mode of transportation over another, such as rail transit over bus transit, even when strong evidence exists that investing in bus transit would be more cost effective.

The case for continued government funding and management of highways and transit infrastructure rests on the belief that the government could seek to maximize net benefits for users of the transportation system and transportation providers, rather than letting private firms maximize profits. Users' and providers' net benefits would be maximized if the government funded all projects for which the amount consumers are willing to pay for the resulting transportation services exceeded the cost, with cost defined as the value of the requisite resources in their next best alternative use. If the DOT tried to maximize net benefits by investing only in projects where marginal benefits are no less than marginal costs, it would have to find a way to calculate and aggregate each project's benefits and the costs of the resources used. The expected amount earned in VMT charges could be used as an estimate of a particular project's benefits, but a government agency would also consider the political power of competing interest groups in deciding which projects to invest in.

Bureaucratic decision makers lack the detailed information on resource availability and alternatives that is necessary to account for the benefits and opportunity costs that determine economic efficiency. As Hayek (1948, 78) noted, information on resource availability and alternatives is constantly changing and is best known to resource owners and users. Buyers and sellers in the marketplace take full account of the knowledge of each resource owner, consumer, and investor, each of whom has an incentive to bid based on his or her priorities, access to technology, and alternatives.

A government agency could best contribute to an efficient allocation by enforcing rules and property rights that would require market participants to experience all associated benefits and costs when making resource-allocation decisions. If the road system were privately operated and used VMT charges, it would be easier to hold drivers accountable for the costs of using roads while enabling owners and managers to profit from designing and managing highways to maximize net benefits. If the DOT and other government agencies eliminated barriers to market competition and to private ownership of roads, profit-maximizing private firms would change the transportation system to enable participants to maximize net benefits.

Besides improving efficiency, implementing a system of VMT charges may also enhance equity. Based on at least two different concepts of equity, market equity and ability to pay, the current system of highway and transit funding is inequitable in comparison with alternatives. According to one view, which Taylor (2010) calls market equity, spending and benefits should be in proportion to revenues paid. Market equity is achieved if those who impose more costs pay more. Operators of heavy trucks, which cause more wear and tear on highways, should pay proportionally more to use them. Although truck operators do pay more in fuel taxes, it is not nearly enough to account for the additional wear and tear they cause (Winston 1991). Also, owners of vehicles powered by alternative energy sources, such as electricity, pay much less than owners of traditionally fueled vehicles even though they cause a similar amount of congestion and pavement damage.

Whether a distribution is considered equitable also depends on the unit of analysis, which could be geographical regions, groups, or individuals. Advocates of market equity view fuel taxes as inequitable geographically, since federal spending on highways is not in proportion to revenues received from each region.

Charging drivers a fee for the miles they drive that varies according to the time they are traveling and the highway and kind of vehicle they are using could reduce or eliminate the inequity between what people pay in gas taxes and the costs they impose by driving. Such a system could require truck operators to pay a price that varies with the weight per axle, which is directly related to the damage they cause on highways. Similarly, varying charges by time and location could enhance equity because the costs resulting from driving a certain distance vary considerably among different highways and time periods.

VMT charges may raise equity concerns based on an ability-to-pay criterion: do they increase costs to low-income drivers relative to high-income drivers? Evidence on the income distributional effects of comprehensive tolling compared to fuel taxes is mixed. Higher toll levels and more comprehensive pricing strategies are likely to take a higher percentage of income from drivers earning less than $25,000 per year than from middle- and high-income drivers (Schweitzer 2009). Nevertheless, Weatherford (2012) finds that a flat-rate, mileage-based user fee would be no more regressive than fuel taxes, which also take a greater percentage of income from low-income drivers. Some evidence suggests that high-income people are much more likely to drive on congested highways during peak periods than low-income people, so that congestion-based VMT charges might be more equitable, in relation to ability to pay, than fuel taxes. Low-income groups may also receive disproportionate benefits from less-dispersed land-use patterns, reduced noise, and reduced air pollution in urban areas that could be consequences of VMT charges (Schweitzer and Valenzuela 2004).

