Road Pricing as a Solution to the Harms of Traffic Congestion

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I. INTRODUCTION

In cities throughout the United States commuters are increasingly finding themselves stuck in traffic. The host of vehicles sitting motionless on the nation's freeways each day impose massive costs upon society; including air pollution, lost time, wasted fuel, added noise, reduced civility, etc. In addition, traffic congestion is an epidemic that is growing. In the nation's largest urban areas the growth in the number of motorists has risen faster than the growth of roadway capacity and will continue to do so.

An effective and administrable measure for reducing traffic congestion and the resulting negative impacts is congestion pricing. Congestion pricing simply refers to any method of charging road users a fee for the congestion costs they impose upon society.[1] Since road users are not currently forced to consider the external costs of commuting when deciding when and how much to drive, the nation's roadways have become an

1. OFFICE OF MOBILE SOURCES, EPA, TRANSPORTATION CONTROL MEASURES: CONGESTION PRICING 1 (1998), *available at* http://www.epa.gov/epahome/search.html (type in the title in the "all of these words" box and then select "in the title" from the drop down menu).

overused resource. Congestion pricing seeks to aid drivers in making more efficient decisions by making them aware of the true costs of driving.[2]

Even though domestic and international congestion pricing programs have proven successful, the chief obstacle to widespread implementation remains public and political acceptance. State and local governments must put time, money and effort into "selling" congestion pricing schemes if they are to have any hope of gaining the requisite support. This necessitates an extensive public debate of congestion pricing, addressing both its strengths and weaknesses as well as considering alternative measures.

Part II of this paper addresses America's infatuation with – and reliance upon – the automobile. Part III analyzes the costs imposed upon society by traffic congestion; including (1) those costs felt directly by motorists, (2) costs incurred by the government, and (3) external costs hidden from commuters. Part IV takes a look at the different forms congestion pricing can take, including the second-best option of parking policy reform. Part V considers the most prominent examples of domestic and international congestion pricing and the success such programs have had. Part VI examines the impediments to popular acceptance of congestion pricing schemes and suggests some ways to overcome initial opposition.

II. American Culture of Mobility

About one thing there can be no doubt – Americans love their cars. Not only do automobiles play a central role in the nation's economy as the primary source of transportation, but cars, trucks and SUVs are essential to the American conception of mobility and personal autonomy. Inexorably linked to the ideals represented by automobile use and ownership is the popularity of suburban living. According to an AAA poll, 65 percent of Washington metropolitan area residents stated that they preferred to live in a less densely populated suburb and use their cars to get to work, school and shopping.[3] In contrast, only 29 percent of residents preferred city living with public transportation.[4] Americans generally enjoy suburban living and "prefer detached homes over row houses, rural living over city life, and home ownership over renting."[5] The open spaces associated with rural and suburban living provide a manifestation of the

2. *Id.*

3. Lathrop B. Nelson, Comment: *Unclogging Virginia's Roads: Aligning Computer Incentives in Northern Virginia,* 28 Transp. L.J. 185, 204 (2000).

4. *Id.*

5. *Id.* at 205.

American ideals of individualism and freedom and is made possible by automobile use.

Not only do Americans prefer suburban living, but when given the choice between driving and public transportation, the vast majority of Americans choose to drive – and drive alone. Now that many middle-class families own three or more cars, driving has become a solitary experience. In 1990, the average American car commuting to or from work contained only 1.09 occupants.[6] The lone driver is often seen as a symbol of American individualism and one who represents the ideals of freedom and liberation.[7] Some also feel that the car is one of the last places free from civilization and the burdens of modern life. Driving in particular – and commuting in general – is not seen as an opportunity to interact with family members, colleagues, and friends. In fact, quite the opposite is true – the car is viewed as a private space where one can collect his thoughts and as a reprieve from the pressures and people of everyday life.[8]

III. Costs of Congestion

Unfortunately, America's love of the automobile and solo driving too often results in overcrowded roadways. Just like a pipe carrying water, there are only so many vehicles that can be moved on a roadway at any given time. The maximum number of vehicles that can move freely on a highway system is referred to as the "physical capacity" of the roadway and is determined by several factors: how many lanes are available to carry traffic, the curvature of the highway, side clearance, and interchange and intersection design.[9] Physical capacity on a normal freeway lane is between 2,050 and 2,200 vehicles in an hour.[10] Unfortunately, as is all too common in cities throughout the United States, when the number of vehicles in an hour reaches the upper limits of capacity, speeds decline and a stop-and-go condition (i.e. congestion) results. In addition, the number of cars that can be carried on the freeway also decreases. Thus, fewer cars and trucks can use each lane and once they do, it is at a slower speed. Congestion, in essence, reduces the value of the commu-

6. Lior Jacob Strahilevitz, *How Changes in Property Regimes Influence Social Norms: Commodifying California's Carpool Lanes*, 75 Ind. L.J. 1231, 1236 (2000).

7. *Id.*

8. *Id.*

9. Cambridge Systematics, Inc., Fed. Highway Admin., Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation at ES-2 (2005), *available at* http://www.ops.fhwa.dot.gov/congestion_report/index.htm.

10. Cambridge Systematics, Inc., Fed. Highway Admin., Traffic Congestion and Reliability: Linking Solutions to Problems 3-6 (2004), *available at* http://www.ops.fhwa.dot.gov/congestion_report_04/congestion_report.pdf.

nity's investment in the freeway by causing actual capacity to fall far below physical capacity.

In addition to the wealth of anecdotal evidence that can be found in households and offices throughout the nation, empirical studies confirm the general intuition that congestion is a major problem that has only been getting worse, especially in and around large urban areas. In its 2003 report, the Texas Transportation Institute's (TTI) researchers found that "congestion levels in 75 of the largest metropolitan areas have grown continuously in almost every year in all population groups from 1982 to 2001."[11] In its analysis of congestion trends between 1990 and 2001, the TTI report concluded that peak period trips took an average of 10 percent longer in 2001 than they did in 1990.[12] "Travelers spent 51 extra hours per year in travel compared to 42 hours in 1990, [and] the percentage of freeway mileage that is congested grew from 49 percent to 60 percent."[13] By some measures, overall roadway congestion has increased by "more than 50 percent between 1982 and 2000 in the largest metropolitan areas[14] and approximately "70 percent of all urban interstates are congested during rush hour."[15]

Moreover, the future seems to promise a continuation of this troubling trend. Population and employment trends in America's largest cities are both expected to lead to a growth in highway congestion of around two percent each year, resulting in more severe congestion on a greater percentage of the nation's transportation system.[16] Not only is passenger vehicle travel expected to grow by twenty-five percent in the next five years, but freight movement by truck is expected to grow in similar proportion as demand for freight transportation in the United States is expected to grow substantially.[17]

The costs imposed by such a systemic state of congestion in the United States can be divided into three broad categories: (1) motorists' direct costs, (2) governmental costs, and (3) external costs.

A. Motorists' Direct Costs

The most obvious and significant costs imposed directly upon drivers who confront congestion are wasted time and fuel. Congestion causes

11. *Id.* at 3-1.

12. A "peak period" is a period of heavy traffic, such as the beginning and end of the working day.

13. Cambridge Systematics, Inc., *supra* note 10, at 3-1.

14. U.S. Gen. Accounting Office, Reducing Congestion: Congestion Pricing Has Promise for Improving Use of Transportation Infrastructure 1 (2003), *available at* http://www.gao.gov/new.items/d03735t.pdf.

15. Strahilevitz, *supra* note 6, at 1237.

16. Cambridge Systematics Inc., *supra* note 9, at ES-9.

17. U.S. Gen. Accounting Office, *supra* note 14, at 3.

commuters to spend a substantial amount of additional time (and thus fuel) on the roadways each year. Washington area residents, for example, spend about 216 million hours each year in traffic delays, with the average driver delayed seventy-six hours.[18] In addition, the average Washingtonian commuter consumes an added 116 gallons of fuel sitting in traffic each year.[19] TTI estimates that congestion costs Washington area residents a total of 3.5 billion dollars per year in lost time and fuel, which corresponds to a cost of 1,260 dollars for the average commuter.[20] Congestion is not only a problem in the northeast, however, as it plagues sizeable cities throughout the country. In Atlanta, for example, the average resident wastes twenty-three hours each year stuck in traffic, which is the equivalent of 1.5 billion dollars annually in lost fuel and time throughout the city.[21]

In addition, there is a host of other costs levied upon drivers as a result of congestion. Vehicle maintenance demands huge amounts of money from owners and is exacerbated by worsening traffic. Significant correlative costs result from time lost in traffic; including late fees at child care centers and expenses such as take out dinners and housekeeping costs. Also, the time spent sitting in traffic is time that commuters could have spent with family or enjoying recreational activities or pursuing educational aspirations. Furthermore, congestion caused by unexpected events often leads to increased vehicle crashes and injury. Although the extent of these direct costs may be substantial, drivers actually bear much of these costs and presumably take them into account when deciding whether and how much to drive. As such, these costs are not the primary concern of this paper.

