Public Perceptions of Pricing Existing Roads and Other Transportation Policies: The Texas Perspective

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This work illuminates public opinion on various transportation policies and issues. Statewide survey results reveal considerable agreement on two issues (higher tolls for heavy vehicles and dedicated truck lanes) and reasonable support for conversion of non-tolled roads to tolled roads. Under congestion pricing, older persons report being more likely to reduce their travel during peak periods, members of larger households are more likely to change travel routes, and full-time workers are more likely not to change their current travel patterns. Other results tie into the information content of messages, highway safety policies and revenue generation for transportation agencies.

BACKGROUND

While traffic congestion and infrastructure deterioration place great pressures on the nation's transportation systems, transportation spending is tightly constrained and regularly characterized by significant budget shortfalls, due to stagnant gas taxes and an aging infrastructure. Highway safety, environmental impacts, basic access and other issues remain important policy considerations. Public officials in multiple states are interested in ways to enhance policymaking while potentially tolling far more of the transportation system (Cada 2007). New policies, such as the expansion of tolled lanes and corridors, will impact many Americans, and a better understanding of the public's interests across a variety of transportation policy options is of great relevance for all stakeholders.

Acquisition and analysis of public opinion data allows policymakers to make more informed decisions. This paper highlights the results of Texas statewide surveys (conducted via mail) and focus groups on the topics of congestion pricing, dedicated heavy vehicle lanes, minimum driving age, alternative modes and other topics. The work complements telephone interview survey results described in Kockelman et al. (2005), which focused on the question of tolling.

Opinion surveys offer valuable information to policymakers (see, e.g., Dillman 1978, FHWA 2009), and transportation policymakers are no exception. For example, when it comes to financing transportation needs, Kockelman et al. (2005) found that 61% of Texans favor toll conversion and only 23% prefer raising the gas tax. A nationwide survey by the American Automobile Association (AAA 2006) suggests that 52% of Americans favor some sort of tolling, while only 21% support raising the gas tax. Delving deeper, Kalmanje and Kockelman (2005) concluded that 25% of Austin, Texas, residents would support a move toward credit-based congestion pricing (where revenues are used to fund driver-based travel budgets, and tolls rise with demand to ensure traffic keeps flowing). A Pacific Rim Resources' (2001) telephone survey determined that 40% of Washington State's Puget Sound area respondents are willing to pay a toll for travel time savings, and 50% support variable toll rates to manage congestion. In San Diego, California, most survey respondents did not view equity as a major issue in converting regular lanes to High-Occupancy Toll (HOT) lanes, and support for the HOT lanes was strong across all income groups (FHWA 2003).

While tolling remains a topic of much debate, inspiring substantial survey work, such data acquisition across a variety of public opinion topics is of value to transportation policymakers. In fact, federal legislation has long mandated that public opinion be obtained and accommodated when making transportation investment decisions, and surveys are a meaningful way to ensure this objective is met.

Podgorski and Kockelman (2006) described the results of over 2,000 phone interviews with a random sample of Texans on the topic of tolling. Through the use of detailed self-completion surveys and five focus groups, their work has been extended here, offering detailed responses on a broader range of transportation policies. The extensive follow-up to the original phone survey was administered (to willing phone survey participants) in both mail out/mail back (MOMB) and online formats. The focus groups were conducted in various locations statewide. Topics include public perspectives on congestion pricing, dedicated bus lanes, minimum driving age, alternative modes and other issues.

Six distinct regions offered a focus for assessing regional attitudes toward potential transportation policies. These included Dallas-Ft. Worth (DFW), Houston, San Antonio, Austin, Lubbock, and the Lower Rio Grande Valley. The seventh sample region was composed of all *other* areas of Texas. While both DFW and Houston have populations in the millions and toll road systems covering over 50 miles, Austin is headed toward having more than 80 miles of tolled roads in the coming years. Many other parts of Texas are also considering such systems.

Tolling can take place via a variety of mechanisms. Traditional toll roads have limited access, tolls on all lanes and manual collection. Another option is conversion of existing non-tolled roads to toll roads or conversion of High Occupancy Vehicle (HOV) lanes into HOT lanes. Similar to HOT lanes, value-priced lanes are tolled lanes that are adjacent to non-tolled lanes within a travel corridor. Tolls can be computed via remote devices and can vary by time of day or level of demand. Credit-based congestion pricing (Kockelman and Kalmanje 2004, Kalmanje and Kockelman 2005) is a revenue neutral policy that assigns toll credits to residents who would only have to pay for charges out of pocket if their roadway use exceeded a designated regional average. Other variations on pricing include higher tolls for larger, heavier vehicles, such as trucks hauling trailers, since they have a greater impact on congestion, safety, pavement damage cost and the environment than do smaller passenger vehicles. Use of revenues, privacy and equity impacts raise questions. The follow-up survey examined opinions on these and other issues. The focus groups tested messages and probed individuals' perceptions.

METHODOLOGY

Survey design and administration can have significant effects on response rates and data quality. Strategies employed in the self-completion survey and focus groups are discussed here.

Self-Completion Survey

Respondents for the follow-up survey were recruited exclusively from phone survey participants (themselves selected with the use of Random Digit Dialing within the selected Texas regions). An official highway map of Texas was offered as an incentive. Mailings, with a paper copy of the survey, or emailings, with a link to the online survey, were sent to the phone survey participants who agreed to take part in the follow-up survey and provided sufficient information. A total of 776 MOMB surveys were mailed and 336 emails (with a hyperlink to the online survey site) were sent. Administration of the follow-up survey lagged approximately one week behind the initial survey. Reminder emails were sent two weeks after the initial emailing, and reminder postcards were sent in one batch at the completion of the earlier, phone survey's administration (Podgorski and Kockelman 2006). While respondents submitted 282 completed surveys for the MOMB version and 330 for the internet version, many did not provide sufficient information to link their follow-up responses to their original phone interview responses (including the address to which the follow-up survey had been sent). Therefore, the final data set for a thorough analysis offered just 183 MOMB responses and 141 internet responses, or 15.3% of the original phone interview sample of 2,111 persons. Tables 1 and 2 summarize key statistics of all responses, as dependent and independent variables, respectively.

