Overcoming Public Aversion to Congestion Pricing

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Abstract

Transportation authorities have consistently failed to employ economic incentives on major roadways--i.e. time-of-day pricing or "congestion fees"--to internalize the costs of congestion. In principle at least, such tolls can easily be shown to increase social welfare by making motorists pay something closer to the full social costs of their driving decisions. In addition, recent advances in electronics make it possible to implement such fees fairly cheaply and non-intrusively. While these same authorities generally understand and acknowledge the case for using congestion fees, they also claim that their use is politically infeasible because too many motorists would suffer large increases in commuting costs. This is the puzzle: If congestion tolls truly do advance social welfare, why is it so difficult to find a way to implement them? Two common explanations for this difficulty are the following: (i) The public perceives, or politicians fear that they would perceive, such fees simply as tax increases. If so, they might be responsive to an explicit promise to return the money in some way. (ii) Motorists dislike congestion fees because they find them coercive, in that they often have few if any practical alternatives to paying the fee. If so, then a policy option that offers motorists a choice of toll lanes and the more customary free lanes may be more attractive than a policy that policy of tolls on all lanes.

We have completed a survey of Southern California residents designed to test these hypotheses. Unlike most opinion surveys on congestion pricing, our survey was quite explicit about the fate of the collected revenues. For example, we presented respondents with policies that returned a substantial portion of the revenues to the public, either in the form of cash (through reductions in sales taxes and vehicle registration fees or through income tax credits) or in the form of coupons to be used for vehicle emissions equipment repair, transit, and the like. In the past, most surveys have not been explicit about the revenues, or they have stated that revenue use was to be for improved highways, transit, or other public purposes. We find that a promise to offset the imposition of congestion fees by other taxes can result in a 7 percentage point increase in support for congestion pricing policies, and the restriction of congestion pricing to a single lane on a freeway attracts from 9 to 17 percentage points of additional support.

Key Words: congestion, HOT lanes, freeways, time-of-day pricing

JEL Classification No.: R41

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OVERCOMING PUBLIC AVERSION TO CONGESTION PRICING

Winston Harrington, Alan J. Krupnick, and Anna Alberini*

INTRODUCTION

As motorists in the U.S. are only too aware, the nation's highways are becoming more and more crowded every year, especially in metropolitan areas where most of us drive. The number of urban areas classified by the Texas Transportation Institute as congested rose from 10 to 18 during the 1980s, as the fraction of interstate highway mileage with traffic volumes within 20 percent of capacity jumped by nearly 50 percent. Average speeds on the freeways in Los Angeles, the nation's most congested urban area, are a mere 31 miles per hour (see MacKenzie, Dower, and Chen, 1992).

Congestion at this level imposes enormous costs on society. The time delay costs alone have recently been estimated to exceed $22 billion annually (Hanks and Lomax, 1991). The U.S. General Accounting Office (1989) cites an estimate of annual national productivity losses from congestion of $100 billion. Moreover, congestion increases environmental costs. Vehicular volatile organic compound (VOC) emissions, which are a major contributor to the ambient ozone problems experienced in many urban areas, are higher at low speeds and higher still in stop-and-go traffic. The California Air Resources Board estimates that a vehicle traveling 10 miles in 30 minutes will emit 2.5 times the running exhaust VOC emissions as one traveling the same distance in 11 minutes (see Burmich, 1989). Unless something is done, congestion will only get worse: regional population is expected to grow by 7.5 million in the next 20 years, with little prospect of a corresponding increase in freeway capacity (SCAG, 1997).

Historically, the response to roadway congestion has been to build more roads, but capacity expansion has not been a successful long-run strategy for congestion in the past, and it is not likely to be successful in the future. This is in spite of billions of dollars of road building per year financed by federal gasoline taxes alone through the Highway Trust fund and allocated by the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA).[1] The main reason for this lack of effectiveness is that capacity expansion does not get at, and in fact exacerbates the basic "open access" problem of urban expressways. Expressways are overused largely because drivers to not pay the full cost of their use -- in particular, drivers do not pay the time delay and environmental costs they impose on others.

Regulatory barriers also will limit road building. The Clean Air Act Amendments of 1990 contain a provision requiring local transportation plans in the worst ozone nonattainment

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[1] At this writing, Congress is currently revising ISTEA, and plans to allocate from $24 to 32 billion per year to expanding and repairing the national road network.

areas to be "in conformity with" local plans to attain air quality standards. The Amendments also require that these problem ozone areas reduce VOC emissions by 3 percent per year.

Transportation planners are looking increasingly to policies designed to reduce driving, encourage carpools, and encourage mass transit, especially during rush hours. One oft-cited, but virtually untested, approach to urban traffic congestion is to require users to pay for highway travel during peak periods by means of time-of-day pricing. Electronic collection devices are making this approach easy and inexpensive to implement, as few toll booths are needed. Several roads in the U.S. and in other countries now feature such electronic tollways--called variously HOT lanes, or FAST lanes, which are either HOV lanes permitting tolled single-occupancy vehicles (SOVs) or new toll roads running parallel to existing highways.[2] But the idea has been very slow to catch on.

Political unpopularity may be the most important stumbling block--it is difficult to convince people that they should pay for something they once got for free. Underlying this, we believe, are two factors of paramount importance. First, the collected fees are customarily perceived as a deadweight loss, with no compensating perception of (or perhaps a disbelief about) the congestion reductions and other benefits that could be provided by those fees. Perhaps this opposition could be reduced if the congestion pricing proposal were coupled with a plan to return some or all of the revenues to the public in the form of a cut in local sales or other taxes, or for some purpose earmarked to help commuters.

