



U.S. Department of Transportation
Federal Highway Administration

Non-Toll Pricing

A PRIMER



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The Primer Series and the Purpose of This Volume

States and local jurisdictions are increasingly discussing congestion pricing as a strategy for improving transportation system performance. In fact, many transportation experts believe that congestion pricing offers promising opportunities to cost-effectively reduce traffic congestion, improve the reliability of highway system performance, and improve the quality of life for residents, many of whom are experiencing intolerable traffic congestion in regions across the country.

Because congestion pricing is still a relatively new concept in the United States, the Federal Highway Administration (FHWA) is embarking on an outreach effort to introduce the various aspects of congestion pricing to decision-makers and transporta-

tion professionals. One element of FHWA's congestion pricing outreach program is this Congestion Pricing Primer Series. The aim of the primer series is not to promote congestion pricing or provide an exhaustive discussion of the various technical and institutional issues one might encounter when implementing a particular project; rather, the intent is to provide an overview of the key elements of congestion pricing, illustrate the multidisciplinary aspects and skill sets required to analyze and implement congestion pricing, and provide an entry point for practitioners and others interested in engaging in the congestion pricing dialogue.

The concept of tolling and congestion pricing is based on charging for access and use of our roadway network. It places responsibility for travel choices squarely in the hands of the individual traveler, where it can best be decided and managed. The car is often the most convenient means of transportation; however, with a little encouragement, people may find it attractive to change their travel habits, whether through the consolidation of trips, car-sharing, by using public transportation, or by simply traveling at less-congested times. The use of proven and practical demand-management pricing that we freely use and apply to every other utility is needed for transportation.

The application of tolling and road pricing provides the opportunity to solve transportation problems without Federal or state funding. It could mean that further gas tax, sales tax, or motor-vehicle registration fee increases are not necessary now or in the future. Congestion pricing is not a com-

About This Primer Series

The Congestion Pricing Primer Series is part of FHWA's outreach efforts to introduce the various aspects of congestion pricing to decision-makers and transportation professionals in the United States. The primers are intended to lay out the underlying rationale for congestion pricing and some of the technical issues associated with its implementation in a manner that is accessible to non-specialists in the field. Titles in this series include:

- Congestion Pricing Overview.
- Non-Toll Pricing.
- Technologies That Enable Congestion Pricing.
- Technologies That Complement Congestion Pricing.
- Transit and Congestion Pricing.
- Economics: Pricing, Demand, and Economic Efficiency.
- Income-Based Equity Impacts of Congestion Pricing.



plete plan of action. It has to be coordinated with other policy measures to maximize success.

Most forms of congestion pricing involve the levying of direct tolls on highway users in one form

or another. This volume focuses on forms of congestion pricing that do not involve tolls but that are still aimed at creating more efficient pricing mechanisms for automobile use.

Introduction to Non-Toll Pricing

Traffic congestion represents a significant and growing threat to mobility in the United States. According to the most recent data, the average driver traveling in the nation's urbanized areas during peak periods experienced 38 hours of total delay in 2005 (up from 14 hours in 1982), at a total cost of \$78 billion in excess travel time and wasted fuel consumption.

To some extent, these trends reflect the vibrancy of our nation's cities, which have seen significant economic growth over the past 3 decades. They also reflect growing imbalances between travel growth and the development of new highway capacity, as the former has exceeded the latter for many years. However, in an important way, traffic congestion also results from the inefficient pricing of highway use, leading drivers to travel more than what is economically desirable, particularly during the height of morning and evening rush hours.

Congestion pricing is becoming increasingly viewed as an important strategy for improving the operational performance of the highway system by using price signals to more efficiently and effectively allocate scarce capacity on our nation's highways. A key feature of this approach is providing more variability in the charges that road users face. When road users face flat fees (e.g., annual registration fees or insurance payments) or find those costs bundled with other services (e.g., free parking), the cost of

additional use will be excessively low, contributing to overuse. Further refinements may lead to a system of charges that can vary by the time and location of travel.

