EQUITY EVALUATION OF MILEAGE-BASED USER FEES IN TEXAS

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INTRODUCTION

• **Texas State Gas Tax:** 20.0 cents per gallon since 1991
• **Federal Gas Tax:** 18.4 cents per gallon since 1993
• **Issues:**
  • Inflation
  • Increased Vehicle Fuel Efficiency
  • Population and VMT Increasing
  • Expanding Fuel Sources
  • Aging Infrastructure
• **One potential solution:**
  • Change to a Vehicle Miles Traveled (VMT) Fee System
Texas Motor Fuels Tax Adjusted for Inflation

Effective Tax Rate (Cents per Gallon)

- 1991: $0.20
- 1993: $0.18
- 1995: $0.16
- 1997: $0.16
- 1999: $0.14
- 2001: $0.14
- 2003: $0.13
- 2005: $0.13
- 2007: $0.12
Average Fleetwide Fuel Efficiency in Texas: Gasoline Powered Vehicles
Annual Percent Increase in Texas: 1990 to 2007

- Population: 2.00%
- Registered Vehicles: 2.50%
- Vehicle Miles Traveled: 3.50%
- State-Maintained Lane Miles: 0.50%
REVIEW OF PREVIOUS VMT RESEARCH

• Oregon has taken the lead on VMT fee research
  • 200 vehicle pilot test

• University of Iowa Public Policy Center
  • Installed VMT tracking devices in vehicles in 12 cities across America

• I-95 Corridor Coalition along eastern coast
  • Discussed possibility of multi-state VMT revenue system

• National Commissions recommend heading towards a VMT fee when looking beyond short-term fix
RESEARCH OBJECTIVE

- Develop, test, and analyze four VMT fee scenarios with respect to equity
DEFINING EQUITY

- **Horizontal Equity**
  - Equal Treatment of Equals
  - Avoid favoring certain individuals or groups
  - How members of same group fare relative to one another
  - Rural versus Urban distinction (Scenario 4)

- **Vertical Equity**
  - Unequal Treatment of Unequals
  - Poor or disadvantaged individuals should be charged less than their more wealthy counterparts
  - Based on household income level
• Performed every 5-7 years
• 2009 version included over 150,000 households nationwide
• Version 2.1 of 2009 NHTS released mid-February 2011
• Key variables we used:
  • ANNIMILES (Self-reported annualized mile estimate)
  • EIADMPG (EIA derived miles per gasoline-equivalent gallon estimate)
  • FUELTYPE (Type of fuel)
• Texas paid for an additional 20,000 household surveys
• Began with 21,410 Texas households with 45,122 vehicles
• Filtered down to 14,595 Texas households with 29,162 vehicles
RESEARCH METHODOLOGY

• Use 2009 National Household Travel Survey (NHTS) data to assess the equity impacts of four VMT fee scenarios

  • **Scenario 1:** Flat VMT Fee
  • **Scenario 2:** Flat VMT Fee for Added Revenue
  • **Scenario 3:** Three-Tier VMT Fee to Encourage “Green” Vehicles
  • **Scenario 4:** Urban and Rural VMT Fee

• Examined scenarios assuming no change in travel behavior
WEIGHTING NHTS DATA

- Weighted the data (14,595 households) to reflect all vehicle-owning Texas households in the year 2008, disaggregated by:
  
  A) Household Income Level (5 classes)
  B) Household Size (1 to 4+)
  C) Number of Household Employees (0, 1, 2+)
  D) Household Geographic Location (Urban, Rural)

- Represent Texas’s 7.9 million vehicle-owning households
SCENARIO 1: FLAT VMT FEE

• Calculated a flat VMT fee that would generate same net revenue as Texas state gas tax
• Accounted for VMT fee system costs, resulting in VMT fees approximately 42% greater
• **Static Scenario 1:** $0.01426 per mile
• **Example:**
  • Texas State Gas Tax=$0.20/gallon
  • If average fuel economy=20 mpg (actually a little higher); $0.01/mile
  • Bump-up cost by 42%; would now be $0.0142/mile
SCENARIO 2: FLAT VMT FEE FOR ADDED REVENUE

- Designed to generate $14.3 billion additional net revenue annually (2030 Texas Transportation Needs Committee)
- Scaled version of Scenario 1
- Static Scenario 2: $0.1156 per mile fee
SCENARIO 3: THREE-TIER VMT FEE TO ENCOURAGE “GREEN” VEHICLES

<table>
<thead>
<tr>
<th>Average Vehicle Fuel Economy</th>
<th>Median Vehicle Fuel Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.02 MPG</td>
<td>19.60 MPG</td>
</tr>
</tbody>
</table>

- **Static Model**
  - Fuel Econ. < Median $0.1541
  - Fuel Econ. between Median and Mean $0.1156
  - Fuel Econ. > Mean $0.0771
## Scenario 4: Urban and Rural Distinction

### Cost Table

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Description</th>
<th>Annual Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Cost</td>
<td>Urban Mobility</td>
<td>7.8 Billion</td>
</tr>
<tr>
<td>Rural Cost</td>
<td>Rural Mobility and Safety</td>
<td>0.9 Billion</td>
</tr>
<tr>
<td>Shared Cost</td>
<td>Pavement Maintenance</td>
<td>4.0 Billion</td>
</tr>
<tr>
<td>Shared Cost</td>
<td>Bridge Maintenance</td>
<td>1.6 Billion</td>
</tr>
</tbody>
</table>

