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# Paying for Infrastructure in an Urban Environment

## Roles of Ideological Beliefs and Self-Interest in Support for Two Funding Mechanisms

Juita-Elena (Wie) Yusuf, Lenahan O'Connell, Khairul A. Anuar,  
and Kaitrin Mahar

**This study examines public preferences for two revenue options—fuel taxes and tolls—to finance transportation infrastructure in an urban area with the use of the results of a survey of residents of the Hampton Roads region of southeastern Virginia. Specifically, the study addresses two related research questions: (a) To what extent do residents support instituting tolls, increasing the fuel tax, or both? (b) What roles do self-interest and ideological beliefs play in support of increasing the fuel tax, imposing tolls, or doing both? The study finds that 50% of respondents expressed a willingness to support fuel taxes or tolls for infrastructure, 29% for increasing fuel taxes, and 28% for tolls, with 7% supporting both revenue options. The study also finds that the support for each funding source is associated with a different set of ideological beliefs and self-interest factors. Implications for generating public support for increases in revenue and funding for transportation facilities are discussed.**

Transportation finance in the United States is facing a crisis. Reports have shown that, year after year, current transportation infrastructure spending at all levels of government is significantly below levels needed to properly maintain existing infrastructure (1). Meanwhile, many areas suffer increasing congestion, deteriorating infrastructure, and increased demand for additional capacity for autos and transit. Traffic delays in 2011 wasted as much as \$121 billion in pollution, fuel, hours, and trucking costs (2). Furthermore, much of the transportation system, especially highways and roads, has reached maturity, and a growing share of revenues is needed for just basic maintenance and repair (3).

That more revenue is needed is clear. AASHTO predicted that by 2015 the nation's transportation system will require an additional \$89 billion in state and local highway spending and \$21 billion in transit spending (4). But, while most stakeholders, including businesses, governments, transportation industry lobbyists, and citizens, agree that a functional transportation infrastructure is vital, generating the needed revenues has repeatedly proved to be politically contentious (5).

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A common assumption is that the public is unwilling to pay for infrastructure, that, as the aphorism has it, the public wants to have its cake and eat it too. But the case may be that the public is divided over the best way to fund infrastructure rather than simply being opposed to efforts to raise more money. For example, Agrawal et al. surveyed representative samples of Americans; their results illustrated the importance of fitting tax proposals to specific beliefs and concerns (6). They found that a large majority of Americans, some 80%, opposed a 10-cent increase in the fuel tax. Yet, when the public was informed that the tax increase would be dedicated to maintaining streets, roads, and highways, their support rose to 58%, and when told it will be spent on projects to reduce accidents and improve safety, it rose to 54%.

This study found that many residents expressed a willingness to pay for infrastructure but favored different payment methods. It also found that the support for each funding source was associated with a different set of ideological beliefs and self-interest concerns. Thus, regardless of the dictates of economic or policy theory, the effort to obtain money for transportation will need to take into account political beliefs and other factors (5, 7). Understanding the nature of such factors is important for successful efforts to raise revenue for two reasons: (a) beliefs can play a determinative role in generating support for new revenue, and (b) projects involving federal funds require some form of public participation in the planning process.

In their discussion of road user charges, Odeck and Kjekreit note that public attitudes about and perceptions of such charges may vary across groups of road users and not correspond with those of their respective governments (8). The same might be said more generally of transportation revenues, and “transport planners need to recognize that users’ attitudes may become a serious obstacle, primarily because the decision makers, who are politicians, will be less likely to sanction schemes that users do not support; after all, road users are their voters” (8). Opposition to revenue increases is well documented. For instance, an April 2013 Gallup poll found that only three in 10 Americans would vote to increase the fuel tax (9). Similarly, research using public opinion data has also found low levels of support for a variety of tolling mechanisms (10). Given that the public, through voting and other forms of political behavior, can (and should) influence the decision to raise revenue, understanding of the attitudes and beliefs that shape the level of public support for different revenue options is important for gaining such support.

