the public and private sectors. Healthy people subsidize medical care of the chronically ill. Young workers pay the retirement costs of retired folks. Using congestion pricing to rectify purported transportation subsidies for urban workers would leave in place limitless opportunities for cross-subsidies in current public policy.

Is it really time for any ultimate solutions to urban traffic problems? Highway agencies have been proclaiming terminal gridlock and the need for demand management since at least the mid-1920s. Yet Census Bureau data on the journey to work show no deterioration in average work trip times for decades.

If anything, congestion pricing as a tool to cope with seemingly intractable central city problems draws attention away from important emerging traffic problems. Peak-period congestion is growing most rapidly in the outer suburbs of some metropolitan areas, and even beyond. These are places where aggressive programs to provide needed highway space are still practical and effective. It is on these underdeveloped outlying road systems that urban growth is having its greatest impact, one not easily met by alternatives to automobile use. It is also true that no-hope approaches to commuting distract us from the more numerous nonwork trips that often face more serious congestion than many peak-hour trips.

As the nation embarks on congestion pricing experiments, several steps are in order. As part of pilot programs, neutral monitors should measure results against predetermined standards of success or failure. Shutdown costs should be included so that projects can be terminated without embarrassment. To test political feasibility, each project should be prominently identified with the name of its most responsible proponent. If politicians routinely link their names with new roads and bridges, surely some brave soul would like to have his or her name tied to a highly visible congestion pricing project.

Reference

1. *Traffic in Towns: A Study of the Long-Term Problems of Traffic in Urban Areas.* Reports of Steering Group and Working Groups Appointed by the Minister of Transport. Her Majesty's Stationery Office, London, 1963.

IMPLEMENTING PEAK-HOUR ROAD PRICING AT FULLSCALE

Finding Solutions to Practical Problems

Anthony Downs

Combatting peak-hour traffic congestion by charging tolls to drivers to travel during those hours is an idea whose time may be almost here. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) allocated $25 million to funding demonstrations of this approach, and several places have applied for funds. As indicated in my recent book, *Stuck in Traffic*, I am a strong supporter of this idea (*1*). I believe it is one of the few anticongestion strategies that might really work. But I also believe that implementing peak-hour road pricing across a major metropolitan area is a difficult task and one that will first require that a host of practical obstacles be overcome. The focus of this article is on those obstacles and how to cope with them, but it should not detract from my unflagging support for the value of trying this approach at full scale in at least one major metropolitan area plagued by congestion.

On Which Roads Should Peak-Hour Tolls Be Charged?

The first problem is determining on which roads to charge peak-hour tolls. Major radial expressways and beltways are obvious candidates, but focusing solely on them would tend to divert many peak-hour travelers onto other arteries that do not have tolls. Many nonexpressway arteries heavily used during peak hours might also have to be included to encompass most of the major peak-hour travel routes now burdened by heavy congestion. This goal would have to be carried out by one agency with the authority to impose tolls throughout a metropolitan area, most of which contain no such bodies. Hence the legal and political problems involved with this decision may be much greater than the technical ones.

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What Toll-Collection Method Should Be Used?

A second issue is deciding on a toll-collection method. The best of these would not force most toll-paying drivers to stop or even slow down to pay their tolls. That implies some electronic system that queries a transponder carried by each vehicle as the vehicle passes over (or under) a wire connected to a computerized detection and billing system. The transponder could be a "smart card" containing a prepurchased toll amount that is reduced each time the vehicle passes the wire, thereby dispensing with the need to keep track of individual vehicle locations on the system. This would help minimize opposition based on fears of invasion of privacy. Only if the smart card had exhausted its credit would the vehicle's location be tracked and a monthly bill sent. Vehicles without such cards would be photographed by videocameras and drivers fined later if they failed to pull over into roadside toll booths.

Should High-Occupancy Vehicles Be Included?