In a number of states and localities, sales taxes cover some highway costs. VMT charges are less regressive than sales taxes. VMT fees would also be much more closely connected to the costs each driver imposes on the highway system than general sales taxes.

II. Implementation of VMT Charges

Objections to a VMT System

VMT charges have some drawbacks. Enforcing VMT charges that vary by time or location may be considerably more costly than enforcing uniform charges. Also, some drivers may prefer uniform charges so that they would not need to reveal private information about when and where they travel. With uniform charges per mile it may still be possible to obtain some benefits of variable pricing if drivers receive discounts for traveling on roads or highways that are less congested or that cost less per vehicle mile to maintain.

Whether the new system used uniform or variable charges, a transition to charging for VMTs would be difficult to accomplish politically. Some voters would likely oppose electronic mileage fees because they are concerned that the government would misuse the information collected about when and where people drive, thus compromising personal privacy. People are also opposed to paying more for using highways when they are already paying fuel taxes. With a comprehensive system of electronic mileage charges, however, the government could drastically reduce or eliminate fuel taxes.

Considerable research has examined how a system of VMT charges could be structured to safeguard personal privacy (NSTIFC 2009, 151), and each of the VMT pilot projects implemented in the United States has sought to address privacy concerns (Puget Sound Regional Council 2008; NSTIFC 2009, 151). For example, VMT pilot programs in Oregon and Minnesota were "designed to make it impossible for the government to know where people drove or when" (O'Toole 2012b). The biggest concern is that charging drivers based on location would require that the fee collector have access to information about where and when each vehicle travels. Privacy concerns surround how that information would be recorded, who would physically own

and control it, and how the information would be communicated to the agency or company responsible for billing and collection.

One approach to preserving privacy is to use an onboard unit that calculates charges and accepts payment within the vehicle so that no location information is communicated outside the vehicle if payment is properly made (Grush et al. 2008). Only bulk charges due would be communicated to the administering organization (NSTIFC 2009, 151). The operating expenses of a system for calculating charges within each vehicle, however, may be too high for it to be a feasible approach. O'Toole (2012a) argues that by the time vehicle mile fees are implemented, advances in computer-processing power and data-storage technology will make it possible to install affordable GPS receivers in vehicles that can store up-to-date road-pricing information and calculate charges owed. With GPS, the satellite signal received is a one-way signal to the vehicle operator that someone outside the vehicle cannot track. Storing data inside the vehicle would preserve privacy if personal equipment included safeguards to prevent hacking and if detailed trip data could be fully and permanently deleted after payment. London's congestion pricing system works this way (NSTIFC 2009, 152).

Grush and Roth (2008) propose an alternative approach that would be more cost effective. It involves calculating prices outside the vehicle at a facility distinct from the billing office. This facility would turn trip data into an anonymous billing feed. The feed would be forwarded to a payment operator who would match the data in the billing feed to a prepaid or credit account. With the right incentives, the private sector could develop cost-effective technology that would preserve privacy while charging people based on when and where they drive.

Political acceptability may require giving drivers more than one option. If a cost-effective system of VMT charges requires external communication of travel information, drivers could opt

to use a system that only records miles traveled within a zone and charges a flat fee per mile instead of one that varies by time or location. To preserve privacy while accounting for some congestion costs, the government or private companies managing roads could charge every driver a flat fee per mile traveled while permitting additional fees to be charged on limited-access expressways that are equipped to electronically assess the tolls owed by each vehicle. Poole (2013) proposes such a dual system that uses traditional transponder technology on limited-access highways combined with uniform mileage-based user fees on other highways. In this case, the government or private managers could track those who choose to travel on limited-access highways, but everyone would have the option of using alternate routes to preserve their privacy.

If private firms owned or managed highways, those firms would have some incentive to maintain customer privacy, albeit possibly limited by pressure from government agencies that want access to their data. Unless enough people can be convinced that government agencies and others who might misuse their personal data could not access it, political acceptance of a system of VMT charges might require giving travelers an option to pay for their road use via an approach that does not require any monitoring of where and when they travel. Nevertheless, the discussion that proponents are already having about privacy is likely to lead to a system that maintains better security for personal VMT data than is the case with cell phone and credit card transaction data (NSTIFC 2009, 152).