A major reason why people drive so much is that alternative transportation can rarely match the speed and convenience of driving alone, and although the fixed costs of driving are quite high, the incremental costs of every mile of driving are relatively low. Even when gas prices spike, most of the costs of owning and operating a vehicle are still fixed. That is, once a person has chosen to acquire and insure a vehicle, which is the case for the vast majority of Americans, there is little financial incentive not to use it for most trips. By contrast, the per-trip price for transit is generally noticeably higher than is the incremental cost of driving.

In addition to most costs of car ownership being fixed, costs for car parking tend to be "bundled" with the purchase of other assets, goods, and services. Bundled parking costs means that although consumers are paying for parking, they are doing so only indirectly, and most importantly, they cannot reduce their parking costs by choosing to exercise more discretion in the frequency of their driving and parking. Thus, for example, customers of a store that provides free parking pay for the cost of the parking as part of their purchases, regardless of whether they park or take (and pay for) transit. Another example of bundled parking costs is when so-called free parking is included in the price to rent an apartment. A renter does not have the option to save on rent by foregoing car ownership and relying on alternative transportation, even though there is clearly a cost involved in providing the parking.



In exchange for reducing fixed driving costs and bundled parking costs, many drivers—especially lower income drivers—would readily accept new charges based on their mileage, such as for insurance, and direct parking charges that they control by their amount of driving and by where and how long they park. Motorists, of course, will only reduce their driving when the savings offered by pay-as-you-drive-and-you-save (PAYDAYS) pricing exceeds the value of a particular drive-alone trip.

Shifting away from fixed driving costs and hidden parking costs to mileage-based and variable-parking pricing would offer substantial environmental, safety, congestion reduction, and other public benefits. Economists do appreciate the benefits of varying driving costs based on mileage and of direct parking pricing, but they have tended to focus instead on promoting road tolling with rates that vary by congestion level. Usage-based vehicle charges and variable parking charges are possible, however, without having to overcome substantial political hurdles that are

commonly encountered when roadway tolling is proposed. Yet as with toll pricing, vehicle-use pricing has been slow in coming.

In addition to inertia that supports pre-existing pricing customs, barriers to implementation include private sector start-up and marketing costs (e.g., PAYDAYS insurance), bundled office space and parking leases precluding immediate cost savings from pricing-related parking-demand reductions, and public sector costs associated with collecting vehicle taxes and fees in different ways (e.g., charging for each mile of road used instead of a fixed annual vehicle-registration fee). Nevertheless, there is noticeable movement toward the adoption of PAYDAYS and variable parking charges, and there is growing recognition that such pricing has great potential to be implemented widely, thus providing a host of significant benefits.

Overview of Mileage-Based Pricing Strategies

There are a number of specific strategies that fall into the broad category of mileage-based pricing. The overall level of incentive to reduce driving that results from deploying multiple mileage pricing strategies could be very large. For example, in 2003, the then-outgoing Executive Director of the National Research Council's Transportation Research Board, Thomas Deen, delivered a speech calling for shifting as much as possible of what was then the equivalent of an average \$0.50 per mile cost of driving to real-time variable charges (Deen, 2003). This section briefly discusses each of the available strategies that could together be deployed to come close to achieving a cost shift of this magnitude.

PAYDAYS CAR INSURANCE

Consumers typically pay a flat annual or semi-annual fee for car insurance. For liability and collision coverage, which represent most of the cost of insurance policies, insurance claims will only result when the insured vehicle is being driven. Thus, the more someone chooses to use their vehicle, the greater the risk of a claim. Through PAYDAYS car insurance, companies more accurately bill their customers on the basis of crash risk and provide policyholders a financial incentive to drive less. The variance in insurance rates based on vehicle miles traveled (VMT) is generally insignificant today, although only a small percentage of insurance claims are made (such as for theft) when a vehicle is not being driven (through comprehensive cover-

age). A 2008 Brookings Institution study estimates that an 8-percent reduction in VMT, along with between \$50 and \$60 billion in annual net social benefits, would result if all fixed automobile insurance costs in the United States were converted to usage-based insurance. The study also estimates that 63.5 percent of all households would experience savings with PAYDAYS insurance, and such savings would amount to an average of \$270 per vehicle and \$496 per household, among households that do save (Bordoff & Noel, 2008). With PAYDAYS pricing, low-income drivers are projected to reduce their driving substantially more than others and thus would experience even greater savings than would the general population (Deakin & Harvey, 1996).

