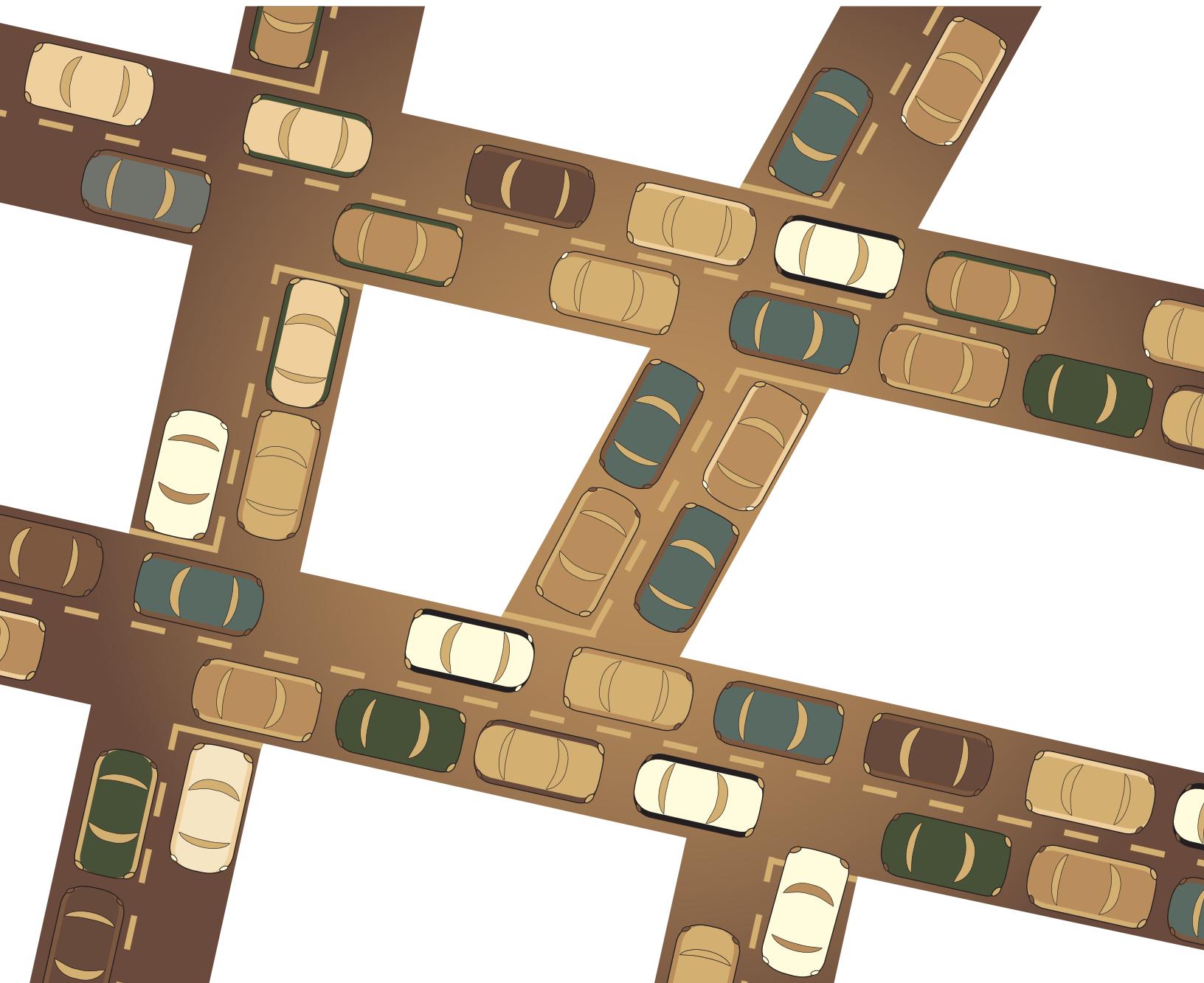




Gaining Public Support for Freeway Congestion Pricing

by Robert W. Poole, Jr.



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Executive Summary

With transportation coffers barely able to maintain highways, let alone adding new capacity to relieve congestion, many transportation economists and urban planners have concluded that the best solution to U.S. freeway congestion is to implement variable pricing on all congested freeways. At the same time, many political scientists and other political observers consider doing so to be politically impossible, primarily due to strong opposition from taxpayers, voters and highway user groups. Federal efforts dating back to the 1970s to induce one or more urban areas to price its freeways have all been unsuccessful, which reinforces the political scientists' skepticism. But even if the political difficulties could be overcome, the conventional model of freeway congestion pricing may not be optimal, since it could well create more losers than winners.