This study examines public preferences for these two revenue options—fuel taxes and tolls—for funding transportation infrastructure in an urban area by using the results of a survey of the residents

of the Hampton Roads region of southeastern Virginia. Specifically, it addresses two related research questions: To what extent do residents support instituting tolls, increasing the fuel tax, or both? What roles do self-interest and ideological beliefs play in support for increasing the fuel tax, imposing tolls, or both?

**TWO TRANSPORTATION REVENUE OPTIONS**

This study examines public support for two of the more popular means of raising revenues for transportation: the fuel tax and tolls. The fuel tax can be considered a quasi-user charge, and tolls are a user charge.

At the state level, the fuel tax has been a large component of the state road funds, contributing more than half of total revenues for highway spending (11). The fuel tax is also a highway revenue option at the local level. Several states allow their local governments to levy supplemental local fuel taxes, but not all eligible localities have implemented them (12, 13). While challenges to the revenue-raising ability of the fuel tax have been raised (14, 15), O’Connell and Yusuf note that the viability of the fuel tax can be maintained by indexing the tax rates to indicators of need, which would allow for regular increases in the fuel tax rate (16).

Toll revenues as a percentage of total revenues have ranged between 4% and 5% of total transportation funding (4). However, the growth in public-private partnerships over the last decade has resulted in greater use of tolling. Given this greater reliance on tolling, understanding of public perception of and support of tolls as a funding source is important for gaining such support.

**FACTORS DRIVING PREFERENCES FOR DIFFERENT TRANSPORTATION REVENUE OPTIONS**

In studying support for tolling, Yusuf et al. developed a four-factor model that successfully identified many elements for predicting individuals’ willingness to pay tolls (17). To compare the sources of support for two types of revenue sources, this paper simplifies that model to two factors: self-interest and ideological beliefs. The paper explores the possibility that those who support tolling differ from those who support raising the fuel tax and do so for divergent reasons related to self-interest and ideological beliefs. The simplified two-factor model is presented in Figure 1, and the hypothesized

**TABLE 1 Summary of Hypotheses**

Variable	Support for Tolls	Support for Fuel Taxes
<b>Self-interest</b>		
Affluence	+ (H1a)	+ (H3a)
Experience with and concern for congestion	+ (H1b)	+ (H3b)
Use transit	+ (H1c)	+ (H3c)
<b>Belief</b>		
Republican Party	+ (H2a)	- (H4a)
Environmental concern	+ (H2b)	+ (H4b)
Government is wasteful	+ (H2c)	- (H4c)
Roads are important	+ (H2d)	+ (H4d)
Positive economic conditions in community	+ (H2e)	+ (H4e)

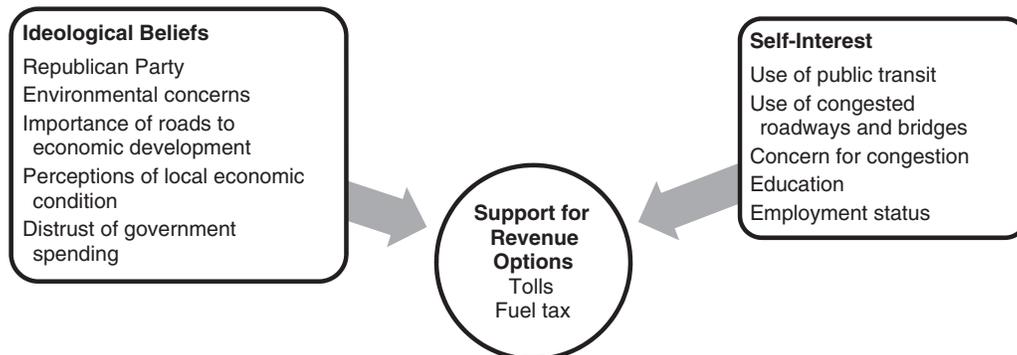
NOTE: H = hypothesis.

relationships between these factors and support for increasing the fuel taxes or introducing tolls are summarized in Table 1.