B. Governmental Costs

Further costs that result from congestion are those borne by the public sector for building, maintaining, and controlling highways. Despite funding obtained through gasoline taxes, tolls, and parking tickets, states and the federal government spend considerably more on highways than they receive from motorists. In New York, for example, public agencies spend about seven billion dollars each year on roads and collect only 4.5 billion dollars in motorist user fees.[22] This results in a taxpayer subsidiza-

18. Nelson, *supra* note 3, at 200.

19. *Id.*

20. *Id.* at 201.

21. Orlyn O. Lockard, III, Note, *Solving the "Tragedy": Transportation, Pollution and Regionalism in Atlanta*, 19 Va Envtl. L.J. 161, 175 (2000).

22. Charles Komanoff, *Pollution Taxes for Roadway Transportation*, 12 Pace Envtl. L. Rev. 121, 127 (1994).

tion of New York drivers at a rate of over two billion dollars annually.[23] A national analysis indicates that drivers throughout the country are subsidized through income, property and sales taxes at a rate of twenty to thirty billion dollars per year.[24] In addition, there is a considerable amount of money spent each year on pollution control measures for automobiles. According to the U.S. Department of Commerce, "consumers, businesses, and governments in the United States spent 17.2 billion dollars on air and water pollution controls for highway transportation in 1993 [and] this is approximately 1,150 dollars per vehicle for emissions control."[25]

C. External Costs

1. Environmental Costs

a. Air Pollution

First and foremost, vehicle use and traffic congestion are major contributors of air pollution. Although automobile emissions have been reduced by ninety-six percent since 1968 due to the Clean Air Act, there has been a simultaneous increase in the use of automobiles.[26] The increase in travel has, unfortunately, offset many of the gains resulting from cleaner emissions. The end result is a slight reduction in each automotive pollutant except lead, for which emissions have dropped more than ninety-five percent.[27] In addition, emission-control devices require periodic inspection and maintenance, and the EPA estimates that only thirty-three percent of vehicles have properly working devices at any given time.[28] Also, SUVs and mini-vans are defined as light-duty vehicles under the Clean Air Act, and as such are exempt from the strict emissions standards that apply to automobiles.[29] Similarly, heavy-duty engines in trucks are not regulated as tightly as engines in automobiles.[30] The result is that "automobiles are currently responsible for [seventy-five percent] of hydrocarbon emissions, [forty-five percent] of nitrogen oxide emissions and [thirty-four percent] of the volatile organic compound

23. *Id.*

24. *Id.*

25. ICF, Inc., EPA, Opportunities to Improve Air Quality through Transportation Pricing Programs 8 (1997), *available at* http://www.epa.gov/otaq/market/pricing.pdf.

26. Tirza S. Wahrman, *Breaking the Logjam: The Peak Pricing of Congested Urban Roadways under the Clean Air Act to Improve Air Quality and Reduce Vehicle Miles Traveled*, 8 Duke Envtl. L. & Pol'y F. 181, 184 (1998).

27. EPA, Automobile Emissions: An Overview 4 (1994), *available at* http://www.epa.gov/otaq/consumer/05-autos.pdf.

28. Wahrman, *supra* note 26, at 185.

29. *Id.*

30. *Id.*

emissions in the United States."[31] Automobile exhaust also accounts for a substantial amount of carbon monoxide emissions.[32] Congestion only exacerbates this problem since vehicle emissions are 250 percent higher at congestion than when the traffic flows freely.[33] The health effects of these air pollutants range from headaches and eye irritation to reduced lung function, lung damage, respiratory disease, and cancer. In fact, according to the American Lung Association, "the health effects of air pollution are estimated to cost fifty billion dollars each year."[34] When crop loss and ecosystem damage is added, the annual total cost of motor fuel pollution has been estimated as high as sixty-six billion dollars.[35] Despite the high level of air pollution harm that results from vehicle emissions, there is evidence that motorists only bear about five percent of air pollution costs, leaving the other ninety-five percent to be felt by the public.[36]

b. Global Climate Change

Given the harmfulness of vehicle emissions, it should come as no surprise that automobile use also has damaging effects on the global climate. The combustion of fossil fuels, such as motor fuel, is one of the major contributors of carbon dioxide and emissions of other greenhouse gases. The transportation sector alone is responsible for thirty-two percent of the nation's human-caused carbon dioxide emissions, which is seven percent of greenhouse gases worldwide.[37] Congestion contributes significantly to these emissions. One study indicates that "congestion causes an extra thirty million tons of carbon dioxide to be released into the air" each year in the United States.[38] Moreover, the transportation sector has the highest rate of growth of carbon dioxide emissions in the country.[39]

c. Water Pollution

Vehicle use is also responsible for a significant amount of water pollution throughout the country, as pollutants originating as air emissions

31. Nelson, *supra* note 3, at 203.
32. Wahrman, *supra* note 26, at 186.
33. TRANSEK AB, SWEDISH NATIONAL ROAD ADMINISTRATION (VÄGVERKET), ROAD PRICING IN URBAN AREAS 22 (The Federation of European Transport and Environment and the Swedish National Road Administration (Vägverket) 2002), *available at* http://www.transport-pricing.net/download/swedishreport.pdf.
34. ICF, INC., *supra* note 25, at 4.
35. Komanoff, *supra* note 22, at 130.
36. *Id.*
37. ICF, INC., *supra* note 25, at 5.
38. OFFICE OF MOBILE SOURCES, *supra* note 1, at 2.
39. ICF, INC., *supra* note 25, at 5.

often find their way into surface waters.[40] Much of this pollution is achieved through atmospheric deposition, but urban runoff is also a contributor.[41] Paving land for roads and parking in urban areas (amounting to about forty percent in many cities) increases the amount of impermeable surface which results in increased runoff.[42]

d. Land Use and Habitat Loss

Roads consume land – both rural and urban. The nation is continually adding to its already expansive system of roadways, appropriating larger segments of land for automobile use and thereby intruding on more landscapes and communities. Throughout the United States, paved and unpaved roads occupy 25,000 square miles of land, an area equal to the size of West Virginia.[43] Although freeway construction obviously takes a toll on the land, the costs of construction are also lodged against the public sector in the form of lost tax revenue and production assets. In fact, one commentator estimates that such losses reach sixty-five billion dollars each year.[44]

2. Other External Costs

a. Congestion Costs

Traffic delays cost Americans billions of dollars each year in lost time and wasted fuel. Much of this cost is felt directly by the individual driver, but a considerable portion is levied upon other drivers and non-drivers. When a commuter joins an already congested roadway, he adds to the time delay (and fuel costs) experienced by all the commuters behind him as well as his own delay. Non-drivers also feel the effects of any additional congestion since stop-and-go conditions on the roadways consume walkers', cyclists', and bus travelers' time as well. Some estimates put these costs as high as twenty-five billion dollars annually.[45]

b. Accidents

Automobile crashes in the United States cause losses in the hundreds of billions of dollars each year. Motorists feel most of the pain, suffering, and lost life, but "employers and taxpayers finance most of the associated health insurance and workers' compensation costs [as well as bearing] much of the cost of workplace disruption" and rehabilitation for injured

40. *Id* at 6
41. *Id.*
42. *Id.*
43. *Id.* at 7.
44. Komanoff, *supra* note 22, at 130.
45. *Id.* at 129

workers.[46] Non-motorists are also affected through loss of life to pedestrians and cyclists struck by vehicles. Some commentators, however, point out that reducing congestion may reduce the total number of accidents but could increase the number of serious accidents as average vehicle speeds rise.

c. Economic Costs

Congestion has several negative economic effects. First, time wasted in traffic results in a less productive work force. Except for the few distracted motorists on their cell phones, most commuters are not very productive while traveling to work. And once these drivers get to work, they are often stressed and frustrated. Moreover, as congestion continues to grow so will the unpredictability of travel times, forcing drivers to budget even more time into their trips in order to avoid being late.

The effects of congestion are especially important for those in service industries, such as technical and maintenance workers. Service workers make fewer calls per day as a result of traffic delays and therefore the nonproductive time per day for each driver increases, forcing companies to raise their hourly rates. Burgeoning traffic also affects emergency medical, fire, and police services that are delayed from attending medical, crime and disaster situations.