Analyzing this conundrum requires a closer look at two assumptions implicit in the standard congestion pricing model: uniformly applied (variable) pricing and all lanes treated the same way. Charging the same price to all users during rush hour ignores the huge variability in people's value of time (and their value of the reliability of trip times). This can vary for the same person from one rush-hour trip to the next, depending on that trip's purpose and the person's circumstances at that time. A uniform price applied to all rush-hour travelers will overcharge many and undercharge others, leading to suboptimal outcomes in which the losers will likely outnumber the winners. In other words, only a minority of those using the freeway might find the value of time savings to be greater than the cost of the toll; the others would divert to already-congested surface streets or to much slower transit alternatives. Similarly, the assumption that all lanes must be the same, serving all kinds of vehicles, prevents consideration (on multi-lane expressways) of reserving some lanes for particular kinds of vehicles or trips.

Once those two constraints are relaxed, it becomes possible to consider a multi-pricing approach for freeways. The current trends toward converting HOV lanes to HOT lanes and adding new priced express lanes are the potential first steps away from the conventional model of pricing. The

second step should develop complete networks of priced lanes, aimed deliberately at those trips with the highest value on any particular day.

Once the network of premium lanes is in place (paid for by the new toll revenues), the network's performance may help generate support for expanding pricing to other lanes of the expressway. Drivers still in congested general purpose (GP) lanes may realize that if more of the lanes were priced, the average price in those lanes would be lower, making them more accessible to those with somewhat lower values of time. This could generate political support for converting an adjacent GP lane to pricing, creating a larger constituency for priced lanes.

Finally, if congestion is still a problem on the remaining GP lanes, the benefits of pricing on the (by now) larger system of premium lanes will be obvious to a larger fraction of the population. This could lead to support for implementing modest peak pricing on the remaining GP lanes, flattening the peaks and shifting some trips to alternate modes. In this evolutionary manner, the entire freeway eventually gets priced, but with at least two different pricing regimes, premium and regular, increasing the likelihood that winners outnumber losers. Political support would also be greater if all the revenues from pricing were dedicated to building, operating, and maintaining the expressway system on which prices were being charged.

In selected freeway corridors with a high percentage of truck traffic, specialized truck-only toll lanes would also be implemented. As separate lanes, they could be tailored more specifically to the needs of heavy trucks—e.g., with shallower grades, more durable pavements, etc. In this limited number of freeway corridors, the end result would be three tiers of lanes and pricing: regular, premium and truck-only.

Given the long history of political failure in implementing the standard top-down model of all-lanes, one-price-fits-all freeway pricing, this evolutionary, bottom-up model of freeway pricing should be seriously considered.

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Part 1

The Economic Case for Freeway Pricing

The general case for road pricing, of which freeway congestion pricing is an example, was set forth in classic works by Sir Alan Walters¹ in the United Kingdom and William Vickrey² in the United States. Basically, they argue that without pricing at the point of use, the demand to use road capacity will tend to exceed its capacity at various times and places, resulting in congestion. In addition, without the information provided by pricing, those responsible for highway infrastructure will be unable to determine how much of it to provide. In some cases, they will produce too much (costs exceeding benefits) while in other cases they will produce too little (where the benefits would exceed the costs). In effect, the argument for using pricing on the roadway network is analogous to the use of pricing in other network utilities—electricity, gas, telecommunications, etc. As Steve Lockwood pointed out in 1996, the road network is a conspicuous outlier among such utilities for failing to make use of pricing both to manage network operations in a tactical (short-term) sense and to direct investment in capacity to its most productive uses (strategic/long-term).³

The most recent *Conditions & Performance Report* from the Federal Highway Administration (FHWA) provides a dramatic example of the difference that pricing could make in estimating highway capacity needs. In making its traditional 20-year estimates of needed investment (a) to “sustain” current conditions and performance and (b) to “improve” them, the FHWA researchers created 24 scenarios.⁴ They used three different benefit/cost (B/C) ratios (1.0, 1.2 and 1.5) as screening devices (i.e., selecting only investments in which the ratio of benefits to costs exceeds a given threshold such as 1.2). They also assumed three different funding methods: general taxation, fixed-rate user taxes (such as today’s fuel taxes) and variable-rate user fees. One set of scenarios focused on the Interstate Highway System, while another addressed all U.S. highways. The discussion below concerns the Interstate scenarios.

For the status quo (no congestion pricing), to “sustain” current performance would require annual investment of \$24.8 billion, compared with the \$16.5 billion per year currently being spent (which means that continuing with the status quo means conditions will decline from year to year—worse congestion and declining pavement quality). By contrast, with variable pricing, annual investment needed to maintain current conditions would drop to \$11.6 billion, 30% less than the \$16.5 billion per year now being spent (because much less would be needed to add capacity, and nearly all the investment could go to maintaining current pavement condition). To “improve” performance (which means reducing future congestion and improving pavement condition) without pricing, and using the least constraining B/C ratio of 1.0, the annual investment would need to be an enormous \$47 billion. Using a more stringent B/C requirement of 1.5 would reduce that somewhat, to \$39

billion. But the big payoff comes by using a combination of the 1.5 benefit/cost threshold and congestion pricing. That scenario requires annual investment of only \$24 billion to significantly improve conditions (congestion and pavement quality) on the Interstate system.