Perceptions may be more important than facts in determining whether privacy concerns could keep a system of VMT charges from being politically acceptable. A University of Iowa field study to determine drivers' attitudes toward mileage-based road-user charges finds that drivers viewed auditing the accuracy of their bills to be more important than privacy so that most preferred a system that recorded detailed travel data to one that provided maximum

privacy protection (Hanley and Kuhl 2011). After participating in the two-year field study, most drivers had a positive attitude toward mileage-based user fees. Only 13 percent of participants thought a system that calculated their charges using detailed records of where and when they drove was undesirable. A transition period of several years during which the public could choose between VMT charges and gasoline taxes could help overcome some people's privacy concerns and give the implementing agency a chance to make adjustments that would make personal data more secure.

Another obstacle to implementing a system of VMT charges is that many voters would view it as a tax increase. Given governments' demand for revenue, they may not be inclined to eliminate the gasoline tax, even if they implement VMT charges. In order to make VMT proposals more acceptable to voters, political entrepreneurs may need to structure them to either tie the implementation of VMT charges to the reduction or elimination of gas taxes, or give drivers the option of switching to VMT charges in exchange for a rebate or exemption from paying fuel taxes. This exemption could be implemented by, for example, requiring motorists to pay or report the VMT charges they owe when they purchase fuel.

One advantage to implementing electronic user fees at the state or local level is that it would allow agencies to try different approaches, with competition between states favoring the eventual widespread adoption of the most efficient approach. Nevertheless, it is not clear that individual states acting alone would ever adopt VMT charging: enforcing fees on out-of-state drivers would be very difficult, and fraud could be a serious problem if only one or a few states adopt fees. In a recent survey, eight states' officials, many of whom support VMT charging, said they would not be inclined to implement such a policy themselves, but might be willing to do so along with other states as part of a larger system (Sorensen et al. 2009).

Comparing VMT Charges to Alternative Methods of Funding

VMT charges are just one alternative for promoting more efficient funding and management of highways. Among the alternatives that some states have considered and implemented are increasing the role of public–private partnerships (PPPs) and tolling interstate highways. Although some alternative approaches have improved mobility in a cost-effective way, each has problems and limitations.

A simpler approach than implementing VMT charges is to allow PPPs to manage some highways. The US Department of Transportation (DOT) has encouraged PPPs, and proponents point to them as examples of how highways could be built and maintained more efficiently. PPPs typically involve some combination of private and public financing that is at least partly supported by toll revenues. However, PPPs are created one highway at a time. In a system where drivers do not pay directly for the use of most roads and highways, it is challenging to cover all highway costs from toll revenues. When only a few highways charge tolls, drivers can choose an alternate route without tolls. This setup means it is only possible to earn enough toll revenues to cover costs in a few highly congested corridors. Furthermore, governments and toll authorities typically reserve the most financially viable projects for public development (Reinhardt 2011). Thus, many PPPs require continued government subsidies in order to be financially viable.

PPPs involve continued government ownership or funding of transportation and transportation infrastructure while contracting out service provision to private firms. Some evidence suggests that when private firms compete for the right to provide subsidized transit service, rather than using subsidies to pay more for inputs (as government often does), they are likely to pass subsidies on to passengers (Gómez-Ibáñez 1999). Public–private partnerships,

however, are not a panacea. Having the government contract with private firms creates a principle–agent problem between the government and the private partner. Because the private firm is accountable to the government and not to users, the government must monitor the firm to make sure it satisfies its contract. Failure of the government in its monitoring role could result in a worse outcome than if the government alone funded and managed the entire operation.

An alternative to PPPs is private ownership or management of highways, which could be sustainable with a system of VMT charges that applied to all highways in a given region. With tolls applied only to selected highways, revenue from each highway would be limited and inadequate in most cases as drivers take other roads and highways in order to avoid tolls. A comprehensive system of VMT charges could enable each highway to be self-supporting so that firms could own and manage highways themselves without government involvement.

If not varied from one road or highway to the next, VMT charges would have fewer advantages, but might still be preferable to fuel taxes because they could do the following:

- promote equity between drivers of different vehicles regardless of fuel type or fuel efficiency;
- maintain more predictable and stable revenues over time as vehicles become more fuel efficient;
- promote geographical equity by requiring drivers to pay in proportion to miles traveled in each political jurisdiction, rather than based on where they purchase their fuel.