Table 1: Description of Self-Completion Survey's Dependent Variables

	Variable	Description	Nobs	Min	Max	Mean	SD
Dependent Variables	increasing current transportation funding sources vs adding new sources	0-existing, 1-new	305	0	1	0 55	0 50
	would you support proposal to raise driving age from 16 to 18 years	0-no, 1-yes	303	0	1	0 54	0 50
	revenue could be used to add lanes	0-no, 1-yes	309	0	1	0 46	0 50
	better pavement maintenance could be provided	0=no, 1=yes	307	0	1	0 56	0 50
	better lighting and signage could be provided	0=no, 1=yes	311	0	1	0 46	0 50
	revenue could be used to improve other area roads	0=no, 1=yes	307	1	1	0 45	0 50
	congestion could be reduced	0=no, 1=yes	307	1	1	0 58	0 49
	travel times would be more reliable	0=no, 1=yes	308	1	1	0 52	0 50
	credit-based congestion pricing was instituted	0=no, 1=yes	300	0	1	0 56	0 50
	how often did you shift routes in the past 30 days	0=more than 5 times, 1=2 to 5 times, 2=once, 3=never	312	9	3	1 55	1 09
	funding improvements with increase in gas tax better than toll bonds	0=strongly agree, 1=agree, 2=neutral, 3=disagree, 4=strongly disagree	298	0	4	2 47	1 29
	toll roads are less convenient becuase of limited access	0=strongly agree, 1=agree, 2=neutral, 3=disagree, 4=strongly disagree	289	0	4	2 07	1 12
	toll roads are less congested than freeways	0=strongly agree, 1=agree, 2=neutral, 3=disagree, 4=strongly disagree	288	0	4	1 38	0 92
	toll roads will create economic opportunity for Texans	0=strongly agree, 1=agree, 2=neutral, 3=disagree, 4=strongly disagree	284	0	4	1 81	1 12
	rate your support of Governor Perry's TTC	0=strongly support, 1=support, 2=neutral, 3=oppose, 4=strongly oppose	319	0	4	1 29	1 12
	more park and ride lots	0-definitely, 1=probably, 2=maybe, 3=probably not, 4=definitely not	290	0	4	1 96	1 21
	dedicated bus lanes	0-definitely, 1=probably, 2=maybe, 3=probably not, 4=definitely not	296	0	4	1 89	1 28
	more "express" bus routes	0-definitely, 1=probably, 2=maybe, 3=probably not, 4=definitely not	295	0	4	1 65	1 34
	construction of light rail lines and stations	0-definitely, 1=probably, 2=maybe, 3=probably not, 4=definitely not	291	0	4	1 76	1 36
	construction and improvement of sidewalks and hike/bike trails	0-definitely, 1=probably, 2=maybe, 3=probably not, 4=definitely not	290	0	4	2 15	1 27
	construction and improvement of bike lanes and storage facilities	0-definitely, 1=probably, 2=maybe, 3=probably not, 4=definitely not	285	0	4	2 29	1 18
	establishment of frequent high speed intercity passenger rail	0-definitely, 1=probably, 2=maybe, 3=probably not, 4=definitely not	293	0	4	1 78	1 30
	shorter travel time by transit than by personal vehicle	0-definitely, 1=probably, 2=maybe, 3=probably not, 4=definitely not	291	0	4	1 37	1 14
	if a $0 10/mile tolls on all area highways were enacted during rush hours, which would you most likely change?	0=nothing, 1-change route to avoid tolls, 2=drive less during peak hours	277	0	2	0 88	0 79
	toll rates would not vary with time of day ($0 10/ mile all day)	0=no opinion, 1=good feature, 2=not good feature	286	0	2	1 42	0 69
	tolls for trucks hauling trailers would be 1 5 times rate for passenger vehicles	0=no opinion, 1=good feature, 2=not good feature	284	0	2	1 12	0 54
	tolls only collected with toll tags	0=no opinion, 1=good feature, 2=not good feature	285	0	2	1 28	0 69
	roadside rest areas would provide services eliminating need to leave toll road	0=no opinion, 1=good feature, 2=not good feature	287	0	2	1 00	0 57
	tolls would be higher for larger heavier, or higher emission vehicles	0=no opinion, 1=good feature, 2=not good feature	282	0	2	1 06	0 48

Note: All values are population-weighted values, to correct for sample biases.

Tolls, the Trans-Texas Corridor, heavy-vehicle lanes, congestion, the driving age and alternative modes of transportation were some of the topics addressed in the base 47-question self-completion (follow-up) survey. In addition to these, six different sets of supplemental questions (one for each region) were included, so that respondents received a questionnaire tailored to their more personal experiences. Due to space limitations, this paper describes results related to tolling questions. Results relating to all other question types can be found in Kockelman et al. (2005).

While phone interviews place considerable constraints on survey length and question formation, the follow-up survey instrument was designed as a mixed mode (MOMB/online) survey, enabling the collection of more information on opinions of and preferences for tolling and other transportation issues, including ranking questions like the following:

Please rank the following possible uses for excess toll revenue from 1 to 5, with 1 being the most favorable way to use toll revenue, and 5 being the least.

____ To add funding to driving alternatives, for example public transit and/or bike trails
____ To add funding to other state government programs, for example education and/or health care
____ To maintain and expand local transportation projects
____ To maintain and expand the Texas toll road system
____ To maintain and expand the non-tolled state highway system

Table 2: Description of Self-Completion Survey's Independent Variables

	Variable	Description	Nobs	Min	Max	Mean	SD
Demographic Variables	Age	Age (in years)	322	22	87	45 59	15 369
	Male Gender (female as base)	Indicator for male gender	324	0	1	0 46	0 50
	Household Size	Household size (number of persons)	323	1	7	2 71	1 424
	Household Income	Annual household income (dollars)	321	10,339*	129,958*	56,284	30,140
	Employment status (unemployed as base)						
	Employed full-time	Indicator for full-time employment	324	0	1	0 51	0 50
	Employed part-time	Indicator for part-time employment	324	0	1	0 13	0 34
	Student	Indicator for student	324	0	1	0 06	0 24
	Retired	Indicator for retired	324	0	1	0 16	0 37
	Education level (low education as base)						
	Medium education	Indicator for completed bachelor's degree	324	0	1	0 47	0 50
	High education	Indicator for completed master's degree or higher	324	0	1	0 08	0 27
	Aware of toll projects (not aware as base)	Indicator for awareness of regional toll projects	318	0	1	0 36	0 48
	Time lived in region (native as base)						
	Less than 3 years	Indicator for less than 3 years	324	0	1	0 11	0 31
	3-10 years	Indicator for 3-10 years	324	0	1	0 23	0 42
	More than 10 years	Indicator for more than 10 years	324	0	1	0 42	0 49
	Region (General Texas as base)						
	Austin	Indicator for Austin region	324	0	1	0 13	0 34
	Houston	Indicator for Houston region	324	0	1	0 13	0 34
	Dallas-Ft Worth	Indicator for Dallas-Ft Worth region	324	0	1	0 21	0 41
	San Antonio	Indicator for San Antonio region	324	0	1	0 15	0 35
	Valley	Indicator for Valley region	324	0	1	0 10	0 30
	Lubbock	Indicator for Lubbock region	324	0	1	0 18	0 38
	Home area opulation density	Population density in persons/square mile (by zip code)	324	4	8056	1806	1926

