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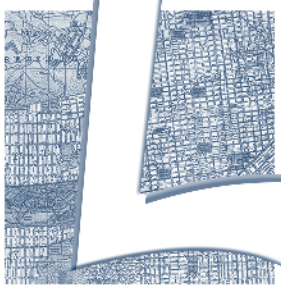

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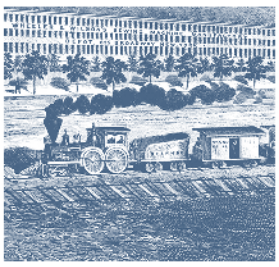

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University of California Center on Economic Competitiveness in Transportation

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CONTENTS

ACCESS Magazine reports on research at the University of California Transportation Center and the University of California Center on Economic Competitiveness in Transportation.
The goal is to translate academic research into readable prose that is useful for policymakers and practitioners. Articles in *ACCESS* are intended to catapult academic research into debates about public policy and convert knowledge into action.

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GREATEST HITS

Prior to the recent explosion of digital access to individual songs, greatest hits albums were a staple of the music industry. An artist with enough successful albums under his or her belt could repackage the best songs on each previous album into a greatest hits collection, which often then became a bestseller itself.

Here at *ACCESS*, we have more than a few successful issues under our collective belt, so many that our first greatest hits album even has a theme: Transportation Finance. While it was hard to narrow down, the six articles we chose for this *ACCESS* Finance Special Issue collectively consider creative approaches emerging in California and elsewhere to address our mounting financial challenges in transportation.

In the pages that follow, we consider the transition from motor fuel taxes to road user fees, the latter of which can both generate revenues and smooth traffic flows. We learn why the gradual expansion of road user fees poses significant political challenges, and what might be done to manage them. We examine the equity implications of these new fees, and how they compare to the increasingly popular dedicated sales taxes for transportation. We also explore the rise of these dedicated sales taxes and what they mean for the future of transportation systems. At a more local level, we examine how variable prices manage parking demand and generate revenues in San Francisco. And finally, we look at a case study of public-private partnerships as a means to finance road projects.

So like that greatest hit by the O'Jays, this *ACCESS* is all about...money, money, money, money...money.

Brian D. Taylor
Professor of Urban Planning
Director, Institute of Transportation Studies
Director, Lewis Center for Regional Policy Studies
UCLA Luskin School of Public Affairs

From Fuel Taxes to Mileage Fees

PAUL SORENSON

For much of the past century, federal and state taxes on gasoline and diesel have provided the majority of funding for US highway construction and maintenance. Fuel taxes perform well in this role: they distribute the tax burden among drivers in rough proportion to their use of the road network, are inexpensive to administer, and offer a modest incentive to buy and drive fuel-efficient vehicles.

Because the federal government and most states tax fuel on a cents-per-gallon basis, the tax rates must be periodically hiked to keep pace with inflation and increased fuel economy, a difficult political task in recent decades. Consequently, fuel tax rates have stagnated, leading to reductions in real (inflation-adjusted) revenue per vehicle mile of travel (VMT).

More stringent fuel economy standards and increased use of alternative fuels are expected to accelerate the erosion of fuel tax revenue in the coming years. Figure 1 traces the trajectory of federal fuel tax revenue if current tax rates, last increased in the early 1990s, are left unchanged through 2035. In short, nominal fuel tax revenue (unadjusted for inflation) will flatten, real fuel tax revenue will decline by over 40 percent, and real fuel tax revenue per VMT will decline by almost 60 percent.

This same concern applies to state fuel taxes. Together, federal and state fuel taxes currently provide around $70 billion in highway funding each year, accounting for about half of the nation's budget for road expenditures. A 40 percent decline in real revenue thus translates to tens of billions of dollars per year.

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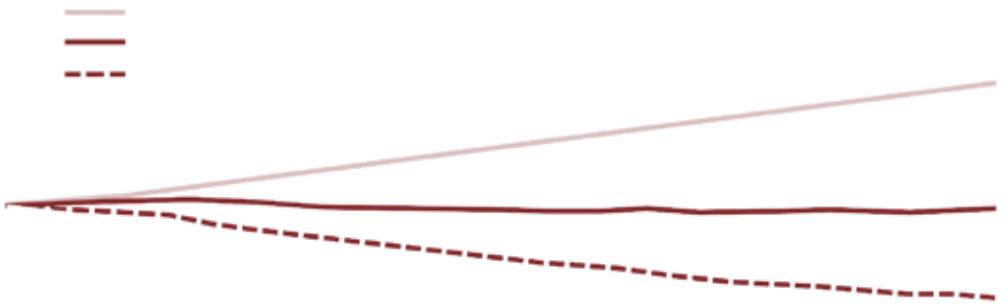

FIGURE 1
Potential Erosion of Federal Fuel Tax Revenue

Based on the Energy Information Administrartion's 2012 Annual Energy Outlook, with assumed inflation of 2.5 percent per year

THE ALLURE OF MILEAGE FEES

Current and projected revenue challenges have prompted growing interest in a transition from taxing fuel to taxing miles of travel. Mileage fees, also known as mileage-based user fees or VMT fees, promise more stable revenue than fuel taxes and allocate the tax burden in proportion to travel with greater precision. Tied to travel rather than fuel consumption, the revenue stream is immune to changes in fuel economy or even fuel type. Mileage fees must still be increased periodically to account for inflation, but the increases need not be as frequent or as large as with fuel taxes. Alternatively, mileage fees can be indexed for inflation when the program is first established.

Fuel taxes can be indexed as well, though the indexing should account for both inflation and fuel economy improvements. With much more stringent federal fuel economy standards planned in the coming years, however, the distribution of the fuel-tax burden will become increasingly regressive; owners of newer vehicles with higher fuel economy will pay much less per mile, while owners of older and less efficient vehicles will pay more. The introduction of alternative fuels further complicates matters. Already, electric vehicles and natural gas vehicles can be recharged or refueled at home, and the same may be true of hydrogen fuel-cell vehicles at some point. Unless the fuel-tax collection regime can be extended to cover at-home refueling, a far more complicated task than collecting gasoline and diesel taxes at the wholesale level, such vehicles will be subject to no fuel taxes whatsoever.

In addition to more stable revenue and more precise allocation of the tax burden in proportion to travel, a mileage-fee system can be designed to provide a range of compelling advantages.

Value-added motorist services. One option for implementing mileage fees involves the use of in-vehicle devices with GPS and wireless communications. This equipment can also host a range of apps offering drivers greater convenience, safety, and opportunities to save money. ▶

Obvious examples include pay-as-you-drive insurance, automated payment of parking fees and tolls, real-time routing assistance, and alerts to safety hazards.

Better data for planning and operations. A system of mileage fees can also generate a steady stream of detailed (and anonymized) travel data, including traffic volumes and speed across all links of the network. Transportation departments can use these data to manage the transportation system in real time and to allocate additional investments where they are most needed.

Greater efficiency. Per-mile fees can be structured to vary according to time, location, and vehicle emissions class and weight, incentivizing travel decisions and vehicle choices that reduce traffic congestion, air pollution, and excessive road wear. For many observers, this represents the most persuasive argument for shifting to mileage fees. One form of variable fees—congestion pricing—has proven highly effective at reducing congestion. At present, however, congestion pricing applications involve significant technology development efforts and are limited to specific facilities or to small urban cores surrounded by a cordon ring of enforcement gantries. Under a mileage-fee system, with no additional expense, congestion pricing can be easily extended to cover all congested routes within a region, with the per-mile price potentially varying by both time and specific route to optimize overall traffic flow.

That said, the ability to implement congestion pricing, or any other form of variable fee, is not generally viewed as a selling point for building public acceptance. Most planning efforts have therefore assumed that a mileage-fee system will begin with a flat per-mile rate. Once the system is in place, local jurisdictions will then have the option of altering the fee structure to implement various forms of congestion tolls or other forms of pricing.

Other revenue mechanisms such as sales taxes, general fund transfers, fuel tax increases, or facility tolls are also viable for increasing funding for transportation. Only mileage fees, however, offer all of the benefits outlined above.

INCREASING INTEREST IN MILEAGE FEES

Mileage fees have attracted great interest abroad, leading to studies, trials, and fully implemented programs. Several European countries have established weight-distance tolls for commercial trucks, a variation on mileage fees that incorporates truck weight or axle weight in the fee structure. New Zealand instituted mileage fees for diesel-fueled trucks and passenger cars. The Netherlands conducted extensive planning for a kilometer-based road use charge that would apply to all vehicles, though a change in government stalled implementation.

Though mileage fees have yet to be implemented in the United States, interest is accelerating. Trials have been conducted in Oregon, Minnesota, and the Puget Sound region, while the University of Iowa staged trials involving participants in 12 cities across the country. Colorado, Nevada, Texas, Washington, and member states in the I-95 Corridor Coalition have studied the concept or are considering their own trials. New York City's planned DriveSmart initiative envisions the deployment of sophisticated in-vehicle equipment that would initially focus on value-added services and could later be used to levy mileage fees. Oregon and New York have also conducted trials or studies looking at the automation of existing weight-distance truck tolls.

Just as Oregon was the first state to levy motor fuel taxes to fund highways in the early 20th century, it is now poised to lead the nation in implementing mileage fees. The Oregon Department of Transportation recently tested a fully-functional mileage-fee system in late 2012. Based on the results, state legislators passed legislation in the summer of 2013 that will allow up to 5,000 Oregon drivers, on a voluntary basis, to pay a 1.5 cents per-mile fee in place of the state's 30 cents per-gallon fuel tax beginning in 2015. If successful, the switch to mileage fees may eventually become mandatory for all vehicles. ▶

LESSONS FROM THE FRONT LINES

Programs in Europe and New Zealand demonstrate the technical feasibility of mileage-based taxation. Evidence from these programs suggests that drivers will modify their travel choices in response to the incentives in the per-mile pricing structure. In the German TollCollect program, for example, the newest and least polluting trucks qualify for a 50 percent discount on the per-kilometer rate. This has led to an extremely rapid turnover among truck fleets.

At the same time, experience from recent US trials make it clear that mileage fees involve a range of challenges and uncertainties:

System requirements. Policymakers must decide what functions mileage fee systems should support, such as varying fees by location and time of travel, providing value added motorist services, or offering various forms of privacy protection.

Technical design. A mileage-fee system must provide mechanisms to meter mileage, collect fees, prevent evasion, and protect privacy. There are numerous technical design options, each with different functionalities, levels of privacy protection, and costs of implementation and administration. For example, mileage fees based on annual odometer readings eliminate the cost of in-vehicle equipment and reduce privacy concerns, but might entail higher labor costs to conduct the readings. Mileage fees based on sophisticated in-vehicle equipment can enable location-based mobility apps, but may engender privacy concerns and increase the system's capital costs. If different states choose different technical options, the systems should be interoperable—that is, able to collect and apportion fees for interstate travel.

Institutional structure. Appropriate institutional roles for government agencies and the private sector also need to be defined. Should the private sector be viewed solely as the source for technology procurement or should it also have a role in managing accounts and collecting revenue on behalf of the government?

Drivers will modify their travel choices in response to the incentives in the per-mile pricing structure.

THE CORE CHALLENGES OF COST AND PUBLIC ACCEPTANCE

Many of the issues and uncertainties above can be resolved with thoughtful planning and engineering. Two fundamental obstacles, however, bring into question the wisdom and viability of replacing fuel taxes with mileage fees: cost and public acceptance.