Table 1: Impact of Pricing on Annual Interstate System Capital Investment

Scenario	Status Quo (\$B)	Congestion Pricing (\$B)	Difference (\$B)
Sustain current C&P	24.8	11.6	13.2
Improve C&P			
Using B/C>1.0	47.0	30.4	16.6
Using B/C>1.2	43.5	27.5	16.0
Using B/C>1.5	39.0	24.0	15.0

Source: FHWA 2008 *Conditions & Performance Report*, Executive Summary, p. ES-16.

The case for road pricing was powerful enough, even in the early years, to stimulate serious efforts to bring about its implementation. In the United Kingdom, an appointed body called the Smeed Commission developed guidelines for implementing road pricing in the 1960s.⁵ And in the United States, the Urban Mass Transit Administration (predecessor of today's Federal Transit Administration) funded a series of studies on urban congestion pricing during the 1970s, many of them carried out under contract by the Urban Institute.⁶ UMTA in those years was prepared to provide funding assistance to any metro area willing to implement road pricing, but it found no takers.⁷ The political obstacles were considered overwhelming.

Part 2

Challenges to Freeway Pricing

U.S. Attempts at Freeway Pricing

Some highway user groups argue that using congestion pricing on urban freeways is akin to asking them to “pay twice” to use the highways. This position has been put forth vigorously by trucking organizations in response to proposals over the past decade or so to put tolls on various Interstate highways, most recently, over Pennsylvania’s ultimately unsuccessful attempt to toll I-80 and use most of the proceeds as a source of transportation (transit and highway) funding statewide. This argument is generally made, as well, by auto clubs, such as the national AAA and its various regional affiliates.

Elected officials take such opposition very seriously. First, with over 91% of households owning motor vehicles,⁸ in most states the motorist population is practically synonymous with the voting population. If the auto club and trucking associations are accurately reflecting popular sentiment on this issue, elected officials are justified in seeing the imposition of tolling/pricing as politically radioactive and a likely threat to their re-election chances.

Second, many (though not all) tolling and pricing proposals garner popular opposition because they don’t add value to the roadway. If the proposal is to add tolling or pricing to an existing highway without making major improvements (e.g., adding lanes, rebuilding obsolete interchanges that serve as bottlenecks, etc.), then the trucking groups’ typical characterization of them as merely “erecting toll booths on the Interstates” rings true. In economic terms, implementing such a policy could well be described as monopolistic exploitation—requiring people to start paying considerably more for an essentially unchanged/unimproved facility.

To be sure, advocates of pricing are convinced that congestion pricing itself would be a big improvement to a physically unchanged highway or freeway. But the extent of such benefits depends critically on the specifics of the facility, the pricing algorithm, etc. So one cannot assert confidently that any and all pricing schemes would provide large benefits to most or all users (as discussed further below). It should also be noted that in the federal SAFETEA-LU reauthorization legislation, after some initial opposition the trucking industry ended up not opposing two Interstate pilot programs involving tolling: one permitting up to three projects to rebuild an Interstate facility with toll financing and the other permitting up to three new Interstate projects to be constructed with toll financing. This suggests that their opposition is primarily to “monopolistic exploitation” rather than to tolling, per se.

During the 1990s, under the federal Value Pricing Pilot Program, the FHWA sought to implement freeway congestion pricing, if it could find a metro area willing to take that major step. One of its most ambitious projects focused on Los Angeles—the most congested metro area in the country. A major Value Pricing grant supported the creation of a 42-member task force, representing a broad cross-section of organizations, called REACH (Reduce Emissions and Congestion on Highways). The grant included funding for modeling, by one of the nation’s leading toll traffic and revenue forecasting firms, the impact of a congestion pricing system for the entire metro-area freeway system. The REACH project had the full support of the regional metropolitan planning organization, the Southern California Association of Governments (SCAG), and there were no evident political constraints on the task force’s recommendations. In the end, the task force concluded that while there would be significant benefits from implementing something like the congestion pricing system that had been modeled, the political acceptability of the idea was overwhelmingly negative. Therefore, as a second-best solution, the task force recommended the development of a network of high-occupancy/toll (HOT) lanes on the freeway system, by converting existing HOV lanes to HOT lanes and adding missing links as new construction.⁹

More recently, in 2007 the U.S. DOT created a national competition for Urban Partnership Agreements (UPAs). Using monies from a variety of departmental sources, DOT offered targeted grants to metro areas that would implement some form of congestion pricing within a relatively short time-frame. One of DOT’s hopes was that one or more of the winning applicants would propose implementing some form of congestion pricing on its freeway system. But that is not what transpired. Of the five winning proposals, two (Miami and Minneapolis/St. Paul) proposed HOV-to-HOT conversions that included important innovations, two proposed replacing existing non-tolled facilities with tolled ones due to lack of funding alternatives (San Francisco and Seattle), and one (New York) proposed congestion pricing on the surface streets of mid- and lower Manhattan. Political opposition killed the New York and San Francisco pricing proposals, but the other three are being implemented. None of the three, however, involves putting tolls on existing non-tolled highway facilities.