Second, motorists are likely to resent the imposition of congestion fees on an existing freeway or freeway system, where they are more or less locked into an existing pattern of single-occupancy vehicle use with few if any viable commuting alternatives. However, if congestion pricing were implemented so as to leave motorists the option of continuing to use unpriced roads, motorists may have less reason to feel coerced and may therefore find congestion pricing more acceptable. Indeed, the success of the HOT lanes built in Houston, Orange County, and Toronto underscores this point.

In this paper we describe the results of a telephone survey designed to examine the sensitivity of public support when the two issues described above are addressed directly. The survey was conducted in Southern California under the auspices of the REACH Task Force (Reduce Emissions And Congestion on Highways), a consortium of local governments,

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[2] The best-known example of a successful congestion pricing program is the Area Licensing Scheme in Singapore where vehicles that wish to enter the central business district during peak travel periods must purchase a license (Watson and Holland, 1978). Hong Kong set up a similar system in a fairly successful pilot program in 1985 but then failed to generate enough public support for full implementation of the program (Harrison, 1986; Pretty, 1988). More recent examples include SR91 in Southern California, a private road built on public land (in the median of an existing freeway), "HOT lanes" on Interstate 15 in San Diego, and Route 407 in Toronto. Recently, a toll road near Paris converted to peak-period tolls, and other countries--namely, Norway, Sweden, and Great Britain--appear to be serious about using congestion pricing sometime in the near future. See Harvey (1993) for a summary of the experiences in Singapore, Hong Kong, and other areas of the world. Up-to-date information about toll roads generally, including use of time-of-day pricing, can be found in *Toll Roads: The Newsletter of Tolling Turnpikes, Bridges and Tunnels.* In particular see Number 15 (May 1997), a special issue of Toronto's new Highway 407.

corporations and citizen groups in the region, coordinated by the Southern California Area Governments (SCAG). SCAG is the designated regional metropolitan planning organization. The purpose of the survey was to estimate public support for a set of rather complex pricing policies combining peak-period pricing on freeways with other devices which we hoped would partially defuse the opposition to congestion pricing, and to find the determinants of respondent support for those policies. The surveys are unusually explicit about the fate of the collected revenues, and in particular they include examination of policies that return a substantial portion of the revenues to the public, either in the form of cash (through reductions in sales taxes and vehicle registration fees or through income tax credits) or in the form of coupons to be used for vehicle emissions equipment repair, transit, and the like.

The results of the survey suggest that the public will respond favorably to details of congestion pricing proposals that address the issues of revenue redistribution and preserving motorist choice. A promise to return a portion of the revenues had a significant effect on the level of support, improving it by about 7 percent. The fraction of revenues returned did not seem to affect the level of support, or at least no significant differences could be observed in the sample. A promise to return the revenues "in kind," by distributing coupons good for use on a number of transportation-related services did not, on average, affect the level of support, although there appeared to be a small positive effect of increasing the fraction of revenues returned. The largest increase in support was found for the two high-occupancy transit (HOT) lane proposals. The proposal to convert an existing freeway lane to a HOT lane increased support by about 8 percent, while the proposal to build a new freeway lane for toll use increased support by 17 percent.

CONGESTION FEES

There is a sizable economics literature examining the benefits of congestion pricing of roadways. Economic theory suggests that congestion fees are the most cost-effective way of achieving a given level of highway use -- i.e., if we add up all the costs, including the costs of inconvenience associated with restricting travel or finding alternative trip routes or modes, we will find that no other rationing method will achieve the result at lower total cost. Moreover, if the fee achieves a level of use such that the benefit to the marginal user equals the marginal cost imposed on other users, then that fee generates a socially efficient level of roadway use. [3]

Whether such theoretical arguments carry the day is unclear. Localities clearly covet the revenues that congestion pricing can raise. And the technological barriers to implementation have fallen dramatically with the development of convenient and reliable

[3] There is a large theoretical economics literature dealing with various aspects of congestion pricing -- see, for example, Kraus, Mohring, and Pinfold (1976), Keeler and Small (1977), Kraus (1989), and Vickrey (1963). Several recent empirical studies show welfare gains from congestion pricing--see Cameron (1994); and Mohring and Anderson (1994).

metering/billing systems.[4] But, it is the political resistance to the use of congestion tolls that limits their use. In 1976, the Urban Mass Transit Administration made available demonstration grants to local and regional transportation authorities for the purpose of establishing congestion fee demonstration programs, but there were no takers (Higgins, 1986). As recently as 1991, the ISTEA authorized $25 million per year for six years of implementation of congestion pricing pilot projects. The Department of Transportation received 16 proposals, only one of which was funded (the San Francisco-Oakland Bay Bridge project) and even it has faced local opposition. Other approaches to rationing roadway use, most notably the use of "high-occupancy-vehicle" (HOV) lanes, which are restricted to vehicles having two, three or four occupants, face problems, but these approaches are in much greater use than congestion tolls. The HOV experience suggests that restricting access to freeways may be tolerated in general, but the particular use of congestion fees for that purpose is not.

Thus policymakers are becoming increasingly interested in understanding the conundrum: Why do people seem to prefer more costly policies, such as HOV lanes, for achieving the same objective? And finally, are there ways to establish congestion fees so that the public supports them? The fact is, of course, that economic efficiency alone has seldom been the deciding factor in public decisions. After examining the political obstacles to congestion fees, Giuliano (1992) concludes that " . . . [I]t is unlikely that congestion pricing will be implemented to any significant extent in the U.S." (p. 335)

Despite the generally positive net benefits, all congestion pricing policies create a large class of net losers, even in theory. In addition, Calfee and Winston (1995) argue that the costs of congestion are not perceived as particularly severe by those who have to endure them. Motorists who are particularly averse to congestion arrange their lives so they can avoid its worst aspects. In addition, congestion pricing policies are often discussed as if the fee revenues themselves were a deadweight loss rather than a source of benefits that can be used to increase support. As a result, it is often difficult for the public to see that it is getting anything for the money. Small (1992) emphasizes the importance of the fee revenues to the net benefits, and outlines a scheme of public transit investments and tax reductions aimed at achieving a broader distribution of net benefits. While Small does not test empirically the potential improvement in public acceptability that might be provided by his proposal, his work does support the notion that the disposition of the fee revenues must be carefully designed and successfully communicated to the public.