PAYDAYS insurance assesses individualized premiums based on miles driven instead of the calendar year and provides motorists a new option to save money by reducing their risk exposure through driving less. PAYDAYS premiums incorporate traditional risk factors, such as driving record and vehicle make and model, and reflect the coverage selected. Such insurance would be expected to result in a reduction in crashes and related insurance claims that are disproportionate (i.e., 1.34 times) to the mileage reduction and would reduce congestion and pollution (Greenberg, 2002).

By providing an affordable insurance option to low-income motorists who are willing to limit their mileage, PAYDAYS insurance would reduce the number of uninsured motorists. PAYDAYS insurance has been shown to be a better way to reduce gasoline consumption in terms of providing net public benefits than even gasoline taxes (Parry, 2005). Finally, government incentives to promote

PAYDAYS insurance have been projected to be cost competitive in terms of reducing air pollution and saving lives with other government transportation-related expenditures aimed at achieving these objectives (Greenberg, 2002).

In the United States and even more so abroad, insurance premiums that are at least in part based directly on miles driven have been or are being piloted or offered in a few markets. In recent years, most of the major car insurance companies in the United States have been experimenting with technologies that would facilitate their offering PAYDAYS insurance if they someday choose to. A subset of these companies is seriously contemplating offering it in the near term, at least on a pilot basis.

From 1998 through 2001, Progressive Auto Insurance piloted PAYDAYS insurance with over 1,200 Texas drivers whose vehicles were equipped with global positioning system (GPS) devices. Individualized premiums under this “autograph” program included a small fixed charge and were primarily based on the number of minutes people drove and when and where they drove. Beginning in 2004, Progressive began its TripSense Program in Minnesota, Michigan, and Oregon. TripSense collected data—including miles and the time of day driven, hard acceleration, braking, and speed—from vehicle on-board diagnostic systems (which did not record driving location).

In 2008, Progressive launched its newest program, MyRate. It is the next generation of TripSense, providing cellular communication of the on-board diagnostic data from the vehicle to Progressive, expanding product availability to more states and affecting premiums more substantially. That is, although drivers could earn total discounts of up to 25 percent under TripSense, with MyRate, depending on state regulations, discounts of up to 60 percent and surcharges of up to 9 percent could be applied on renewal of the policy. Progressive representatives have said that with TripSense, the predecessor program to its newly launched MyRate, 34 percent of its customers who signed up for insurance by telephone or the Internet (but not via an

agent) chose TripSense over Progressive’s standard product in the three states where TripSense was offered. Progressive also reported interest among over half its customers for PAYDAYS policies, as long as they could save money.

In January 2004, GMAC Insurance and OnStar jointly announced that drivers in Pennsylvania, Arizona, Indiana, and Illinois with active OnStar accounts, which are used to communicate vehicle mileage to GMAC Insurance, would be eligible to save from 5 percent to 40 percent on their car insurance, depending on in which of seven mileage categories the amount of their driving fell. By 2008, OnStar’s market penetration had grown to over 5 million subscribers in the United States, and a year of coverage became standard on every General Motors vehicle. The GMAC Insurance discount—which has increased to 54 percent for the lowest mileage drivers driving 2,500 or fewer miles per year and is at 13 percent for those driving between 12,501 and 15,000 miles per year—is available in most states to drivers who use OnStar.

Beginning in October 2008, MileMeter, a start-up insurance company, began to offer “insurance buy the mile” throughout Texas. Instead of purchasing coverage for 6 months or a year, a Texas motorist may purchase between 1,000 and 6,000 miles of coverage and make additional purchases as needed.

The on-line Transportation Demand Management Encyclopedia produced by the Victoria Transport Policy Institute includes information about PAYDAYS insurance internationally and regularly updates the status of such insurance offerings around the world. See <http://www.vtppi.org/tdm/tdm79.htm> for updates.