Table 2: Description of Self-Completion Survey's Independent Variables (continued)

	Variable	Description	Nobs	Min	Max	Mean	SD
Travel Variables	Travel on toll roads (never as base)						
	More than once a week	Indicator for more than once a week	324	0	1	0 11	0 32
	At least once a month	Indicator for at least once a month	324	0	1	0 14	0 35
	At least once a year	Indicator for at least once a year	324	0	1	0 36	0 48
	Less than once a year	Indicator for less than once a year	324	0	1	0 23	0 42
	Distance from home to work (<5 miles as base)						
	5-10 miles	Indicator for 5-10 miles	321	0	1	0 17	0 38
	11-25 miles	Indicator for 11-25 miles	321	0	1	0 15	0 36
	More than 25 miles	Indicator for more than 25 miles	321	0	1	0 15	0 35
	Road type for commuting (local roads as base)						
	Highway	Indicator for non-tolled highways	321	0	1	0 30	0 46
	Toll Road	Indicator for toll roads	321	0	1	0 04	0 19
	Rural	Indicator for rural roads	321	0	1	0 03	0 18
	Area traffic change, past 5 years (same/ decreased as base)						
	Dramatic increase	Indicator for dramatic increase	324	0	1	0 68	0 47
	Slight increase	Indicator for slight increase	324	0	1	0 17	0 38
	Non-SOV travel mode for commuting (drive alone as base)	Indicator for other travel mode for commuting	324	0	1	0 07	0 25
	Travel during rush hour	Travel during rush hour (days/week)	317	0	1	3 28	2 01
	Work most frequent trip purpose	Indicator for work as most frequent trip purpose	324	0	1	0 59	0 49
	Commute time	Commute time for workers (in minutes)	182	3	240	24 82	25 01

*Imputed income values
Note: All values are population-weighted values, to correct
SOV stands for single-occupant vehicle (i e , drive alone) for sample biases

Several series of questions with similar structures grouped by topic were also included. These questions, when numerous, are less tedious to respond to with a self-completion method. For example, Part A of a question that included parts A through G is:
Would you support converting certain non-tolled roads into toll roads if

	Yes	No
A. The toll revenue could be used to add an extra lane in each direction on that road?	○	○

Non-response can lead to statistical biases in the survey results. Using the 2000 Census of Population's Public Use Micro Sample (PUMS) for the State of Texas, target population characteristics were computed. The follow-up survey data exhibited the same biases as the phone survey data (Podgorski and Kockelman 2006), only more pronounced. It over-represented older persons, females, the highly educated and the older unemployed. For example, persons 55 years and older account for 24% of the target population, but 30% of the phone survey sample and 37% of the follow-up survey sample. Women, 51% of the Texas population, comprised 60% of the phone survey sample and 61% of the follow-up survey sample. Those with bachelor's degrees (or higher) represent only 21% percent of the population, yet comprised 43% of the phone survey sample and 58% of the follow-up survey sample. Unemployed persons 55 years and older make up 17% of the Texas population but comprised 20% of the phone survey sample and 26% of the follow-up survey sample. As with the phone surveys (Podgorski and Kockelman 2006), sample weights were developed to correct for these age, gender, education and employment status biases. Such weights reflect a respondent's representation in the population, relative to his/her representation in the survey. Those who are undersampled have weights greater than one; those who are oversampled (relative to their population share) have weights less than one.

Focus Groups

Focus groups were used as a complement to the phone and self-completion surveys in an attempt to understand opposition to toll roads, as well as discuss ideas for an informational campaign that promotes greater understanding of toll road policies. The focus groups were conducted in Dallas-Fort Worth, Houston, San Antonio, Lubbock and Brownsville. Austin-area focus groups, led by colleagues at the Texas Transportation Institute, were already underway at the time, and those efforts assisted development of the messages and discussion guide in the five focus groups discussed here. These five groups were lead by SUMA/Orchard Social Marketing, Inc., which has extensive experience in leading such discussions within the social marketing industry. SUMA's two principals conducted these groups under contract to the research team.

Participants for each focus group were recruited by the marketing research facilities in each city, using random digit dialing of home phone numbers in surrounding zip codes. Respondents were screened to ensure variability in gender, age and employment status, and to recruit commuters (those traveling to work or school three to five times a week) living within five miles of proposed toll roads. Commuters and those that lived close to proposed toll roads were a desirable target population, because they are most likely to be affected by such policies. Group sizes ranged from five persons (in Houston, where a storm impacted participant travel) to 10 persons (in San Antonio, Brownsville and Dallas). Lubbock had eight participants. Of the 43 participants, 40 worked outside the home, representing a variety of job types. And five drove regularly throughout the day for work-related reasons (SUMA 2005).

The discussion began with an icebreaker, asking participants to characterize local traffic experiences. Next, participants viewed and discussed a nine-minute TxDOT-generated video that presented the magnitude of traffic problems in Texas cities and explained the State's transportation funding situation. The participants then rated seven informational messages concerning funding options and toll roads (in terms of believability, agreement or solution prioritization, depending on the message). The group discussed which messages were most informative and influential, as well as their perceptions of TxDOT as an agency.

All focus groups were taped and transcribed for analysis. And all participants were asked to complete a survey that closely paralleled the self-completion survey described in the previous section. The discussion guide, messages, survey and responses can all be found in Kockelman et al. (2005).

While not offering a statistically representative snapshot of Texas, the focus groups offer a more personal perspective of the results from the phone and follow-up surveys. The results of the phone surveys are discussed in Podgorski and Kockelman (2006), and the results of the follow-up (self-completion) and focus groups are discussed in this paper.

RESULTS

Self-Completion Survey Results

Unlike results from the phone survey (Podgorski and Kockelman 2006), very few issues in the follow-up survey generated a considerable consensus among respondents. The two statements offering at least 70% agreement were: (1) higher tolls for larger, heavier, or higher emission vehicles are a good toll road feature, and (2) dedicated heavy-vehicle lanes should be added to highways.