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[4] The diffusion of these technologies is not completely a technical issue, since most methods require the presence in each vehicle of a device capable of exchanging information with the metering system. Getting these devices into the vehicles is as much a behavioral and economic issue as it is a technical issue. There is in addition a coordination problem among different tolling authorities, so that motorists are not required to have different devices for each different toll road system they might employ. This problem appears on its way to solution, as tolling data systems are being standardized and toll clearing houses are being established. Finally, the technical problem is influenced by the political problem. Nearly all congestion pricing plans under consideration by localities in the U.S. assume that high-occupancy vehicles will be exempt from tolls, a policy feature that greatly complicates the monitoring problem.

The other main political obstacle identified by Giuliano is the lack of choices now available to commuters. While congestion pricing will encourage the development of alternatives to private, single-occupancy vehicle use (such as carpools, transit expansion, or some as yet unimagined market response by entrepreneurs), the promise of such development may not be credible to current commuters, and will be a cold comfort even in the best of circumstances, since virtually any supply response will take some time. With only a Hobson's choice of "pay the toll" or "don't commute," congestion pricing begins to feel like coercion. It may be difficult to imagine how congestion pricing could be implemented, while preserving commuter choice, especially in a very transit-poor region such as Southern California. One possibility is to make only some lanes of the freeway toll lanes, leaving the rest as open-access or, better still, to implement pricing only on added lanes. If the priced lane is a new lane, it cannot be perceived as taking away from consumers what is "rightfully" theirs.[5]

There is little empirical data indicating the degree of the additional public support such a proposal would enjoy over a "pure" congestion pricing proposal, although there are a large number of surveys of public attitudes towards congestion tolls. For instance, CIC Research (1995) administered a survey designed to estimate the elasticity of demand for use of the Coronado Bridge in San Diego, while examining where revenues should be spent, whether congestion-varying tolls are a good idea and what the rush hour toll should be. However, subjects were not asked if they would "support" such an idea on a ballot and were not queried about either revenue recycling or HOT lanes.

Roper (1986) asked questions in a ballot format. Only one question dealt with tolls for commuting trips and the format was a choice among three travel options: use a free interstate, an interstate toll road with a faster commuting time, or a local route with a very long commute time. Forty percent of those polled favored the toll option. Here, again, the revenue recycling and HOT lane ideas were not addressed.

Finally, J. Moore Methods, Inc. (1994) administered a survey that combined concerns about air pollution with concerns about traffic congestion and then asked for opinions about use and impact fees. Complete revenue recycling was considered ("Would you support a use and impact fee system if it would not result in any tax increase overall?"), and received support from 75 percent of those polled.

SURVEY DESCRIPTION

The survey instrument used in this project was developed after extensive focus group interviews with commuters in Southern California, including those living in the far suburbs (e.g., Palmdale) and more close-in areas (Los Angeles).[6] These focus groups were used to

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[5] Although new HOV lanes are common, proposals to turn existing freeway lanes into HOV lanes have been bitterly contested around the country (Giuliano, 1992)

[6] A similar instrument was used in a companion effort to examine the public acceptability of emission fees for motor vehicles. See Krupnick, Harrington and Alberini (1996).

define commuter concerns with congestion fees, develop appropriate language to communicate our ideas, and explore a variety of revenue recycling and other options for their appeal.[7]

The survey was designed to use a Computer-Assisted Telephone Interview (CATI) protocol. This protocol helped standardize the conduct of the survey and improve data handling. More importantly, it allowed the fees that a subject would pay as part of the congestion fee program to be personalized, based on driving distances, number of riders, and frequency of rush hour travel.

Survey Samples

The survey sample was a random sample of adults (age 18 or greater), stratified by county in the 5-county SCAG region. We screened out adults who reported that they did not travel on the freeways during rush hour. The excluded adults might be expected to be more supportive of the fee policies, as they will not be paying into the system but are likely to benefit from cleaner air, less congested freeways and the promised tax rebates. After adjusting for oversampling,[8] the demographic properties of the sample resemble those of the population of Southern California. In total, 1,743 interviews were completed. The cooperation rate, defined as the quotient of the total completed interviews and the total viable contacts who have the potential to pass through the screeners, was 22 percent.

The interview consisted of three parts. In the first part the interviewer elicited from the respondent some fairly detailed information about the respondent's commuting behavior, including the number of rush-hour commutes per week, travel time and distance, travel mode, etc. This part of the survey generated useful information about commuting behavior, but its main purpose was to enable the CATI program to estimate the weekly and annual fees that would be paid by the respondent. The second part of the survey asked a set of standard demographic questions: age, marital status, education, family composition, work status and income. These variables, as well as those on driving characteristics and respondent beliefs about a number of pertinent issues, were useful in explaining the observed voting patterns elicited by the survey.

The third and most important part of the survey elicited opinions on several different congestion fee policies. All respondents had described to them a "base" policy, in which a fee of 5 to 10 cents per mile (depending on current congestion levels) was to be levied on all freeways in the region. Respondents were told that, based on their reported commuting behavior, the policy would cost them an estimated X dollars in congestion fees each week, with the revenues to be used for a variety of transportation-related purposes. They were also given an estimate of the weekly time savings that would result from the policy. Estimates of congestion fees and time savings were based on individual survey responses, informed by a

[7] Interested readers can consult Harrington, Krupnick, and Alberini (1996) for a full report on the focus group activities.

[8] Oversampling was necessary to ensure adequate geographical coverage; we undersampled in Los Angeles County and oversampled in the other four counties (Orange, Riverside, San Bernadino and Riverside).

travel model of the Los Angeles region developed for SCAG by Wilbur Smith Associates (1997).