Congestion Pricing Overseas

Overseas, there have been far more failures than successes in implementing congestion pricing. In the 35 years since Singapore implemented the first version of its successful highway congestion pricing system, the only other notable successes have been London (2003) and Stockholm (2007). In the first, a charismatic mayor made reducing central-London congestion a key part of his initial election platform, and the net revenues were spent on transit improvements (which the large majority of Londoners use). In Stockholm, the innovation of a six-month trial period followed by a popular vote led to voter acceptance, most certainly helped by the dedication of net revenues to both highway and transit improvements.

In contrast with these limited successes, we have witnessed failures to gain political support in Hong Kong and Kuala Lumpur, despite the nearby example of Singapore. Following pricing's implementation in central London and then Stockholm, the U.K. government provided funding to Cambridge, Manchester and other congested urban areas to plan implementation of congestion pricing, but the resulting plans died due to political opposition. The Netherlands has made repeated attempts over the past decade, the most recent one coming to defeat in early 2010. In all of these overseas examples, per-capita auto ownership is much lower and transit mode-share much higher than in large U.S. metro areas where congestion pricing would have the largest impact.

Why is the opposition to congestion pricing so strong, even in non-U.S. urban areas where it would appear to face less opposition than in the United States? Several researchers have suggested that it is likely that the implementation of congestion pricing would produce more losers than winners, i.e. it would hurt more people than it would help. Concentrating now on freeway congestion pricing in the United States (which is the focus of this paper), were such pricing to be implemented, those affected would fall into three categories, as follows:

- The Tolled: those who pay the congestion price because their high values of time and/or reliability make them better off by paying;
- The Tolled-off: those who divert to parallel arterials or transit, since their gains from pricing are not worth the high cost; and
- The Un-tolled: those already on the parallel arterials, whose trips are made worse by the added traffic from the Tolled-off.

As World Bank economist Timothy Hau¹⁰ and others have maintained, the second and third of these groups are likely to perceive themselves as losers from congestion pricing. And at least in a U.S. urban area context, it is plausible that the second and third groups would total considerably more people (voters) than the first group. Hence, this kind of assessment adds depth to the political case against shifting to freeway congestion pricing.

Part 3

Addressing These Challenges

Most proposals seeking to overcome these challenges to freeway congestion pricing focus on using the net revenues in various ways. One of the earliest of these came from transportation economist Kenneth Small in 1992.¹¹ Using metro Los Angeles as an example, Small hypothesized a freeway pricing system with peak-period prices averaging 15 cents per mile in congested corridors, generating net revenue of \$3 billion per year. Small proposed using two-thirds of this for various rebates and transportation tax reductions in the region, with the remaining one-third used for regional transportation improvements. Perhaps because of its complexity, the proposal did not gain traction.

The most common proposed use of revenues is to expand non-driving alternatives for those tolled off the freeways, inspired by the successful London and Stockholm implementations. There are several problems with this approach. Those two European systems are cordon-price congestion pricing (drawing a boundary around the downtown and charging a toll to cross it), aimed at reducing traffic in traditional central business districts that already had a much higher transit mode share than any large, congested U.S. metro area. If a large fraction of all jobs are in a traditional downtown area (e.g., Manhattan or the Chicago Loop), a set of radial transit lines converging on downtown can attract a significant share of commuters. But this kind of transit is a relatively poor fit for serving most large U.S. urban regions, which are characterized by multiple business centers and the majority of the jobs in suburban locations. In the United States, the primary commuting pattern for several decades has been suburb-to-suburb. With commuting trips needing to go from “anywhere” to “anywhere” across a huge landscape, conventional transit systems (especially fixed-route rail transit) are a very poor fit.

Doubling transit’s mode share in the 20 most congested metro areas is far beyond the budgets of those areas’ long-range transportation plans, and doubling a typical 5% mode share to 10% would still leave 90% of the commuting population unserved by transit. Average door-to-door travel time via transit nationwide, at 48 minutes, is currently about double that of solo driving (23.9 minutes), due to the time needed to get to a transit stop, the time involved in one or more transfers, and the time used in getting from the transit stop to the workplace.¹² So it is not surprising that those who expect to be tolled off the freeways due to pricing would judge the available transit alternatives as making them worse off.

A more radical proposal was made recently by David King, Michael Manville and Donald Shoup.¹³ Considering the real-politik point that elected officials fear for their jobs if they try to implement

freeway pricing, they proposed that 100% of the net revenues be allocated to the jurisdictions through which priced freeways extend, in proportion to route-miles or lane-miles. There would be no restrictions on the use of these funds; they would become a new source of general revenue for those cities. In effect, the aim is to garner those officials' support by giving them a significant new source of funding, in the hope that they will be motivated to take the political risks of implementing pricing. Presumably, those officials would seek to use at least some of the proceeds on projects or programs aimed at compensating those tolled off or those negatively affected by those tolled off.