Fuel taxes are collected from fewer than 2,000 fuel wholesalers around the country and passed along to consumers in the retail price of gasoline and diesel. They are cheap to administer, typically costing about 1 percent of revenue. Mileage fees, by contrast, involve collecting taxes from millions of drivers, a much more complicated endeavor. This raises a legitimate concern that the advantages of mileage fees will be outweighed by the increased cost of collecting them. Recent evidence and modeling suggests that costs as a share of revenue could be around 5 or 6 percent, though earlier estimates have been even higher. Yet even with higher administrative costs, mileage fees are likely to yield far more net revenue over the coming decades than fuel taxes, given shifts toward higher fuel economy and alternative fuels.

Polls, however, indicate that current support for the concept of mileage fees is dismal. In fairness, other revenue options such as increasing fuel taxes also poll poorly. But mileage fees pose additional public acceptance challenges, such as fears of privacy invasion and low public trust in government.

When people hear about mileage fees, especially in conjunction with GPS-based metering, many think, "The government will be able to track where and when I drive, and I don't like it." New taxes and fees of any type are always a difficult political sell and it will be critical to assure the public that mileage-metering devices will be fair and secure.

ADDRESSING PUBLIC CONCERNS

Planners and elected officials interested in mileage fees are well aware of the significant hurdles posed by high system costs and low public support, and have responded with considerable ingenuity. Earlier trials focused on demonstrating the technical feasibility of alternate mileage-fee implementation mechanisms. More recent efforts, in contrast, have explored innovative strategies aimed at overcoming cost and public acceptance challenges. Taking stock of recent trials and initiatives in the US, several broad themes emerge.

Proactively building support. Support for mileage fees appears to rise with greater familiarity and understanding. In the University of Iowa trials, the share of participants who viewed mileage fees favorably increased from 40 percent before the trials to 70 percent afterwards. Recent polling by the Mineta Transportation Institute indicates that support for mileage fees also increases when voters understand how the revenue will be allocated.

Building on the recognition that greater familiarity with mileage fees often translates to greater support, both Oregon and Minnesota included elected officials as participants in their recent mileage-fee trials. Another way to build support is to convene a diverse stakeholder taskforce to identify concerns and provide input on design principles and policy decisions. Minnesota, for example, included a member of the American Civil Liberties Union on its exploratory mileage-fee taskforce to help ensure that privacy concerns are properly addressed.

Providing drivers with choices. Recognizing that personal preferences vary, mileage-fee planners in Oregon have designed the system to allow drivers to choose among different options for metering mileage, paying fees, and protecting privacy. Drivers with strong privacy concerns, for example, can opt for a simple metering device that tallies only total mileage. Other drivers may prefer a GPS-equipped device that supports a greater range of value-added services and exempts fees for miles traveled out of state or on private roads. For those who remain steadfastly opposed to mileage fees, however metered, Oregon plans to provide drivers with an additional option of paying a fixed annual fee instead of paying by the mile. To avoid adverse selection, the fixed fee assumes high annual mileage.

The Minnesota trials also provided participants with the option of metering total miles based on odometer readings or miles by time and location using a GPS-equipped smartphone app. Drivers using the smartphone app qualified for discounts on the per-mile fees for travel in rural areas or during off-peak hours, and paid no fees for out-of-state travel.

Fostering private sector competition and ingenuity. There are also several potential advantages to designing a system under which multiple firms are licensed to collect fees and provide metering devices. Much like smart phones, in-vehicle metering devices can support a range of mobility apps. Some of these, such as pay-as-you-drive insurance or automated parking fee payment, create additional revenue flowing through the system. Competition among firms can drive down costs and stimulate innovation in value-added services, while the revenue from additional paid services will reduce the cost borne by the public sector for collecting mileage fees. ▶

Because many firms already provide in-vehicle equipment that offers all manner of motorist services, it isn't necessary to reinvent the wheel. Oregon has developed open standards so that firms can modify existing devices and have them certified for metering and assessing mileage fees.

Starting small. Switching from fuel taxes to mileage fees will be enormously challenging, so recent planning efforts have started small and moved slowly. Oregon, for example, initially planned to levy mileage fees for any vehicle rated at 55 miles per gallon equivalent or higher, most of which are battery and plug-in hybrid vehicles. Texas also considered legislation to levy mileage fees on electric vehicles. Based on focus-group research, the notion that all drivers should pay their fair share resonates, and there aren't enough electric vehicle owners to mount strong opposition. Some are concerned that this approach will slow sales of electric vehicles, but current government tax credits and subsidies for electric vehicle purchases greatly exceed what one might expect to pay in mileage fees.

Another approach is to establish a system in which drivers can voluntarily switch to mileage fees. The intent, however, is not to increase revenue in the near term; rather, it is to demonstrate through the engagement of willing drivers that the system works before transitioning to mileage fees for all vehicles. Oregon adopted this approach, and New York City's planned DriveSmart initiative embodies this concept as well.

Developing a multi-jurisdictional system. A final idea being pursued in Oregon, and also explored by the I-95 Corridor coalition and in the University of Iowa trials, is to create a system that can accommodate multi-jurisdictional mileage fees. This enables either a multi-state or a national system, and it also allows localities to levy their own fees on top of state or federal fees. The net effect is to apportion fixed system costs across a larger number of drivers and increase total revenue flowing through the system, in turn reducing administrative costs as a share of revenue.

WHAT COMES NEXT?

The prospect of a broad transition to mileage fees in the United States remains uncertain. Many of the efforts described here are still ongoing, and it is too early to evaluate their cost and effectiveness. As fuel tax revenue continues to decline, however, interest in a more stable source of highway funding is increasing. With the shortfalls in transportation funding, the success of distance-based road pricing in other countries, and the advances in supporting technologies, future prospects for mileage fees are surely greater than what current public opinion polls suggest. ◆

Originally published in Issue 43, Fall 2013

This article is adapted from *Mileage-Based User Fees for Transportation Funding: A Primer for State and Local Decisionmakers*, originally published by the RAND Corporation.

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SF*park*: Pricing Parking by Demand

GREGORY PIERCE AND DONALD SHOUP

In 2011, San Francisco adopted the biggest price reform for on-street parking since the invention of the parking meter in 1935. Most cities' parking meters charge the same price all day, and some cities charge the same price everywhere. San Francisco's meters, however, now vary the price of curb parking by location and time of day.

SF*park*, San Francisco's new pricing program, aims to solve the problems created by charging too much or too little for curb parking. If the price is too high and many curb spaces remain open, nearby stores lose customers, employees lose jobs, and governments lose tax revenue. If the price is too low and no curb spaces are open, drivers who cruise to find an open space waste time and fuel, congest traffic, and pollute the air.

In seven pilot zones, San Francisco installed sensors that report the occupancy of each curb space on every block, and parking meters that charge variable prices according to the time of day. In response to the observed occupancy rates, the city adjusts parking prices about every two months. ▶

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Consider the prices of curb parking on a weekday at Fisherman's Wharf, a tourist and retail destination (Figure 1). Before SF*park* began in August 2011, the price was $3 an hour at all times. Now each block has different prices during three periods of the day—before noon, from noon to 3 pm, and after 3 pm. By May 2012, prices on almost every block had decreased for the period before noon and increased between noon and 3 pm. Most prices after 3 pm were lower than during mid-day, but higher than in the morning.

FIGURE 1

Weekday Parking Prices at Fisherman's Wharf, May 2012

(A) Before Noon
(B) Noon to 3pm
(C) After 3pm

SF*park* bases these price adjustments purely on observed occupancy. Planners cannot reliably predict the right price for parking on every block at every time of day, but they can use a simple trial-and-error process to adjust prices in response to occupancy rates. This process of adjusting prices based on occupancy is often called performance pricing. Figure 2 illustrates how nudging prices up on crowded Block A and down on under-occupied Block B can shift a single car to improve the performance of both blocks.

Beyond managing the on-street supply, SF*park* helps to depoliticize parking by setting a clear pricing policy. San Francisco charges the lowest prices possible without creating a parking shortage. Transparent, data-based pricing rules can bypass the usual politics of parking. Because demand dictates the prices, politicians cannot simply raise them to gain more revenue.

DID SF*PARK* MOVE PARKING OCCUPANCY IN THE RIGHT DIRECTION?

After several years of planning, the San Francisco Municipal Transportation Authority (SFMTA) launched SF*park* in April 2011 by installing new parking meters and extending or removing the time limits on curb spaces. The pilot program covers seven zones that contain 7,000 metered curb spaces. The initial prices in each zone were simply carried over from the previous, uniform pricing scheme. Under the new SF*park* program, most meters operate daily from 9 am to 6 pm, with prices that vary by the time of day and between weekdays and weekends. SFMTA established the desired target occupancy rate at between 60 and 80 percent for each block. If the average occupancy on a block for a given period falls in this range, the price will not change in the following period. San Francisco's pricing policy is thus data-driven and transparent, while most other cities' pricing policies are political and opaque. ▶

FIGURE 2

Performance Prices Balance Occupancy on Every Block

In setting a target occupancy rate, SF*park* has two goals: to make curb parking readily available, and to ensure that curb parking accommodates as many customers as possible for the adjacent businesses. These two goals conflict because when meter rates increase to encourage one or two open spots per block, the higher prices also reduce average occupancy.

For example, large groups gathering at a restaurant may generate exceptionally high parking demand on a block on some days, so cities cannot aim for a consistently high occupancy rate of 80 to 90 percent without often reaching 100 percent occupancy, which produces unwanted cruising. A lower average occupancy, however, means fewer customers. San Francisco set the target occupancy rate at between 60 and 80 percent to cope with the random variation in parking demand and to balance the competing goals of reliable availability and high occupancy. If SF*park* works as intended, prices will move occupancy rates toward this target range.

During its first two years, SF*park* adjusted prices 11 times on each block for three different periods during the day. Prices increased in 31 percent of the cases, declined in 30 percent, and remained the same in 39 percent. On average, prices declined in the morning and increased in the midday and afternoon. The average price fell 4 percent, which means SF*park* adjusted prices up and down according to demand without increasing prices overall.

Because occupancy rates have moved toward the target goals, the share of blocks needing no price adjustment has slowly increased since the program began. By August 2013, after the program had been operating for two years, 62 percent of blocks were in the target range. Altogether, a third of all the blocks that had been over- or under-occupied at the beginning of SF*park* had shifted into the target occupancy range.

We can use an example of parking prices and occupancy rates on Chestnut and Lombard Streets in the Marina District to show the effects of SF*park*. In July 2011, these parallel streets had the same meter rate ($2 an hour) but very different occupancy rates. All five blocks of Chestnut were over-occupied (above 80 percent); of the five blocks on Lombard, two were under-occupied (below 60 percent), and three were in the target range (60 to 80 percent). What would it take to shift a few cars from the over-occupied blocks on Chestnut to the under-occupied blocks on Lombard?

Figure 3 shows the path of average prices and occupancy on the five blocks of Chestnut and Lombard Streets from 3 pm until 6 pm. In response to the over- and under-occupancy, SF*park* began to increase the prices on Chestnut and reduce them on Lombard. After 10 price changes in two years, the average price on Chestnut had climbed by 75 percent to $3.50 an hour; on Lombard it had fallen by 50 percent to $1.00 an hour. As prices diverged, occupancy rates converged within the target range.