**Self-Interest and Support for Tolls**

Research has shown that support for tolls can be related to the personal benefits associated with the tolled facility (10, 17, 18). One particular benefit that has been linked to increased support for tolling is the reduction of congestion and travel time (18, 19). In relation to the use of congested roadways, research has suggested that those who experience congestion and delays are more likely to support tolling (20–22). In addition, tolled roads that significantly reduce travel time, by means of avoiding congestion, tend to have greater support, as evidenced by an increase in the willingness to pay the toll (19, 23). Thus, those traveling on congested roads will likely be more supportive of tolls to pay for new or improved facilities, as these are apt to reduce congestion and travel time.

The affluent can afford to pay tolls, a characteristic suggesting that they are more likely than the less affluent to favor them. Two variables separate the more from the less affluent: education and full-time employment. However, the literature contains conflicting evidence related to tolling support and personal income. For example, in their California study, Dill and Weinstein found that, whereas support for revenue sources that would increase vehicle ownership



**FIGURE 1 Drivers of support for revenue options.**

and use costs generally increased with income, support for various tolling options showed no clear pattern by income (24). In Norway, Odeck and Kjerkreit found that lower-income groups were significantly more negative about tolls (8). The only significant income-related finding in a Texas study on support for and opinions about a variety of funding mechanisms was that higher-income groups were less likely to consider toll roads inconvenient and, relatedly, that educated road users were more likely to support tolling as an acceptable mechanism (25).

Some residents in urban environments, albeit usually a minority, rely on public transportation and therefore drive less frequently or do not drive. Those who use transit will not have to pay the toll or will pay it less often. Odeck and Bråthen found evidence suggesting that those who commute by transit tend to have fewer negative feelings about tolling than do those who commute by automobile (26). Possibly, transit riders are less likely to see tolls as a threat to their disposable income and, therefore, more likely to express a greater degree of support for tolls as a source of funding. In addition, research has found that introducing significant improvements to public transit and congestion pricing measures simultaneously could significantly improve acceptability, a situation indicating that one's personal ability to conveniently avoid paying a higher price to travel plays a key role (27, 28). These observations lead to the following hypotheses:

Hypothesis 1. Those who (a) are affluent, (b) experience and are concerned about congestion, and (c) use transit are more likely to support tolling.

Hypothesis 1a. Those who are affluent are more likely to support tolling.

Hypothesis 1b. Those who experience and are concerned about congestion are more likely to support tolling.

Hypothesis 1c. Those who use transit are more likely to support tolling.

### Ideological Beliefs and Support for Tolls

Since the election of Ronald Reagan to the presidency in 1980, the Republican Party has consistently and loudly voiced opposition to raising taxes. It has been less vocal in its opposition to fees, especially user fees for government services. Although fuel taxes are a type of user fee, the case is apparently that, in the public mind, tolls are more clearly a user fee. When asked to endorse a funding source, Republicans will likely be more supportive of tolls than fuel taxes.

Many Americans appear to believe that government wastes much of the money raised through taxes (29). This belief is one that may incline those who hold it to be more supportive of tolls than of fuel taxes for the funding of transportation facilities. Toll revenues are less likely to be viewed as wasted, as they are usually dedicated to paying for the facility requiring the toll.

Environmentalists may favor tolls for another reason. The frequent argument is that toll roads will decrease the number of miles driven as they increase the overall cost of driving to the general public. Less driving will result in a concomitant decline in the emission of greenhouse gases, a result greatly desired by environmentalists. Not surprisingly, environmentalist attitudes have been found to be correlated with support for tolls (17, 18, 28). Another segment of the urban public seems likely to support tolls: those who, in contrast to environmentalists, believe roads contribute to people's well-being. These individuals would generally believe that roads are important.

Another belief may predict support for tolls: it concerns an optimistic or positive belief about the current economic condition of the community. Those with this belief may be less likely to assume that tolls will prove excessively burdensome for a city's residents. These factors lead to the following hypotheses:

Hypothesis 2. Republicans, those with environmental concerns, those who believe that government is wasteful, those who believe that roads are important, and those who express optimism about the local economic condition are more likely to support tolls.