There are several problems with this proposal. Most fundamentally, it dispenses with one of the two rationales for freeway pricing, which is to direct resources to those locations and projects where price signals indicate that increased freeway investment is needed. Because it lacks this component, the Shoup proposal is an example of the monopoly exploitation version of congestion pricing, and would surely generate intense opposition from the very highway user groups that are the largest source of opposition to pricing. It also dispenses with the users-pay/users-benefit principle on which U.S. highway funding has long been based.

Jurisdictional issues are also involved. Freeways are state highways, not local ones, so it is difficult to imagine that state DOTs, already strapped for highway funding in most states, would acquiesce to any proposal that gave away a potentially large new highway funding source to local governments for (potentially) non-transportation purposes. In addition, many freeways are part of the Interstate highway system, and thus far when Congress has created limited exceptions to the general federal prohibition on charging tolls or prices on Interstates, it has insisted that the revenues be reinvested in highways (or in transportation facilities in the same corridor).

Several more-nuanced proposals have come from Patrick DeCorla-Souza of FHWA's Value Pricing Office. The first of these, in 2000, was called Fast and Intertwined Regular Lanes (FAIR Lanes).¹⁴ Existing freeways would be divided into two types of lanes: Fast and Regular. Those using the Fast lanes would pay congestion-related tolls; the Regular lanes would operate just as freeway lanes do today. All freeway users would have transponders: Fast lane users would pay their tolls thereby, while Regular lane users would acquire credits enabling them to make a certain number of trips in the Fast lanes on days when they are in a hurry. The aim was to provide benefits for both categories of user. The Value Pricing program offered funding to metro areas to test the concept, but the only one that received a grant to assess the feasibility of FAIR lanes, Alameda County, California, ended up deciding not to implement the idea, based in part on polling data that found this approach "was not well supported by the public."¹⁵

DeCorla-Souza offered several variants of this idea in subsequent years, but all were complex and difficult to explain simply to motorists and voters. More recently, he has turned his attention to converting all freeway lanes to pricing. His 2008 concept is called High Performance Highways.¹⁶ According to this plan, all lanes of existing freeways would use congestion pricing during peak periods only, with all vehicles except express buses and employer-sponsored carpools and vanpools paying those charges. Tolled-off motorists would have the choice of either waiting in a

toll-bypass queue for access to the freeway or using parallel arterials with enhanced traffic signal optimization. (In an early, non-published version of the paper, DeCorla-Souza also suggested that paying customers be offered money-back guarantees on promised time savings. And he proposed sharing a portion of the net revenues with all paying customers, either as rebates against vehicle taxes or as credits for future tolls, transit fares and parking at park-and-ride facilities. Neither proposal appears in the published version.) The bulk of the published 2008 paper is addressed to transportation planners, drawing on modeling analysis that shows the benefits exceeding the costs, and that pricing all lanes would be more efficient than adding priced capacity to the freeway system. But even such a promising idea requires public support to be politically feasible, and with its pricing of currently unpriced freeways, this plan would face opposition.

DeCorla-Souza's latest concept is called Flexible and Efficient Express (FEE) Highways. Under this approach, new capacity would be added to a congested freeway by restriping the lanes from 12 feet to 11 feet and converting the right shoulder to a traffic lane. All lanes would be priced during peak periods, with ramp metering added to fine-tune traffic flow. A set of technologies called "Active Traffic Management" (including lane-specific speed limits) would be added to address safety concerns about the new configuration. Expected surplus revenues would be used to expand bus transit, to provide employer incentives for telecommuting, to improve traffic management on parallel arterials, and to pay for improved traveler information systems.¹⁷ These proposals are aimed at compensating the tolled off and the untolled. But the FEE Highways proposal is complex and difficult to explain in simple terms to motorists and voters.

Part 4

Problems with Conventional Approaches

Nearly all proposals for converting U.S. freeways to congestion pricing make, explicitly or implicitly, two questionable assumptions. First, they assume that all motorists will be charged the same rate per mile, which varies in proportion to time and place. We can call this the single-price assumption. The second assumption is that all lanes will be the same in terms of access, types of vehicles, etc. Let us call this the general purpose (GP) lanes assumption. A key thesis of this paper is that rethinking those two assumptions may help in developing a more politically feasible approach to freeway pricing.

The Single-Price Assumption

Most transportation studies use a single value of time for motorists (or occasionally two different values, one for business travel, including commuting, and another for leisure/personal travel). Increasingly, however, researchers are finding that values of time vary greatly, depending on factors such as individual preferences, trip purpose, time of day and week, etc.

The complexity of commuters' value of time has been studied in some detail in recent years in the United States, in connection with the introduction and use of HOT lanes and express toll lanes, where the price charged varies in proportion to demand. The variably priced facility that has been in operation the longest is the 91 Express Lanes, on SR 91, a congested freeway linking the bedroom communities of inland Riverside County (Calif.) with the employment centers in coastal Orange County. Kenneth Small and other researchers who studied traveler behavior in that corridor in some detail concluded the following: "We find that the users of SR 91 have high average values of travel time and travel-time reliability, and that the distributions of these values exhibit considerable dispersion."¹⁸ In other words, there is no single value of time. Instead, there is a huge range of values of time, and a separate range of values of the reliability (predictability from day to day) of what that travel time will be. Those values can even be quite different for the same individual from one day to the next, depending on the circumstances of the trip (e.g., a crucially important business meeting, a plane to catch, etc.).