Figure 4 shows the parking prices on each block in April 2013. Between Pierce and Scott Streets, for example, the price on Chestnut was $3.50 an hour, and just a block away the price on Lombard was only 50 cents an hour, yet both blocks were in the target occupancy range. Parking spaces so close together would seem close substitutes for each other, but the huge price differences reflect very different local demand patterns. ▶

FIGURE 3

Average Parking Prices and Occupancy Rates on Chestnut and Lombard Streets, 3pm to 6pm

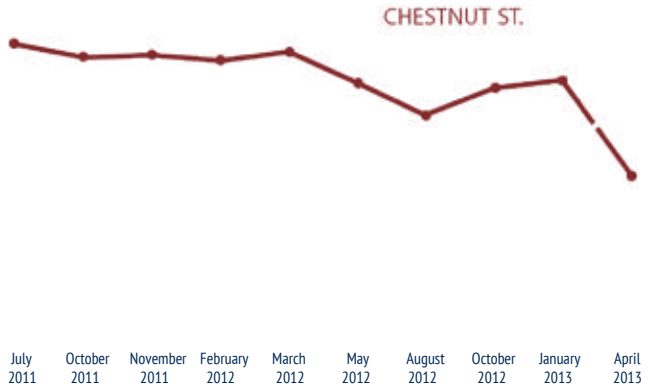

FIGURE 4

Parking Prices on Chestnut and Lombard Streets, April 2013, 3pm to 6pm

PRICE ELASTICITY OF DEMAND

Before each price change, SF*park* publishes data on the occupancy and prices for all curb spaces in the pilot zones. The price elasticity of demand measures how these price changes affected occupancy rates. Economists define price elasticity as the percent change in the occupancy rate (the quantity of parking demanded) divided by the percent change in the meter price. For example, if a 10 percent price increase leads to a 5 percent fall in occupancy, the price elasticity of demand is –0.5 (–5% ÷ 10%).

We calculated the elasticity of demand revealed by all the price changes during SF*park*'s first year. For each price change, we compared the old price and average occupancy to the new price and average occupancy during the following period. We thus have 5,294 elasticity measurements, one for each price change during the year at each time of day at each location.

The average price elasticity of demand was −0.4, but when we plot the elasticity for individual price changes at the block level, we find astonishing variety. Figure 5 shows the distribution of the price elasticities calculated for 5,294 individual price and occupancy changes on 1,492 city blocks.

The wide range of price elasticities suggests that many variables other than price affect parking demand. Higher prices should reduce occupancy, and lower prices should increase occupancy. In many cases, however, occupancy either rose after prices rose or fell after prices fell. Higher prices do not cause higher occupancy, and lower prices do not cause lower occupancy, so other factors must have overwhelmed the effects of prices on occupancy in the cases of positive price elasticity.

The wide range of elasticity at the block level also suggests that the circumstances on individual blocks vary so greatly that planners will never be able to estimate an accurate elasticity to predict the prices needed to achieve the target occupancy for every block. Instead, the best way to achieve target occupancy is to do what SF*park* does: adjust prices in response to the observed occupancy. This trial-and-error method mirrors how other markets establish prices, so it should work in the market for on-street parking.

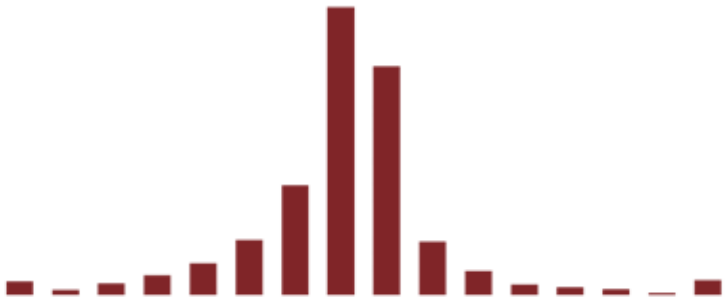

FIGURE 5

Distribution of Elasticities for 5,294 Price changes

EQUITY IN PERFORMANCE PRICING

While it is clear that performance parking prices can improve transportation efficiency, are they fair? In San Francisco, 30 percent of households do not own a car, so they don't pay anything for curb parking. How the city spends its parking revenue also affects the equity implications of charging for parking. San Francisco uses all its parking meter revenue to subsidize public transit, so automobile owners subsidize transit riders. SF*park* will further aid bus riders by reducing traffic caused by drivers cruising for underpriced curb parking.

Performance pricing is not price discrimination because all drivers who park on the same block at the same time pay the same price. Performance pricing is also not the same as maximizing revenue. Because demand was, on average, inelastic, the city could increase revenue by charging higher prices. However, SF*park*'s goal is to optimize occupancy, not to maximize revenue, and the average price of parking fell by 4 percent during SF*park*'s first two years.

THREE SUGGESTED IMPROVEMENTS

Our findings suggest three ways to improve SF*park*: (1) refine the periods of operation, (2) shift from reaction to prediction in setting prices, and (3) end the abuse of disabled placards.

Refine the time periods

Most meters stop operating at 6 pm, so anyone who arrives at 5 pm and pays for one hour can park all night. Drivers who park during the evening thus have an incentive to arrive during the last hour of meter operation while a few open spaces are still available. Since SF*park* sets the price to achieve an average target occupancy for the period from 3 to 6 pm, a price can be too high at 4 pm (and occupancy too low) but too low at 5 pm (and occupancy too high). ▶

One way to solve this problem is to operate the meters in the evening for as long as they are needed to achieve the optimal occupancy. Free parking after 6 pm is a holdover from the days when meters had one- or two-hour time limits to increase turnover during the daytime. Most businesses closed by 6 pm, so parking turnover was not needed in the evening. Today many businesses remain open after 6 pm, so the old rationale for free parking in the evening no longer applies. The purpose of metering in the evening is to prevent shortages, not to create turnover.

Because the occupancy sensors and parking meters are already in place for the pilot program, it seems unwise to cease operating at 6 pm simply because the old meters did. If, during the day, SF*park* reduces cruising, congestion, traffic accidents, energy waste, air pollution, and greenhouse gases, San Francisco can incrementally extend metering to additional evening hours when it will provide similar benefits. SF*park* has not increased curb parking prices overall, so the major benefit is better parking management, not more revenue from the existing meters. Nevertheless, more revenue can come from installing more meters and extending meter hours. In 2013, for example, the city extended meter operation to include Sundays, so SF*park* increased meter revenue without increasing the average meter rates.

Taking this process to its logical end, SF*park* can refine its pricing strategy to fit the demand on specific blocks at different times of the day across different days of the week. Narrowing the pricing windows to meet varying demand will increase the program's efficiency.

SF*park*'s goal is to optimize occupancy, not to maximize revenue.

Shift from reaction to prediction

The wide range of occupancy changes after each price change shows that many factors other than prices affect parking demand. Therefore, basing the next period's parking prices only on the previous period's occupancy rates will not reliably achieve occupancy goals. For example, SF*park* should not increase prices in January because occupancy rates were high during the Christmas shopping season. Seasonal adjustments based on occupancy rates in previous years may greatly improve the program's performance.

By shifting from reaction to prediction when adjusting prices, SF*park* may be able to get closer to target parking occupancy rates. Like hockey players who skate to where the puck will be, SF*park* can price parking based on future demand, not simply on past occupancy.

End the abuse of disabled placards

Abuse of disabled parking placards helps explain why occupancy does not reliably respond to price changes. Because California allows all cars with disabled placards to park free for an unlimited time at parking meters, higher prices for curb parking increase the temptation to misuse disabled placards to save money. Higher prices at meters may therefore drive out paying parkers and make more spaces available for placard abusers. If so, disabled placard abuse will reduce the price elasticity of demand for curb parking.

Placard abuse is already rampant in California. A survey of several blocks in downtown Los Angeles in 2010, for example, found that cars with disabled placards occupied most of the curb spaces most of the time. For five hours of the day, cars with placards occupied all the spaces on one block. The meter rate was $4 an hour, but the meters earned an average of only 28 cents an hour because cars with placards consumed 80 percent of the meter time. Drivers using disabled placards were often seen carrying heavy loads between their cars and the adjacent businesses.

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Reforms in other states show how California can prevent placard abuse at parking meters. In 1995, Michigan adopted a two-tier placard system that takes into account different levels of disability. Drivers with severe disabilities receive special placards allowing them to park free at meters. Drivers with less severe disabilities receive ordinary placards and must pay at meters. Before this reform, Michigan had issued 500,000 disabled parking placards allowing all users to park free at meters. After the two-tier reform, only 10,000 people (2 percent of the previous placard holders) applied for the special placards that allow free parking at meters. Enforcement is simple because any able-bodied driver who misuses the distinctive severely-disabled placard is conspicuously violating the law. Illinois adopted a similar two-tier placard law in 2013.

How will ending placard abuse affect SF*park*? If reform reduces placard abuse at meters, more spaces will open up for paying parkers. SF*park* will then reduce prices to increase occupancy, but all the new parkers will pay for the spaces they occupy, so parking revenue will probably increase. The lower prices, higher revenue, and greater availability of curb spaces will benefit almost everyone except placard abusers.

CONCLUSION: A PROMISING PILOT PROGRAM

SF*park* is a pilot program to examine the feasibility of adjusting prices to manage parking occupancy, and it appears largely successful. Los Angeles has already adopted a similar program called LA Express Park, and other cities are watching the results. After drivers see that prices can decline as well as increase, they may appreciate the availability of open curb spaces and learn to use the pricing information to optimize their parking choices for each trip. What seemed unthinkable in the past may become indispensable in the future.

With performance parking prices, drivers will find places to park their cars just as easily as they find places to buy gasoline. But drivers will also have to think about the price of parking just as they now think about the prices of fuel, tires, insurance, registration, repairs, and car purchases. Parking will become a part of the market economy, and prices will help manage the demand for cars and driving.

If SF*park* succeeds in setting prices to achieve the right occupancy for curb parking, almost everyone will benefit. Other cities can then adopt their own versions of performance parking prices. Getting the prices right for curb parking can do a world of good. ◆

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This article is adapted from "Getting the Prices Right: An Evaluation of Pricing Parking by Demand," originally published in the *Journal of the American Planning Association*.

Just Road Pricing

LISA SCHWEITZER AND BRIAN TAYLOR

Economists have long advocated road pricing as an efficient way to reduce congestion and improve the environment. Many critics, however, object to road pricing on the grounds that it unfairly burdens low-income drivers. Implicit in these objections is the idea that existing transportation finance methods burden the poor less, or at least spread the burden more fairly. Most of the equity concerns about road pricing stem from the fact that it is regressive; that is, poorer people spend a larger share of their incomes on tolls than do wealthier people. But in the US, road systems are financed primarily through fuel taxes, vehicle registration fees, property taxes, and, increasingly, sales taxes—all of which are also regressive. Thus the relevant question is not simply whether road pricing is regressive, or even if it will burden the poor. The relevant question is whether road pricing will burden the poor *more* than other ways of paying for roads.