Table 3 provides weighted response percentages for preference and opinion questions. Support for *conversion* of existing (non-tolled) roads to tolled roads ranged from 45% (when toll revenues are used to improve other area roads) to 58% (assuming congestion could be reduced). A total of 26% of respondents indicated they would support conversion of existing roads to toll roads for all seven scenarios, while 18% indicated they were opposed to toll conversion in all cases. These results are somewhat surprising, considering that phone survey respondents (Podgorski and Kockelman

Table 3: Summary of Responses to Opinion and Preference Questions

Indicate how you feel about each statement:		**Agree**	**Neutral**	**Disagree**
Q16a	Funding improvements with an increased gas tax is better than toll-funded bonds	24%	22%	53%
Q16b	New public transportation is better than new or expanded highways	42%	17%	41%
Q16c	Toll roads are less convenient because of limited access	28%	41%	31%
Q16d	Toll roads are less congested than freeways	61%	26%	13%
Q16e	Toll roads will create economic opportunity for Texans	37%	40%	23%
Imagine that each of the following features were applied to the highway you most often use		**Good Feature**	**Not Good Feature**	**No Opinion**
Q30a	Toll rates would not vary with time of day ($0 10/mile all day)	30%	55%	15%
Q30b	Tolls for trucks hauling trailers would be 1 5 times rate for passenger vehicles	62%	24%	14%
Q30c	Tolls only collected with toll tags	41%	41%	18%
Q30d	Roadside rest areas would provide services eliminating need to leave toll road	69%	15%	17%
Q30e	Tolls would be higher for larger, heavier, or higher emission vehicles	73%	12%	14%
Would you support converting non-tolled roads into toll roads if . . .			**Yes**	**No**
Q31a	revenue could be used to add lanes?		46%	54%
Q31b	better pavement maintenance could be provided?		56%	44%
Q31c	better lihting and signage could be provided?		46%	54%
Q31d	revenue could be used to improve other area roads?		45%	55%
Q31e	congesion could be reduced?		58%	42%
Q31f	travel times would be more reliable?		52%	48%
Q31g	credit-based congestion pricing was instituted?		56%	44%
Q31	Of those who answered all parts of this multipart question:	**All Yes's** – 26%	**All No's** – 18%	
Which of the following would encourage you to use alternative transportation		**Definitely/ Probably**	**Maybe**	**Probably Not/ Definitely Not**
Q37a	More park and ride lots	44%	19%	37%
Q37b	Dedicated bus lanes	40%	25%	34%
Q37c	More "express" bus routes	53%	18%	29%
Q37d	Construction of light rail lines and stations	50%	19%	32%
Q37e	Construction and improvement of sidewalks and hike/bike trails	33%	25%	43%
Q37f	Construction and improvement of bike lanes and storage facilities	25%	30%	46%
Q37g	Establishment of frequent high speed intercity passenger rail	48%	20%	32%
Q37h	Shorter travel time by transit than by personal vehicle	54%	32%	14%
			Yes	**No**
Q35	Would you support a proposal to raise driving age from 16 to 18 years		54%	46%
		Support	**Neutral**	**Oppose**
Q32	Characterize your support of Governor Perry's TTC vision	61%	27%	12%
Q34	Characterize your support of dedicated heavy vehicle lanes	83%	14%	3%
		Increase Current		**Add New**
Q19	Increase current transportation funding sources or add new sources?	45%		55%
Q28	If a $0 10/mile toll on all area highways were enacted during rush-hours, which of the following would you most likely change?	**Change Route** 41%		**Nothing** 34%
		Drive Less 18%		**Other** 6%

Notes:
All values are population-weighted values, to correct for sample biases.
Error on all follow-up survey response percentages is ±3%.

2006) largely agreed that drivers should not have to pay tolls to drive on existing roadways (i.e., 71% agreed with the statement that drivers should not have to pay tolls to use existing roads). They suggest that, although there is considerable opposition to tolling existing roads in principle, the idea becomes more acceptable when some benefit is perceived. (Moreover, asking respondents to simply "agree" to a statement is rather different than asking what policies they support.) Binary logit models were specified to predict support for conversion under these seven different scenarios, based on respondents' demographic and travel characteristics, and these results are shown in Table 4.

For many scenarios, those who commute more than 25 miles to work, those who have lived in the region 3-10 years or more than 10 years, those living in areas where traffic had changed, and Austin residents were less likely to support conversion of existing roads to tolled roads, while frequent toll road users (more than once a week) and those traveling during rush hour tended to be more supportive. Longer-distance commuters are probably more opposed to toll conversion because their already high transportation costs could grow if their routes were converted. Austinites also were less likely to support conversion to toll roads, perhaps because of negative perceptions of the recently approved (and extensive) toll plan for the area. Frequent toll road users, however, were more likely to support toll conversion, understandably, since they were already willing to pay a toll for the higher level of service provided on toll roads. Interestingly, gender did not play a role in impacting support or opposition to toll conversion, so this variable was not included in the final model specification.

Behavioral responses to a policy of congestion pricing on all area highways offer interesting insights. Underlying the average and standard deviations of all responses, as presented in Table 1, are shares of respondents selecting particular statements: While 41% of respondents indicated that they would change their route to avoid tolled sections of highway if congestion pricing were implemented, 34% indicated that they would change nothing about their current travel and location choices, 18% said they would drive less during times when tolls were in effect, and 6% indicated one of five other options (which included changing child care or school locations, changing residential location, walking or biking more, using transit more and carpooling more). A multinomial logit (MNL) model was also used to predict response preferences for the three most popular choices. Respondents from the Valley and San Antonio regions and older persons are estimated to drive less under such a policy, while those in larger households are more likely to change their routing, and full-time workers favored doing nothing or driving less. Residents of the Valley and San Antonio regions may favor driving less, because the toll rate in these widespread regions could make driving too costly during rush-hour and alternate routes would be less available. It seems reasonable that older persons (who may have more flexibility in scheduling their travel, due to seniority at their workplace or their potential status as retirees) would favor driving less during rush hours. Full-time workers may have higher values of travel time (than part-time workers, the unemployed, students and retirees), thus preferring to either change nothing (about their travel) or to simply drive less often during rush hour rather than change their route. All model results are shown in Kockelman et al. (2005) and Podgorski (2004).

Rank Data Questions – in which respondents rank various alternatives in order of their preference – offer much more information than questions wherein only one alternative (the most preferred) is chosen (Hausman and Ruud 1987). Several models have been used to analyze ranked data, including Mallows' (1957) distance-based models, paired-comparisons (Kendall and Smith 1940, Bradley and Terry 1952), multistage models (Luce 1959, and Plackett 1975), and latent class and unfolding models. The most common is the ranked-order logit, which is based on Plackett's multi-stage approach (where a standard logit applies for the top-rated alternative, and then for the second-rated alternative – after the top alternative is removed from the choice set, and so forth). This specification also is known as the "exploded logit" (Train 2003), as described below.