Respondents were then asked whether they would support in a referendum the policy described. A follow-up question determined whether their support or opposition was "definite" or "probable."

Throughout the survey it was necessary to convey to the respondent a great deal of information about the congestion fees: information about the features of the basic plan, such as the transponder technology, treatment of carpools, and uses of the revenues. In order to keep the respondent engaged in the interview process, we presented this information to respondents in questions of the form, "Suppose X. Would you be more or less likely to support the fee policy?"[9] In addition, we wanted to remind respondents of the different ways that people might respond to the fees, such as rescheduling some of their trips or using transit. We presented this information as a series of questions structured as: "Some people say that congestion fees will cause people to do X. Do you think this will happen most of the time, some of the time, or almost never?[10]

While the main function of these questions was to convey information to the respondent, the answers are also available for analysis. We found, however, that the responses to the features of the plan are difficult to interpret. For example, most of those opposed to the base fee described themselves as "less likely" to support any given feature. Such respondents were apparently choosing the most negative category to the question and did not want the interviewer to get the impression that they might support any feature of it. The responses to the "belief" questions appear to be more meaningful, and in general we found that those who thought the congestion fees would be effective at changing behavior were more likely to support the policy.

As shown in Figure 1, the sample was then split randomly into three groups of approximately equal size, with each group getting a set of questions related to a variation of the congestion fee policy. The three policy alternatives examined are as follows:

(i) *Congestion fees with tax reductions*. Respondents were told that a certain portion of the fee revenues (25, 50 or 82 percent[11]) would be used to reduce other taxes, such as sales tax or state gasoline taxes or DMV registration and license fees. They were also given a dollar amount of the tax reduction. For the purposes of the survey these tax-reduction amounts were computed by taking 25, 50 or 82 percent of the respondent's estimated congestion fee payments, although of course respondents were not informed of this. A follow-up question asked whether

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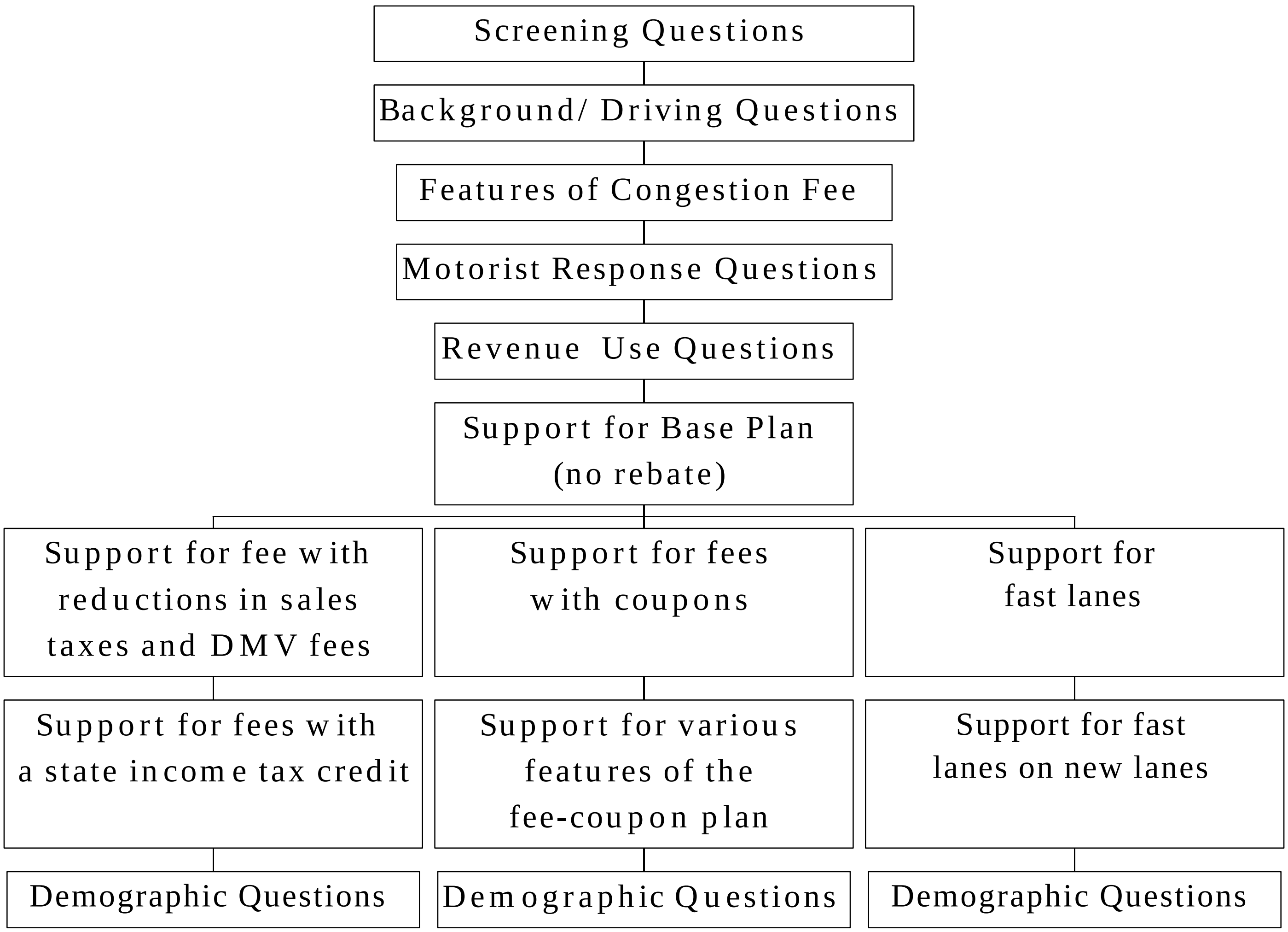
[9] For example, "Suppose you were told that carpools were exempt. Would you be more or less likely to support …?"