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This question of road pricing's fairness is particularly important now because traditional sources of revenue for transportation infrastructure are drying up. Travel is increasing (as are concerns about its social and environmental costs) but the buying power of fuel taxes has been declining for decades. Governments have responded to these funding shortfalls in a number of ways. Some have borrowed money to finance new roads, and some have started tolling roads. Many, however, have turned to general taxes, especially sales taxes, which have proven popular among voters and elected officials. Why are sales taxes, unlike other taxes, so popular? Sales taxes are automatically collected a few cents at a time from all consumers, and are hidden in a large number of transactions. So with sales taxes, unlike property or income taxes, it is almost impossible for residents to see how much they pay over the course of a year. The ease and relative opacity of the sales tax are keys to its ubiquity. Sales taxes also make it easy for cities and counties to shift part of the tax burden onto visitors who spend money in the taxing jurisdiction—the strategy cleverly described by the Monty Python comedy troupe as "taxing foreigners living abroad." But the fact that sales taxes are popular doesn't make them inherently fair or effective. ▶

FOR WHOM THE ROAD TOLLS

We should begin by defining some terms. Arguing that a policy proposal is "fair" assumes that fairness has a set definition, which of course it does not. Fairness is often in the eye of the beholder; what is consummately fair by one definition might be intolerably unfair by another. One common way to measure the fairness of a tax is to ask if it is progressive or regressive. We define a tax (or other charge) as progressive if its burden is proportionally greater for those with higher incomes than for those with lower incomes. The American income tax system, which imposes a higher tax rate on higher income people, is progressive. Likewise, a tax is regressive if its burden falls proportionally more heavily on those with lower-incomes than those with higher-incomes. A typical sales tax, where all consumers pay the same rate (say, 10 percent of purchase price), is regressive, because the tax burden for poor people will be larger as a share of overall income than it will be for rich people. In absolute terms, of course, wealthier people pay more in sales taxes than poorer people, because they spend more. But regressivity is a measure of proportional burden, and sales taxes paid as a percentage of income tends to fall as incomes rise.

"Road pricing" is the practice of charging drivers in rough proportion to the costs (congestion delay, damage to roadbeds, emission of pollutants, etc.) they impose on others. Long the apple of economists' eyes, road pricing can take many different forms. In the US, High Occupancy/Toll, or HOT, lanes are the most common type of priced road. HOT lanes impose congestion tolls on only part of a multilane road, giving drivers the option of paying to drive in the uncongested toll lanes, or of driving for free in the unpriced-but-congested lanes. Many of these facilities also allow carpoolers to use the priced lane for free or at a reduced rate. HOT lanes are a good illustration of how elusive the concept of "fairness" can be. In one sense, HOT lanes are eminently fair, because no one is forced to pay—drivers always have the option of remaining in the free, slow lane. In another sense, however, HOT lanes are unfair, because they discriminate based on ability-to-pay. All drivers pay the same toll, and the toll is a larger burden for those who have only a little money than it is for those who have a lot. HOT lanes are therefore regressive. For this reason critics call HOT lanes "Lexus Lanes," and argue that they make it easy for the rich to buy their way out of congestion, while leaving the poor stuck in traffic.

There is truth in both sides of the argument. Only users pay for HOT lanes, but poor people certainly have a harder time paying, and are therefore less able to be users. On average, wealthier drivers use paid lanes more than poor drivers do (just as they spend more on gas, drive nicer cars, and drive more in general). But income is not the sole determinant of people's willingness to pay, and there will be instances where low-income drivers are in enough of a hurry to pay their way into uncongested lanes. So while a low-income single mother might not usually pay to bypass traffic, she will do so gladly when rushing to avoid late pick-up fees at daycare. There is also some evidence that HOT lanes pull travelers out of free lanes, and this can make even the free lanes move faster. But does this make the HOT lane fair?

COMPARING TOLLS AND SALES TAXES

In the abstract, it might be difficult to determine if a HOT lane is fair. But the more important question is whether tolls are fairer than a sales tax. For a given road, how much would different households pay in congestion tolls compared with what they pay in sales taxes? We attempted to answer this question by examining the 91 Express Lanes in Southern California. The 91 Express Lanes are HOT lanes in the median of a 10-mile stretch of a congested freeway that links job-rich Orange

The question is not whether road pricing will burden the poor, but whether it will burden the poor *more* than other ways of paying or roads.

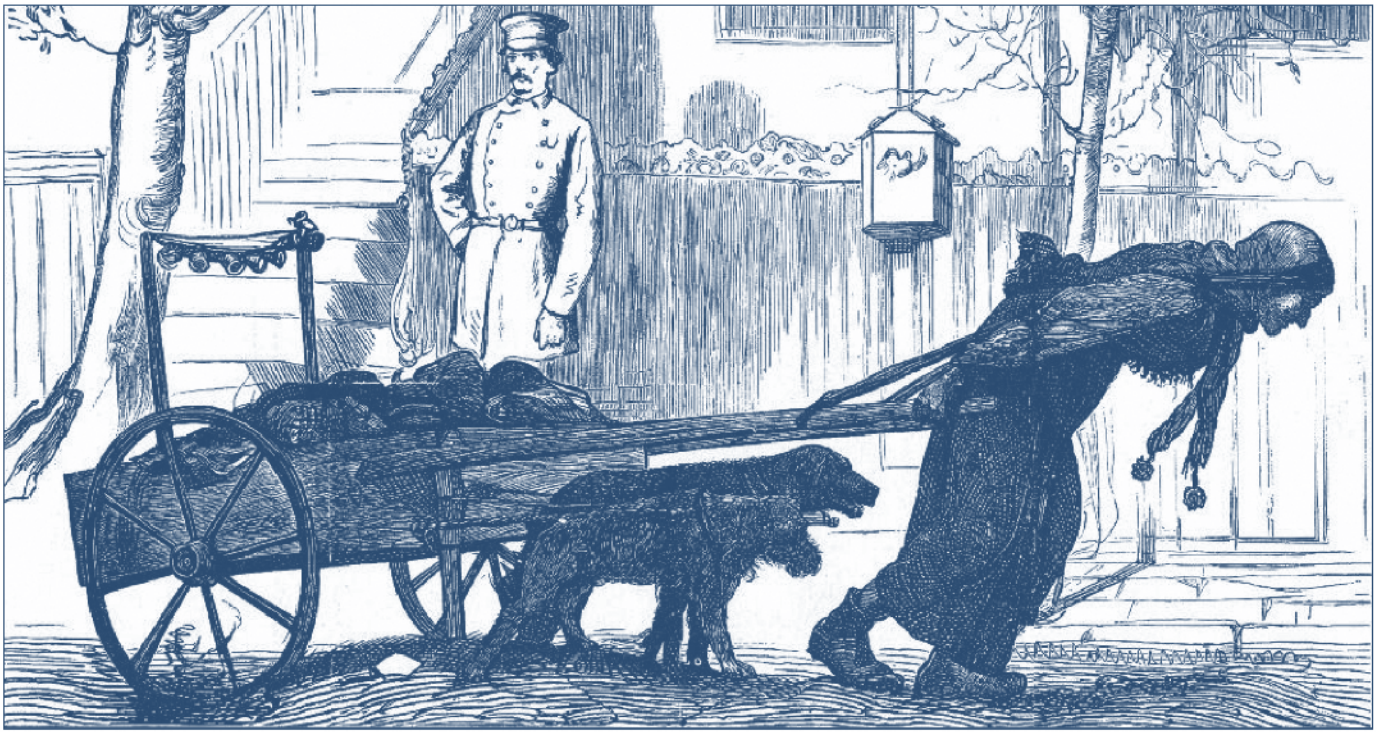
Orange County with housing-rich San Bernardino and Riverside Counties. The tolls in the Express Lanes serve two purposes: they regulate demand to keep the lanes moving at free-flow speed, and they finance the lanes' construction, operation, and maintenance. In our analysis, we compare the population who paid the $34 million in tolls collected on the road in 2003 with the population who would have paid that amount had it been collected through sales taxes in Orange County that same year.

To make this comparison, we used data from the 2002 Bureau of Labor Statistics' Consumer Expenditure Survey (CES). We analyzed household consumer expenditures in Orange County at various income levels and estimated the household sales tax burden that would have accompanied those expenditures. To estimate 91 Express Lanes users' toll payments by household type, we extrapolated from a survey that examined both travelers in the Express Lanes corridor and a comparison sample of people who traveled in the parallel free lanes.

WINNERS AND LOSERS

In 2003 the 91 Express Lanes raised $34 million in tolls. All of this money was, naturally, paid by users of the HOT lanes. Our question, again, was where the money would have come from if the same funds had been raised through sales taxes. Specifically, we examined the effects of such a change on three groups: the poor (people whose incomes are below $25,000), the rich (people whose incomes are above $120,000 a year), and those who pay county sales taxes but rarely or never use the toll lanes. (There is considerable overlap between the poor and the non-user group because the poor tend to be non-users).

We found that switching from tolls to sales taxes would shift the burden of paying for the road from users to non-users, and away from middle-income people and onto both the rich and the poor. People in the poorest households in Orange ▶



County almost never use the 91 Express Lanes. So while few of the poor enjoy the time savings of travel in the tolled lanes, they also don't pay for the road space that benefits others. But these same poor households pay up to 4 percent of their income each year in sales taxes. Had the lanes been financed by a sales tax, Orange County's poorest households would have paid over $3 million of the $34 million needed to fund the facility in 2003. The richest households, for their part, would lose the most in absolute terms, because they buy lots of goods and services subject to sales taxes.

With tolls, the burden of the Express Lanes falls on the relatively small group of people who choose to pay, and who as a consequence enjoy the time savings the lanes provide. With sales tax finance, virtually all users of the 91 Express Lanes would pay considerably less than they do now, because so many nonusers would pay. In 2003, this burden shift would have benefited frequent users of the 91 Express Lanes by around $700 a year. The additional costs to each sales-tax-paying "loser," by contrast, would be relatively small, on the order of $5 to $80 per year, depending on the household type. But the relative size of this burden transfer does not obviate the question of whether people who don't use the lane should subsidize people who do. If the answer is "yes," the underlying logic implies that any public expenditure, no matter how small its benefits, can be justified, so long as the cost is spread over a large enough base of taxpayers. It also implies that those who drive least should, with every purchase they make, help pay for roads for those who drive most.

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One caveat: our analysis examined sales tax payments by Orange County residents. But not all sales taxes collected in Orange County are paid by residents, just as Orange County residents pay some of their sales taxes outside of the county. And because Orange County is home to Disneyland, two other major theme parks, beach resorts, and professional sports teams, it "imports" sales tax paying residents from other counties. But the fact that some of the sales tax burden is exported does not reduce the tax's regressivity—it may, in fact, worsen it if the visitors to the County are, on average, less affluent than Orange County residents.

CONCLUSIONS

Is road pricing regressive with respect to income? The short answer is yes. Whenever members of lower income groups pay for services, they tend to pay a larger share of their income than do the wealthy. But whether congestion tolls are regressive is an incomplete, and probably misleading, way to understand the fairness of tolls. A regressive charge is not automatically an unfair charge, and in public finance we frequently must decide between regressive alternatives, not between a regressive and a progressive choice. Hence the more relevant question is comparative: are congestion tolls fairer than other means of transportation finance?

Our examination of the 91 Express Lanes in Orange County, California finds that transportation sales taxes are doubly unfair. They disproportionately burden the poor and those who drive little or not at all. We find that the heaviest users of the 91 Express Lanes—and the largest beneficiaries of them—are primarily from middle- and upper-middle income households both inside and outside of Orange County. From a regional planning perspective, funding freeway capacity with sales taxes is a pro-auto/pro-driving policy that taxes all residents, rich and poor alike, to provide benefits to a much smaller group of drivers and their passengers.

This analysis has focused on one side of the ledger: the question of who pays. But transportation systems have both costs and benefits. Indeed, the access benefits of travel are transportation's raison d'être. So while regressivity can be viewed as a cost of road pricing (and of most other ways of paying for roads), pricing confers transportation benefits that other transportation finance mechanisms do not. Tolls and taxes can both pay to build a road. But congestion pricing can also reduce traffic delays, fuel consumption, and vehicle emissions, often to a surprising degree. Sales tax finance for transportation, by comparison, does none of these things.