CAR SHARING

Car sharing, or automated hourly neighborhood car rentals that substitute for car ownership, is an innovative, voluntary transportation-pricing measure that converts virtually all fixed-vehicle ownership costs to usage-based fees. It started in Europe and today is widely available in both European and U.S. cities. Car sharing allows households to get by without owning a car or owning fewer cars than they would otherwise need. Car-sharing vehicles are placed throughout neighborhoods. Users make reservations on the Internet and, as part of their membership in a car-sharing organization, are provided a smart card to access vehicles they have reserved. The car-sharing company pays all driving costs, including gas and insurance, in exchange for a member's hourly fee. Most lower mileage households will save money by using car sharing instead of owning a car.

The best-studied car-sharing program in the United States is San Francisco City CarShare. Through the use of extensive travel surveying and a matched pair analysis, car-sharing membership was shown, independent of other factors, to result in seven fewer VMT per day. A key reason for this was the relatively significant reduction in car ownership among members when compared with non-members (Cervero et al., 2006). VMT reductions that result from car sharing have been found to be even more dramatic in Europe. In Switzerland, for example, car owners who sold their vehicle(s) and became Mobility CarSharing customers reduced their annual mileage driven by 72 percent, whereas new car sharers who had not previously owned cars did not drive more than they did before when they borrowed vehicles instead of sharing cars (Swiss Federal Office of Energy, 2000). Car sharing is also an important strategy in addressing urban parking woes. Twenty households typically share each car-sharing vehicle, thus reducing parking costs and the need to park around the office and housing developments.

Overview of Parking and Access Pricing Strategies

Off-street parking is typically not priced in part because zoning requires that it be provided in quantities sufficient for it to be offered for free. This approach, though, has been shown to have very negative consequences, making it important to explore pricing alternatives. A one-of-a-kind before-after study of a 1961 Oakland, CA, ordinance that required one parking space per apartment-building dwelling unit showed an 18-percent rise in construction cost per dwelling unit and a reduction in housing density of 30 percent after the requirement was imposed. Reduced density in itself increases the need for and ownership of automobiles as it spreads destinations and creates an environment less hospitable to walking and other alternative transportation modes. A doubling of residential density, for example, reduces vehicle ownership by 32 percent to 40 percent, which also reduces VMT (Holtzclaw et al., 2002).

The fact that parking appears to be free in the United States to most users most of the time and yet is very expensive to provide means that there are many opportunities available to charge for parking directly or to offer financial rewards to those who do not use parking. Parking pricing takes many forms, including employer-provided parking “cash-out” benefits, variable on-street meter charges, and off-street pricing strategies. Parking cash-out allows employers to offer their employees the option of receiving taxable cash in lieu of any parking subsidy offered, providing employees an incentive to find alternatives to drive-alone peak-period commuting.

Pricing of street and municipal parking is an excellent strategy to encourage alternatives to drive-alone trips to and from congested urban areas and to manage limited parking supply. A related strategy to discourage freight-related congestion is variable port-access charges.

PARKING CASH-OUT

The vast majority of employers provide their employees free parking at work; a minority offer transit or other commuter benefits, and even where such alternative benefits are offered, they are generally capped at a far lower value than the parking subsidy that is provided. For these and other reasons, most employees choose to drive alone to work.

Parking cash-out is an especially good parking-pricing strategy to realign existing employer commute benefits so as to reward employees for using alternative transportation. Parking cash-out allows employers to offer their employees the option of receiving taxable cash in lieu of a parking subsidy, providing employees an incentive to find alternatives to drive-alone peak-period commuting. In most cases, employers offer their employees the cash value of a monthly parking space in lieu of the space itself. Employees may decline the cash and keep the tax-free parking space or accept tax-free transit or vanpooling benefits in its place—with any difference between the value of the parking and the alternative benefit being provided in taxable cash to the employee. Both employers and employees ultimately benefit from implementing parking cash-out, because employees’ incomes rise by using savings from employers’ reduced business