[10] For example, "Some people believe that congestion pricing might drive people off the freeway and onto ordinary surface streets. Do you think this will happen …?"

[11] The 82 percent figure was the result of an estimate that 18 percent of the revenues would be needed for administrative and hardware costs (Wilbur Smith Associates, 1997). The other two percentages were arbitrarily set.

Figure 1. Congestion Fee Survey



respondents would support the policy if the revenues were returned as a tax credit on the state income tax.

(ii) *Congestion fees with coupons*. Respondents were told that they would be given coupons that could be used for a variety of transportation-related services, including public or private transit, jitney services, vehicle emission equipment repair, etc. This is the COALESCE proposal, as applied to congestion fees. The face values of the coupons being offered were 25, 50 or 82 percent of the respondent's estimated fee payments.

(iii) *HOT lanes*. Respondents were asked if they would support a policy in which fees would be charged only on the left-most lane of all freeways. It was made clear that this would mean a reduction in the number of lanes available for "free" travel. A separate question asked whether the respondent would support fees if they were levied only on newly-constructed lanes.

SURVEY RESULTS

We begin with a discussion of the demographic and commuting characteristics of the respondents, and the level of support for the base congestion pricing policy. Then we examine the support for the three specific alternative policy designs.

Table 1. Demographic and Commuting Characteristics of Survey Samples

	Los Angeles	Orange	Riverside	San Bern.	Ventura	Regional mean
Sampling weights	13,610	4,147	4,806	3,947	2,595	
Age of respondent	38.3	39.7	39.2	39.7	39.3	38.9
Years of schooling, head of household	14.7	14.8	14.1	14.5	14.7	14.6
Percent Asian	8.1%	5.0%	3.0%	4.3%	4.9%	6.0%
Percent Black	11.9%	2.3%	3.5%	6.9%	3.5%	7.7%
Percent Hispanic	22.9%	14.9%	17.3%	19.1%	17.2%	19.8%
Percent White	56.3%	76.7%	74.8%	69.3%	73.9%	65.6%
Average household income	$52,800	$64,600	$53,000	$50,500	$64,800	$55,300
Median daily commuting distance (miles)	24	22	37.5	30	20	
Median commuting time (minutes)	50	45	57.5	57.5	40	

Background Data

Table 1 provides some personal characteristics of the survey respondents. The respondents in each county in the five-county SCAG region are representative of county residents in their age, education and race. The county averages are reasonably similar to one another except that the county of Los Angeles has considerably higher minority populations than the four suburban counties. County differences in median commuting behavior are more substantial. As shown, commuters living in San Bernardino and Riverside Counties experience much more onerous commutes than residents of the other counties, a reflection perhaps of their position on the outskirts of the metropolitan area. However, Ventura County is even further removed from the center of the Basin, its median commute is the shortest, suggesting a greater prevalence of local employment among Ventura County residents.

The implications of the base congestion fee plan described above for survey respondents is shown in Table 2. As shown, despite the greater use of freeways in Riverside and San Bernardino Counties, the median congestion fees are a fairly constant four or five dollars per week. However the distribution of fees varies considerably, with much larger tails in Riverside and San Bernardino Counties, where the 75th percentile fee is $21 and 16 dollars per week, respectively.

Table 2. Regional Distribution of Commuting Behavior and Commuting Characteristics

	Quantile		
	25%	50%	75%
Los Angeles			
Average commuting mileage (round-trip)	5	24	50
Average daily commuting time (min.)	10	50	95
Congestion fees per week ($)	0	4	12
Minutes saved per day	4	15	30
Implicit price of time saved ($/hr)	2.51	4.74	7.31
Orange			
Average commuting mileage (round-trip)	7	22	45
Average daily commuting time (min.)	10	45	86
Congestion fees per week ($)	0	4	10
Minutes saved per day	5	13	27
Implicit price of time saved ($/hr)	2.27	4.94	6.91
Riverside			
Average commuting mileage (round-trip)	10	37.5	80
Average daily commuting time (min.)	15	57.5	120
Congestion fees per week ($)	0	5	21.5
Minutes saved per day	5	23	50
Implicit price of time saved ($/hr)	2.42	5.75	7.92
San Bernardino			
Average commuting mileage (round-trip)	7	30	70
Average daily commuting time (min.)	20	57.5	118.5
Congestion fees per week ($)	0	4	16
Minutes saved per day	3	20	35
Implicit price of time saved ($/hr)	2.3	5.14	8.46
Ventura			
Average commuting mileage (round-trip)	6	20	50
Average daily commuting time (min.)	11.25	40	80
Congestion fees per week ($)	0	4	10
Minutes saved per day	5	15	30
Implicit price of time saved ($/hr)	2.57	5.04	6.89

Support for the Base Congestion Fee

As shown in Table 3, a solid majority (56 percent) opposes the base congestion fee policy, with only 38 percent in favor. If we consider the intensity of preferences, we see that a much higher fraction of the opposers are "definites," suggesting that this policy enjoys soft support and faces hard opposition.

Table 3. Support for Base Congestion Fee Policy

Support		Oppose		Don't Know
38%		56%		6%
Definite	Probable	Probable	Definite	
15%	23%	17%	40%	6%

The most common reason given for opposing the base policy is that it is nothing but another tax (Table 4). Fully a quarter of all respondents gave this as their reason for opposition. Another ten percent felt the time savings were not worth the estimated cost, and eight percent were skeptical about its ability to reduce congestion. About twelve percent cited unfairness to low-income people or those with long commutes.