To illustrate how much variability in these values exists in their sample of SR 91 corridor commuters, the researchers found the median value of time (VOT) of Express Lane users to be \$25.51 per hour, compared with \$18.63 for the GP lane users. But the range of those values was very large: from as low as \$11.50 (at the 5th percentile) to a high of \$39.99/hour (95th percentile) for Express Lanes users, and from \$7.76 to \$29.08/hour for GP lane users. And those were just the value of time figures. The separately measured value of reliability (VOR) had median values of \$23.78 for Express Lane users and \$19.50 for GP lane users—and with even greater variability than shown for value of time. Moreover, their database was drawn only from the morning peak period, for which the Express Lanes toll levels (and hence presumably VOT and VOR) are considerably lower than those in the afternoon peak.

The researchers summed up their findings by writing that motorists in this corridor “exhibit a wide range of preferences for speedy and reliable travel, as total heterogeneity in VOT and VOR is nearly equal to, or greater than, the corresponding median value. On average, express lane users have higher values of travel time and reliability than do users of the [GP] lanes, as expected, but wide and overlapping ranges exist within these two groups, resulting from strong heterogeneity in preferences.”

The researchers then used these findings to critique standard proposals for freeway congestion pricing, which would impose a uniform charge for all users of all lanes during peak periods, with lower or zero charges at other times of day. Using a demand model, they estimated the social welfare implications of policies such as having priced HOT lanes alongside GP lanes, tolling all lanes, or charging different rates on premium and GP lanes. They conclude that some version of the latter (which they call a “two-route HOT” policy) is a reasonable compromise, providing some degree of peak-spreading and time-savings for all lanes on the expressway, but without greatly over-charging the majority, whose VOT and VOR are lower than what needs to be charged to keep premium lanes uncongested during peak periods.

The argument that different prices for different lanes would be superior to uniform pricing on a congestion-prone highway was first put forward by Stephen Shmanske of Cal State Hayward in 1991,¹⁹ and elaborated upon in his 1993 paper.²⁰ In the latter he describes simulation of a multiple-price system for the San Francisco Bay Bridge, in which “the gainers clearly outnumber the losers,” and “the dollar amount of the gains is clearly greater than any losses imposed” compared with the status quo of uniform tolls for all.

Shmansky goes on to point out that all the pioneers of highway congestion pricing “have ignored the possibility of non-uniform pricing,” citing papers by Walters (1961), Vickrey (1969), Mohring (1985) and others. Several key papers did consider a range of values of time in their analysis, but “none of these papers even mentions the possibility of varied tolls *at the same time.*” (emphasis in original) Thus, it appears productive to consider more seriously the proposed model of different prices on different lanes.

The General Purpose Lanes Assumption

The case for general purpose (GP) lanes, rather than specialized lanes, rests on two widely accepted ideas: capacity and cost-savings. First, for road capacity in a single direction, the provision of two GP lanes permits somewhat higher throughput (vehicles/lane/hour) than two separated lanes. That is because with more than one lane, faster vehicles can change lanes to pass slower-moving vehicles. This effect is less pronounced as the total number of lanes per direction increases, but even with four or five lanes in one direction (as on some California freeways), reserving one lane for specialized use subjects that lane to the problem of faster vehicles in that lane being unable to pass a slow-moving vehicle. Consequently, that restricted lane is scored by traffic engineers as having lower capacity than the adjacent GP lanes that do permit lane-changing.²¹ Special lanes for high-occupancy vehicles (HOVs) are sometimes opposed by traffic engineers for this reason, at least where only one such lane is provided per direction.²²

The second argument for GP lanes concerns cost. Separate lanes are generally proposed for a subset of vehicles. In the United States today, the vehicle categories most often proposed for “managed lanes” (the generally accepted term for specialized lanes) are carpools (HOV lanes), buses (exclusive busways), toll-paying vehicles (HOT or Express Toll Lanes), or trucks (truck-only lanes). But if the fraction of vehicles eligible to use the special lane is a significantly higher or lower percentage of projected daily traffic than one lane’s worth, the special lane may provide either too little or too much capacity for the designated subset of vehicles. The “lumpiness” of a lane’s capacity means that, in general, the risk of building the wrong amount of capacity is less if all the lanes can be used by all types of vehicles—i.e., be operated as GP lanes.

In a recent paper for the OECD’s Joint Transport Research Centre (JTRC), Poole argued that in certain situations, specialized lanes should nevertheless be considered.²³ For example, as researchers Ng and Small have argued, current U.S. highway design standards for freeways and arterials specify 12-foot traffic lanes, assuming that users of such roads travel at high speeds and operate in mixed (cars plus trucks) traffic. But Ng and Small present models for “narrow” freeways and arterials that could accommodate an additional lane in each direction within the same total right of way, using 11-foot lane widths and narrower shoulders, and serving automobiles only.²⁴ The JTRC paper showed that separate cars-only lanes for urban expressways using these altered specifications would permit adding some congestion-relief lane capacity in situations where such capacity additions are not considered possible today.