It is widely understood in public finance that a transparent payment mechanism is a good payment mechanism. Those who use scarce public resources—including space on the roads—should pay for what they use, in proportion to what they use, and know that they are paying. Knowing that resources have a cost is essential to using those resources judiciously, and our road network will function better when drivers pay the costs of their travel. It is entirely appropriate to worry about the burden tolls place on the poor, but the solution is not to forgo tolls altogether. We should not subsidize all drivers (and charge all consumers) to help the small number of poor travelers who use congested freeways in the peak hours and peak directions. Rather we should help those who are less fortunate, and see to it that the rest of us pay our own way on the roads. ◆

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For Whom the Road Tolls

THE POLITICS OF CONGESTION PRICING

DAVID KING, MICHAEL MANVILLE, AND DONALD SHOUP

There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old order of things, and lukewarm defenders in those who may do well under the new.

NICCOLO MACHIAVELLI

It is almost universally acknowledged among transportation planners that congestion pricing is the best way, and perhaps the only way, to significantly reduce urban traffic congestion. Politically, however, congestion pricing has always been a tough sell. Most drivers don't want to pay for roads that are currently free, and most elected officials—aware that drivers are voters—don't support congestion pricing.

Academics have proposed a host of ways to make pricing politically acceptable. Most of these proposals focus on using toll revenue to buy the public's tolerance, if not its support. Plans have been floated to rebate toll revenue directly to motorists, to spend it on public transportation, and to spend it on roads. Some pricing programs that have been implemented—such as those in London, Singapore, and Stockholm—spend their toll revenue on public transportation, but these programs were implemented in places where drivers were a minority. Other pricing programs, like the SR-91 toll lanes in Orange County, required

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building entirely new roads just to toll them. If pricing is to make a meaningful dent in American congestion, however, it will need to be put in place on existing roads in places where most people drive, and we have scant political guidance for accomplishing that task.

We propose a new way to create political support for congestion pricing on urban freeways: distribute the toll revenue to cities with the tolled freeways. With the revenue as a prize, local elected officials can become the political champions of congestion pricing. For these officials, the political benefits of the toll revenue can be far greater than the political costs of supporting congestion pricing. If congestion tolls were charged on all the freeways in Los Angeles County, for example, and the revenue were returned to the 66 cities traversed by those freeways, we estimate (using a model first developed by Elizabeth Deakin and Greig Harvey) that each city would receive almost $500 per capita per year.

Cities with freeways have three attributes that make them appropriate recipients for toll revenue: their gains are certain, their residents suffer the environmental consequences of living near freeways, and their local elected officials will have a strong incentive to spend the money in a way that makes their residents better off.

THE PROBLEM OF INSUFFICIENT SUPPORT

First, we should address the obvious question: why not rebate the toll revenue to drivers? The answer is that returning the revenue to drivers solves the wrong problem. A rebate is designed to reduce opposition, but opposition is only one part of pricing's political problem, and arguably not the most important part. The dilemma confronting congestion pricing is not just that opposition is too high, but that support is too low.

Nothing about congestion pricing matters if no one ever implements it, so all thinking about the politics of congestion pricing must start with the challenge of winning its initial approval. In this circumstance, the absence of advocates is a far greater hindrance than the presence of opponents. Even if there were no opposition to congestion pricing, the political problem would remain because the absence of opposition does not equal the presence of support. We can eliminate every argument against congestion pricing, but if we don't create strong political arguments for it, we will never properly price our roads.

Congestion pricing lacks a constituency that derives concentrated benefits from priced roads, a group whose gains greatly outweigh its losses, and who can be certain before the fact that pricing will be to its advantage. Without this constituency, congestion pricing has few strong advocates—people or groups willing to spend time, money, and political capital to make pricing a reality. Congestion pricing may well be in the public interest, but right now it is no one's special interest.

The dilemma confronting congestion pricing is not that oppposition is too high, but that support is too low.

ONLY CONCENTRATED GAINS LEAD TO POLITICAL MOBILIZATION

Even if most people thought they would be better off with congestion pricing, it would still lack strong advocates. Before a group will fight for a policy, the gains need to be big. Specifically, the benefits of the policy must exceed both the costs of the policy and the costs of mobilizing and campaigning to adopt the policy.

Drivers are a large and dispersed group, so the costs of organizing them are high while the rewards of successful mobilization are, for each individual driver, relatively low. We could therefore have a situation where congestion pricing would help every driver a little, but where no one would fight for it because it wouldn't help any of them a lot. Think of it this way: if you offer a hundred people the prospect of $1 million each, they will likely organize and spend the time and money necessary to get it. If you offer 100 million people the prospect of $1 apiece, most will gladly accept it, but few will actively campaign for it.

CITIES AS REVENUE CLAIMANTS

Toll revenue is a major benefit of congestion pricing. British transportation economist Philip Goodwin argues that many of the benefits of congestion pricing are "locked up" in the revenue collected, and are realized only when the revenue is spent. If the potential beneficiaries of the added public spending financed by toll revenue don't know who they are, they will be hard to organize to support the tolls. So what should governments do with the toll revenue to create support for congestion pricing?

Drivers make poor recipients for congestion toll revenue because they are difficult to organize and because their gains from pricing are modest. Cities, in contrast, have lobbyists and elected officials whose explicit purpose is to promote their interests and who can be effective advocates at the state and national level. The city of Los Angeles, for instance, is one of the largest lobbyists in California. And most cities already work together politically, either through informal coalitions or municipal leagues.

For local officials, the potential gains from pricing can be very large. The number of cities will be small compared to the total congestion revenue, so each city's leaders will have a strong incentive to lobby for congestion pricing. Politicians can use a regional pool of money to deliver local services for their own residents. This arrangement will allow local leaders to evade the blame for congestion pricing, because someone else is charging the tolls, but capture credit for new services. The revenue will enhance their constituents' quality of life and their own chances of re-election.

Because local elected leaders are more accountable to residents than are the appointed heads of regional transportation agencies, they would be under more pressure to spend the toll revenue in a way their residents support. Suppose the hypothetical congestion toll revenue from all the freeways in Los Angeles County were returned on a per capita basis (about $500 per person per year) to the 66 cities traversed by freeways. Each of these cities could then decide on the best way to spend its share of the revenue. Some cities might spend the money on road improvements, others on fixing sidewalks, still others on affordable housing. In this way, revenue return works with, rather than against, the fragmentation of American metropolitan areas. The many local governments in a region can choose to spend the toll revenue in many different ways. We wouldn't have to convince ▶

an entire region of drivers—many of whom will have relatively little in common—about the wisdom of spending toll money on one or two large programs.

By contrast, consider what might happen if the toll revenue were spent on public transportation. In the United States, transit is used by a small minority, and most transit systems are oriented around center cities where most Americans neither live nor work. Affluent suburban drivers are unlikely to benefit if the toll revenue is spent on transit systems they never use in places they rarely go. They will correctly view such toll payments as transfers to another group, not as payments that come back to benefit them.

So then why not spend the money on roads? In theory this idea is sensible, but in practice it becomes complicated. Congestion tends to be worst in dense areas, and building roads in dense areas is extremely expensive and politically difficult. Congestion is heaviest in central cities and tolls would be highest there. But these cities have little room to build new freeways, and the cost of land is so high that construction would be prohibitively expensive. Building a road also takes time: even modest highway expansions undergo lengthy environmental reviews, and many endure protest and litigation. The final stretch of the 710 freeway in Los Angeles has been held up by lawsuits and protest for 42 years! Tolls paid now would not translate into new roads until years later. Given the constraints of time,

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money and space, a road-building authority would likely end up using toll revenue generated in the densest parts of the region to (eventually) build roads in the least dense parts—essentially transferring income from current drivers in high-toll areas to future drivers in low-toll areas. That doesn't seem fair, efficient, or politically feasible.

If we distribute the toll revenue to cities on a per-capita basis, the money can be spent quickly and locally, and revenue distribution is likely to be progressive. In 2000, average per capita income in LA County was $20,100 a year in the 66 cities with freeways, and $35,100 a year in the 22 cities without them. Distributing the toll revenue to cities with freeways will thus shift money from richer cities without freeways (like Beverly Hills) to poorer cities with freeways (like Compton). In their study of congestion tolls for Los Angeles, Deakin and Harvey estimated that higher-income motorists will pay most of the tolls—in part because the richest 20 percent of the population own 3.1 times more cars than the poorest 20 percent, and they drive 3.6 times more vehicle miles per day. Higher-income motorists also drive more during peak hours. As a result, high-income drivers will pay to provide added public services for low-income people.

Distributing toll revenue to cities with freeways can also help compensate for vehicle emissions that pollute the air immediately surrounding freeways. Concentrations of ultrafine particulate matter, which penetrates deep into the lungs, can be up to 25 times higher within 300 meters downwind from a freeway than in other areas. Diesel exhaust and road dust also accumulate near freeways, and pose a particular threat to children's developing lungs. Public health researchers have shown that communities near freeways suffer from higher rates of asthma, low birth weights, cardiovascular disease, and some forms of cancer. Local revenue return of congestion toll revenue means that drivers who contribute to these environmental problems would compensate the victims.

CONCLUSIONS

Congestion pricing is, to borrow a line from the quote that introduces this article, "a new order of things." It is a fundamental change in the way we think about and provide space for driving; what has long been regarded as "free" would now have a price. Those who support pricing should not be surprised that most drivers resist it. Drivers, after all, have "done well under the old order of things," and while they may come to appreciate (or at least tolerate) priced roads, we should not expect them to like the idea beforehand.

But opposition is not the only reason so many roads are unpriced, and reducing opposition is not the same as creating support. Most pricing proposals attempt to placate those who "do well under the old order," and fail to focus on those who might "do well under the new." Congestion pricing will be implemented not when it is tolerable to the prospective losers, but when it is irresistible to the prospective winners.

Unlike many others who have written about congestion pricing, we do not think the toll revenue should go to drivers, transit agencies, or road bureaucracies. Claimants for the revenue should have both the means and the motivation to secure pricing's prior approval. They must be politically powerful, they must be certain beforehand that pricing will deliver a concentrated benefit, and they must be able to use the revenue in a way that quickly makes as many people as possible better off. We believe that cities with freeways fit this description, and that their local elected leaders can become the champions of congestion pricing. ◆

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Local Option Transportation Taxes: Devolution as Revolution

MARTIN WACHS

Ever since the widespread adoption of automobiles, Americans have preferred to pay for highways and bridges with "user fees"—that is, money collected from those who use the roads. Tolls and fuel taxes, which are roughly proportional to travelers' use of roads, have been the most common user fees. However, revenues from user fees have been falling for three decades, as legislators become ever more reluctant to raise them to meet inflation. It has been easier to try new kinds of fees, such as sales taxes, to pay for transportation infrastructure. In the guise of urgent solutions to immediate problems, seemingly modest local tax increases are setting a national trend. Without deliberating or consciously adopting a change in policy, indeed without much discussion at all, we are gradually devolving transportation finance back to local governments and reducing user fees. Without knowing it, we may be experiencing a revolution in transportation finance, and we haven't stopped to ask whether this is good or bad.

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A hundred years ago almost all roads were local facilities. Neighborhood streets and county roads have long been and still are the responsibility of local governments. Neighborhood streets carry a small proportion of traffic by volume, even though they make up most of the system's lane miles. They are critically important because they provide access to residential and commercial properties. In addition to being essential to residents and employees, access imparts value to property by allowing service by postal trucks, fire engines, police cars, ambulances, trash collectors, plumbers, and others. Streets are also the most common channels for electric wires, gas mains, and water and sewer pipes. Local governments have long provided and maintained such roads, financing them primarily by levying taxes on the properties that benefit from them.