Additionally, travel time is critical to the trucking industry. There is a direct link between "travel conditions (congestion and reliability) and economic productivity for truckers."[47] As such, any impact congestion has on reliability will have a corresponding effect on the total cost of freight transportation. If congestion continues to spread into the midday periods, which is the peak travel period for trucks, more costs will be incurred by the trucking industry which will eventually trickle down to the final consumer. Furthermore, as the ability of truckers to hit their delivery target-times decreases, costs will be levied upon companies attempting to optimize delivery schedules. This is especially troublesome and costly for firms that are attempting to establish a "just-in-time" delivery schedule. Such effects on the trucking industry have implications for the nation as a whole and for consumers in particular. "In 1999, [for example], purchases of transportation-related goods and services accounted for 10.6 percent of GDP ($980 billion) of GDP."[48] In addition, transportation costs account for a share of many products' final price, ranging from one percent to fourteen percent depending on the product and dis-

46. *Id.*

47. CAMBRIDGE SYSTEMATICS INC., *supra* note 10, at 3-18.

48. FED. HIGHWAY ADMIN., STATUS OF THE NATION'S HIGHWAYS, BRIDGES, AND TRANSIT: 2002 CONDITIONS AND PERFORMANCE REPORT 22-2, *available at* http://www.fhwa.dot.gov/policy/2002cpr/pdf/ch22.pdf.

tance traveled.[49] Thus, even a relatively small change in the physical condition or operating characteristics of a highway system can have a major influence on the final price consumers pay for goods and services.

As mentioned above, transportation has a direct effect on companies that rely on the timely arrival of products and materials. When congestion makes shipment arrival-times unpredictable, businesses with production schedules designed to take advantage of reliable transportation must instead plan for items to arrive early. This takes up valuable space and inventory, wasting resources that could otherwise be spent on productive activities. Also, any increase in transportation costs caused by congestion reduces a company's ability to invest in making more products, improving quality, or introducing new product lines.

d. Noise and Vibration Costs

The increased vehicular noise (from tires, engines, brakes, horns, sirens, etc.) caused by stop-and-go conditions takes a toll on the public in terms of stress, lost sleep, and impaired activity (estimated at twenty-two billion dollars by one commentator[50]). In addition, automobiles cause vibrations which can damage buildings and underground infrastructure, such as water mains. This is especially harmful for older northeastern cities where highways are situated close to older structures.

e. Costs to Civility

As many of us can testify to from personal experience, congestion also contributes to a distinct lack of civility in society. In a hurry to arrive at their destinations, many otherwise law-abiding citizens frequently break traffic laws. This in turn sparks another phenomenon, known as "road rage." Road rage has been defined as violent behavior exhibited by drivers in traffic, often as a manifestation of stress. Although such incidents are not commonplace, they do undermine commuters' sense of safety on the roads. For instance, "the AAA Mid-Atlantic Transportation Poll 2000 found that [fifty-three percent] of area residents rated aggressive driving as the number one highway safety concern."[51]

D. Estimates of Total External Costs

Several studies have measured the hidden costs (i.e. those not felt directly by the driver imposing the costs) of automobile use in the United

49. Fed. Highway Admin., *Benefit-Cost Analysis of Freight Investments, available at* http://ops.fhwa.dot.gov/freight/freight_news/cost_analysis/benefit_cost.htm (last visited November 25, 2006).

50. Komanoff, *supra* note 22, at 130.

51. Nelson, *supra* note 3, at 204.

States. In estimating these figures, the studies included the costs of all or some part of the following: (1) police, fire, ambulance, road construction and maintenance, and other related local government expenditures, (2) property taxes lost from land cleared for freeways, (3) parking, (4) air, water, land pollution, (5) noise, vibration damage to structures, (6) global warming, (7) petroleum supply line policing, security, petroleum production subsidies, (8) trade deficit, infrastructure deficit, (9) sprawl, loss of transportation options, (9) uncompensated auto accidents, and (10) congestion.[52]

These studies concluded "that the total annual hidden costs of automobile usage ranged from 378 to 739 billion dollars (in 1991 dollars)."[53] This correlates to a subsidy of 2,185 to 4,220 dollars per car to automobile users.

E. Cost Internalization

Because drivers do not bear a considerable amount of the costs they impose upon society in the form of noise and air pollution, road construction, global warming, accidents, etc., these costs are not taken into account when drivers decide to use their cars. Thus, driving becomes an over-consumed resource and the nation's highway systems become a classic "tragedy of the commons." Although those who experience congestion incur costs to their own time, lost fuel, and wear on their automobiles, they do not internalize the loss levied upon others. The more efficient approach to driving is to craft mechanisms to internalize these costs into the price of automobile use, so that individual decisions on whether and how much to drive more accurately reflect the cost of driving to society. The objectives of both equity and efficiency would be served through such a scheme because the costs of vehicle-related harms would be shifted onto those benefiting from driving (equity) and commuters would be encouraged to choose the most socially beneficial travel option for each trip (efficiency).

IV. Congestion Pricing, Parking Policies, and Internalization

A. Congestion Pricing

A basic theoretical representation of the economic analysis often used in describing congestion pricing is presented in Figure 1 below.[54] The willingness of road users to pay for a trip is represented by the de-

52. *See generally* Cambridge Systematics Inc., *supra* note 10.

53. *Id.*

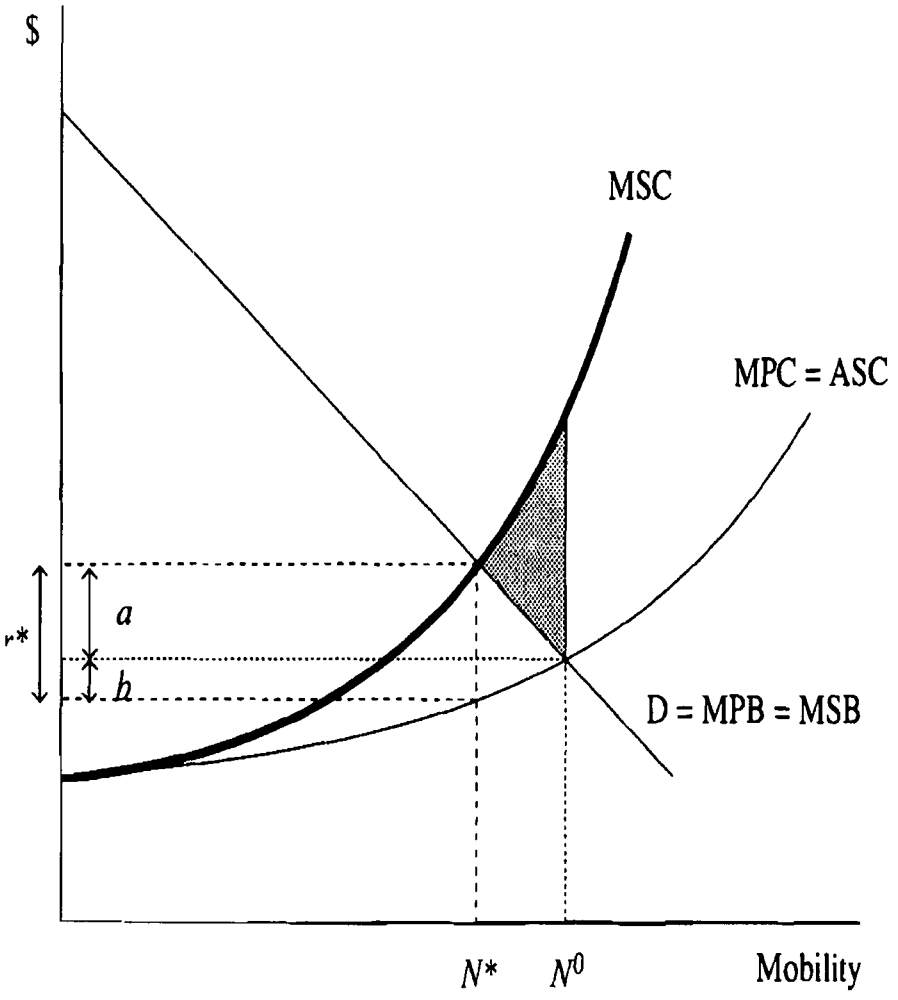
54. Kenneth J. Button & Erik T. Verhoef, *Introduction in* Road Pricing, Traffic Congestion and the Environment 4-5 (Kenneth J. Button & Erik T. Verhoef, eds. 1998).

mand curve (D). The marginal private cost curve (MPC) represents those costs felt directly by the commuter when taking a given trip. The marginal social cost curve (MSC) depicts the aggregate of the direct costs felt by the commuter *and* the hidden costs the driver imposes on society when taking a trip. Due to congestion, the marginal social cost is far higher than the marginal private cost (i.e. congestion inflates the hidden costs of driving). The free market equilibrium outcome rests where demand intersects marginal private cost (N^0) and shows the level of driving that occurs when commuters do not take into consideration the hidden costs of driving. The socially optimum road usage, however, lies where demand intersects marginal social cost (N*) and represents the level of driving that occurs when drivers consider the costs they are imposing on society. The road price that causes socially optimal road usage is r* and is equal to the marginal external congestion costs (i.e. the hidden costs of driving imposed on society but not felt by the driver, which is equal to MSC – MPC). The welfare gained from such a charge is given by the shaded area.