If highway agencies used revenue from VMT charges to fund the specific highways on which they collected revenue, it would necessitate changes in mass-transit infrastructure funding. In recent years, the government has spent approximately 20 percent of federal fuel tax revenue on mass transit. If the level of VMT charges varied by time of day and location so as to reduce or

eliminate congestion in urban areas, demand for public transportation would increase and users would be willing to pay higher fares that would cover a greater share of operating and capital costs. Transit subsidies from the federal government could be replaced by a combination of higher fares and subsidies targeted at low-income transit users and financed by local governments. Since access to transit raises local property values, local tax financing of subsidies would be more equitable than state or federal government funding.

With marginal-cost pricing of highway capacity and of public transportation, the ways people travel in urban areas would undoubtedly be quite different than they are today. Although replacing gas taxes with VMT charges could raise commuting costs for many urban drivers and mass-transit users, it would reduce the amount of time and fuel wasted due to congestion. Marginal-cost pricing would give people an incentive to consider each travel decision they make and allocate scarce transportation resources to the uses people value most. It would also lead to more efficient choices of where to live in relation to one's place of employment.

How a Transition Might Come About

Although the transportation infrastructure could be more efficiently managed if it were privately owned, it is hard to imagine a way to achieve such a change through the political process. Too many interest groups would suffer losses from such a drastic change in property rights. Reducing or eliminating federal subsidies may be more politically feasible, and everyone would have a greater incentive to use resources efficiently if the federal government stopped subsidizing mass transit and highways. The most compelling case for continued transit subsidies is that those subsidies contribute to efficient resource allocation by giving people an incentive to substitute public-transit use for automobile use on congested urban freeways. Tolls on expressways or

VMT charges high enough to eliminate congestion during peak periods would give people adequate incentives to use transit without subsidies.

There may be some advantages to having the federal government, presumably through the DOT, spearhead a transition to electronic user fees. One of the biggest challenges in implementing electronic user fees is making sure that every vehicle is equipped with an on-board unit (OBU) to record its mileage. If all new vehicles contained OBUs, a transition to VMT charges would take at least 15 to 20 years, since that is how long it takes for newer models to replace the existing US vehicle fleet (Congressional Budget Office 2011).[1] Without the DOT mandating the installation of OBUs in all vehicles manufactured after a certain year, it is not clear how a state would be able to charge all drivers who use its roads regardless of their state of residence. Installation on such a large scale could bring the costs of OBUs down so that the cost of administering VMT charges would not be much higher than the cost of administering fuel taxes.

Any transition to user fees would involve political conflicts. A proposal to gradually implement user fees beginning with selected interstate highways raises equity issues and could lead to potentially high external costs as motorists switch to competing highways without fees. These problems explain why recent attempts to impose tolls on selected interstate highways, such as I-80 in Pennsylvania, generated intense political opposition (Benefield 2009).

Implementing VMT charges on all highways as a substitute for fuel taxes would be more equitable than imposing user fees on selected highways. During the transition period, motorists could choose between continuing to pay fuel taxes and switching to mileage charges. The costs per capita of such a transition might be lower if implemented nationally rather than state by state.

[1] This calculation is based on data showing that the average age of cars and light trucks in the United States was 10.2 years at the end of 2009 and that 4–7 percent of vehicles were scrapped each year from 1999 through 2009 (R. L. Polk and Co. 2010). If many people want to avoid having an OBU installed, the transition could take more than 20 years.

Also, it might not be necessary to mandate installation of OBUs. If the government raised fuel-tax rates before the transition so that expected VMT charges would be less than fuel taxes for most drivers, many would choose to install OBUs.

To avoid excessive complexity and to minimize implementation and enforcement costs, it may be more feasible to implement a uniform per-mile VMT charge within each political jurisdiction at first. Higher prices that account for congestion and more costly maintenance can be implemented separately; one approach, advocated by Poole (2013), would be to rebuild each interstate to satisfy 21st century design standards and then to begin tolling to compensate for the improved quality. This could include redesigning some old interchanges to meet current standards and adding truck-only lanes in major truck corridors.