expenses (i.e., from not having to subsidize as much parking), which helps employers in recruiting and retaining good employees. The potential congestion-reduction benefits can be quite high. Among 1,700 employees in eight case study firms in southern California, parking cash-out implementation led to an 11-percent reduction in commute trips and a 12-percent reduction in commute VMT (Shoup, 1997). Studies of parking cash-out in Seattle, WA, and the Minneapolis–St. Paul, MN, metropolitan area yielded similar results, with a 10-percent reduction in employee parking demand in Seattle (Glascock, Cooper, & Keller, 2003) and an 11-percent shift to alternative transportation modes in Minneapolis–St. Paul (Van Hattum et al., 2000).

VARIABLY PRICED METERED PARKING

Free on-street parking provides a perverse incentive for motorists to circle around congested urban blocks in search of a space and to bypass commercial garages that do have space but for which the driver must pay. This worsens already congested conditions. The results of 16 studies of cruising for on-street parking in 11 cities were summarized in

the book, “The High Cost of Free Parking” (Shoup, 2005). The share of city traffic cruising in these studies ranged from 8 percent to 74 percent and averaged 30 percent, with an average search time of 3.5 minutes to 13.9 minutes, or an “average of the averages” of 8.1 minutes. If cruising for parking could somehow be eliminated, its congestion-reducing benefits would clearly be very substantial. It could reduce the need to provide additional costly roadway infrastructure (where such expansion might be possible) to serve travel needs.

The obvious solution is to price parking to achieve a particular occupancy standard; thus, at least a few spaces will always be readily available. University of California, Los Angeles, professor Donald Shoup, the preeminent U.S. authority on parking policy, has regularly called for prices to vary in order to yield 85-percent curb-space occupancy, leaving about one in seven parking spaces per block available for the taking. New technologies, such as pay-by-cell-phone systems and mid-block parking-ticket-dispensing machines that accept credit cards, can facilitate such pricing. Shoup suggested that residents of an area with new street parking charges share in its revenues. Redwood City, CA, has enacted and is implementing a law that requires city staff to set and adjust parking meter charges to achieve an 85-percent curb-space occupancy rate. The U.S. Department of Transportation (DOT) has begun funding projects in San Francisco, CA, and New York City, NY, to vary meter charges to meet specific curb-space occupancy objectives.

PRICING OF OFF-STREET PARKING

Even for employees who purchase their own monthly parking spaces, once they have made the decision to purchase such parking, there is no financial benefit to using it sparingly. In fact, it would often cost them more not to use the parking, because taking a transit alternative would require the payment of a fare, whereas driving would incur no



incremental cost for parking. One strategy to change this would be to sell more flexible parking passes. Rather than monthly passes, parking operators could sell passes for a limited number of uses (e.g., 10 or 20), or operators could continue to sell monthly passes (perhaps at a higher rate) and provide a rebate for unused days. In a similar vein, a monthly parking pass could include free transit, in which the transit agency and parking operator could agree to some revenue apportionment scheme. A monthly transit pass could also include a few days of free parking as a sales enticement.

A time in which turnover of off-street parking spaces may not be a good thing from a public-policy perspective is in the middle of rush hour. Ideally, motorists will have an incentive to avoid driving at such times. Although congestion-priced tolling is one appropriate strategy, another approach is to place a surcharge on entering or leaving a parking facility during and near the rush hour. The City of Chicago is considering implementing just this strategy by placing a surtax on off-street parking that is accessed or vacated at peak-travel times.

VARIABLE PORT ACCESS CHARGES FOR TRUCKS

A freight-related strategy that has been successfully demonstrated is variable port access charges for trucks. It is not unusual that trucks must pay for the privilege of transferring loads at a port facility, but it is rare that the rates vary to discourage peak-period use and to encourage use during off-peak times.

The PierPASS OffPeak Program at the Ports of Los Angeles, CA, and Long Beach, CA, is an exception, providing a financial incentive for cargo movements to shift away from peak-traffic periods and into nights and weekends. Prior to the launch of the program, between 17 and 21 percent of port traffic moved during off-peak hours. In a July 8, 2008, report on the program, about 45 percent of port traffic was found to move during such hours (BST Associates, 2008).