The JTRC paper also summarized work by several researchers on the productivity and safety gains that could be realized via truck-only lanes in certain urban and long-haul settings. For example, research on urban truck toll lanes by the Southern California Association of Governments found that the addition of these very costly lanes to congested freeways linking the region’s ports to inland distribution centers would more than double the productivity of short-distance “drayage” trucking, and might generate sufficient toll revenues to pay for building and operating the lanes.²⁵ An earlier study by Poole, Samuel and Chase found similar results for truck lanes linking the Port of Oakland to distribution centers inland from the San Francisco Bay Area.²⁶ Truck-only lanes

could be designed with heavy-duty pavement and bridges, able to handle significantly higher weight limits than the current federal maximum of 80,000 lbs. gross weight. Longer combination vehicles (double and triple-trailer rigs) that are not legal on most Interstate highways due to safety concerns about mixing with automobile traffic could significantly increase trucking productivity. Such rigs could operate without conflicts with car traffic if used on barrier-separated truck lanes.²⁷ And to the extent that trucks could be shifted from GP lanes to truck-only lanes, state DOTs would experience significantly lower maintenance costs on the GP lanes.

In short, despite the general advantages of GP lanes in most circumstances, there are cases where specialized lanes may offer compelling advantages. This is especially the case when pricing is part of the policy toolbox.

Part 5

An Evolutionary Pricing Strategy

Based on the foregoing discussion, perhaps the goal toward which transportation policy should be working is not uniform congestion pricing on all freeway (GP) lanes, but rather a three-tiered system of lanes and pricing, as follows:

- Premium lanes, offering guaranteed trip times by means of demand-based pricing;
- Regular lanes, using modest peak-period tolls to spread the peak load to shoulder periods;
- Truck-only lanes, designed and priced for heavy trucks.

The premium lanes would be advanced versions of existing value-priced lanes such as the 91 Express Lanes; only express buses would be exempt from pricing. These lanes would be priced to guarantee uncongested level of service (LOS) C traffic flow or better. The regular lanes would charge tolls during peak periods only, set to encourage shifting some trips out of the peak and/or to non-SOV (single-occupant-vehicle) modes. The peak rates would be aimed at maintaining high throughput but avoiding the breakdown of flow into hypercongestion, and would thus approximate LOS E. Truck-only lanes would be used only on selected freeway routes considered critical for (primarily) through truck traffic.

This approach is likely to produce more winners than losers and would therefore be better able to overcome the political obstacles to implementation. It builds on Small, Winston and Yan's important findings about the very large range of commuters' value of time and value of reliability and adopts their proposal for two-tier pricing for light vehicles (cars and light trucks), which their modeling found to produce greater social welfare than a combination of toll lanes and unpriced GP lanes. It would lead to a smaller fraction of commuters being "tolled off," since the majority of lower-time-value motorists would face only modest peak tolls that would improve traffic flow in the regular lanes. And with fewer tolled off onto parallel arterials, there would be less negative impact on the "un-tolled" who previously used arterials. And if DeCorla-Souza's suggestion of coupling the priced freeways with expanded express bus service were adopted, those contemplating using either premium or regular lanes would have a new transit option—reliable, high-speed express bus service. The premium lanes would thus be functioning as Virtual Exclusive Busways.²⁸

The trucking industry's objection to "erecting toll booths on the Interstate" would be answered by the fact that the truck-only lanes would be new capacity in selected corridors, giving the users a faster and safer path through congested urban areas (such as SCAG's proposed toll truckways in

Los Angeles). In addition, those truckways could be designed for higher gross vehicle weights and permitted to allow longer combination vehicles in addition to conventional big rigs. Thus, the industry would be enabled to achieve large productivity gains in exchange for paying tolls.

These inherent advantages may not, by themselves, be sufficient to overcome the political opposition. But carefully phasing in this approach could assist in achieving that goal. The idea would be to build upon the growing acceptance of HOT and express toll lanes in large congested urban areas. Of the top 20 congested metro areas in the latest Texas Transportation Institute report,²⁹ priced lane projects are in operation or under construction in nine and in the plans of 17 (see Table 2). Only Boston, Detroit and Philadelphia have no such lanes on the drawing boards. Networks of priced “managed lanes” are in the long-range transportation plans of Atlanta, Dallas, Houston, Minneapolis, San Diego, San Francisco and Seattle—and are being studied for Chicago, Denver, Los Angeles, Miami and Washington, DC.