Although the results depicted in Figure 1 may be idealized, the principles represented are sound – charging road users a congestion fee would make commuters aware of the external costs associated with making a trip and thereby cause drivers to base their decisions on more accurate knowledge of the costs of their actions. Simply put, congestion pricing seeks to assess vehicles for the costs they impose on society, which may include time costs, external congestion costs, and other variable costs (e.g. environmental or governmental costs). Ideally, congestion charges would vary based on each vehicle's responsibility in creating congestion. This can be done in two ways; (1) basing fees on the time of day (higher charges for peak hours and lower charges for off-peak hours) or (2) basing fees directly on the level of congestion on a given roadway. Airlines, train travel, and other modes of transportation have used similar pricing schemes for several decades to shift demand to off-peak periods. Only roads have by tradition been "free" and failed to take into account the effects of peak period usage. Several different impacts of road pricing may affect automobile congestion: its affect on (1) the number of trips, (2) total miles traveled, (3) the length of trips, (4) traffic speeds, (5) the routes taken by travelers, (6) the times at which trips are taken, (7) the amount of carpooling and public transportation used, and (8) smoother traffic flow.

There are three types of congestion pricing schemes. First, there is facility pricing, which charges fees for use of a bridge, tunnel, or small segment of road. Second, there is road pricing, which assesses a fee along a specific roadway (usually a road connecting two more densely populated areas). Lastly, there is cordon pricing, which establishes a series of

FIGURE 1. THE SIMPLE ECONOMICS OF CONGESTION PRICING



congestion toll collection stations in a ring around a congested area (usually a city).[55] Commuters are charged a fee as they enter the area. One variation to road-style pricing which has become popular in the United States is to modify high occupancy vehicle (HOV) lanes. Instead of building a new roadway that is subject to congestion pricing or to convert an existing freeway, several states have opened HOV lanes on congested roadways to paying commuters. This allows single drivers to buy their

55. FED. HIGHWAY ADMIN., TRANSPORTATION AND GLOBAL CLIMATE CHANGE: A REVIEW AND ANALYSIS OF LITERATURE 34 (1998), *available at* http://www.fhwa.dot.gov/environment/glob_c5.pdf.

way onto less-congested HOV lanes traditionally reserved for carpooling. Such a pricing system decreases congestion along crowded highways by spreading traffic more evenly among available lanes.

Regardless of which pricing scheme is used (facility, roadway, or cordon) there are several different methods by which the fee structure can be determined. The method chosen depends primarily on the purpose of the pricing scheme that is implemented. First, although not as efficient, a pricing scheme could be designed to raise revenue. Funds obtained through such automobile user fees can be used to finance new road construction and maintenance on existing highway systems or to improve and expand public transportation. In order to be effective, however, the fees should be lower than those aimed at curbing congestion and should remain constant. Because the objective is to raise as much revenue as possible, vehicle use would be expected to remain relatively stable. The weakness of such an approach is that drivers are not charged enough to truly feel the costs that their trips impose on society and thus results in marginal efficiency gains.

The second option is to design a pricing scheme aimed at achieving economic efficiency and congestion relief. Again, the revenue can be used for funding road construction and maintenance as well as public transportation, but the amount of the charge and the hours of application should vary throughout the day depending on traffic levels. If user fees are set so that they reflect congestion, drivers will pay according to the marginal external costs they are imposing on society by joining the roadway and thereby make more economically efficient choices. Thus, if a commuter enters onto a highway that is experiencing congestion, he will be charged more than if he were to enter a highway that is flowing freely. One way to closely approximate periods of traffic congestion is to use "time-of-day pricing," where higher congestion fees are charged during peak periods, less during shoulder-periods (in between peak and off-peak), and minimal fees during off-peak hours. A second and more accurate approach is to vary congestion fees according to congestion levels on an affected roadway at any given time. This has been made possible by the advent of transponders and cash cards which allow travelers to be tracked and the average speed of commuters determined. The reason congestion pricing based directly on roadway congestion is more accurate and efficient than time-of-day pricing is that it approximates the marginal external costs imposed by drivers more closely than time-of-day pricing, which uses the average marginal external cost imposed by drivers over a given time period (during peak periods, for example). In order to better understand this difference, imagine a large group of friends meeting for an expensive dinner and, in order to reduce the bookkeeping, the bill is

divided evenly amongst each friend (as in time-of-day pricing).[56] Since each individual friend could not lower the group bill significantly by ordering less, there is reason for excessive consumption. If, however, every individual friend is charged according to the amount of food he orders (as in direct congestion pricing) there is reason for self-restraint.

Furthermore, two recent technological advancements have made congestion pricing schemes both affordable and administratively feasible. The first is electronic road pricing of the type currently used in many states as a part of their tolling schemes.[57] Drivers purchase accounts with the state or road operator and receive a transponder which is placed on the dashboard of the vehicle. When the commuter enters a road or area subject to congestion pricing the transponder signals a sensor, and a deduction in the amount of the toll is automatically made from the user's account. The second option is to use "cash cards," an approach currently used in Singapore's congestion pricing system.[58] Such cards work much like telephone cards and can be bought or recharged at retail outlets, banks, gas stations, and automatic machines.[59] The driver can place funds onto the card and then fix it to a vehicle's windshield.[60] As with the transponder system, once the commuter passes onto a road subject to user charges, the card signals a sensor and a deduction in the amount of the toll is made from the card.[61] In addition, technological advancements have also made enforcement more effective. As with toll systems throughout the country, surveillance cameras can be used to photograph the license plates of violators or those who do not have adequate funds to account for the toll. Tickets with appropriate penalty charges can then be sent to those drivers.

B. Parking Policies

Although not the focus of this paper, urban parking policies provide an alternative to congestion pricing as a method of reducing car trips to a more socially optimal number. It should be noted, however, that parking is a second-best solution to the problem of congestion because, unlike congestion pricing, parking policies can not generally differentiate between types of trips (e.g. length of trip, time of trip, route taken). Al-

56. Timothy D. Hau, *Congestion Pricing and Road Investment in* Road Pricing, Traffic Congestion and the Environment 39-40 (Kenneth J. Button & Erik T. Verhoef eds., 1998).

57. V. Halloran III, *Standardizing Electronic Toll Collection*, Reason, Sept. 1992, http://reason.org/ps149.html.

58. Transp. Alternatives, Congestion Pricing, http://www.transalt.org/campaigns/sensible/congestion.html#s (last visited November 24, 2006).

59. *Id.*

60. *Id.*

61. *Id.*

though parking policies are unable to target specific external costs associated with congestion, they can easily and effectively shift some associated external costs onto commuters. "Parking is effective for several reasons: (1) virtually every car is parked at the end of a trip, (2) on-street parking affects road capacity, (3) the cost of parking is substantial and many times the largest cost of a commute, and (4) cruising for parking is a major contributor to downtown traffic congestion."[62] Thus, increasing the price of parking with the purpose of decreasing demand for road use has the beneficial effect of reducing many of the costs associated with urban congestion.

A simple and effective parking policy that can be adopted by cities with congestion problems is to abolish free parking for downtown employees. The reason parking prices do not currently affect drivers' decisions is because about ninety percent of the nation's commuters park free of charge at work.[63] Instead of providing free parking, employers might instead charge each employee for their parking space and then disperse the funds equally amongst all the employees, regardless of whether they used a parking space or not. As an illustration, consider an office park with 1,000 workers, 700 of whom drive and park.[64] If each car were charged the actual cost of providing a parking space (taking into consideration land, maintenance, etc.), say five dollars per day, each day's parking revenue would be 3,500 dollars.[65] This money would then be distributed to each worker (3.50 dollars each) whether they drove or not. The group as a whole breaks even, but those who choose to drive are still spending 1.50 dollars each day to park while those who find other modes of travel are making 3.50 dollars each day.[66] In addition, empirical studies performed in Ottawa, Los Angeles, and Washington, D.C. confirm the intuition that parking costs affect the number of people who commute to work.[67] In one study, parking fees of about ½ the commercial rate were imposed on governmental employees who previously had free parking.[68] The result was a decreased number of people who commuted by automobile.[69] Other studies have determined that employer-subsidized parking

62. Richard Arnott, Andre de Palma and Robin Lindsey, *Recent Developments in the Bottleneck Model in* ROAD PRICING, TRAFFIC CONGESTION AND THE ENVIRONMENT 103 (Kenneth J. Button & Erik T. Verhoef, eds., 1998).