Table 4. Reasons Given for Opposition to the Base Policy (percent)

No reason given, respondent just doesn't like idea	14.7
Doesn't understand the program	1.4
Too big a change, too sudden	1.8
Reported time savings not worth the reported cost	10.5
Just a tax increase	26.5
Spillover effects on other roads	1.3
Not fair to low-income people	4.5
Not fair to people with long commutes	8.8
Suspicious of electronics	4.2
Unaffordable in my household	7.1
Policy wouldn't effectively reduce congestion	8.3
This fee would be okay for me but would hurt other household members	1.4
Other	6.5
(Don't know/NA)	3.1
Total	100.0

The proportion of respondents favoring the plan does not vary much from one county to another. As shown in Table 5, residents of Los Angeles County are slightly more likely, and those of Ventura slightly less likely than residents in the other counties to support the base policy. Only the difference between Los Angeles and Ventura is statistically significant (at the 5 percent level).

Table 5. Support for the Base Policy by County

County	Support	Oppose	Don't know
Los Angeles	39	55	5
Orange	36	60	4
Riverside	36	57	7
San Bernardino	37	57	6
Ventura	32	63	5

<u>Explaining Base Fee Support</u>

A large number of variables can be reasonably supposed to affect support for the base policy. To isolate the influences on support, we estimate a set of probit regression equations. The estimated dependent variable in these equations can be interpreted as the probability that an individual with the given characteristics will support the policy. The independent variables include (i) sociodemographic variables indicating gender, age, education income and ethnic identification; (ii) respondent's commuting habits, including travel time and distance during commutes, use of transit or carpools; and (iii) personalized impacts of the congestion fee proposal on the respondent. The coefficients on the independent variables indicate their influence on the probability of support.

Four different regression specifications were examined, and results are shown in Table 6. After specification I we drop income, because its effect is small and it has an adverse effect on sample size. In specification II and III we split the time-saved variable into two parts, as explained below. Finally in specification IV we add a variable indicating the respondent's belief in the efficacy of congestion fees. As shown, this variable is quite significant, but it is also to some extent jointly determined with support for the policy. A more useful model would perhaps explain belief in efficacy and support jointly, but there were no variables that we could use to identify either.

Evidently, few of the independent variables do a very good job of explaining support or opposition to congestion fees. Several variables are almost statistically significant at conventional levels, or are significant in some specifications but not others. Their effects are not robust; that is, their coefficients are strongly affected by the presence or absence of other variables in the equation or by slight changes in the sample due to missing values.

Table 6. Regression Results: Base Congestion Fee Policy

	I	II	III	IV
Hispanic	0.390 (0.114)	0.371** (0.106)	0.362** (0.106)	0.286** (0.111)
Black	-0.156 (0.175)	-0.187 (0.162)	-0.187 (0.162)	-0.187 (0.173)
Asian	0.345 (0.182)	0.240 (0.163)	0.241 (0.163)	0.271 (0.172)
Rating of congestion problem, 1-10	0.026 (0.017)	0.014 (0.018)	0.014 (0.018)	0.015 (0.019)
Democrat	0.097 (0.103)	0.139 (0.094)	0.136 (0.094)	0.105 (0.100)
Republican	-0.060 (0.106)	-0.019 (0.095)	-0.031 (0.095)	-0.087 (0.101)
Household income	-1.52E-03 (1.36E-03)			
Household size	0.041 (0.030)	0.054* (0.026)	0.054* (0.026)	0.032 (0.028)
Number of rush hours per week		-0.030* (0.015)	-0.026 (0.016)	-0.023 (0.016)
Percent of commute in congestion		0.172 (0.165)	0.181 (0.165)	0.172 (0.165)
Commuting distance	-1.16E-03 (1.24E-03)	-5.96E-04 (1.06E-03)	-4.91E-04 (1.06E-03)	-7.31E-04 (1.10E-03)
Respondent age	-1.01E-02 (3.77E-03)	-9.40E-03** (3.30E-03)	-9.39E-03** (3.30E-03)	-9.96E-03** (3.50E-03)
Education -- some college	-0.213* (0.103)	-0.214* (0.090)	-0.216* (0.091)	-0.210* (0.096)
Minutes saved by base plan per week	-8.11E-04* (3.95E-04)	-7.77E-04* (3.89E-04)		
Minutes saved, if minutes saved <60			3.02E-03 (2.59E-03)	4.83E-03* (2.74E-03)
Minutes saved, if minutes saved >60			-6.11E-04 (3.90E-04)	-6.18E-04 (3.93E-04)
Congestion fees paid per hour saved	-4.35E-03 (2.21E-03)	-4.98E-03* (2.22E-03)	-4.90E-03* (2.23E-03)	-4.92E-03* (2.40E-03)
Number of days per week in carpool	0.026 (0.030)	0.035 (0.027)	0.036 (0.027)	0.035 (0.029)
Number of days using transit	0.110 (0.083)	0.125 (0.071)	0.125 (0.070)	0.118 (0.083)
Belief that congestion fees will speed up traffic				0.615 (0.056)
Constant	0.172 (0.231)	0.174 (0.208)	0.073 (0.247)	-1.134** (0.285)
Mean Log Likelihood	-.635	-0.632	-0.631	-0.573
N	978	1157	1157	1123

There are some surprises in these regression results, especially with respect to the demographic variables. It would have been reasonable to expect, for example, that respondents with higher incomes would have supported congestion fees, because they would tend to value the time savings more. Likewise, we expected that more educated respondents would be more likely to be able to assimilate the information provided during the survey and better understand the arguments in favor of user fees, and therefore would be more likely to support the policy than those less well-educated. In the event, we found no income effect at all and education was negatively associated with support. Perhaps more educated respondents were more skeptical of an untested economic theory or the competence of governments to implement these ambitious plans. The strongest result among the demographic variables was the very strong support for the policy among Hispanic respondents. Again, we have no explanation for this result.