Using random utility theory, the utility of an alternative *i* for a particular individual *n* can be written as $U_{in} = \beta' X_{in} + \varepsilon_{in}$, where X_{in} is the vector of attributes characterizing alternative *i* and

Table 4: Binary Logit Model Specifications for Support of Conversion to Toll Roads

Would you support converting existing roads to toll roads if…	a. Revenues used to add lanes?		b. Better maintenance provided?		c. Better lighting/ signage provided?		d. Revenues used to improve other area roads?		e. Resulted in less traffic/ congestion?		f. More reliability ensured?		g. CBCP were instituted?	
	Coef.	T-stat	Coef.	T-stat	Coef.	T-stat	Coef.	T-stat	Coef.	T-stat	Coef.	T-stat	Coef.	T-stat
Constant (Yes)	0.922	3.700	3.608	5.892	-0.053	-0.126	-0.354	-0.844	0.966	2.641	0.106	0.392	-0.075	-0.276
Age					2.19E-02	2.272	2.10E-02	2.385						
Household Characteristics														
Household size			-0.311	-3.188										
Employment status														
Employed part-time									1.439	2.717				
Student													2.658	2.420
Travel on toll roads (never as base)														
More than once a week	1.001	2.968							1.592	3.831	0.911	3.025	0.702	2.238
At least once a year	-0.795	-2.986												
Time lived in region														
Less than 3 years			-1.763	-3.012										
3-10 years	-1.108	-3.084	-2.840	-5.547	-1.349	-3.761	-0.714	-2.008	-1.969	-4.441	-0.817	-2.461		
More than 10 years (but not native)	-0.815	-2.737	-2.181	-4.507	-1.022	-3.219	-0.671	-2.211	-1.483	-3.984				
Distance from home to work														
More than 25 miles	-0.998	-2.960							-1.588	-3.822	-0.907	-3.011	-0.697	-2.225
Non-SOV travel mode for commuting									-1.890	-3.075			-1.791	-2.662
Area traffic change last 5 yrs														
Slight increase			-1.380	-3.863	-1.239	-3.412	-1.592	-4.165			-1.394	-3.924		
Travel during rush-hour (days/week)									0.215	2.900	0.234	3.255	0.233	3.139
Home area population density													-2.25E-04	-2.994
Region														
Austin			-1.520	-3.255	-1.560	-3.623	-1.119	-2.790			-1.004	-2.219		
Houston													1.216	2.473
San Antonio			-1.104	-2.952										
Nobs	289		286		290		286		286		287		280	
L(Constants)	-199.523		-196.600		-200.269		-196.714		-195.009		-199.065		-192.607	
L(Convergence)	-175.835		-151.406		-174.619		-177.043		-149.416		-161.610		-158.099	
ρbar_c^2	0.094		0.194		0.103		0.075		0.198		0.158		0.143	

Note: CBCP stands for credit-based congestion pricing. All values are population-weighted values, to correct for sample biases individual n, β is the vector of parameters (to be estimated), and ε_{in} is a random, unobserved component of utility, assumed to be iid across alternatives and individuals.

Thanks to the iid nature of the error terms,[1] the probability that a given ordering/ranking of alternatives will be observed equals the probability of choosing the first ranked alternative from the set of J alternatives, times the probability of choosing the second ranked alternative from the remaining J-1, times the probability of choosing the third alternative from the remaining J-2 alternatives, and so on. When the error terms are iid Gumbel distributed (with η = 1), the result is as follows:

(1) $$\Pr\left[U(r_1) > U(r_2) > U(r_3) > .... > U(r_J)\right] \quad \prod_{h\ 1}^{J\ 1} \frac{e^{\beta' X(r_h)}}{\sum_{m\ h}^{J\ 1} e^{\beta' X(r_h)}}$$

This model was first applied by Beggs et al. (1981) to assess the potential demand for electric cars. Chapman and Staelin (1982) studied alternative set sizes (*J*), and Hausman and Ruud (1987) presented several specification tests.[2] More recent applications include Hajivassiliou and Ruud's (1994) rank ordered probit analysis and Calfee et al. (2001) mixed logit analysis (in a study of travel time valuations). Essentially, Equation 1 is a set of nested, conditional probabilities, one logit probability after another, as the top-rated alternative is included and then removed from the choice set, and then next-best rated alternative is removed, and so forth, until only two alternatives remain (for a standard binary logit).

Several ranking questions were asked in the survey, to appreciate the degree of opinions on issues and preferences among alternative policies. The simple averages of numeric ranks in Table 5 suggest that safety (with an average rank of 1.50) is the most important transportation policy issue, while beautification (6.0) and noise abatement (6.03) are the least important. There is strong support for raising revenues by increasing driver behavior fines (with an average rank of 1.71) and levying taxes on heavy vehicles (average rank of 2.26). Rankings for other potential revenue sources (emissions fees, congestion pricing, tolls on new and existing roads and taxes on car parts) were closely grouped, indicating much less agreement in their rankings. Maintenance and expansion of non-tolled highway system and local transportation projects are felt to be the best uses of toll revenues. New revenue sources with the least support were state income tax (6.81) and property taxes (6.64).

As mentioned, the exploded logit modeling approach makes use of the extensive information in ranked responses and respondent characteristics, allowing one to draw more meaningful conclusions than cross-tabulations or other approaches. Estimation was carried out via stepwise addition, combination and deletion[3] of various variables using LIMDEP software. Results are shown in Table 6.

The results indicate that older, well-educated individuals and long-distance commuters are more likely to choose safety as the top issue. Older and more-educated persons may be more conservative in their risk-taking, and long-distance commuters tend to be more exposed to driving risks. Using Table 6's values in appropriate probability expressions, one can deduce that the probability of the "average" respondent[4] selecting safety first rises by about 1% for every added year of respondent age. It also is predicted to rise by about 8% for every added household member, and fall by about 5% for every added $10,000 in annual household income.

Higher income individuals and long-distance commuters (as well as residents of Austin and DFW) are more likely to support funding to alleviate highway congestion. Older individuals are less inclined to support roadway beautification, while highly educated persons (and Austinites) are more likely to be supportive. Retirees tend to prefer safety, improved signage, noise abatement and pavement and bridge maintenance equally, over congestion, beautification and street lighting.