EIGHTY YEARS OF USER FEES

Over time, states assumed a different, complementary transportation mission. In the early part of the twentieth century, Americans wanted to get farmers out of the mud and connect them to regional markets. At the same time, rapid growth in automobile use created traffic jams on existing roads. Gradually, states augmented local roads by creating major routes designed for heavy longer-distance traffic. These arterials—the state highways—had to be paid for, which quickly strained state treasuries. In the early 1920s, California was devoting more than forty percent of all its revenue to building and maintaining roads and paying interest on bonds it had issued to build roads. Despite this spending, congestion was getting worse because appetites for road travel were growing.

From this financial exigency came the revolutionary concept of "user fees." Because traffic on state roads imposed costs on the state roughly in proportion to its volume, it made sense to cover the costs of those roads by charging the users. While tolls were considered the fairest way to charge users, they had a major drawback. Toll booth construction and toll-collector wages absorbed so large a proportion of toll revenues that they were sometimes difficult to justify.

The first revolution in transportation finance came when states adopted user fees in the form of motor fuel taxes. Although they charged for road use in rough proportion to motorists' travel, and heavier vehicles paid more because they used more fuel per mile of travel, fuel taxes didn't quite match tolls for efficiency because they didn't levy charges at the time and place of use. However, they cost much less to administer than tolls, so fuel taxes became the principal means of financing America's main roads. Because they were user fees, most states reserved fuel taxes exclusively for transportation expenditures. When the federal government decided in 1956 to expand intercity highways on a national scale, it increased federal fuel taxes and created the Federal Highway Trust Fund, emulating the "user pays" principle that had been so successful in the states.

For eighty years, motor fuel taxes have paid most costs of building and operating major roads in the US. As public policy gradually came to favor a transportation system balanced between private cars and public transit, highway user fees also contributed to construction and operation of transit systems. But a major change is now underway, and most citizens are not even aware it is happening. Federal and state fuel taxes, though still the largest source of revenue for transportation, are rising much more ▶

slowly than travel volumes and transportation costs. They no longer cover the costs of building, operating, and maintaining the transportation system. And instead of raising fuel taxes or introducing electronic toll- collection systems, legislators are allowing local governments to raise funds locally even if not through user fees—thus changing the basis of transportation finance. Cities, counties, and transit districts are increasingly turning to "local option transportation taxes" to fund new transportation investments. The most visible examples of these in recent years have been voter-approved sales taxes funding particular roads and rail transit projects.

SHRINKING FUEL TAX REVENUES

Fuel taxes are generally levied as a charge per gallon of fuel sold. They do not increase automatically when the cost of living rises, as do sales taxes and income taxes. Instead, they must be increased by acts of legislatures. These taxes were in the past enormously popular because many constituencies saw the benefits of transportation investments to be well worth their costs, but this is no longer true. Between 1947 and 1963 the California fuel tax was increased three times, as was the federal fuel tax; but then neither was raised for over twenty years. Since 1982 the California gas tax has been raised only once by the legislature and once again by popular vote when the governor refused to endorse a change without a referendum.

In 1957 the California fuel tax stood at 6 cents per gallon. If it had risen at the same rate as inflation, the state fuel tax would today be set at 32.5 cents per gallon. But it's only 18 cents per gallon, or 14.5 cents below its 1957 buying power. California is not unique; on average, fuel taxes in the fifty states would have to rise about 11 cents per gallon to recoup their 1957 buying power.

FIGURE 1

California gas tax rate
(1923-1997)

While these figures are impressive enough, the situation is actually even worse. Overall new vehicle fuel consumption was about 14 miles per gallon in 1974, and today it stands at about 28 miles per gallon. While we collect fewer pennies per gallon, we drive twice as many miles per gallon—so, when measured per mile of driving, fuel tax revenues are plummeting dramatically.

BIG CHANGES UNDERWAY

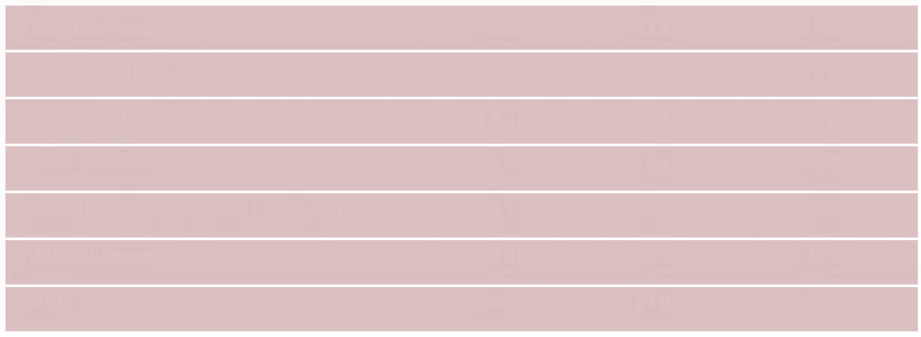
A surge in local ballot measures has been taking up the slack caused by the drop in fuel tax revenues at the state and federal levels. Before 1980, few states encouraged or even permitted their towns or counties to levy their own transportation fees, except for the property taxes traditionally used for neighborhood streets and county roads. In the '70s, major metropolitan areas adopted permanent sales taxes to support the development of new transit systems; in the '80s, several states authorized local jurisdictions to use ballot measures to raise revenues for transportation purposes. The pace accelerated during the '90s as 21 states either adopted new laws authorizing local option transportation taxes or saw dramatic expansion in their use.

The accompanying table based on data assembled by the Surface Transportation Policy Project shows how dramatic the change has been in just a five-year period. While revenue from user fees increased by eighteen percent from 1995 through 1999, and is still the largest source of revenue, the growth rate in local transportation taxes was several times as great during this time period. Although "borrowing" money by issuing bonds grew at the fastest rate, it remains a small proportion of the total and is not really a source of revenue, since money from other sources is always needed to repay the principal and interest.

During calendar year 2002, American voters considered 44 separate ballot measures to raise money for transportation. Nine of them were state-wide elections, and only a few involved user fees like fuel taxes. Local sales taxes are by far most common in these measures, but some local governments have enacted vehicle registration fees (arguably a user fee, but more accurately a form of property taxation), taxes on real estate sales, local income or payroll taxes earmarked for transportation, and taxes on new real estate developments. ▶

FIGURE 2

Changes in state and local transportation revenue, 1995-99



Source: Michelle Ernst, James Corless, and Kevin McCarty. *Measuring Up: The Trend Toward Voter-Approved Transportation Funding.* (Washington: Surface Transportation Policy Project, November 2002). www.transact.org

In California, residents of eighteen counties—containing eighty percent of the state's population—have voted to raise their sales taxes to pay for county and city transportation improvements. Collectively, these measures are producing roughly $2 billion per year for capital investment in new highway and transit facilities and for maintenance and operation of existing ones. These sales taxes are the fastest growing source of money for transportation in California and in many other states.

The popularity of local sales taxes for transportation can be attributed to four important characteristics:

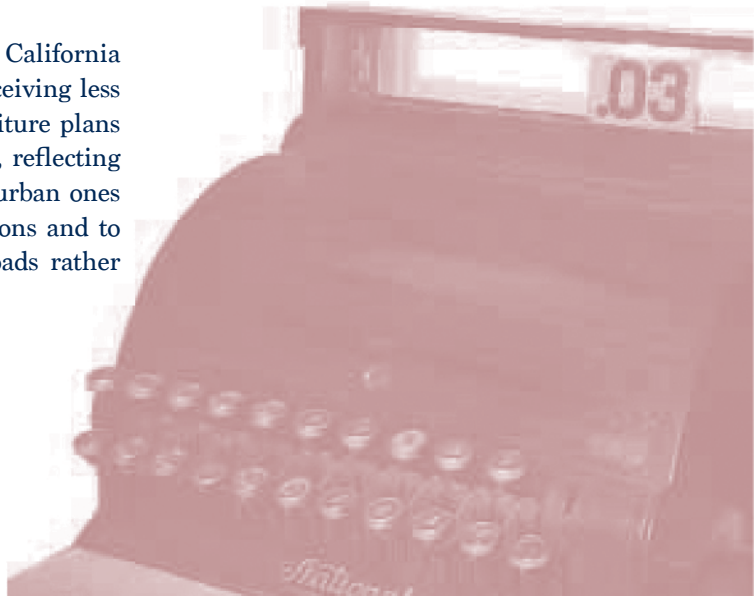
- *Direct local voter approval:* These measures typically result in projects and services near voters' homes and work places, so they personally can appreciate them and anticipate their benefits. In an era of growing distrust of politicians, these measures provide tangible direct local benefits.
- *The taxes have finite lives:* Voters enact transportation taxes that will persist typically for fifteen or twenty years unless specifically reauthorized by another popular vote. Voters thus have a sense of control over their money. If projects don't live up to their expectations or if they fully accommodate growth and reduce congestion, the taxes could end.
- *Specific lists of transportation projects:* The taxes may be used only to build specific projects or fund specific programs, and politicians' discretion to spend the money is severely limited.
- *Local control over revenues:* The money raised locally is spent locally and for local benefit, under the control of a local transportation authority, assuring citizens that the money will not leak into other jurisdictions.

These provisions give citizens more direct control over the transportation investments they pay for than was typical with motor fuel taxes. Sales taxes are also lucrative because they have a broad base. While fuel taxes are paid only when we purchase a single commodity, sales taxes are paid by many more people when they purchase a wider range of goods. So a low tax rate can provide a lot of money. One county, for example, estimated that a one-percent general sales tax produces as much revenue as would a motor fuel tax of sixteen cents per gallon.

WHAT TRANSPORTATION SALES TAXES ARE SUPPORTING

County transportation sales taxes have supported a wide variety of projects, with a fairly even split among highways, local roads, and public transit. Measures adopted earlier generally earmarked revenue for specific projects listed on the ballot; later measures more frequently allocated funds for "program categories," or less explicit groups of uses and projects.

The most consistent trend in sales-tax expenditures across all California counties shows operations and maintenance of existing facilities receiving less funding than new capital projects. However, the content of expenditure plans varies widely from county to county and from measure to measure, reflecting differences in local priorities. Rural counties are more likely than urban ones to put control of sales tax revenues in the hands of local jurisdictions and to spend most of their revenues on highway projects, streets, and roads rather than transit.



TRANSPORTATION AUTHORITIES

Each county that collects and administers a transportation sales tax has a designated transportation authority to oversee use of the funds. Transportation authorities build improvements themselves, rather than relying on the California Department of Transportation (Caltrans), and proponents cite this shift of authority from state to counties as a major benefit of county-level taxes. Transportation authorities typically claim a number of advantages over Caltrans in developing and delivering transportation projects, including greater sensitivity and flexibility in responding to local needs, less institutional inertia, and flexibility to pursue environmental review and design simultaneously rather than sequentially. The creation of county transportation authorities significantly reinforced planning and delivery of transportation improvements at the county level. But stronger county-level decision-making could be weakening the regional planning mandate of California's multi-county metropolitan planning organizations. State and federal funds, for example, may be diverted to complement county projects, rather than spent on priorities of metropolitan planning organizations. Opportunities to plan regionally also suffer where a large proportion of sales tax revenue is returned directly to local jurisdictions within a county.

The earliest measures envisioned transportation authorities focusing solely on delivery of a few high-profile capital transportation projects, not on planning. Local transportation sales taxes have since evolved into a funding source to serve many ongoing transportation needs, including maintenance of local streets and roads, paratransit services, and transit operations. In California and elsewhere, transportation authorities are playing increasingly central roles in funding the ongoing operations of communities' transportation systems. Because these authorities have evolved without oversight by state or metropolitan planning organizations, their governing boards consider themselves accountable solely to the county voters for implementing their expenditure plans. Integrating land use planning with county-level transportation planning, for instance, is not an explicit transportation authority goal or responsibility.