63. Kenneth J. Button, *Road Pricing and the Alternatives for Controlling Road Traffic Congestion in* ROAD PRICING, TRAFFIC CONGESTION AND THE ENVIRONMENT 125 (Kenneth J. Button & Erik T. Verhoef, eds., 1998).

64. Komanoff, *supra* note 22, at 148.

65. *Id.*

66. *Id.*

67. Maureen B. Cavanaugh, *On the Road to Incoherence: Congress, Economics, and Taxes,* 49 UCLA L. Rev. 685, 719 (2002).

68. *Id.* at 719-20.

69. *Id.* at 720.

increases solo driving among all groups and has a substantial effect on marginal commuting decisions.[70] In addition, subsidized or free parking at train stations has been shown to increase rail commuting.[71] Given the implications of such studies, there seems to be powerful evidence that an urban parking policy which reduces or abolishes free employee parking while at the same time providing cheap or free parking for public transportation users would have a significant influence on automobile commuters.

C. Funding

Even if a state decides that congestion pricing or parking policies would be an appropriate and effective approach for addressing the problem of congestion, the issue of funding remains. In order to pay for the planning and implementation of a congestion pricing scheme or parking policy, states can either fund the operation themselves or enlist the services of a private firm. As recently as two years ago states that chose to handle the project alone could apply for federal funding through the Federal Highway Administration (FHWA).[72] FHWA funds were available to "support the development, operation and evaluation of pilot tests of innovative road and parking pricing projects."[73] The project was mandated by Congress as an experimental program to learn the potential of different value pricing approaches for reducing congestion.[74] Upon application, states were eligible to receive grants up to eighty percent of the cost of the project.[75] The project, which reserved eleven million dollars each year for congestion pricing programs, was discontinued by Congress in 2003.[76] This loss of funds means that federal support is not currently available for new projects or to support the implementation of current "pre-project" studies. Reinstitution of federal support would be critical to the expansion of the current level of congestion pricing projects. With the loss of federal monies, the best option for state and local governments is to support pricing projects through the issuance of revenue bonds that are payable from the funds generated by the congestion tolls. In this way,

70. *Id.*

71. *Id.* at 720-21.

72. Memorandum from Madeleine S. Bloom, Director, Office of Policy Development, Federal Highway Administration to Regional and Division Administrators, *Equity Act for the 21st Century*, July 13, 1998, http://www.fhwa.dot.gov/TEA21/valuepri.htm (this section of the TEA-21 Act was canceled on July 27, 2004).

73. Fed. Highway Admin., *Good Practice in Value Pricing*, http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/digst1v9.htm (last visited November 24, 2006).

74. Fed. Highway Admin., *Value Pricing Pilot Program*, http://www.fhwa.dot.gov/policy/13-hmpg.htm (last visited November 24, 2006).

75. Bloom, *supra* note 72, at 1.

76. *Id.*

a state can avoid backing any bond issuance with the full faith and credit of the state's treasury.

If a state feels overwhelmed by the operation of a congestion pricing system or finds it difficult to obtain the approval of local officials, a private firm could be used. An example of such a consortium can be found on State Road (SR) 91 in Orange County, California.[77] In December 1995, the State contracted with California Private Transportation Company (CPTC), a private firm, to construct, finance, and operate a congestion pricing project which would add four new lanes, termed "ExpressLanes," to SR-91.[78] To encourage carpooling, automobiles with three or more passengers may use the ExpressLanes for free, but all others pay a toll ranging from 1.15 dollars during off-peak hours to 9.25 dollars during peak periods.[79] Under its agreement with the State, the rate of return for CPTC is maxed out at 175 percent with any excess revenues going to State and local highway projects.[80]

V. Domestic and International Congestion Pricing

A. Singapore

Singapore was the first country to experiment with congestion pricing when, in 1975, a one dollar charge was instituted for private vehicles entering the central business district (CBD).[81] The cordon-style charging scheme initially applied to automobiles entering the CBD during the morning peak hours (7:30 to 9:30).[82] Only vehicles displaying a particular license were allowed to enter the zone, although carpoolers, buses, motorcycles, and freight vehicles were exempt from the requirement.[83] The result was an immediate seventy-three percent reduction in the use of private cars within the CBD, a thirty percent increase in carpooling, and a doubling of bus usage.[84] It was also found that many people shifted their travel times within the CBD to just before and after the restricted hours.[85] One negative impact of the congestion pricing scheme was a

77. Wahrman, *supra* note 26, at 199-200.

78. *Id.* at 200.

79. Orange County Transp. Auth., *91 Express Lanes – Toll Schedules*, http://www.91expresslanes.com/tollschedules.asp (last visited January 28, 2006).

80. Kenneth A. Small & Jose A. Gomez-Ibanez, *Road Pricing For Congestion Management: The Transition from Theory to Policy in* Road Pricing, Traffic Congestion and the Environment 228 (Kenneth J. Button & Erik T. Verhoef, eds., 1998).

81. U.S. Gen. Accounting Office, *supra* note 14, at 11.

82. Kristen M. Zolla, *Can Singapore's Area Licensing Scheme Effectively Reduce Traffic Congestion During the Peak Hours of Traffic Flow?* (1996), http://www.colby.edu/personal/t/thtieten/air-sing.html.

83. U.S. Gen. Accounting Office, *supra* note 14, at 11.

84. *Id.*

85. Zolla, *supra* note 82, at 2.

slight traffic increase on roadways around the CBD as commuters sought to avoid the restricted area and find alternate routes.[86]

In 1989, in an effort to strengthen the results of the CBD's congestion pricing scheme, the charging hours were extended to the afternoon peak hours and the exemptions were eliminated for all vehicles expect public transit.[87]

Five years later, in 1994, the charging hours were once again extended, but this time lower fees were added to cover the hours between the morning peak and afternoon peak hours (10:15 to 4:30).[88] Then, in 1998, the paper license system was replaced by an electronic cash card system.[89] As mentioned above, the cash cards operate much like telephone cards and may be purchased or recharged at retail outlets, banks, gas stations, and automatic machines. The cards are then affixed to the vehicle's windshield and different charges for different roads at different times are automatically deducted from the card as the vehicle passes under gantries.

The lasting effects of Singapore's congestion pricing system have been encouraging. Although the morning peak hour traffic has slowly increased since 1975, congestion is still thirty-one percent lower than before the charges were introduced.[90] These results have held in spite of a thirty-three percent increase in employment and a seventy-seven percent increase in the number of cars.[91] In addition, the reliability of the cash card debiting system has been studied and estimated at 99.99 percent accuracy.[92] The annual revenue from the congestion pricing system equals about forty to fifty million Euros, while the costs for operation and maintenance are only about eight million Euros.[93]

B. Norway Toll Rings

A cordon-style system of toll rings surround three Norwegian cities (Bergen, Oslo, and Trondheim).[94] Unlike in Singapore, however, the tolls are designed to generate revenue instead of reduce traffic congestion. Since congestion reduction is not an objective, the tolls are relatively low and do not vary much throughout the day (the charging period is from 6:00am to 6:00pm on weekdays). Toll locations were chosen to achieve political acceptance of the balance between the amounts paid by

86. *Id.*
87. Small & Gomez-Ibanez, *supra* note 80, at 215-216.
88. *Id.*
89. *Id.*
90. Transek AB., *supra* note 33, at 18.
91. *Id.*
92. *Id.* at 38.
93. *Id.* at 39
94. Small & Gomez-Ibanez, *supra* note 80, at 221.

city and suburban residents while altering commuting behavior as little as possible.[95] As in many American states, the toll systems in Norway utilize "unmanned electronic toll booths that deduct fees from dashboard-mounted transponders each time a vehicle enters the toll zone or passes a toll point."[96] While heavy goods vehicles pay a double toll (corresponding to the damage they cause the roadways), residents who live close to a toll station or who make frequent crossings are protected by a one-charge limit per hour.[97]

Even though congestion management was not an objective of the Norwegian toll systems, Trondheim has experienced a ten percent reduction in traffic during peak periods and an eight percent increase in traffic during off-peak periods within the charging zone.[98] Furthermore, as a revenue generating asset, the toll rings have exceeded expectations. "The revenue in 2002 was about one billion NOK (Norwegian Krone), [while] the operative costs were only ten percent of that revenue."[99] The annual maintenance costs are also minimal, amounting to about ten million NOK.[100] Revenues from the tolling system have been used to improve roads, build bypasses, upgrade public transit, build bicycle paths, and even to provide 200 free bicycles for use downtown.[101]