In terms of supporting existing and new revenue sources, retired individuals and medium- to long-distance commuters (as well as residents of DFW) are estimated to be more supportive of

Table 5: Average Rankings of Transportation Policy Issues and Options

Topic	Number of complete rankings	Alternative (Alt #)	Average Rank
Importance of transportation characteristics…	296	Safety (1)	1.50
		Highway congestion (2)	2.49
		Beautification (3)	6.00
		Pavement and bridge maintenance (4)	2.81
		New/Improved signage (5)	4.51
		Noise abatement (6)	6.03
		Street lighting (7)	4.66
Existing revenue sources that respondents would most support an increase of…	297	Lubricant taxes (1)	3.36
		Title transfer fees (2)	2.91
		Driver behavior fines (3)	1.71
		Motor vehicle registration fees (4)	3.20
		Gasoline taxes (5)	3.82
New revenue sources that respondents would most support…	289	Sales taxes (1)	5.14
		Emission Fees (2)	3.49
		Taxes on car parts (3)	4.17
		Taxes on heavy vehicles (4)	2.26
		Congestion pricing (5)	3.57
		Toll revenues (6)	3.92
		Property taxes (7)	6.64
		State income taxes (8)	6.81
Possible uses of revenue respondents would most support…	292	Add funding to driving alternatives (transit and/or hike/bike trails) (1)	3.24
		Add funding to other state government programs (2)	3.64
		Maintain and expand local transportation projects (3)	2.47
		Maintain and expand the Texas toll road system (4)	3.30
		Maintain and expand the untolled state highway system (5)	2.35

Note: Rank options vary from 1 (highest) to 8 (lowest). All values are population-weighted values, to correct for sample biases.

Table 6: Results of Ranked Ordered Logit (Exploded Logit) Model Estimation

Variables	Transportation Issues			Existing Revenue Sources			New Revenue Sources			Uses of Revenue		
	Alt*	Coeff	t-ratio	Alt	Coeff	t-ratio	Alt	Coeff	t-ratio	Alt	Coeff	t-ratio
Alternative Specific Constants	1	1 492	3 194	1	1 851	4 082	1	1 325	4 377	1	-0 776	-4 837
	2	1 371	5 326	2	2 235	5 032	2	2 811	8 758	2	0 012	0 033
	3	0 025	0 053	3	3 645	7 462	3	2 132	6 945	3	0 695	2 154
	4	1 769	7 226	4	1 587	3 922	4	2 653	6 799	4	-1 214	-8 000
	5	0 153	1 382	5			5	1 994	5 124			
	6	-0 462	-1 170	6			6	0 978	2 273			
							7	0 803	2 809			
Male							2,5,6	-0 220	-1 870	4,5	0 313	2 145
Age	1	0 022	2 686	5	0 018	2 576	4,5	0 010	2 109	2,3	-0 010	-1 992
	3	-0 026	-3 236				6	0 021	3 477			
	6	-0 015	-2 063									
Household size	2	-0 315	-4 122	4,5	0 106	1 793	8	0 255	3 252			
	3,4	-0 133	-2 381									
Annual Income (in $10,000's)	2	0 188	5 756	3	-0 097	-3 022	8	-0 111	-3 001	2	-0 066	-2 188
	4	0 057	1 896									
Employment status												
Employed full time				1	0 381	2 277	2,3	-0 586	-4 039	2,3,4	0 278	1 789
Employed part time							4,5	0 722	2 568	3,4	0 546	2 141
							6	1 174	3 635			
Student	3,4,5	-0 612	-2 243				1,2,3	-0 825	-3 220	1,2	1 307	3 624
										3	0 766	1 801
Retired	1,4,5,6	0 321	1 975	3	0 611	2 506	1	0 508	2 464	1	-0 386	-1 712
							2	-0 465	-2 317			
Education												
College Education (Assoc/ Bach)	1	0 520	1 949	4	0 324	1 951	2,3,6	0 385	3 227	2	-0 385	-2 055
	6	-0 443	-2 303									
Grad Education (Masters and above)	1	0 679	2 127				1	-0 960	-4 304	1	0 638	3 153
	3	0 544	2 356				6	0 466	2 375			
							7	-0 460	-2 053			

*The "Alt" column represents the (alternative-specific) variable corresponding to that alternative number
**M&E = Maintain and Expand
Note: All values are population-weighted values, to correct for sample biases

Table 6: Results of Ranked Ordered Logit (Exploded Logit) Model Estimation (continued)

Variables	Transportation Issues			Existing Revenue Sources			New Revenue Sources			Uses of Revenue		
	Alt*	Coeff	t-ratio	Alt	Coeff	t-ratio	Alt	Coeff	t-ratio	Alt	Coeff	t-ratio
Region												
Austin	2,6	0 403	2 275				1,2	0 292	1 656			
	3	0 449	1 761				3	0 513	2 466	1,2,3	-0 294	-1 488
Houston				1,3	-0 413	-2 075				4	0 610	2 451
Dallas-Fort Worth	2	0 704	2 871	2,4	0 496	2 180	1,2	0 459	1 640	4	0 769	3 119
				3	1 394	3 958	3,4,5,6	1 028	3 579			
San Antonio				5	0 601	2 349	4,7	-0 445	-2 479	1	0 310	1 334
							5,6	-0 864	-4 599			
Rest of Texas	1	1 42083	2 539				4,5	0 476	1 990	2,3	-0 390	-1 637
Lubbock							6,7,8	-0 420	-2 561	1,2,3	-0 447	-2 274
Distance from home to work												
Close distance (5-10 miles)	1,4	-0 37816	-1 68613							3	-0 410	-2 003
	2	-0 60703	-2 3092									
Medium distance (11-25 miles)	1,2	0 67262 4	2 30169	3	1 127	3 354	4	0 522	1 981	2,3	-0 443	-2 078
Large distance (> 25 miles)	1	1 32047	2 84362	1,4	1 576	2 958	2,5,6	0 649	1 896			
	2	0 79463	2 22441	2,3	2 336	4 085	1,3,4	1 172	3 469			
Number of observations	291			291			284			287		
LL at equal proportions	-2480 78			-1393 16			-3011 71			-1374 01		
LL at constants	-1686 00			-1236 99			-2468 017			-1297 36		
LL at convergence	-1594 75			-1166 1			-2349 71			-1240 96		
LRI (0)	0 357			0 163			0 22			0 096		
LRI (constants)	0 054			0 057			0 048			0 043		
Alternatives	1	Safety		1	Lubricant Taxes		1	Sales Taxes		1	Funding of Driving Alternatives	
	2	Highway Congestion		2	Title Transfer Fees		2	Emission Fees		2	Funding of Other State Programs	
	3	Beautification		3	Driver Behavior Fines		3	Taxes on Car Parts		3	M&E** Local Transp Projects	
	4	Pavement and Bridge Maintenance		4	Vehicle Registration Fees		4	Taxes on Heavy Vehicles		4	M&E State System of Toll Roads	
	5	New/Improved Signage		5	Gasoline Taxes		5	Congestion Pricing		5	M&E State System on Non-Tolled Roads	
	6	Noise Abatement					6	Toll Revenues				
	7	Street Lighting					7	Property Taxes				
							8	State Income Taxes				

increasing driver behavior fines, while higher income individuals (as well as residents of Houston) are estimated to be less supportive. College-educated respondents, many of those traveling long distances to work, and residents of DFW appear more inclined to support gas taxes. Interestingly, older, more-educated, part-time employed persons, long-distance commuters, females and residents of non-metro areas appear to be more supportive of tolling (and congestion pricing) new and existing roads than others. Older persons, part time employees and medium- to long-distance commuters are more likely to support tax increases on heavy trucks. Higher income persons are less likely to support state income taxes (as one might expect), while those from larger households tend to be more supportive of such a change in policy (currently, there is no state income tax in Texas).