Hypothesis 2a. Republicans are more likely to support tolls.

Hypothesis 2b. Those with environmental concerns are more likely to support tolls.

Hypothesis 2c. Those who believe that government is wasteful are more likely to support tolls.

Hypothesis 2d. Those who believe roads are important are more likely to support tolls.

Hypothesis 2e. Those who express optimism about the local economic condition are more likely to support tolls.

### Self-Interest and Support for Fuel Taxes

Opposition to fuel taxes may be less intense among the more affluent. Those who are more affluent probably spend less of their disposable income at the gas pump, even though they tend to drive more miles annually. This prediction is derived from the fact that the fuel tax is moderately regressive, as low-income and high-income drivers pay the same tax rate per gallon purchased (30).

As in the case of support for tolls, those who experience congestion are more likely to support greater use of fuel taxes to pay for infrastructure improvements. In addition to delays, highway congestion engenders frustration, anger, and other uncomfortable emotions arising from slow-moving, bumper-to-bumper traffic. Many people can be expected to support taxes that reduce these undesirable driving conditions.

Those who use transit probably spend less money on gasoline or diesel fuel. They may view a rise in fuel taxes as something that has little effect on their daily lives. Thus, they could be more supportive of fuel taxes than those who do not use transit. In contrast, many others may be low-income automobile owners and therefore opposed to increased fuel taxes. The relationship between transit users and support for or opposition to a fuel tax increase is ambiguous but needs examination, so the following hypotheses are offered:

Hypothesis 3. Those who are affluent, experience congestion, and use transit are more likely to support increasing fuel taxes.

Hypothesis 3a. Those who are affluent are more likely to support increasing fuel taxes.

Hypothesis 3b. Those who experience congestion are more likely to support increasing fuel taxes.

Hypothesis 3c. Those who use transit are more likely to support increasing fuel taxes.

### Ideological Beliefs and Support for Fuel Taxes

In principle, fuel taxes can be described as a quasi-user fee but instead are perceived to be taxes, and the Republican Party has consistently opposed increases in fuel taxes. This position has been popular with the public in general but more so with Republicans. The authors

expect to see that, in contrast to their support for tolls, Republicans are opposed to paying for infrastructure with fuel taxes. Similarly, those who view government as a source of waste will oppose fuel taxes. In contrast, Inglehart found that those with more-liberal leanings (who tend to favor the Democratic Party) are less opposed to fuel taxes, policies said to contribute to environmental sustainability, or both (31).

The authors also anticipate support for fuel taxes from two sets of people holding different beliefs: environmentalists who seek to reduce driving by increasing its cost and those who view roads as important and presumably want to raise revenue to invest in them.

Optimism about a city's economic condition may indicate support for fuel taxes. As in the case of tolls, people with this belief may be more likely to assume that the community can afford to pay more for transportation facilities, and the following hypotheses result:

Hypothesis 4. Republicans, those who view government as wasteful, or both will oppose fuel taxes, while those concerned about the environment, those who view roads as important, and those who express optimism about a community's economic condition are more likely to support fuel taxes.

Hypothesis 4a. Republicans are more likely to oppose increasing fuel taxes.

Hypothesis 4b. Those concerned about the environment are more likely to support increasing fuel taxes.

Hypothesis 4c. Those who view government as wasteful are more likely to oppose increasing fuel taxes.

Hypothesis 4d. Those who view roads as important are more likely to support increasing fuel taxes.

Hypothesis 4e. Those who express optimism about a community's economic condition are more likely to support increasing fuel taxes.