Among the commuting behavior variables, only the carpool and transit use variables affected support, and only weakly. Certainly individuals with more days in carpools or in transit will benefit more from congestion fees and will be more likely to support them, but we found only weak support for this hypothesis. This result may be a consequence of the small number of transit and carpool users in the sample; average transit and carpool use was only 0.12 and 0.56 days per week. One may need a larger sample of transit users or carpoolers to be able to discern an effect.

Neither trip length nor duration nor the number of commutes per week had any effect, but we had no *a priori* expectations about those variables. On the one hand, more rush hours should mean more time savings from congestion fees, but on the other hand require greater congestion fee payments. Similar considerations apply to the trip distance.

The variables of greatest interest are those that correspond to the individual costs and benefits of congestion pricing policy: minutes saved and estimated cost per hour saved. The cost per hour saved is calculated by taking the respondent's estimated congestion fee payments per week and dividing by the estimated time savings attributable to the fee policy, both quantities being determined by the CATI program. It is simply the unit price of time savings to the individual. Indeed, we find that an increase in the unit price causes support for the policy to decline.

We also find that support declines as the "minutes saved" variable increases, a result that at first glance appears counter-intuitive. Because the unit price is included in the regression, however, this result is actually consistent with a downward-sloping demand curve for time savings. That is, motorists have a lower willingness to pay as the savings increases, and as time savings increases the probability of support will drop as willingness to pay becomes less and less likely to exceed the price per unit of time. The effect is small but not negligible; at time savings of 100 minutes per week (about the average for the sample), the probability of support drops by about three percentage points.

There is no reason to expect this effect to be linear, and in fact we might expect the level of support to be more sensitive to the minutes-saved variable when the quantity, and hence the payment required, is large. That is what we find. In Columns III and IV of

Table II-6 we allow the effect of this variable to be different for savings below one hour per week and above one hour per week. As shown, increasing minutes saved if anything increases support up to savings of about an hour per week, after which point it drops.

In the final specification we add as a variable the respondent's view as to whether congestion pricing would cause travel to move faster. This was by far the most potent variable increasing support, although other "belief" variables also were strongly associated with the policy. This leads to the tentative conclusion that an effective campaign to educate the public on the benefits of congestion pricing may produce dividends. In addition, support may increase as word spreads about the experience with pricing experiments such as SR91.

Support for Policy Enhancements

As explained above, after eliciting the respondent's opinion about the base policy we split the sample and inquired about the three enhancements to the policy. Our main interest is to determine by how much each enhancement adds to the base level of support and whether the change in support is significant. The estimation and related test of hypotheses is complicated by the fact that we ask each respondent about both the base policy and about one alternative, and the responses to these two questions are likely to be highly correlated. Indeed, it is clear that the respondent's attitude toward the base congestion fee is by far the best predictor of his response to the other policies. This point can be illustrated by the data in Table 7, a cross-tabulation of support for the base policy and the combined congestion fee/tax reduction.

Table 7. Importance of Base Policy

	Support congestion fees with tax reductions?		
Support base policy? ↓	No	Yes	Don't know
No	74%	20%	6%
Yes	10%	88%	2%
Don't know	22%	48%	30%
Average support for fees/tax reduction	46%	49%	5%

The rows of Table 7 can be thought of as the conditional support for the fees with tax reductions given their support or opposition to the base policy. Thus, among opponents of the base policy, 74 percent oppose the fees combined with tax reductions. An even higher percentage of base fee supporters--88 percent--support fees with tax reductions. The fact that 20 percent of base fee opponents change their vote, compared to only 10 percent of supporters, is the reason that support for the fees with tax reductions is higher than support for the base policy.

To address the likely correlation between support for the base policy and for the policy with rebates, we estimate a system of bivariate probit equations. This system assumes that support for each of the policy variants is driven by an underlying, and unobserved, normally distributed random variable, and allows for correlation between these two normal variates. In view of the meager success at finding variables to explain support for the base policy, we only include a constant term for the base policy and a dummy variable for each treatment of the alternative policy in the right-hand side of our bivariate probit equations. The estimates of the coefficients of the bivariate probit equations are used to predict the probability of supporting the base policy and the rebate options, and the standard errors around such predicted probabilities.[12] In a second specification of the bivariate probit model, we replace the dummies for the percentage of revenue rebated to the public with dummies for the amount of the "net congestion fee," experienced by the respondent, defined as the difference between the respondent's estimated fee and estimated tax deduction per week. Specifically, the dummies denote whether such "net congestion fee" is at least $3 per week, between $0 and $3 per week, or is negative. This second formulation of the model assumes that the respondent is primarily interested in what the policy means to him or her personally.[13]

Predictions based on the two alternative bivariate probit models are reported in Table 8 for the tax rebate policy enhancement, in Table 9 for the coupon rebate, and in Table 10 for the HOT lane option. We also report the difference in support between the base and alternative policies. The bivariate probit procedure, which produces an estimate of the correlation between the support for the two policies, allows for very efficient estimation of this difference.

As shown, the random variation in support for the base policy is considerable: 43 percent in the tax rebate sample compared to only 36 percent in the coupon rebate sample. The second column of Tables 8 and 9 shows the support for congestion fees when this policy is coupled with tax reductions or coupons.

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[12] The model to be estimated for the tax rebate and the coupon policies is

$$\begin{aligned} y_1^* &= a + e_1 \\ y_2^* &= b_1 Z_{25} + b_2 Z_{50} + b_3 Z_{82} + e_2 \end{aligned} \quad (1)$$

where $e_i \sim N(0,1)$, $i = 1,2$, $Cov(e_1, e_2) = r$, and $y_i = 1$ if $y_i^* > 0$, 0 otherwise. The variables y_1 and y_2 are dummies that indicate support or opposition to the base policy and the enhanced policy, respectively, and Z_k is a dummy variable indicating whether the respondent in the subsample is told that *k* percent of the fee revenues would be returned as tax cuts or coupons.