In terms of using surplus toll revenues, students and well-educated persons (as well as residents of San Antonio) tend to support alternatives to driving, like transit and bike trails. The employed and students are more supportive of maintaining and expanding local transportation. Older people, Austinites, residents of Lubbock and people driving short and medium distances don't favor this alternative. Employed males (and residents of Houston and DFW) tend to be more supportive of maintaining and expanding Texas' current toll road system. Males also are more supportive of maintaining and expanding the state's non-tolled highway system. Of course, residents of Houston and DFW enjoy much use of Texas' current toll roads, and males tend to drive more miles than females, everything else constant (see, e.g., Kweon and Kockelman 2003).

The results of the various ordered probit, binary logit and MNL models were examined in order to identify consistent tendencies in opinions across certain demographic groups. Long-distance commuters were less likely to support new tolling policies, while frequent (at least once a week) toll road users were more likely holding everything else constant (including household income, vehicle ownership, age, gender and education). Males were also less supportive of some new policy ideas, particularly improvements to alternative transportation and truck tolls. And they were more likely to agree (i.e., less likely to disagree) that funding new highway construction with an increase in the gas tax is better than issuing bonds. More frequent rush-hour travelers were also more likely to support tolling policies, and were more likely to support toll road features like truck tolls, automated payment (via transponders) and roadside facilities.

Interestingly, household income only impacted respondent opinions on one question: individuals in higher income households were less likely to agree with the statement that toll roads are less convenient because of their limited access. Additionally, although education level was statistically significant in several models, the highly educated are not consistently supportive of or opposed to new transportation policies. The overall results of variable significance across all such models are presented in Kockelman et al. (2005).

Non-response to the survey and to individual questions considerably impacted the data quality of responses to regional supplemental questions. Additionally, because of the limited number of observations (from 18 for Houston to 48 for Austin), all results obtained from these supplemental questions are unweighted. Nevertheless, interesting preference distinctions for handling the shortage of transportation funding were obtained in the four large urban areas. Residents of Dallas-Ft. Worth ranked tolling new highways as their most favored option; residents of Houston preferred putting more money into transit; and residents of San Antonio and Austin chose building fewer new roads. These distinctions may be moderated by a larger, more representative sample.

Responses were split on many of the tolling and transportation issues presented in the survey. There was considerable support (83%), however, for dedicated truck lanes. Discrete choice model results revealed consistencies for key demographic groups, such as frequent toll road users, who are more supportive of new tolling and transportation policies—a result also found in the earlier phone survey (Kockelman et al. 2005). These and other detailed model results can be found in Kockelman et al. (2005).

Focus Group Results

The focus groups provided several interesting observations concerning the underlying opinions and attitudes of Texans. Because of the small sample sizes, qualitative, rather than quantitative, results are emphasized here. The following results present the central themes portrayed by the participants, along with sample statements elicited of these participants. SUMA's (2005) final report, contained in Kockelman et al. (2005), provides further details.

The focus groups started with open questions for each participant regarding their characterization of traffic. A couple of themes emerged from these traffic characterizations. Many participants reported having to plan their commute by listening to traffic reports, including extra time in their commute (to allow for unpredicted delays), and/or having alternative routes to their destination (in the event of considerable delays). Such delays may be due to incidents or construction. The latter was another area of concern, particularly for Lubbock and Brownsville residents. Perhaps this is because smaller cities tend to have fewer alternative routes to major roadways. Their concerns with construction relate to the delays experienced and dangerous driving behavior that can occur in construction zones.In general, the nine-minute TxDOT video captured everyone's attention. It presented perspectives and information on the state's population growth, gas taxes used as a source of funding, gas taxes levied in other states, the effect that traffic can have on the economy, increasing car mileage (and its effect on revenues), and road maintenance costs. In response to being asked what most surprised them about the video, participants had the following to say:

> *I knew that the population had risen. That's obvious. But the amount, eight million people from 1980 to 2003, was very surprising. And the increase in vehicles, 61%, was also amazing. And that only 7% more roads are being constructed is ridiculous. (Brownsville)*
>
> *I didn't know that most of the revenues to build roads are from gas. I always had an idea—where does property tax go? I always thought that the property tax was to make new roads and all that. (Brownsville)*
>
> *It's a bigger problem than I thought it was. The goods that are delivered here are delayed, and that makes the food costs rise. That was something for me that I didn't know. (Brownsville)*
>
> *How expensive it is for maintenance on the roads and to do an interchange. I didn't know that it cost so much to build a road and to maintain it. (Brownsville)*
>
> *I think it would surprise most of us in here to know how much they spend on planning and design of the highways. I'm sure that's probably an enormous chunk of money, of tax money. And they all fail. (Dallas)*

Ultimately, the main objective of the focus groups was to test messages in order to determine which most effectively conveyed the benefits of toll roads to a variety of travelers. For more information on the messages tested and the responses to each of those messages, further analysis can be found in Kockelman et al. (2005). Response to the messages presented several central themes. One such theme related to a general feeling of distrust or inadequacy. Specifically, the participants expressed reservations about the planning competency of TxDOT, distrust with politicians or tax usage and distrust with the quality of construction materials or maintenance procedures. For example:

> *To me the key question is, "How are the funds being managed?" To me it just goes back to the planning and even beyond planning, when you take it from planning, you've got the people who actually manage the tax that they're raising from this gasoline. (Dallas)*

Some messages prompted discussions concerning the logistics and technology aspects of tolled roads. Discussions in Brownsville, Lubbock and San Antonio centered on the technology, how it would work at high speeds, how travelers would remedy incorrect bills and how much it would cost. Participants also seemed to be confused by the concept of tolled lanes and how these differed from HOV lanes, other than in out-of-pocket cost for travelers. Others thought it seemed unfair to be driving next to a tolled lane. The concept seemed to be too foreign to be accepted.