The problem with a national transition led by the DOT, however, is that if the new system is ill conceived (for example, if it inadequately addresses privacy concerns), it might not be politically viable. Mistakes made in a large-scale, nationwide implementation would be much more costly than mistakes made by states experimenting with alternative funding approaches. Such approaches could include different mixes of private and public ownership and control of highways and different ways of collecting fees. The federal government could play an important role by establishing national standards for the devices used to record vehicle mileage and possibly by mandating the installation of devices in new vehicles. Otherwise, a better system would likely result if states or owners of private highways competed to find the most efficient way to monitor and charge highway users. Competition between states or private owners would also more likely result in systems that safeguard the privacy of drivers' travel information.

By establishing best practices for VMT and congestion-pricing technology, the DOT could make it easier for states to adopt an innovative approach to highway funding, which might

include privatization of some or all of the highway network. As part of setting standards, the DOT should recommend laws for protecting the privacy of travel data and options that would permit drivers to limit how much travel data they reveal to the agency or private company assessing the VMT charges. DOT researchers could also explore and promote best practices for the privatization of highways and transit infrastructure.

Another important role the DOT might play in this process would be to make sure that laws permit all Americans, including pedestrians and bicyclists, to continue to access the places they want and need to travel to. With the possible exception of modest subsidies for low-income mass-transit users and for maintaining some lightly traveled rural roads, access rights could be maintained and mobility could be enhanced if private firms or the government funded transportation infrastructure with revenue from market prices paid by drivers and transit riders.

Ideally, local governments or private firms would have the freedom to set a low or no price per mile on local roads and streets that they manage, and recoup the cost from users through other means such as increased retail sales or a fixed periodic fee. Private or local ownership would work better in a system where VMT charges vary depending on who owns or manages each road. Nevertheless, even with VMT charges that are the same for each mile traveled in a state, state governments could contract with private firms or local governments, which could manage specific local roads and have the option to offer residents and shoppers rebates for the miles they travel on those roads.

Summary and Conclusions

In light of the financial crisis facing the federal government and many state governments, exploring new ways of funding transportation through direct user charges makes sense, whether

they are mileage fees on highways or unsubsidized fares for mass transit. People demand transportation services and would be willing to pay the cost of those services even if the government did not subsidize them.

Without subsidies, user charges high enough to cover marginal costs would have the desirable effect of allocating scarce transportation inputs to their most urgent uses. Entrepreneurs would be motivated to expand supply in some areas and reduce it in others, and the traveling public would be motivated to limit its use of those inputs, whether they are space on highways or seats on buses, trains, or commuter vans. Another benefit of user charges would be that drivers could reach their destinations more quickly with less congestion along the way.

Fuel taxes worked reasonably well for funding highways during most of the 20th century. But growing traffic congestion, along with declining real revenues as vehicles have become more fuel efficient, has revealed the inadequacies of fuel taxes as a way to charge drivers for highway usage. A better approach, if transactions costs are low enough, is for drivers to pay in proportion to the miles they drive with pricing varying according to where and when they drive and how much damage their vehicles cause to road surfaces. This approach would provide better incentives to consider relative scarcity in decisions about where and when to drive and where to live and work.

Changing technology is lowering transaction costs, making vehicle-mile charges much more feasible than they were in the past. Implementing them would have major impacts on the distribution of rents, and thus interest groups and bureaucrats who would lose from the changes can be expected to exert political pressure to resist them and support status quo methods of funding highways. If the federal or state governments implement VMT charges, all kinds of options will open up for funding transportation more efficiently, including a transition to at least partially private ownership and management of roads and highways.

With the interstate highway system complete, there is much less reason for continued federal funding and regulation of highways and mass transit. Although the DOT might play a central role in implementing a transition to mileage fees, once those fees are in place, its role in funding surface transportation could be drastically reduced or eliminated. Implementing a system of VMT charges as part of a decentralized approach to funding transportation infrastructure could facilitate a more efficient transportation system while permitting everyone the freedom to use the mode of transportation they prefer.