## METHODOLOGY

This study uses data from the 2012 Life in Hampton Roads survey, conducted by Old Dominion University's Social Science Research Center (32). This 77-question survey concerned satisfaction with the quality of life in the Hampton Roads region of southeastern Virginia. This region includes seven cities: Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, Suffolk, and Virginia Beach. Trained telephone interviewers using computer-assisted telephone interviewing conducted the survey in May to August 2012 through a combination of random digit dialing of landline numbers in the Hampton Roads area code exchanges and of cell phone numbers selected on the basis of switch points within the area. Calls were made from Monday to Friday during peak daytime and evening hours, and 762 interviews were completed. After cases with missing values were removed, the sample size used for regression analysis was 593. The following list describes the characteristics of the sample:

- Gender:
  - Male = 35.2% and
  - Female = 64.8%;
- Age = 51.3 years;
- Race:
  - White, non-Hispanic = 61.2% and
  - Minority = 38.8%;
- Employment status:
  - Employed full time = 44.5%,

- Employed part time = 13.5%, and
- Unemployed = 15.4%;
- Married = 56.1%;
- Education:
  - High school, GED, or less = 22.6%,
  - Some college = 34.8%,
  - Bachelor's degree = 22.6%, and
  - Graduate degree = 20.0%;
- Political affiliation:
  - Republican = 25.1% and
  - Democratic = 34.8%;
- Use transit = 6.4%; and
- $N = 762$ .

Analysis of public support and preferences for different revenue sources relies on one key survey question. This question asked respondents to identify the revenue sources that they would support as a means of funding to maintain or expand the road, highway, and bridge systems in the region. The specific question was, "If additional funds are needed to maintain or expand the road, highway, and bridge systems in Hampton Roads, which of the following would you support as an additional source of funding for the region's road and highway system?" Possible responses to this question included increasing the fuel tax, increasing vehicle registration fees, borrowing money, raising the tax on vehicle purchases, and implementing tolls on highways. Multiple responses could be selected. From this question, two dichotomous dependent variables were created that are indicative of support for increasing the fuel tax and support for tolls. The authors chose to explore support for these two funding sources, as they are often presented to the voting public in referenda and can be dedicated to specific transportation projects or tasks (e.g., maintenance). Table 2 defines the variables and presents descriptive statistics.

As Table 2 shows, a large majority of the respondents (70.4%) endorsed the statement that the local government has a fair amount of waste. This potential source of opposition to new revenues is counterbalanced by several findings that suggest congestion is a problem for many. The average respondent appears to travel on congested roads at least three to four times each month, and 37% report that they have avoided visiting a business in a neighboring city because of concerns about traffic congestion. Moreover, most endorse the statement that improved roads, highways, and bridges are important to the region's future economic growth.

Three control variables that have been found in other studies to be important for funding preferences—race, gender, and age—are included here. The Agrawal et al. study of preferences for green versus nongreen road financing mechanisms found that being white significantly increased support for "feebates," which would tax vehicles that pollute excessively and offer rebates to those that do not (33). However, their findings did not show a clear pattern of preference for more environmentally incentivized revenue sources. Similarly, Yusuf et al. found that being white increased willingness to pay tolls (17). Beyond race, gender may also be an important control variable. In a Swedish study collecting data from those paying tolls, Odeck and Kjerkeit found that men were significantly more negative than women about tolling schemes (8). Preference patterns sorted by age group often have conflicting results. Specifically in relation to tolls, Dill and Weinstein (24) found that those aged 18 to 34 were more likely to support them, but Odeck and Kjerkeit found that younger people were much more negative about tolls (8).