C. London

On February 17, 2003, London introduced a cordon-style congestion pricing scheme aimed at reducing traffic levels within the city. The system charges the equivalent of fourteen dollars a day to drive through the center of London between 7:00am and 6:30pm.[102] "The congestion charging zone is enclosed within a boundary formed by the Inner Ring Road, which [is not subject] to the congestion charge.[103] Enforcement of the charging system is left to a network of cameras situated at entry and exit points to the congestion zone.[104] "These cameras record images of traffic and sends them to a central processor where the [license plate] numbers are checked against the list of vehicles that have been paid for."[105] Unless charges have been paid for in advance or are paid before

95. *Id.*
96. Transp. Alternatives, *supra* note 58, at 13.
97. *Id.*
98. U.S. Gen. Accounting Office, *supra* note 14, at 12.
99. Transek AB *supra* note 30, at 38.
100. *Id.*
101. Transp. Alternatives, *supra* note 58.
102. RoadTraffic-Technology.com, *Central London Congestion Charging, United Kingdom*, http://www.roadtraffic-technology.com/projects/congestion (last visited November 25, 2006).
103. *Id.*
104. *Id.*
105. *Id.*

midnight on the day of travel, the automobile's registered owner will be fined.[106] Several groups of drivers are exempt from the congestion charges, including licensed taxis, public service vehicles, motorcycles, mopeds, emergency vehicles, disabled drivers, and alternative fuel vehicles.[107] Exempting and thereby incentivizing the use of alternative fuel vehicles such as hybrids[108] is especially important from an environmental perspective since they not only use less gasoline (the Toyota Prius, for example, gets up to fifty-three mpg in the city) but also emit ninety percent fewer smog-forming pollutants and half of the carbon dioxide that a conventional automobile does.[109] Also, residents within the congestion charging zone pay only ten percent of the charge.[110] The immediate result of London's pricing scheme is a twenty percent decrease in traffic within the city and a fourteen percent increase in bus use during the morning commute.[111] In addition, average speeds within London are at their highest since the 1960s, travel times are more reliable, and even businesses within the zone have seen benefits.[112] Furthermore, the exemption for alternative fuel vehicles may be influencing sales of hybrid vehicles, such as the popular Toyota Prius. Prius sales during the first quarter of 2005, for example, were more than double the sales in the first quarter of 2004.[113] Overall, Toyota expected 2005 British sales to more than double those in 2004.[114] Owning exempt vehicles means significant savings for London commuters who could avoid up to 1,250 pounds per year in congestion charges.[115]

D. New York

In May of 2000 the Port Authority of New York and New Jersey instituted a weak facility-based congestion pricing system for the tolls on the George Washington Bridge, Lincoln Tunnel, Holland Tunnel, Goe-

106. *Id.*

107. *Id.*

108. Hybrids are vehicles whose engines rely on both gasoline and electricity for their power. *See, e.g.*, Fueleconomy.gov, *How Hybrids Work*, http://www.fueleconomy.gov/feg/hybridtech.shtml (last visited November 25, 2006).

109. Idaho Dept. of Envtl. Quality Info. Res., Air Quality in the Treasure Valley: The Benefits of Fuel-Efficient Vehicles (2003), http://www.deq.state.id.us/multimedia_assistance/p2/fuel_efficient_vehicles_fs.pdf.

110. RoadTraffic-Technology.com, *supra* note 102, at 2.

111. U.S. General Accounting Office, *supra* note 14, at 11.

112. Transp. Alternatives, *Europe Eyes London Style Congestion Pricing* (Feb. 23, 2004), http://www.transalt.org/press/askta/040220.html.

113. Carpages.co.uk, *Toyota Prius Sales Surge in 2005* (July 7, 2005), http://www.carpages.co.uk/toyota/toyota-prius-07-04-05.asp?switched=on&echo=981703353.

114. *Id.*

115. *Id.*

thals Bridge, and Outerbridge Crossing.[116] The scheme increased the four dollar charge on these facilities to five dollars for the morning hours of 6:00am to 9:00am, the afternoon hours of 4:00pm to 7:00pm and weekend hours of 12:00pm to 8:00pm.[117] The charge for trucks increased from five dollars to six dollars per axle during these same periods.[118] The results of this pricing scheme, unfortunately, have been slight. One year after the scheme was implemented, four percent fewer motorists used the facilities during the afternoon peak period which corresponded to a seven percent increase in travel after the afternoon peak period.[119] In addition, "[seven] percent fewer commuters and trucks traveled during the morning peak period."[120] Such small shifts in traffic patterns are probably attributable to the marginal increase in charges during peak periods, although there may also be a lack of alternatives to using the facilities during these hours. More recently, Mayor Bloomberg, who is in favor of congestion pricing schemes to address traffic problems in Manhattan, proposed expanding the congestion pricing system to the East Bridge but was forced to abandon the idea after State lawmakers, whose approval he requires, rejected the idea.[121]

E. Orange County, California

The congestion pricing program on SR-91 in Orange County, California is an example of a road-style pricing scheme that is operated by a private firm. SR-91 is a particularly congested commuter link between residential and employment centers in Orange, Riverside, and San Bernardino Counties. From 1980 to 1994 the eight-lane highway experienced an annual growth rate of six percent[122] and carried over 200,000 vehicles per day with one-way delays reaching as high as fifty minutes.[123] In 1995 the State contracted with CPTC to build and operate four new "ExpressLanes," along ten miles in the median of the highway.[124] Unless carpooling with three or more passengers, all drivers pay a charge for using the ExpressLanes, which varies by time of travel, ranging from 1.15

116. Transp. Alternatives, *supra* note 58.

117. *Id.*

118. *Id.*

119. Press Release, The Port Auth. of N.Y. & N.J., The Early Returns: Port Authority Releases Preliminary Congestion Pricing Data for Bridges, Tunnels and Path, Press Release No. 92-2001 (June 26, 2001), http://www.panynj.gov/AboutthePortAuthority/PressCenter/PressReleases/PressRelease/index.php?id=73.

120. *Id.*

121. *Bloomberg Rejects Congestion Pricing to Cut Traffic,* Daily News, Nov. 11, 2005, *available at* http://www.nydailynews.com/front/breaking_news/story/364691p-310530c.html.

122. Wahrman, *supra* note 26, at 200.

123. Small & Gomez-Ibanez, *supra* note 80, at 228.

124. Wahrman, *supra* note 26, at 200.

to 9.25 dollars per trip.[125] Each car has a transponder in its windshield that corresponds to an account maintained by the operator.[126] As the driver approaches the ExpressLanes, the price is announced on an electronic message sign so that the motorist can decide whether to opt for the priced or un-priced lanes.[127] If a commuter chooses to enter the ExpressLanes, a charge equal to that displayed on the sign is deducted from the user's account. As mentioned above, under CPTC's contract with the State, the rate of return is limited to 175 percent with any excess revenues going to the State to finance local highway projects.

From a business perspective CPTC's operation of the ExpressLanes has paid off, with revenues growing 8.4 percent in 2004 to 31.2 million dollars.[128]

This increase in revenues was due, in part, to an overall traffic volume increase of 12.1 percent in 2004, from ten million trips to 11.2 million trips.[129] The popularity of the ExpressLanes continues to grow as drivers find that they can save about thirty-six minutes per trip in the afternoon by using the toll roads.[130] Nowhere has this time savings been more evident than in the city of Corona, where the average speed and travel times in the city for westbound rush hour before the tolls was twelve mph and fifty-eight minutes.[131] After the ExpressLanes were introduced the average speed and travel times improved to fifty-two mph and 13.5 minutes.[132] What's more, delays have been decreased in the other "free" lanes along SR-91. Average delays of thirty to forty minutes were reduced to twelve to thirteen minutes as traffic moved to the ExpressLanes.[133]

F. San Diego, California

Similar to the scheme implemented on SR-91, San Diego utilizes a road-style congestion system to address burgeoning traffic.[134] Unlike SR-91, however, San Diego varies congestion charges based on actual levels of congestion on the roadway at any given time.[135] San Diego is one of the nation's most congested metropolitan areas and the traffic on Inter-