A tougher issue is whether to force those in high-occupancy vehicles (HOVs) to pay

peak-hour tolls. The key to reducing peak-hour congestion is to make solo driving during peak hours so costly that fewer people are willing to do it. Hence it would be desirable to exempt HOVs from peak-hour tolls, thereby encouraging people to share rides. If HOVs are provided with separate lanes and enforcement is vigorous, exempting them from peak-hour tolls should be feasible. If no separate HOV lanes exist, distinguishing electronically between solo vehicles and HOVs would not be easy, if even possible. I have not seen much attention directed to this issue and believe it deserves more consideration so that a major purpose of the scheme—encouraging ridesharing—would not be defeated.

One of the thorniest issues likely to arise is how to handle traffic diverted from tolled roadways onto other streets.

How Should Tolls for a System Be Phased In?

Next on the agenda is how to phase in tolls for a whole system over time. Should peak-hour tolls be collected on a few roads initially, and then gradually spread to cover the entire metropolitan area? Or should the whole system be set up before any part of it is implemented? I would assume that the former is more practical, but I am not aware of any definitive discussions of this issue.

Once these policy issues have been settled, practical implementation must begin.

Configuring Toll Roads

Roads on which tolls will be charged should be physically configured. In Texas and Oklahoma, some major toll roads have been designed to permit vehicles carrying electronic transponders to pass checkpoints without slowing down, whereas all other vehicles must stop at toll booths to one side. These or other configurations will require major adjustments in existing roadway layouts. Finding the required space will be especially difficult if tolls are to be charged on nonexpressway arterials hemmed in by urban development. Major traffic disruptions may occur during this configuration period.

Handling Traffic Diverted from Toll Roads

One of the thorniest issues likely to arise is how to handle traffic diverted from tolled roadways onto other streets. It is certain that many drivers will try to avoid peak-hour tolls without sacrificing traveling during peak hours by shifting to nontolled routes, even if those routes are more circuitous. This could cause a sudden increase in peak-hour traffic on many previously nonarterial streets, often through residential neighborhoods. Fear of this result by local residents could become a major source of opposition to peak-hour road pricing.

Dealing with Nonpaying Drivers

The next issue is coping with drivers who fail to pay. There must be some method of identifying vehicles that do not carry electronic transponders or stop at toll booths, and subsequently serving them with charges in ways likely to result in payment. Videocameras could record the licenses of such "scofflaws," and bills can be sent. However, this might require a videocamera network throughout a metropolitan area, raising fears of invasion of privacy. One solution might be to attach such charges to vehicle registrations and refuse to issue the next year's licenses without full payment. However, many vehicles pass through from other states where they are registered, and significant interstate legal cooperation might be required.

Protecting Privacy of Drivers

The issue of invading the privacy of vehicle users is sensitive and is one that is sure to arise. The electronic system must be able to identify drivers failing to pay, and to track their movements so that bills can be computed. However, that requires pinpointing vehicle locations at specific times. Americans are notorious for resisting any systematic recording of their movements. Political awareness of this resistance is the only possible explanation of why the U.S. Department of Transportation has not invested any money in developing systems for automatically tracking and fining all drivers of vehicles exceeding speed limits. In any event, defusing the privacy question will not be easy, even though use of pre-paid "smart cards" presents a partial solution.

Setting Toll Limits

Once the toll-collection system has been set up, another issue to be decided is how high the tolls should be set. The answer depends in part on what degree of remaining congestion is to be considered acceptable. The less peak-hour congestion on any road is considered acceptable, the higher the toll will be, and vice versa. Another related factor is by what percentage existing congestion must be reduced to achieve any given speed of peak-hour traffic flow. This will, of course, vary greatly from one road to another, and even from one day to another on any given road. Hence tolls can probably best be set by trial and error. This implies that the toll-setting agency should have considerable flexibility to experiment with toll levels over time. It will need to establish some regular fee schedule for public relations purposes, but should be able to change that schedule from time to time without elaborate review procedures.