**TABLE 2** Descriptive Statistics

Variable	Definition	Mean	SD
Support for tolls	Support for tolls as a source of funding for the region's road and highway system if additional funds are needed to maintain or expand the road, highway, and bridge system in the region (0 = no; 1 = yes)	0.282	0.450
Support for increased fuel tax	Support for increased fuel taxes as a source of funding for the region's road and highway system if additional funds are needed to maintain or expand the road, highway, and bridge system in the region (0 = no; 1 = yes)	0.290	0.454
Use congested roads	Frequency of travel through congested bridge or tunnel (1 = not at all; 2 = once or twice a month; 3 = three or four times a month; 4 = five or six times a month; 5 = more than once a week)	3.256	1.465
Avoid congestion	Avoids visiting a business in a neighboring city due to concerns about traffic congestion (0 = no; 1 = yes)	0.372	0.484
Use transit	Have used public transportation, including buses, taxis, or light rail (0 = no; 1 = yes)	0.064	0.245
Local economic condition	Rating of economic conditions in Hampton Roads today (1 = poor; 2 = fair; 3 = good; 4 = excellent)	2.295	0.704
Importance of roads	Importance of improved roads, highways, and bridges to the region's future economic growth (1 = not at all or not very important; 2 = somewhat important; 3 = very important; 4 = extremely important)	2.855	0.394
Republican	Identifies with Republican Party (0 = no; 1 = yes)	0.251	0.434
Local government waste	Thinks local government has a fair amount of waste (0 = no; 1 = yes)	0.704	0.457
Concern for the environment	We worry too much about the future of the environment and not enough about prices and jobs today (1 = strongly agree; 2 = agree; 3 = disagree; 4 = strongly disagree)	2.613	0.967
Environmental laws	There needs to be stricter laws and regulations to protect the environment (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree)	3.022	0.772
Employed full time	Employment status: full-time employment (0 = no; 1 = yes)	0.445	0.497
Education	Highest level of education (1 = high school diploma or less; 2 = some college education; 3 = college degree; 4 = more than college degree)	2.399	1.045
White	Race: white (0 = no; 1 = yes)	0.612	0.488
Male	Gender: male (0 = no; 1 = yes)	0.352	0.478
Age	Age in years	51.329	16.717

NOTE: SD = standard deviation.

**RESULTS AND FINDINGS**

To answer the first research question—To what extent do residents support instituting tolls and/or increasing the fuel tax?—the authors examine how survey respondents answered the question about funding sources to maintain or expand the road, highway, and bridge systems. The percentage of respondents indicating support or preference for the respective revenue sources is summarized in the following table (*N* = 762):

<i>Revenue Option</i>	<i>Support (%)</i>
Fuel tax	29.0
Tolls	28.2
Neither fuel tax nor tolls	50.0
Both fuel tax and tolls	7.2

As the table shows, 29% of survey respondents supported increasing the fuel tax, and 28.2% supported the introduction of tolls. Only 7.2% supported both. Half of all respondents supported neither funding option. While half the respondents are willing to pay more for transportation, they are about equally divided between two mechanisms, neither of which is close to majority support.

Table 3 summarizes the results of the logit regression models predicting support for introducing tolls and increasing the fuel tax. The same independent variables were used in both regressions. Hypothesis 1 summarizes the expected effect of self-interest on support for tolling. It states that those who are affluent, experience traffic congestion, and use transit are more likely to support tolling as a funding mechanism. This hypothesis received mixed support.

Affluence (measured by education) was statistically significant, while the use of congested roads was statistically significant but in the opposite direction of the prediction.

Hypothesis 2 obtains some support. It states that Republicans, those who believe that government is wasteful, those concerned about the environment, those who believe roads are important, and those who express optimism about the local economic environment are more likely to support tolling. Belief in the importance of roads and in government waste did not reach statistical significance, but the other three belief variables did reach significance in the predicted direction.

Hypothesis 3 posits a positive effect of self-interest on support for fuel taxes. Only one of the measures of affluence—education—was a significant positive predictor. The measures of congestion experience did not reach significance. Use of transit was statistically significant but in the opposite direction of the prediction. This hypothesis, like Hypothesis 1, had mixed support.

Hypothesis 4 was supported. It predicted that Republicans, those who view government as wasteful, or both will oppose fuel taxes, while environmentalists, those who view roads as important, and those who express optimism about the local economic condition will support fuel taxes. Four of the five predictors were statistically significant and in the predicted direction.