LIMITED SPENDING FLEXIBILITY

Supporters tout the benefits of enumerating specific projects in the ballot measures. But voters thereby limit the transportation agencies' flexibility in responding to changes in conditions or needs during the life of the measures. All but five of California's transportation sales taxes earmark some amount of revenue for specific projects, limiting the power of transportation authorities to reset priorities once the tax has been approved. Even when funds are not earmarked for specific projects, the intended uses of revenue for specified program categories are constrained by ballot measures.

Revenue shortfalls, cost escalations, or changing political sentiments about projects may mean that over time agencies will want to deviate from the list of voter-approved projects. Transportation authorities face pressure to expend funds in accordance with the ballot measures and to deliver on the commitments made by local political leaders regardless of changing budgets or shifting political priorities. This pressure can have serious drawbacks. There have proven to be many obstacles to the completion of projects administered by transportation authorities. And the transportation authorities are not required by ballot measures to base their implementation priorities on project cost-effectiveness, nor to spend sales tax revenues on mitigating potentially damaging environmental consequences. ▶

WHERE ARE TRANSPORTATION SALES TAXES TAKING US?

Transportation tax referenda around the nation are often assumed to be nothing more than a new and politically expedient way of raising needed revenue; but they are doing much more than that. In addition to raising money, they are gradually but inexorably changing the way we finance transportation systems in four fundamental ways:

1) The growing popularity of sales taxes is shifting the financial base of our transportation system from user fees to general taxes paid by all citizens, regardless of their direct reliance on the transportation system. Economists find that user fees have at least some tendency to induce more efficient use of the transportation system; higher fuel taxes might, for example, encourage motorists to acquire more fuel-efficient vehicles. In contrast, general taxes provide no incentive for greater transportation efficiency of any sort. And, while sales taxes and fuel taxes are both regressive, the effects on the poor of user fees are tempered by the fact that those who pay them always benefit from them, while sales taxes burden non-users as well as users. When fuel taxes were adopted in the '20s they were considered "second best" solutions; tolls were better but administratively complex. Today, we can lessen the problems associated with toll collection by implementing electronic systems like Fastrak or Easy Pass. Ironically, user fees are declining in favor of general taxes just as technology is making them more feasible.

2) The rising use of county sales taxes and the growing role of metropolitan transportation planning are consistent with a national trend toward devolution, but federal policy and the rise of county tax measures are in fundamental conflict. While Congress and many states are devolving transportation decision making to the regional level by enhancing the powers of metropolitan planning organizations, county sales taxes can undermine the influence and authority of those groups by focusing resources and decision making on counties and other smaller units of government.

3) Gradually, local taxes are increasingly limiting the transportation policymaking authority of elected officials by requiring that transportation funds be spent strictly in accordance with the language of the ballot measures over fairly long periods of time. And project lists are gradually eliminating the flexibility necessary to adapt to changing needs.

4) While transportation planners and engineers often apply analytical procedures like benefit-cost analysis to determine which investments should be selected, ballot measures proposing local transportation taxes substitute election campaigns—some-times called "beauty contests"—for analysis. Many believe that greater reliance should be placed on analysis of project cost effectiveness, but by listing popular projects in the sales tax measures, we are gradually limiting the relevance of systematic analysis in project selection. While local control and direct democracy are American ideals, it is probably not appropriate for voters to preempt the application of technical expertise in the design and management of transportation systems.

Most important, there has not yet been a national debate in which Americans or their elected representatives have deliberately considered the merits and drawbacks of these potentially enormous changes. Instead, a significant shift in national policy is occurring without public notice as one local measure is adopted after another. Drop by drop, we are creating a flood of change which may deservedly be called a second revolution in transportation finance. ◆

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THE PRIVATE SECTOR'S ROLE IN HIGHWAY FINANCE: LESSONS FROM SR 91

MARLON G. BOARNET AND JOSEPH F.C. DIMENTO

The gap between needed highway-construction funds and gasoline-tax revenues threatens to widen further. Hybrid vehicles are a reality; alternative fuels are on the horizon; and the gasoline tax—long the workhorse of highway finance in the United States—will inevitably decline in importance. So the search is on for new funds. Can the private sector help fill the gap?

Only a few privately financed highways have been built in the US in the past half century. Among them, California's State Route 91 (SR 91) in Orange County stands out as one of the mature examples. It began as something of a public policy long shot. In 1989, when state legislators debated a bill to allow a limited number of private high-way franchises, even the bill's supporters doubted it had a real chance of passage. The Democrat-controlled state legislature favored expanding the gasoline tax instead. A transportation summit that convened leaders from both parties in the legislative and executive branches settled on a compromise that included a nine-cent gas-tax increase and allowed up to four private highway demonstration projects.

Rather than designate specific projects or routes as potential private franchises, the legislation encouraged private enterprisers to be innovative. Profits from the franchises would be capped at predetermined rates of return, but otherwise private entities were to enjoy broad leeway to locate, finance, and operate their roads as they saw fit. Toll rates, in particular, were not regulated except as would be required by limits on the rate of return. Private highway projects had to conform to the usual elements of state law that pertained to public highways, such as environmental clearance, but otherwise the private sector was allowed latitude to innovate in project specification, design, financing, and operation.

SR 91 surfaced early as a prime candidate for private franchising. The Orange County Transportation Authority (OCTA) had planned to build high-occupancy vehicle lanes (carpool or HOV lanes) in the median of the existing ▶

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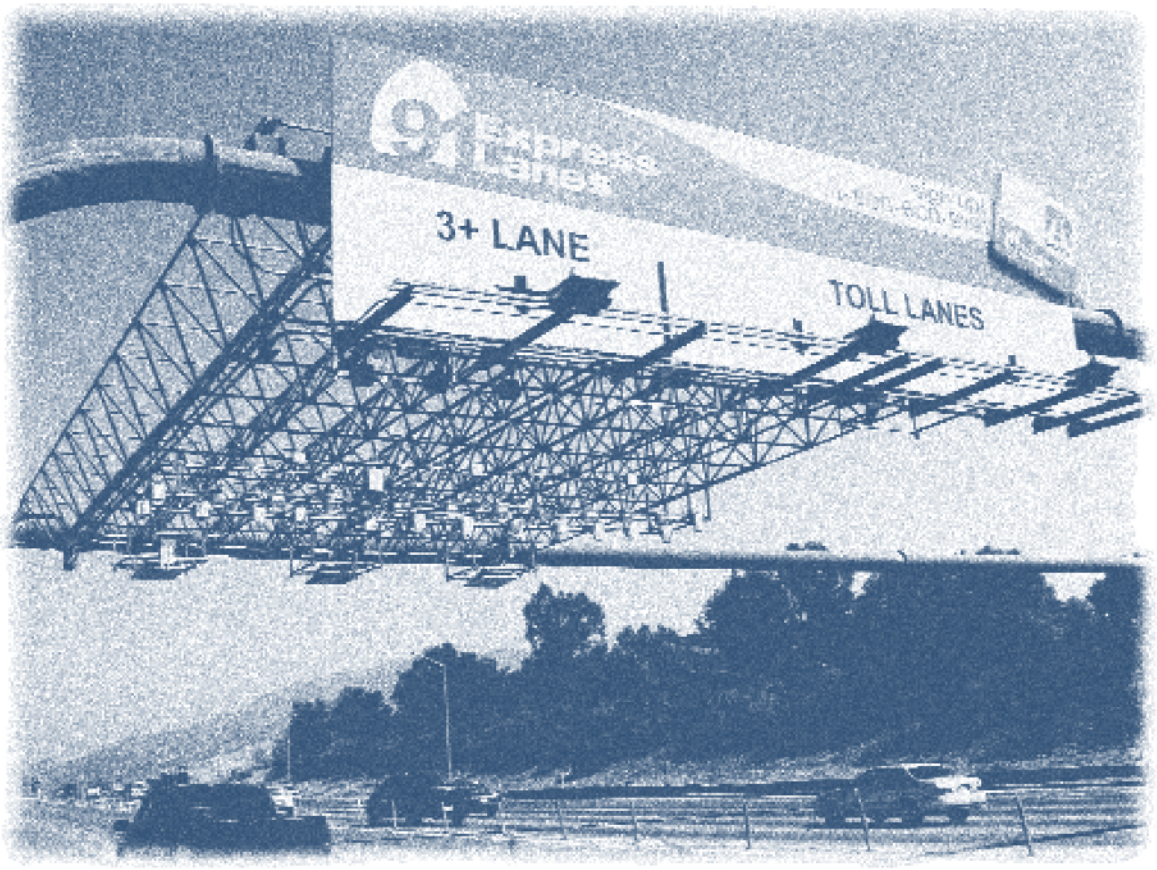
highway connecting the fast-growing suburbs of Riverside County to job centers in Orange County. But funds for the project were not available from traditional public-sector sources, so Orange County transportation officials were receptive to private-sector interest in the project. The California Private Transportation Company (CPTC), a limited partnership formed by subsidiaries of several corporations involved in highway construction, proposed private toll lanes for the median of SR 91. A 35-year franchise was approved in 1990, and the privately owned facility opened on December 27, 1995. The ten-mile-long toll lanes paralleled the most heavily congested portion of the approximately thirty-mile-long corridor from Riverside into northern Orange County.



The SR 91 toll lanes were innovative in several respects. They were the first US implementation of peak/off-peak road pricing (often called congestion pricing). The lanes have no toll booths; all tolls are collected electronically. While detailed financial information on the privately held CPTC has not been released to the public, experts generally agree that toll revenues likely met the private firm's expectations. In the third year of operation (1998), the CPTC's annual report noted that toll revenues covered all operating costs and all debt service except a subordinated loan which did not have to be paid in the near-term and which was less than ten percent of the project cost.

SHIFTING PUBLIC PERCEPTIONS

In the first few years after SR 91 opened, the lanes were viewed by many as a net public benefit. Early public opinion polls showed a majority of SR 91 drivers supported the peak/off-peak pricing scheme. A study conducted by Edward Sullivan at California Polytechnic State University in San Luis Obispo showed dramatic reductions in peak-period travel times. Travel time for the eastbound afternoon peak trip on an 18-mile portion of SR 91 that included the toll lane corridor dropped from seventy minutes in June 1995 to just under thirty minutes in June 1996. Also, average peak-period travel speeds on the eastbound free lanes more than doubled as traffic diverted to the toll lanes.

Yet by the late 1990s the public mood regarding the toll road had shifted. The franchise agreement contained a "non-compete" clause that forbade public agencies from increasing highway capacity within a one-and-a-half-mile-wide corridor on either side of the toll lanes for the life of the franchise agreement. During franchise negotiations in 1990, the non-compete area was considered essential to providing CPTC some assurance that their investment would not be subject to unanticipated competition from future free highway projects. Such non-compete clauses were part of most discussions and much received wisdom about highway franchising at the time. In the late 1990s, the California Department of Transportation (Caltrans) wanted to add merging lanes between the free lanes on SR 91 and the newly completed Eastern Transportation ▶

Corridor, a separate toll road built by a public agency. Caltrans justified the need for the new lanes based in part on accident rates and a wish to improve safety. According to the franchise agreement, safety concerns could override the non-compete provision. Yet Caltrans' safety analysis was disputed, and the safety claims and competing public and private interests were hotly debated. In the course of that debate public opinion turned against the toll lanes. What had once been viewed as a source of needed congestion relief was now viewed by many as contributing to congestion or, worse, unsafe conditions.