Table 2: Managed Lanes in Operation, Under Way, or Planned in Congested Metro Areas

Metro Area	In Operation or Under Way	In Planning Stages
Los Angeles/Orange County	SR 91, I-10, I-110	I-10, I-405
Washington, DC	I-495	I-95
Atlanta	I-85	Network
Houston	I-10, US 290	Network
San Francisco/Oakland	I-680, I-580	Network
Dallas/Ft. Worth	I-30, I-635, NTE	Network
Detroit		
Miami	I-95, I-595	I-75, SR 826, Busway
New York		Lincoln Tunnel HOT
Phoenix		Various
Seattle	SR 167, SR 520 bridge	I-405, Network
Boston		
Chicago		I-90/94, I-290
Philadelphia		
San Jose	US 101, SR 85	Network
Orlando		I-4
San Diego	I-15	Network
Tampa	Selmon, Truckway	
Denver	I-25, U.S. 36	
Riverside/San Bernardino	SR 91	I-15, I-10

A scenario for beginning with a managed lanes (ML) network could run as follows. After several MLs are in operation and prove popular, sufficient benefits are perceived to proceed with development of a network of such lanes. The provision of significant mobility benefits to both motorists and express bus commuters is a key selling point. The network development involves converting existing HOV lanes to priced MLs, adding MLs to those freeway segments currently without HOV lanes, and (as resources permit) building flyover connectors at freeway interchanges to make the network seamless. The large capital costs make it wise to follow the “Managed Lanes

2.0” approach to access and pricing (charging all vehicles except buses, and pricing that leans more toward revenue maximization than throughput maximization).³⁰

Because of the high cost of the lane additions, flyover connectors, park-and-ride lots and direct access ramps, in many metro areas the network will be developed initially with a single lane in each direction on most segments (despite the fact that single-lane facilities are not optimal for traffic throughput). But with only a single lane offering congestion relief, peak-period toll rates will be high, limiting motorist congestion relief to those with very high values of time and reliability. Pricing advocates can *at that point* make the case for expanding the amount of priced capacity by converting an adjacent GP lane, thereby providing two MLs in each direction at very little additional cost (especially if plastic pylons are used to separate MLs and GP lanes). Conceivably, this could lead to a bottom-up demand for more priced capacity to provide congestion relief to more commuters than possible with a single priced lane, and at a more affordable price.

A further evolutionary step could be taken at some point after implementation of the ML expansion to dual lanes. Pricing advocates *at that point* could make the case for benefits from adding peak-only tolls to the GP lanes. In contrast to the DeCorla-Souza situation of going directly from a completely unpriced freeway to making all lanes peak-priced, this new scenario could build on two key factors for the GP lanes. First, there would be a large demonstration effect from the ML network that pricing really does work to relieve congestion, so the idea that pricing the GP lanes would actually bring congestion relief would be more credible. Second, fast and reliable express bus service would already exist on the ML network, providing an alternative for those who would object to paying even a modest peak toll on the GP lanes.

Some will argue that this proposed scenario eventually reaches the same end result (all lanes priced) as DeCorla-Souza’s High Performance Highways approach, but only after spending needless billions of dollars building the ML network. But if providing a seamless network of premium lanes (in addition to modestly peak-pricing regular lanes) maximizes social welfare (as Small and colleagues argue), then the investment in creating the network will not be wasted. Most urban freeway systems have far more traffic today than they were designed for, so “catch-up” investment in additional capacity is likely to have benefits in excess of its costs. And providing a significantly better, higher-capacity system in exchange for road pricing is the kind of trade-off that highway users—the people we most need to convince—understand.

Part 6

Conclusion

Conventional approaches toward implementing congestion pricing on U.S. freeways have made little headway. Besides not being able to overcome the political resistance from highway users (motorists and truckers), conventional pricing proposals are likely to create more losers than winners. Research suggests that social welfare would be maximized not with a single price for all freeway users but with several choices of price and service level for various categories of user. This paper has proposed one way to implement such a system, with separately priced lanes for premium-service motorists, regular motorists and heavy trucks. It has also sketched out a possible evolutionary approach to implementing such a system, in which each step can be justified on its own merits, and each creates preconditions for later moving on to the next step. This approach seems more likely to succeed in the U.S. freeway context than conventional “big bang” approaches.

About the Author

Robert Poole is director of transportation policy, and Searle Freedom Trust Transportation Fellow, at Reason Foundation. In 2010, he was a member of the transportation policy transition team for Florida Governor-Elect Rick Scott. In 2010 he served as a member of the Expert Review Panel convened by the Washington State DOT to advise on a proposed \$1.5 billion managed lanes project. In 2008 he was a gubernatorial appointee to the Texas Study Committee on the Role of Private Provision in Toll Projects. He has advised the U.S. DOT Office of the Secretary of Transportation, the Federal Highway and Federal Transit Administrations, and the state DOTs of a number of states, including California and Florida. He is a member of the Transportation Research Board's standing committees on Congestion Pricing and on Managed Lanes. Poole has also testified before U.S. House and Senate Committees, as well as a number of state legislatures. He is the author of several dozen Reason Foundation policy studies on surface transportation. Poole, a Florida resident, received his B.S. and M.S. in mechanical engineering from MIT, and did additional graduate work in operations research at NYU.

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