[13] Formally, the model is:

$$\begin{aligned} y_1^* &= a + e_1 \\ y_2^* &= g_1 N_{>3} + g_2 N_{0-3} + g_3 N_{<0} + e_2 \end{aligned} \quad (2)$$

where $N_{>3}$, N_{0-3}, and $N_{<0}$ are dummy variables for estimated net fee payments of at least $3 per week, between 0 and $3 per week, and negative fee payments, respectively.

Table 8. Support for Congestion Fees with Tax Rebates: Two specifications

Base Policy	Tax Rebate		Difference	p-value
$P(y_1 = 1)$	Extent of rebate	$P(y_2 = 1)$		
0.43	25 percent	0.50	0.07	0.0
	50 percent	0.54	0.11	0.0
	82 percent	0.48	0.05	0.006
Base Policy	Tax Rebate			
$P(y_1 = 1)$	Amount of net cong. fee	$P(y_2 = 1)$		
0.43	net cong. fee more than $3/week	0.49	0.06	0.0
	net cong. fee $0 to $3/week	0.52	0.09	0.0
	negative net cong. Fee	0.52	0.09	0.0

Table 9. Support for Congestion Fees with Coupon Rebates Two Specifications

Base Policy	Coupon distribution		Difference	p-value
$P(y_1 = 1)$	Extent of rebate	$P(y_2 = 1)$		
0.37	25 percent	0.33	-0.04	0.98
	50 percent	0.36	-0.01	0.60
	82 percent	0.40	0.03	0.014
Base Policy	Coupon distribution			
$P(y_1 = 1)$	Amount of net cong. Fee	$P(y_2 = 1)$		
0.37	net cong. fee more than $3/week	0.49	0.08	0.012
	net cong. fee $0 to $3/week	0.39	0.02	0.06
	negative net cong. Fee	0.33	-0.04	0.998

Table 10. Support for HOT Lanes on Existing Freeways

Base Policy	HOT lane (existing lane)	Difference	p-value
$P(y_1 = 1)$	$P(y_2 = 1)$		
0.37	0.46	0.09	0.0
Base Policy	HOT lane (new lane)		
$P(y_1 = 1)$	$P(y_2 = 1)$		
0.37	0.54	0.17	0.0

Turning specifically to Table 8, it is clear from both specifications that the tax rebate enhancement offers the prospect of increasing support by a modestly respectable amount, from 43 to 50, 54 and 48 percent, as the total amount rebated increases from 25 to 82 percent of the revenues. Each of these support levels is significantly higher than that of the base level,[14] although they are not significantly different from each other. When we look at the effect of the individualized net rebate (the bottom half of Table 8), we see that support is highest when the net fee is negative, but there is again no significant difference in response among the different net fee categories.

The bivariate probit routine also reveals that the correlation between the unobserved variables measuring support is quite high. Specifically, the correlation coefficient is equal to approximately 0.88 for both specifications of the model explaining support for the base policy and congestion fees with tax rebates. This suggests that the unobserved factors that lead an individual to be in support of the base policy are also very important in predicting his or her support for the tax rebate variant of the policy. Furthermore, what is important is not the absolute level of support for each of the policy enhancements but the increment over the support for the base policy.

The patterns of support for the coupon enhancements (Table 9) are, in contrast, not easy to explain. First, we find that the support for congestion fees coupled with a refund of 25 percent of the revenue unaccountably reduces the level of support. Even more puzzling, the relation between the individualized net coupon rebate and the support is the reverse from what one would expect. As shown in the bottom part of the table, the more coupons received relative to the average congestion fee, the *less* likely is the individual to support the policy. Perhaps individuals perceive the coupons to have little value to them if they must be used for transit and other alternative transportation. Individuals may have failed to realize that a coupon system would likely stimulate alternatives to private driving, and may have based

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[14] The hypothesis tested in Table 8 is that the support for the policy enhancement (in this case, the tax rebate) is greater than the support for the base policy, against the null hypothesis that support is the same for both.

their responses on the present (and limited) availability of public transportation in Southern California. As an alternative explanation, perhaps this result stems from the inability of the survey instrument to make the policy understood to the respondent. Notably, the correlation coefficient between the underlying support variable remains positive and high (0.87).

For the HOT lane enhancements the bivariate probit model is similar, but all respondents are presented with the same policy, and only a constant term is included in the right-hand of the equation explaining support for this policy variant.

When we turn to the HOT lane policies, designed to give commuters a choice between free lanes and toll lanes, we find the largest increases in support (Table 10). A policy the converts an existing lane to tolls attracts 9 percentage points more support than the base congestion fee policy, which imposes tolls on all lanes. A policy of building a new toll lane increases support over the base policy by 17 percentage points. Assuming base support of 39 percent, the estimated support in the population of the South Coast, this is the only policy commanding a majority of support. It is also interesting to note that the correlation coefficient between the unobserved variables denoting support is here somewhat lower--only 0.65 in the first specification (top panel) and 0.51 in the second specification (bottom panel).

CONCLUSION

Public aversion to congestion pricing is well-accepted among transportation planners and policymakers. As in most things, however, details matter. We find that the level of support for congestion pricing among survey respondents is sensitive to these details, which were designed to deal with prominent objections to congestion pricing. In particular, informing respondents that some portion of the revenues would be returned in the form of reductions in other local taxes increased the support for congestion fees by 5 to 10 percentage points. However, when the rebates are made not in cash but in kind, namely in the form of coupons for subsidized, privately provided transit, the level of support is no better than the base congestion fee policy.

It is no accident that the greatest increment in support over the base policy occurs for policies that involve new construction and do not in any way reduce the open-access resources available. This outcome is consistent with the continuing political opposition to congestion pricing, as well as the recent successes in gaining acceptance of new HOT lane proposals and also the opening of a new freeway devoted to time-of-day pricing in Toronto.

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