The debate was resolved when OCTA purchased the toll lanes from CPTC in early 2003 (for $207.5 million dollars). The lanes are now operated by OCTA, which still charges peak/off-peak tolls. But the non-compete clause was eliminated, and the issue of public mobility competing with private profit-making interests has receded. What had been one of the nation's most visible examples of a privately owned toll road is now owned and operated by a public agency.

LESSONS FOR PRIVATE HIGHWAY FINANCE

The SR 91 experience, seen in the context of a decade of highway privatization worldwide, provides at least four lessons for transportation agencies looking for alternative sources of highway finance.

1. Private-sector funding may work, but only as part of a public-private highway financing partnership. SR 91 was possibly a best-case option for wholly owned private franchising. The corridor cuts through a canyon in the Santa Ana Mountains, and there are few if any good alternative routes between Riverside and Orange County. Traffic demand was high and congestion was severe. Because the lanes were built in the median of a public highway, right-of-way was owned by OCTA and could be leased to CPTC. (The lease price for the right-of-way was a dollar a year.) OCTA had obtained environmental clearance for carpool lanes before franchising discussions began, so at the outset the project had already cleared environmental approval hurdles, typically a source of substantial uncertainty in highway projects. The combination of high travel demand in a congested urban area with low right-of-way costs and minimal difficulties with environmental clearance is unlikely to happen in other projects. Most experts believe that other projects might face high right-of-way costs, uncertainty of public or environmental approval, and uncertainties of travel demand that would preclude an acceptable rate of return.

Instead of imagining that private financing will substitute for public financing, transportation officials should view private involvement as a supplemental source of investment. In such circumstances, public and private investment would be combined. Merged funds can narrow the gap for projects that are too expensive to build with limited public funds, but that are also too expensive or too risky for private investors. Sharing risk and reward between the public and private sectors will be complex, and balancing public and private interests will be more difficult than in purely private franchises. Yet the future of private involvement in highway finance in the United States almost certainly will be in the context of public-private partnerships, rather than in wholly private highway franchises.

2. Balancing public and private interests will be fundamental. The SR 91 franchise was eventually undone by conflicts between public- and private-sector interests. Such conflicts are probably inevitable, and transportation officials must become

Sharing risk and reward between the public and private sectors will be complex.

adept at balancing competing public and private interests. Yet such conflicts will be difficult to predict fully in advance.

The SR 91 franchise, when granted in 1990, had a 35-year term, typical of private toll road franchises. It is difficult to anticipate urban growth patterns, changing travel demand, shifting political winds, and technology changes over such a time period. While understanding future possibilities at the time of the initial franchise agreement is desirable, it is even more important to define what happens when unanticipated circumstances cause either the private participant or the public sector to question the continuing wisdom of the original agreement. In short, public-private franchise agreements should contain within them the terms of the contract's "undoing" should such undoing become necessary.

One lesson is that strict non-compete clauses are too inflexible to balance public and private interests over a span of decades. Instead, public-private highway agreements must articulate methods for balancing competing and evolving interests. One tool that can help, but that has been rarely if ever used in the US highway sector, is least-present-value of revenue (LPVR) franchise bidding. The LPVR concept was developed through research conducted by Eduardo Engel, Ronald Fischer, and Alexander Galetovic. The idea is that highway franchises can be auctioned by allowing private entities to bid on the present value of the toll revenue stream they would collect over the life of the project. The bidder proposing the lowest present value of toll revenues, or LPVR, wins the franchise. The LPVR becomes, in effect, an estimate of the value of the franchise. If the parties wish to end the franchise, the LPVR provides a benchmark assessment of the fair value to the private entity. While we do not suggest that LPVR auctions be adopted in exactly that fashion in the US, the benefit of assessing franchise value at an initial stage can be useful should contract renegotiation become necessary. Public-private highway franchise agreements can adopt both LPVR methods and more general institutional designs that provide a basis for negotiating the end to or major modification of agreements if circumstances require that.

3. The public sector must be institutionally strong. Some assume that private sector involvement can compensate for a weak public sector. In highway finance, nothing could be further from the truth. The complicated nature of public-private highway partnerships requires a well-trained, well-staffed, institutionally strong public-sector partner. Transportation agency employees will need new skills to be able to partner with private entities in complex highway finance projects. This includes skills in project finance, not traditionally at the forefront of the "pay-as-you-go" financing philosophy that has characterized the gasoline-tax era. Institutional design will also require careful thought. Several rules of thumb adapted from other regulatory environments should be examined. These include shielding regulators from direct political pressure, providing buffers that reduce the risk of industry capture, and balancing the need for commitment with the need for flexibility in the face of changing circumstances. The regulatory environment for public-private highway partnerships will be complex, and transportation agencies will have to learn from other fields, such as electricity and telecommunications, where similar complexities have been more common.

4. High-occupancy vehicle lanes (carpool lanes) provide early opportunities to pioneer some public-private highway partnerships. Cash-strapped metropolitan transportation ▶

agencies will increasingly face difficulties funding needed highway projects. Proposed carpool lanes, typically adjacent to unpriced highway lanes, provide an opportunity to involve the private sector. Public cost sharing will often be needed to lower private investment to levels that allow profitability. The publicly provided right-of-way for the SR 91 toll lanes was one form of public cost-sharing. Yet public-sector officials should carefully consider what they get in return for sharing the cost. One benefit public-private partnerships can provide is expensive infrastructure that would not otherwise be viable, especially in urban areas where land and right-of-way are becoming increasingly costly. While such ideas go beyond carpool lanes, unfunded carpool lane proposals on existing public rights-of-way will likely be the first opportunities to explore these new partnerships.

CONCLUSION

Public-private highway partnerships have much to offer cash-strapped transportation agencies, and SR 91 provides lessons in both opportunities and pitfalls inherent in those projects. Private sector involvement may be of particular interest in periods when public sector economic conditions are uncertain yet growth is rampant. As gasoline tax revenues are increasingly stretched, agencies that innovate will be best able to meet the public's demand for mobility.

Yet public-private highway partnerships will be complex, and transportation officials should be pragmatic while learning from the SR 91 experience. Non-compete clauses such as were used for SR 91 will continue to be controversial, especially in regions where highly motivated voters are forced either to pay the toll or use lanes with poor service even where government can improve service. Private sector involvement also brings the calculation and balancing of costs and benefits into the realm of hard-nosed financial analysis. This does not necessarily mean that environmental and social factors are ignored. Rather, it can mean that they are more rigorously quantified, allowing for better informed decisions on alternatives.

In many urban areas, public funds will prove insufficient for needed transportation improvements. If current highway finance trends continue, some future choices will be between involving the private sector or foregoing needed infrastructure projects. Of course the private sector will only be interested in helping finance highway projects to the extent that there are profit-making opportunities; yet experiences in other countries suggest that private interests are willing to invest in infrastructure. Such investments require difficult decisions about cost sharing and the division of risks and rewards between the public and private sectors.

Are transportation agencies ready to partner with the private sector? Unfortunately, the answer is often "no." Agencies that have been construction managers will have to become regulators in a complex environment. This will require new skills, changes in agency culture, and a willingness to seek practical solutions in an often ideologically charged environment. State transportation departments should nurture officials who are schooled in the complex regulatory, financial, and legal skills that will be needed for public-private highway partnerships. The main lesson from the SR 91 project is that private sector involvement in highway finance is not simple or predictable; nevertheless public officials should plan now for the day when such involvement can provide revenue that would otherwise not be available for needed infrastructure projects. ◆

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Transportation Finance: An Unexpected Source of Innovation

MARTIN WACHS

If you read about the future of transportation, you likely will be overwhelmed by a flood of contradictory good and bad news, especially in California.

The good news is that there is boundless promise of growth and change in personal mobility, mostly in the private sector. The current pace of innovation in transportation is faster and farther-reaching than at any time since the invention of the automobile. Automated vehicles are evolving rapidly, new apps are helping us find our way and lowering travel costs, social network transportation services are booming, and the hyperloop promises to increase future longer distance mobility. We are on the verge of blending new technologies to provide instant automated point-to-point mobility for people and goods.

While the future is full of promise, the bad news is that the public sector seems unable to govern in the face of a flood of innovations, or plan for future changes that we know are on the way. Even maintaining existing transportation infrastructure needed for a functional society is a challenge.

Sixty-eight percent of California's roads are in "poor" or "mediocre" condition, and nearly a quarter of its bridges are structurally deficient or functionally obsolete. Its interstates rank as the most highly travelled and congested in the nation, but the average condition of their pavement has greatly deteriorated. Caltrans estimates that it will take $57 billion to correct existing deficiencies in the state's core highway infrastructure and another $78 billion to fix local streets and roads. And that is just for roads we already have. We are simultaneously trying to expand public transit and are committed to building a $64 billion high-speed rail system (even though only $12 billion are currently available or promised to it).

In opinion polls, Californians strongly favor increased spending on road repair and transit expansion, but they do not want to pay higher taxes. This dilemma leaves us with no consensus on how to finance current needs ▶

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and new initiatives. Excise taxes on gasoline and diesel fuel served the state well because revenue rose steadily as travel grew. Currently, fuel tax revenue is declining as we improve vehicle fuel efficiency to achieve environmental improvement that comes from lower fuel consumption but not the increases in other taxes and fees needed if we are to raise enough money to fix our highways.

The contradiction of innovation and insufficiency makes it seem that we are at the edge of an abyss our own making. But public investment always seems to lag behind private sector innovation. When California could not finance its roads to accommodate growing auto and truck traffic before the First World War, it reluctantly turned to motor fuel excise taxes only after going deeply into debt. It took forty years of debate to arrange the financial partnership between federal and state governments that enabled construction of the Interstate system.

Sixty years ago, Will Rogers said we could solve America's congestion problem if auto companies built roads and the government built cars. So yes, it may seem that we are at the edge of an abyss, but we have been here many times before, and creative solutions eventually prevented plunges over the edge. Public policy innovation created a bridge.

California counties continue to expand their reliance on local option sales taxes. Twenty self-help counties use precious sales tax revenues to support transit and road projects. Los Angeles County Metro's fiscal year 2016 budget shows the agency anticipating about $488 million in state aid, $523 million in operating revenue (from fares, tolls, advertising revenue), and about $1 billion in federal assistance. In contrast, the agency will raise $2.3 billion—over half its total—from local sales taxes.

The most recent Federal transportation funding law, the FAST Act, provides $95 million to research and field test mileage-based user fees. Even before its passage, a pilot program in California started field-testing road charges based on actual travel using 5,000 vehicles. Mileage-based fees can eventually be both fairer and more efficient than the motor fuel taxes currently used, and the trial will help determine whether they are politically acceptable.

In the past, we thought of revenue only as a way to raise money by which to build and maintain infrastructure. Demand and flow were thought of as externally determined or fixed. Now, we can influence travel patterns and use infrastructure far more efficiently by using pricing, along with real time information, to manage demand and traffic flow. As a result, dynamic pricing is being adopted rapidly throughout the transportation system and the benefits are enormous.

By experimenting over two decades, we have learned about niche markets in which private investments excel in delivering value for money. Private investments in toll roads and contracted private transit operations have grown dramatically in recent years.

Innovations in the financial management and funding of public infrastructure are widely portrayed as lagging behind innovations in mobility by the private sector. But the public sector is deeply engaged in active experimentation that will lead to a new generation of infrastructure finance. The current financial crisis is serious, frustrating, and painful, but it is not unprecedented and is already leading toward innovations that will be emulated on a grand scale. ◆

The public sector seems unable to govern in the face of a flood of innovations, or plan for future changes that we know are on the way.

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