Overall, the measures of beliefs were better predictors than those of self-interest for both support for tolling and support for fuel taxes. None of the self-interest indicators predicted support for tolling, and the only significant and positive self-interest predictor of support for

**TABLE 3 Logit Regression Results**

Revenue Option	Support for Tolls		Support for Fuel Tax	
	Coefficient (SE)	Odds Ratio	Coefficient (SE)	Odds Ratio
Use congested roads	-.139 (.069)*	.870	.020 (.072)	1.019
Avoid congestion	-.089 (.203)	.916	.074 (.211)	1.077
Use transit	.313 (.388)	1.367	-.973 (.587)*	.378
Local economic condition	.256 (.137)*	1.291	.284 (.146)*	1.329
Importance of roads	-.017 (.247)	.983	.489 (.322)	1.631
Republican	.422 (.233)*	1.525	-.524 (.249)*	.592
Local government waste	.207 (.208)	1.230	-.400 (.212)*	.670
Concern for the environment	-.231 (.105)*	.793	-.277 (.109)**	.758
Environmental laws	-.146 (.134)	.864	.105 (.142)	1.110
Employed full time	-.234 (.204)	.791	.149 (.218)	1.161
Education	.160 (.095)*	1.174	.334 (.098)***	1.397
White	.215 (.217)	1.230	.876 (.229)***	2.401
Male	.155 (.201)	1.167	.262 (.210)	1.299
Age	-.015 (.007)*	.985	.022 (.007)**	1.022
Constant	.056 (.991)	1.06	-4.945 (1.204)***	.007

NOTE: SE = standard error;  $N = 593$ . Support for tolls:  $\chi^2 = 29.38^{**}$ ; McFadden's pseudo- $R^2 = .041$ ; Cragg-Uhler (Nagelkerke) pseudo- $R^2 = .069$ ; correct classification = 71.67%. Support for fuel tax:  $\chi^2 = 88.69$ ; McFadden's pseudo- $R^2 = .124$ ; Cragg-Uhler (Nagelkerke) pseudo- $R^2 = .198$ ; correct classification = 73.52%. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

fuel taxes was educational attainment. Transit use was significant but negative. The results are summarized in Table 4.

**CONCLUSIONS AND IMPLICATIONS**

The goal of this research was to examine public preferences for two revenue options—implementing tolls and increasing the fuel tax—to pay for roads, highways, and bridges. This examination took place in the context of current concerns about the aging infrastructure, congestion, and the need for greater capacity, coupled with a fiscal environment in which the public is generally opposed to government spending and higher taxes and fees. An interesting finding is that in no instance did a majority of respondents indicate support for a particular funding option, yet half of all respondents were supportive of one or the other option.

The respondents were slightly more likely to support increasing the fuel tax over implementing tolls, but this difference was very small

**TABLE 4 Summary of Findings About Predicted Relationships**

Variable	Support for Tolls	Support for Fuel Taxes
Self-interest		
Affluence	+ (H1a) <sup>a</sup>	+ (H3a) <sup>a</sup>
Experience with and concern for congestion	- (H1b) <sup>a(b)</sup>	+ (H3b)
Use transit	+ (H1c)	- (H3c) <sup>a(b)</sup>
Belief		
Republican Party	+ (H2a) <sup>a</sup>	- (H4a) <sup>a</sup>
Environmental concern	+ (H2b) <sup>a</sup>	+ (H4b) <sup>a</sup>
Government is wasteful	+ (H2c)	- (H4c) <sup>a</sup>
Roads are important	+ (H2d)	+ (H4d)
Positive economic conditions in community	+ (H2e) <sup>a</sup>	+ (H4e) <sup>a</sup>

<sup>a</sup>Statistically significant at  $p < .05$ .

<sup>b</sup>Statistically significant but in opposite direction of predicted.

and not statistically significant. The findings suggest that ideological beliefs contribute greatly to the public's willingness to support either of the two revenue sources. The findings also suggest that the factors that lead to support or opposition can differ in relation to the revenue source. For instance, Republicans opposed fuel taxes but not the use of tolls as a source of funding for the region's road and highway system. In this respect, the position of the Republican Party and its members appears to be in line with economic theory, which deems user fees more efficient.