For some messages, believability was based on previous experience. Those in Dallas, Houston and Brownsville were more likely to believe certain messages, since these residents have seen tolled roads (or a tolled bridge, in the case of Brownsville residents) built quickly.

Several message responses varied regionally. Dallas and Houston residents were relatively receptive, because of past positive experiences with toll roads. However, other focus groups expressed skepticism, with three of the groups comparing the state lottery to toll roads. Since the participants believed that lottery revenue was to have contributed to school funding and did not, they do not believe that toll road revenue will contribute to funding other construction projects. Many wondered about the state's supposedly "new" sources of revenue. The following comments verbalize their skepticism:

> *If funds are available for tolls – why not non tolls? Where does the money come from? I could see toll roads in this area, yes. Definitely. But also, I would like to know that 100% of that money is going to go to maintenance of roads that are within the community. (Brownsville)*
>
> Note: the above is a single, long comment, all from a Brownsville participant.
>
> *I think I would feel better about the idea if they put a toll road that was specifically in Lubbock, and Lubbock maintained control over that money to maintain Lubbock roads instead of we get tolled and it fixes the Dallas roads. I think if we're using it, we might as well pay for it. (Lubbock)*

After reading the messages and completing the worksheets, the moderator asked the participants which message was the most persuasive. Interestingly, all groups overwhelmingly opted for the two messages that were the most informative. Many participants believed that informing the public about gas taxes and the benefits of toll roads would be key to persuading others to support tolling. One Brownsville participant suggested presenting toll roads as progressive:

> *I remember my parents being against it (the expressway) because they were being taxed for it. Now that is what has made this valley grow. In order to grow more and in order to have more people and more industry and plants, we have to have the transportation availability, and toll roads might be one of the things to make it progress faster. (Brownsville)*

Participants were also asked who would be most effective to deliver a message. Resoundingly, all focus groups agreed that the messenger should *not* be a politician. The messenger mentioned the most often and with the most agreement among the group was an average member of the community:

> *I like what Chris said. Listening to him, and he drives it and experiences it. … He's on it, and he's seen it work … I would like to hear people say that, "Hey, I drive on this road, and it looks totally smooth, and it's running smooth," and things like that. I think I might change. I might want a toll road if I see it working. (San Antonio)*

At the end of the discussions, 59% of participants indicated on a survey form that the focus group experience had changed their perceptions of toll roads in a favorable way. Only 5.4% responded that they were in favor beforehand and remained so, and 13.5% indicated that they remained neutral. Another 22% indicated that their negative perceptions of tolling had not changed.

Evidently, these two-hour focus group interactions changed the majority of the participants' opinions concerning toll roads in a positive way. These opinions may have been changed due to several reasons. First, supporting factual information was presented that was new and surprising to many of the participants. Second, the discussion of toll roads was between "ordinary" people. An objective observer of the focus group could tell that, if a member of the focus group spoke of positive experiences with toll roads, the rest of the group began to be more receptive to the possibility of toll roads. Simply from the results of these focus groups, it is clear that the power to persuade the public in favor of toll roads is a possibility. The next step is determining the course of action that is most likely to result in favorable persuasion.

CONCLUSIONS AND RECOMMENDATIONS

The varied and comprehensive methodologies used here (from phone interviews, to self-completion surveys and focus groups) serve as an example for future surveys of public perceptions of transportation policies. They also offer a great many conclusions. Based on the self-completion survey results, it seems clear that regular toll road users and more frequent rush-hour drivers are more supportive of new transportation policies, while long-distance commuters, males and those who have lived in their regions for many years tend to be less supportive. Tolls are preferred to gas taxes, as is the improvement of existing roads before building new ones. Simply educating Texans about the costs of roadway construction and maintenance, current revenue sources and the benefits of tolling should increase support for toll policies.

While in general, Texans presently oppose tolling existing roads (Podgorski and Kockelman 2006), self-completion survey results suggest they support such policies if benefits can be obtained. For the seven hypothetical conversion-to-tolling scenarios, support ranged from 45% (when using toll revenues to improve other area roads) to 58% (when congestion will be reduced). Logit models indicated that those who commute more than 25 miles (one-way) to work, and/or live in Austin were less likely to support conversion. In contrast, frequent toll road users tended to be more supportive.

Response to congestion pricing was another issue examined in the follow-up survey. A total of 41% of respondents indicated they would change their route to avoid tolls, 34% favored doing nothing, 18% preferred driving less during rush-hours, and 6% chose one of five other options. An MNL model for the top three choices showed that Valley and San Antonio residents tended to prefer driving less, those in larger households favored changing their routes, and full-time workers were more likely to do nothing or drive less.

Rigorous analysis of rank data questions provided valuable results on a variety of issues, indicating certain populations (and regions) that policymakers may wish to target when proposing different policies and priorities. For example, a campaign to raise funds for transportation safety may enjoy early support among long-distance travelers, as well as older persons and those with more education, particularly in non-metro areas. Roadway pricing may enjoy such support from older, more-educated, part-time employed persons and long-distance commuters.

While the survey responses were corrected for biases in gender, education and household income, and multivariate regression models controlled for these various attributes to a great extent, the data and models do not always offer great insight as to why respondents hold the opinions they do. Focus groups helped fill this gap, while underscoring many survey results.

First, a lack of information concerning transportation funding and logistics of toll roads within the general public may be one source of opposition. Several fundamental sources of traffic congestion (such as population growth and inadequacy of gas tax revenues) do not appear to be common knowledge. Toll road technology prompts confusion, which can stymie support. A clear distrust of government officials suggests that messengers/spokespeople should come from the community at large. Finally, information sharing makes a positive difference. These and other results of this work suggest that toll policies may have a future, even in an environment of cautious conservatism.

Endnotes

1. As is typical of MNL models, an iid assumption on the Gumbel error term results in the independence of irrelevant alternatives (IIA) property. If some alternatives share certain unobserved attributes, one can overcome this model deficiency using the mixed logit or probit specification. In such cases, simulated MLE techniques will be required. (Train 2003.)

2. Chapman and Staelin (1982) suggested that four is roughly the maximum number of alternatives respondents can be expected to reliably rank. The number of alternatives, which ranged from five to eight alternatives in the current survey, though inconsistent with the maximum, are quite close and would produce reliable estimates.

3. The p-value used for testing significance (and thus variable inclusion) was 0.1 in most cases and sometimes 0.2, if the associated control variable was of particular interest.

4. The average respondent is a 38-year-old employed male living in Austin. He has a bachelor's degree and commutes to work between 11 and 25 miles (one-way). He resides in a two-person household with an annual household income of $37,500.

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