125. Orange County Transp. Auth., *supra* note 79.
126. Small & Gomez-Ibanez, *supra* note 80, at 230.
127. *Id.* at 229.
128. *See* 91 Express Lanes, Orange County Transp. Auth., 2005 Ann. Rep. 9., *available at* http://www.91expresslanes.com/generalinfo/91annualreport.pdf.
129. *See* Orange County Transp. Auth., 2004 Ann. Rep. 7, *available at* www.octa.net/pdf/2004_octaannual.pdf.
130. *Id.*
131. 91 Express Lanes, *supra* note 128, at 5
132. *Id.*
133. U.S. Gen. Accounting Office, *supra* note 14, at 14.
134. *See* Strahilevitz, *supra* note 6, at 1251.
135. *Id.*

state 15 (I-15), a main commuter artery connecting northern suburbs with the southern downtown area, was a problem for the city. As a possible solution, San Diego began opening HOV lanes on I-15 in 1988.[136] Although vehicles with two or more occupants could use the HOV lanes, they remained underutilized and congestion worsened on the rest of I-15.[137] Finally, a simple yet effective congestion pricing plan was implemented in December of 1996, called FasTrak.[138] FasTrak allows solo drivers to pay a per trip fee to use the existing HOV lanes located along an eight mile stretch of I-15.[139] Normally, congestion charges range from 0.50 to four dollars, although to maintain free-flow on the FasTrak lanes at all times, tolls may be raised up to eight dollars in the event of severe congestion.[140] The actual fee is posted on the roadside prior to entering the FasTrak lanes so that drivers can make informed decisions. When entering onto FasTrak lanes, a solo driver must pass through a particular lane where a transponder inside the car signals a ground-based sensor and a deduction in the amount of the posted fee is made from the user's prepaid account (carpoolers have their own marked lane and no deduction is made).[141]

During the first year of the program's operation, the amount of traffic in the FasTrak lanes increased by twenty percent during the morning peak period and by twelve percent during the afternoon peak period.[142] The overall impact of the FasTrak program has been to increase the average daily traffic on the HOV lanes from 9,400 to 20,000 vehicles per day and to double the number of daily carpools to more than 15,000 each day.[143] This change corresponds to a two to three percent decrease in traffic volume on the main, "free" lanes as well.[144] This decrease in congestion along I-15 has brought reduced travel time, reliability of on-time arrival, and improved safety for all commuters. As a result of FasTrak, the economic costs of congestion along the I-15 corridor to the San Diego region dropped eighteen percent during the first year of operation alone.[145] In fact, this figure may be a modest approximation, since it does not take into consideration that many of the solo drivers using the HOV

136. *Id.* at 1250.

137. *Id.* at 1250-1251.

138. *See id.* at 1251.

139. Kiewit, *I-15 FasTrak*, http://www.kiewit.com/markets/pro_I-15FasTrak.html (last visited Nov. 10, 2006).

140. San Diego Association of Governments, *I-15 FasTrak Online, Toll Schedule and Information*, *available at* http://fastrak.sandag.org/schedule.html (Feb. 1, 2006).

141. Strahilevitz, *supra* note 6, at 1251.

142. *Id.* at 1252.

143. Kiewit, *supra* note 139.

144. Strahilevitz, *supra* note 6, at 1252.

145. *Id.*

lanes and realizing the greatest time savings are those whose time is most valuable.[146] It also does not include the slight increase in business patronage that resulted from the program.[147]

Revenue gained from the FasTrak congestion charges pays for the 750,000 dollars in operating costs each year as well as 60,000 dollars for enforcement by the California Highway Patrol.[148] State law requires that the remaining revenue be spent improving public transportation and ridesharing services along the I-15 corridor.[149] In fact, the San Diego congestion pricing scheme has been so successful that other states, such as Minnesota, are initiating plans to convert their underutilized HOV lanes to congestion lanes using I-15 as a model.[150]

VI. Problems of Inequity and Political Viability

There is general agreement that congestion pricing is an effective measure for internalizing the hidden costs of driving and reducing traffic problems. The relevant question to be asked, then, when an area struggling with burgeoning traffic considers a congestion pricing solution is not "will it work," but "will there be enough public and political support to get the scheme started." There have been many attempts to introduce pricing systems on urban roadways around the world in the last forty years and most have failed due to lack of public (and therefore political) acceptability.[151] Thus, the most important part of many congestion pricing schemes may be the way in which it is "sold" to the public. In fact, there is evidence that once initial opposition to a pricing scheme is overcome, people generally accept the system. In Trondheim, Norway, for example, seventy-two percent of residents were opposed to the tolling ring prior to implementation while only thirty-five percent were opposed two years later.[152] What follows is an analysis of the issues affecting public support for congestion pricing schemes.

A. Inequity

Simply put, if all vehicles of the same type are charged the same fees

146. *Id.* at 1252-1253.

147. *Id.* at 1253.

148. San Diego Association of Governments, *I-15 FasTrak Online, Funding and Revenue*, http://fastrak.sandag.org/fundrev.html (last visited Nov. 10, 2006).

149. *Id.*

150. *See* Press Release, Minnesota Department of Transportation, Site Visits Scheduled to Observe California Express Lanes (Sept. 29, 2003), *available at* http://www.hhh.umn.edu/centers/slp/projects/conpric/mediaadvisory-sitevisits.pdf.

151. Peter Jones, *Urban Road Pricing: Public Acceptability and Barriers to Implementation*, *in* Road Pricing, Traffic Congestion and the Environment 263, 263 (Kenneth J. Button & Erik T. Verhoef eds., 1998).

152. Transek AB, *supra* note 33, at 46.

during the same periods, these fees will constitute a more significant barrier to travel for those who have less discretionary income. Highway networks are seen as one of the few situations where people are treated equally as commuters and where all have equal access to the roadways, regardless of income or stature. Since there is little doubt that peak period fees will impact lower-income commuters more severely than higher-income commuters, special concern is paid to those lower-income users with little or no flexibility in setting their schedules. For many commuters, it is often difficult to find co-workers with similar routes and work schedules who also agree on travel routes and times and who can arrange for backup transportation if the carpool falls through. In addition, those with low incomes are more likely to live far from the city-center and their destination is more often located outside the city's core where public transportation is poor.[153] Such problems are compounded for households with multiple-workers or households with young children. The fear is that these conditions will allow wealthy commuters to travel during the most convenient peak period hours while lower-income drivers will be forced to travel at less convenient times or will have to bear the brunt of higher peak period charges.

There are several responses and methods for addressing the inherent problem of inequity in congestion pricing. First, reduced traffic congestion will have disproportionate benefits for those with low incomes. More than any other group, the poor are victims of pedestrian deaths (especially children) which are attributable, in part, to traffic levels.[154] The poor also tend to congregate closer to noisome highways and in areas with higher levels of automobile-caused air pollution that will become cleaner, safer, and quieter with less congestion.[155] Reduced air pollution alone would have a substantial impact on the poor since they are more likely to be asthma sufferers vulnerable to such pollutants and, at moderate income levels, such health benefits may outweigh modest congestion charging impacts.[156] Additionally, road-style congestion pricing schemes like the one used on I-15 in San Diego provide direct benefits to the poor as well as the wealthy. Low income commuters will never be priced off the road since there are free lanes adjacent to the tolled lanes. They may face longer commutes than the wealthy, but even the free lanes should become less congested and move more smoothly as toll-paying drivers are siphoned from the free lanes.

153. *Id.* at 26.

154. Komanoff, *supra* note 22, at 154.

155. *Id.*

156. Harry W. Richardson & Chang-Hee Christine Bae, *The Equity Impacts of Road Congestion Pricing*, *in* ROAD PRICING, TRAFFIC CONGESTION AND THE ENVIRONMENT 247, 254 (Kenneth J. Button & Erik T. Verhoef eds., 1998).

A second option is to provide rebates for certain categories of commuters. The use of electronic tolling systems in congestion pricing schemes provides an opportunity for targeted relief. For instance, congestion charges could vary with income upon submission of W-2 forms and income tax returns.[157] This allows communities to minimize the disparate impacts congestion pricing may have on the poor. The problem with such a strategy, of course, is designing a fee structure for both the wealthy and poor that diverts enough traffic from the priced roads to generate adequate time savings and yet is equitable among different income groups. A related measure designed to provide relief for those living within a cordon-style congestion zone is to allow those drivers a certain number of free trips each month or to provide them with a discount (as in London). Another alternative suggested by some commentators is a Fast and Intertwined Regular (FAIR) lanes approach.[158] If a FAIR system were implemented on I-15 in San Diego, for example, funds generated from commuters using the electronically tolled FasTrak lanes would be transferred to drivers using the adjacent free lanes. This would be accomplished through transponders in vehicles using both the tolled lanes and the free lanes. Those in the free lanes would receive a credit to their FasTrak account equal to some percentage of the effective toll, which could then be used for public transportation charges or toward the use of the FasTrak lanes another day.