A full 70% of respondents agreed that local government wastes money, and those subscribing to this attitude were significantly more likely to oppose raising fuel taxes. Clearly, those seeking to raise fuel taxes will need to overcome or neutralize this belief. A common way to do this appears to be a tax proposal that dedicates the new revenue directly to something the public views as a legitimate need. For instance, New Hampshire in 2014 increased its fuel tax and dedicated all the new revenues from the increase to specific projects and to maintenance work. As the results of the Agrawal et al. study suggest, the public is very willing to pay for maintenance (6). In the more rural and low-income states, however, the more advisable position might be reliance less on the fuel tax and more on tolls or having local-option fuel taxes in more prosperous urban regions of the state where residents tend to depend less on their automobiles.

The results point to other groups of voters willing to support new revenues. Environmentalists and the more affluent (as measured by education level) are potential supporters of efforts to raise revenue to fund urban transportation infrastructure. Presumably, people who experience congestion would be more supportive if they were asked about a specific proposal for a toll facility that they were likely to use on a regular basis. One measure of self-interest, education level, which the authors interpreted as a measure of affluence or the ability to pay, was a significant predictor of support for tolls and the fuel tax.

Taken together, the findings imply that, to build a coalition large enough to increase the fuel tax, activists would start by enlisting Democrats, environmentalists, and the more educated or affluent. However, to produce a majority coalition, the results also suggest that the tax proposal somehow confront the belief that government waste is a problem and reassure the public that the revenue raised will be spent on a real public need. Quite often, this approach will require a compelling demonstration of a need in the public discussion and a proposal that clearly dedicates the new revenues to the need (34). Tolls, in contrast, appear to have the political support of Republicans and environmentalists, two groups that are often considered at odds. This support base can be further enhanced by enlisting groups of more-affluent residents. But proponents of tolling must also be careful to address the concerns of those who experience or are concerned with congestion, as they will be more likely not to be supportive of tolls (possibly because of the perception that toll avoidance may exacerbate congestion on nontolled roads).

Admittedly, this study examined support for transportation revenue options in an urban region, where problems about congestion (primarily associated with roads, bridges, and tunnels) drive the conversation about transportation. Although specific findings apply only to the population of Hampton Roads, Virginia, they fit within the patterns that current literature suggests are found in other regions. While this limitation in applicability may pose challenges to generalizability, support levels for different revenue options vary across studies. Furthermore, the support levels found in this study are reasonably consistent with those found in polls and studies in other areas of the country. A 2014 poll of New Jersey voters found

72% opposition to raising the fuel tax (35), and a 2013 Gallup poll found 66% opposition to increasing the state fuel tax (9). This study sample likely captures broader sentiments about support for different transportation revenue options, and these findings are likely generalizable across other urban settings.

Rural residents, however, may differ from urban residents. A similar survey of Kentucky residents found that tolling garnered 46% support and increasing the fuel tax only 17% (36). The low level of support for raising the fuel tax in the Kentucky study may be a function of the state's demographics: a large percentage of Kentucky's residents are rural and lower income. Relying more on automobiles and small trucks for transportation, rural residents probably spend a larger share of their disposable income on fuel. Therefore, this study's findings may be more applicable to financing infrastructure in an urban context.

That this study finds different beliefs to be driving support for different revenue options has implications for public deliberations over transportation finance and how to raise the needed revenue to support the transportation system. Most importantly, public preferences about revenue options should be considered in tandem with the research on public participation and citizen engagement. States and localities have increasingly turned to citizen referenda and ballot boxes to make decisions about implementation of local option taxes, increasing taxes, or introducing new fees. For government officials, understanding public preferences and beliefs is the first step in understanding how citizens may respond to referenda and ballots but should not be the only step in government-citizen interactions. For example, O'Connell and Yusuf point to the need to educate and inform citizens about the issue being deliberated (34). They found that public support for contentious or complex transportation revenue solutions, such as increases to the fuel tax or vehicle registration fees, can be increased through the dissemination of the right types of information. This research suggests that the source of new funds should be linked to their specific use to counteract the belief that government will waste the new revenue. This linkage can increase the chances of public acceptance of a funding increase. Therefore, policy makers considering solutions that have low levels of initial public support do not necessarily need to despair and abandon these solutions. However, they need to consider how their proposals can be better tailored to address the different groups of stakeholders and to reassure them that the new revenue will in fact meet the proposed need.

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