Determining Where Funds Should Go

A more pleasant issue to contemplate is what should be done with the toll money collected over and above capital costs and operating expenses. I believe that peak-hour tolls would be more palatable politically if the money were used for transportation improvements rather than being added to general revenue. The latter practice would reinforce the criticism that

peak-hour road charges are "just another government tax" instead of a means of making transportation systems more efficient. Transportation improvements could consist of increased or better roads and public transit, rebates to low-income drivers, new vehicle signalling systems, and so on.

Reducing Peak-Hour Toll Inequity

The last issue is how to reduce the economic inequity of peak-hour road tolls. There is no doubt that such tolls would inconvenience the poor more than the non-poor, since the latter would be more easily able to pay for continued peak-hour driving. This disadvantage cannot be offset directly without undermining the whole point of peak-hour tolls: to raise the money cost of driving—especially alone—during peak hours. Perhaps some type of offsetting benefits could be provided to poor households through license fee rebates based on income, or special income tax rebates. Exempting HOVs from tolls would help the poor, many more of whom share rides than do the non-poor.

Conclusion

These issues pose formidable challenges to those agencies put in charge of implementing peak-hour road pricing across any metropolitan area. I believe that they can be dealt with effectively, and that doing so is eminently worthwhile. But I also believe that confronting their existence at the outset will produce more effective long-term results than trying to pretend they do not exist. Only if these concerns are considered together can the most effective overall strategy for dealing with them be designed and achieved.

Reference

1. A. Downs. *Stuck in Traffic.* The Brookings Institution, Washington, D.C., 1992, Chapter 4.

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ENVIRONMENTAL BENEFITS OF CONGESTION PRICING

Michael Cameron

The movement of people and commerce within our urban areas consumes valuable resources, including time, money, land, fuel, minerals, and clean air. An efficient transportation system, one that uses the fewest resources possible to accomplish needed levels of mobility, is economically and environmentally desirable. Congestion pricing, if it leads to greater efficiency, would promote environmental protection.

Economists have long recognized our transportation systems and urban air sheds as common pool resources. Although they are finite, access to them is virtually unlimited, and they are vulnerable to being overused. In the case of our roadways, overuse means that when the number of vehicles exceeds the capacity of the roads, the number of people served falls below capacity. With our air sheds, overuse means that the volume of pollutants emitted from burning fossil fuels exceeds the absorptive capacity of the atmosphere, and people's health is endangered.

In response to chronic traffic congestion, society has traditionally responded by building more roads, buying more vehicles, and spending more time and fuel traveling. Instead of solving the problem of unlimited access to the transportation system, our only response thus far has been to make the system bigger. In response to fouled skies we have ensured that new additions to the vehicle fleet are cleaner than the old. Instead of addressing the problem of unlimited access to the air shed, we keep trying to reduce the impact of additional users. Both responses fail to address the fundamental violation that occurs when there is free and unlimited access to social resources. To save society from wasting precious time and money, and from breathing polluted air, vehicle access and emissions must eventually be limited to the capacity of the systems.

Congestion pricing is one of several economic tools available for limiting vehicle access to the capacity of the transportation system. By charging a fee high enough to keep vehicle usage within the limits of road capacity, congestion pricing would promote transportation efficiency. Because reduced vehicle use would likely result in lower vehicle emissions, congestion pricing incidentally would help restore the integrity of the air shed. In a 1991 study of the South Coast Air Basin in California by the Environmental Defense Fund and the Regional Institute of Southern California, it was estimated that congestion pricing would reduce vehicle miles of travel by 5 percent and smog precursors by 8 percent (*1*).

In a 1991 study . . . it was estimated that congestion pricing would reduce vehicle miles of travel by 5 percent and smog precursors by 8 percent.

Congestion pricing, however, has one serious Achilles' heel with regard to its potential benefits for both transportation efficiency and reduced air pollution. As a public fee, congestion pricing would raise

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