Making Non-Toll Pricing Happen

INDIVIDUAL AND CORPORATE ACTIONS

Employers have the ability to implement parking cash-out now, along with complementary incentives, such as subsidized transit for employee commuting. Doing so helps establish an employer as a good corporate citizen that contributes to community clean-air and traffic-reduction goals and helps with employee recruitment and retention. A good resource for employers looking to implement parking cash-out and complementary measures is the Best Workplaces for Commuters Program (<http://www.bestworkplaces.org>), originally launched by the U.S. Environmental Protection Agency and DOT and currently run by the University of South Florida's Center for Urban Transportation Research. Employees can encourage and work with their employers to establish programs that provide parking cash-out and transit benefits.

Individuals may consider signing up for car sharing if it is available in the area where they live. If after a short test period they find that car sharing works for them, they could then sell a household vehicle and increase their reliance on car sharing and alternative transportation modes. Individuals may also seek out companies that offer PAYDAYS car insurance or encourage their own car insurance company to offer such an option.

GOVERNMENT INCENTIVES

Some forms of PAYDAYS and variable parking pricing are advancing strongly on their own, whereas others could use a boost, perhaps from governmental incentives. For example, car sharing is growing very rapidly in U.S. cities on its own, whereas PAYDAYS insurance, at least where the premium is based mostly on usage, is not available to most consumers and probably will not be for some time without strong governmental incentives.

King County, WA, which encompasses Seattle, WA, has undertaken research and has engaged in extensive outreach to insurance companies. This includes launching a partnership with Unigard Insurance Group to pilot PAYDAYS insurance, with support from the Federal Value Pricing Pilot Program. The North Central Texas Council of Governments, covering the Dallas–Fort Worth area, has also aggressively sought insurance company partners. It made around \$2 million available for this purpose because of the potential of PAYDAYS insurance to reduce driving and in an effort to begin to reverse a severe regional air pollution problem.

In recognition of the benefits, and also the challenges, that the industry faces in offering PAYDAYS insurance, the State of Oregon enacted tax credits, capped at \$1 million, for policies that are at least 70 percent variable and that cover all household vehicles. Eligible policies earn a \$100 per-vehicle credit, up to \$300 per household. These tax credits have spurred many conversations with insurance companies about offering PAYDAYS insurance in Oregon. No company has yet established an eligible program there, largely because the total credits offered are small relative to

the expected transition costs and risks companies would face. Still, the Oregon approach of providing incentives to introduce PAYDAYS insurance is one that garnered substantial support and might ultimately achieve its desired result.

The Brookings Institution has recommended a Federal tax credit of \$100 for each new mileage-based policy that an insurance company writes, phased out after the first five million vehicles are covered this way. As Oregon has demonstrated, states could also enact their own tax credits. Brookings also recommended dedicating \$15 million in the next Federal surface transportation reauthorization bill exclusively to support PAYDAYS insurance pilots (Bordoff & Noel, 2008).

Parking cash-out is mandated by law for some large California employers whose circumstances allow them to recover the cost of offering the benefit by shedding parking. Some states provide tax credits and other incentives to employers that offer transportation commute benefits, including parking cash-out. Maryland provides the most generous incentives of any state, offering employers a 50-percent tax credit (extended also to non-profits), up to \$30 per employee per month, for the cost of these benefits, including for a parking cash-out payment.

Other incentive approaches may also be used. For example, states could set aside a portion of their Federally apportioned Congestion Mitigation and Air Quality Improvement (CMAQ) Program funds to support PAYDAYS and variable parking pricing pilots. A hypothetical incentive policy to promote vehicle-use pricing, which could be established as its own new Federal or state program or through set aside CMAQ Program funding from states, has been shown to be many times more cost effective than the typical CMAQ expenditure of funds by states in reducing transportation emissions (Greenberg, 2002).

Regardless of what, if any, incentives are offered, PAYDAYS and variable parking pricing strategies are beginning to garner appreciation for their potential to reduce congestion, while saving consumers money and offering a plethora of other benefits.



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