Additionally, the way in which revenue from a congestion pricing system is used provides an opportunity to benefit low income groups. In fact, if there is to be any public support for a congestion pricing scheme the revenue must be allocated to achieve a range of transportation and other social benefits. Congestion pricing funds can be used to expand existing road capacity, install traffic control systems that enhance road network capacity, improve public transportation, mitigate harms from traffic congestion, and address other social and economic problems that plague many large urban areas. An integral aspect of any congestion pricing system is to improve public transportation systems and improve facilities for walking and cycling, particularly in areas where alternatives to driving are inadequate. Furthermore, some funds could be directed toward repairing damages caused by traffic congestion; such as investing in communities blighted by highways, healthcare for people with asthma or other victims of air pollution and accidents, soundproofing schools against highway noise, etc.[159] When analyzed under a "redistributional" lens, this begins to look like a progressive tax, where wealthy motorists are paying fees that support low income transportation and social pro-

157. *Id.* at 248-249.
158. U.S. GEN. ACCOUNTING OFFICE, *supra* note 14, at 6-7.
159. Komanoff, *supra* note 22, at 153.

grams. But unlike many other redistribution schemes, this one will retain the support of high-income individuals since they are getting something valuable in return. Moreover, it has been shown that support for congestion pricing systems increases drastically when it is understood that the revenue will be used for local transportation and environmental projects. One British survey found, for example, that thirty percent of adults supported road pricing as a stand alone measure, but support increased to fifty-seven percent for a road pricing scheme where the money raised was used to fund public transportation improvements, traffic safety measures, and better facilities for pedestrians and cyclists.[160]

Lastly, congestion pricing revenue could be directly returned to the citizenry in the form of tax breaks. One option is to cut the most regressive taxes that disproportionately burden the poor, such as the gasoline and sales taxes. An alternative is to direct a certain percentage of toll revenue toward providing income tax credits for those in low income groups. A similar approach that would provide more local relief is to provide property tax credits for the lowest income brackets.

B. Congestion Pricing is an Improper Solution

Belief that congestion pricing is an improper solution to traffic problems stems from two different sources. First, many drivers are unable to accept the notion that they should be charged for congestion. Road pricing is seen as another form of taxation that takes away what was previously considered free as a matter of right. Moreover, many commuters do not see themselves as part of a larger problem, but as victims of congestion. Drivers feel that they already pay enough for congestion through delays and increased stress. Second, some road users do not believe that congestion pricing is needed. They do not perceive traffic conditions to be bad enough to warrant such an extreme measure as road pricing and feel that other remedies would be more appropriate.

Given the widespread adoption of these beliefs and the disastrous impact they can have on the implementation of a congestion pricing scheme, there is general agreement that congestion must be considered a serious problem and charges must be regarded as essential to solve the problem before any road pricing system can gain public support.[161] This means that both communication and public awareness are prerequisites to congestion pricing. Many groups in society must be involved and different alternatives for improving traffic must be openly considered. The public must come to the conclusion that the alternatives to congestion pricing are alone inadequate to address the problem. This process neces-

160. Jones, *supra* note 151, at 275-276.
161. Transek AB, *supra* note 33, at 51.

sitates a good description given of the positive effects on the problem that the charges are meant to address, how the potential negative effects should be handled, and what distributional effects are to be expected and how they are to be dealt with, etc.[162]

C. Congestion Pricing will be Ineffective

Some people believe that drivers are inelastic to road charges so that congestion pricing will not change drivers' behavior (i.e. commuters will not switch the times they drive, begin to carpool, take public transportation, etc.). The idea is that drivers already pay for their car and its running and maintenance costs, which leaves the costs of use a small proportion of the total. This proportion is not considered nearly high enough to keep drivers from maximizing the benefit of their investment. The evidence, however, suggests that this is largely a faulty perception rather than an observed fact (e.g. London and Singapore's successful congestion pricing schemes).

D. Privacy Concerns

One concern with an electronic tolling scheme is that tracking of an individual's car trips by the government leads to the potential for invasions of privacy. But in many situations, such a capability may actually prove to be quite beneficial. For example, transponder information may be useful to law enforcement for checking the alibi of a suspected criminal. This information could also help the police track down the location of a stolen vehicle if the transponder is in a difficult-to-find area of the car. Even if the consensus is that the government should not have this information, there are technological solutions to the privacy problem. A simple system could allow individuals to opt for a class of identifying codes that would erase information regarding place and time from the record as soon as the appropriate charge has been deducted.[163] Also, as in Singapore, a system of cash cards could be used so that the actual owner of each card is unknown and once funds have been deducted from the commuter's card, any information about place and time could be erased

E. Congestion Pricing is Just Another Tax

The fear many people have with congestion pricing is that the revenue might become an easy "rainy-day-fund" when additional tax revenue is needed. Such distrust in politics and politicians must be defeated before a congestion pricing scheme will be accepted. One solution is to

162. *Id.* at 53-54.
163. Strahilevitz, *supra* note 6, at 1249.

have the revenue from congestion charges tagged in advance in order to make clear the benefit and to take discretion away from politicians. Regulations or state laws mandating that the revenues be used only in the transportation sector or for urban social programs is another way to prevent political corruption of the congestion pricing system. A third option is to have a private firm collect the tolls, thereby operating as a buffer against governmental use for unrelated purposes (e.g. CPTC's operation of SR-91 in Orange County, California). With the government taking a secondary role in the scheme, the public's inherent distrust in politicians may be overcome.

F. Negative Affects on Local Businesses and Shops

Some fear that congestion pricing may have adverse effects on shopkeepers and businesses that rely on priced roadways. The counterargument is that, as accessibility improves, economic growth should be stimulated since businesses have more potential customers. Moreover, as commuters spend less on vehicles and fuel, more income will be available for local goods and services. Even without increased business patronage, firms with a high time-value (e.g. professionals, merchandise deliverers, and the service industry) should see benefits from shorter trips; including less spending on automobile fuel and more productive-hours during the day. Additionally, congestion pricing schemes can be designed with businesses in mind by allowing for discounted daily permits for fleet vehicles or short periods of free on or off-street parking for drivers entering the city. Given the beneficial effects congestion pricing will have on businesses, any negative consequences should be minimal. A simulation study of a typical European city, for example, showed that only about two percent of workplaces and shops would move out of the city center as a result of congestion pricing.[164]

G. Real Estate Prices and Housing

Congestion pricing schemes make car trips more expensive. This increased transportation cost incentivizes households to move closer to destinations in order to avoid congestion charges. In a city with an obvious city-center, this means an increased demand for housing and residences in the downtown area. Areas with good public transportation would also become more popular. The result is an increase in housing prices as well as an increase in the supply (through new construction and/or increased sales of existing homes).[165] As with business relocation, however, any such effects are expected to be small. In the same simulation study of a

164. Transek AB, *supra* note 33, at 31.
165. *Id.* at 29-30.

typical European city mentioned above, it was shown that only about two percent of households would relocate as a result of congestion pricing.[166]

H. Phasing in Congestion Pricing

Trucks constitute fourteen percent of vehicle miles traveled in the United States but account for disproportionately more air pollution, infrastructure damage, and road congestion, especially on city streets and urban highways.[167] Given the general perception that trucks contribute more than their share to traffic problems, the public is more likely to accept a congestion pricing scheme that initially applies only to trucks. User fees targeting truckers would reduce per-mile harms by encouraging shippers to switch to rail transport, consolidate loads, travel during off-peak hours, use smaller vehicles in congested areas, and use nearby suppliers.[168] Most importantly, though, a congestion pricing scheme that is implemented on the back of the trucking industry is more likely to garner public support should it ever be expanded.

VII. Conclusion

In the context of congestion pricing, one commentator rightly observes that "it has been a commonplace event for transportation economists to put the conventional diagram on the board, note the self-evident optimality of pricing solutions, and then sit down waiting for the world to adopt this obviously correct solution. Well, we have been waiting for seventy years now . . . why is the world reluctant to do the obvious?"[169] This paper suggests that the problem with congestion pricing has nothing to do with its effectiveness as a congestion-reducing measure, but with its ability to overcome public opposition. Popular reaction to being charged for something which was previously considered free as a matter of right will always be skepticism and resistance. As such, any region or locale considering road pricing as a solution to traffic congestion must address the public's concerns head-on. State and local governments must have a two-way conversation with the public that both explains the purpose of congestion pricing and makes the government aware of major concerns. This information can then be used to design a publicly and politically acceptable congestion pricing scheme.

166. *Id.* at 31.

167. Komanoff, *supra* note 22, at 157.

168. *Id.*

169. Piet Rietveld & Erik T. Verhoef, *Social Feasibility of Policies to Reduce Externalities in Transport, in* Road Pricing, Traffic Congestion and the Environment 285, 285 (Kenneth J. Button & Erik T. Verhoef eds., 1998).