### Static Model under 80/20 Assumption

- **Urban Roadway Fee:** $0.1325 per mile fee
- **Rural Roadway Fee:** $0.08621 per mile fee
## Percent Increase in the Average Annual Amount Assessed Per Household in the Form of a VMT Fee Versus the State Gas Tax for the Static Models (%)

<table>
<thead>
<tr>
<th>Household Income Level ($1,000s)</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4 80/20 Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urb</td>
<td>Rur</td>
<td>Urb</td>
<td>Rur</td>
</tr>
<tr>
<td>&lt;20</td>
<td>41.3</td>
<td>38.6</td>
<td>1,045</td>
<td>1,023</td>
</tr>
<tr>
<td>20-40</td>
<td>44.8</td>
<td>36.3</td>
<td>1,073</td>
<td>1,005</td>
</tr>
<tr>
<td>40-60</td>
<td>43.4</td>
<td>39.9</td>
<td>1,062</td>
<td>1,034</td>
</tr>
<tr>
<td>60-100</td>
<td>43.1</td>
<td>39.3</td>
<td>1,059</td>
<td>1,029</td>
</tr>
<tr>
<td>100+</td>
<td>43.3</td>
<td>40.2</td>
<td>1,061</td>
<td>1,036</td>
</tr>
<tr>
<td>Total</td>
<td>43.3</td>
<td>39.1</td>
<td>1,061</td>
<td>1,027</td>
</tr>
</tbody>
</table>
**VERTICAL EQUITY**

**GINI COEFFICIENT (G)**

\[ G = \frac{A}{A + B} \]

![Diagram showing the Gini coefficient and areas A and B. The diagram illustrates the accumulated proportion of tax burden against the accumulated proportion of households based on income, with the Lorenz curve and the equity line.]
# Vertical Equity Results: Gini Coefficient

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Gini Coefficient (G)</th>
<th>Description of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Scenario 3</td>
<td>0.1734</td>
<td>Most Progressive</td>
</tr>
<tr>
<td>Dynamic Scenario 3</td>
<td>0.1712</td>
<td></td>
</tr>
<tr>
<td>Static Scenario 1</td>
<td>0.1697</td>
<td></td>
</tr>
<tr>
<td>Static Scenario 2</td>
<td>0.1697</td>
<td></td>
</tr>
<tr>
<td>Dynamic Scenario 1</td>
<td>0.1692</td>
<td></td>
</tr>
<tr>
<td>Gas Tax</td>
<td>0.1687</td>
<td></td>
</tr>
<tr>
<td>Dynamic Scenario 2</td>
<td>0.1684</td>
<td></td>
</tr>
<tr>
<td>Static Scenario 4, 70/30</td>
<td>0.1672</td>
<td></td>
</tr>
<tr>
<td>Static Scenario 4, 80/20</td>
<td>0.1670</td>
<td></td>
</tr>
<tr>
<td>Dynamic Scenario 4, 70/30</td>
<td>0.1661</td>
<td></td>
</tr>
<tr>
<td>Dynamic Scenario 4, 80/20</td>
<td>0.1656</td>
<td>Most Regressive</td>
</tr>
</tbody>
</table>
VERTICAL EQUITY RESULTS

- Differences in Gini Coefficients are small
- Texas state gas tax near the mid-point
HORIZONTAL EQUITY

• Scenario 4: Inherently horizontally equitable

• VMT fees associated with urban roadways go towards addressing urban roadway needs (similar for rural areas)

• Scenarios with urban/rural household revenue distributions most distant from those under Scenario 4 are the least horizontally equitable
### HORIZONTAL EQUITY: STATIC RESULTS

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Percentage of Revenue Collected from Urban Households</th>
<th>Percentage of Revenue Collected from Rural Households</th>
<th>Comments</th>
<th>Percent Difference in Rural Household Revenue versus Scenario 4 (80/20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Scenario 4</td>
<td>77.4</td>
<td>22.6</td>
<td>Horizontally Equitable</td>
<td>0</td>
</tr>
<tr>
<td>Static Scenario 2</td>
<td>72.6</td>
<td>27.4</td>
<td></td>
<td>4.8</td>
</tr>
<tr>
<td>Static Scenario 1</td>
<td>72.6</td>
<td>27.4</td>
<td></td>
<td>4.8</td>
</tr>
<tr>
<td>State Gas Tax</td>
<td>72.0</td>
<td>28.0</td>
<td></td>
<td>5.4</td>
</tr>
<tr>
<td>Static Scenario 3</td>
<td>71.7</td>
<td>28.3</td>
<td>Rural Households Affected Most Negatively</td>
<td>5.7</td>
</tr>
</tbody>
</table>
RESEARCH LIMITATIONS

• Road-type travel breakdown by both urban households and rural households based on educated estimate (seems reasonable based on some TTI research using GPS data estimates)

• Only gasoline-run household vehicles included (excluded only 1.6 percent of vehicles)

• Actual installation costs, operating costs, and leakage costs unknown
CONCLUSIONS

- Using NHTS data from 14,595 Texas Households, weighted to reflect all vehicle owning Texas Households, we investigated the equity impacts of replacing the state gas tax with a VMT fee under four scenarios and found:
  - Small differences in vertical equity impacts for the VMT scenarios versus the current state gas tax
  - Some negative horizontal equity impacts for rural households under most scenarios...but most were more equitable than the current state gas tax
  - The scenario favoring fuel efficient vehicles (#3) was the least horizontally equitable but most progressive (vertical equity)
QUESTIONS???