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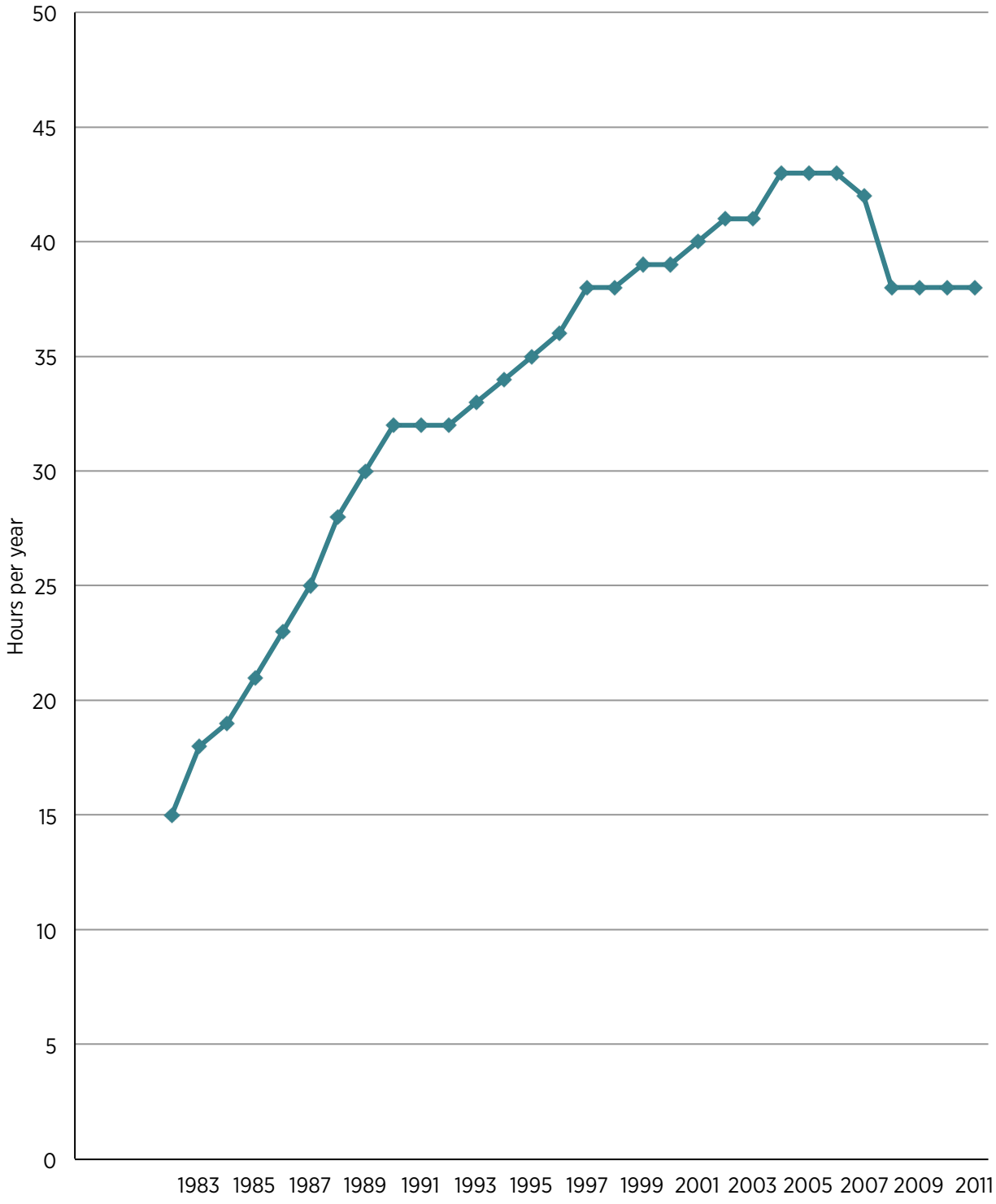
Annual Hours of Delay per Urban Commuter, 498 US Metro Areas



Source: David Schrank, Bill Eisle, and Tim Lomax, table 9: Congestion Trends—Wasted Hours (Yearly Delay per Auto Commuter, 1982 to 2011). In *2012 Urban Mobility Report*. College Station, TX: Texas A&M Transportation Institute, December 2012.