

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
 - Aging Infrastructure
- **One potential solution:**
 - Change to a Vehicle Miles Traveled (VMT) Fee System



RESEARCH OBJECTIVE

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

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 (a) assuming no change in travel behavior (static) and (b) assuming some change (dynamic)



- Version 2.1 of 2009 NHTS released mid-February 2011
- Key variables we used:
 - ANNMILES (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 households with 45,122 vehicles
- Filtered down to 14,595 households with 29,162 vehicles

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



PRICE ELASTICITIES

Household Income Level (\$1,000s)	Urban	Rural
<20	-0.447	-0.254
20-40	-0.280	-0.159
40-60	-0.259	-0.147
60-100	-0.335	-0.191
100+	-0.373	-0.212

Adopted from Wadud, Graham and Noland, 2009

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
- **Dynamic Scenario 1:** \$0.01442 per 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
- **Dynamic Scenario 2:** \$0.1503 per mile fee

SCENARIO 3: THREE-TIER VMT FEE TO ENCOURAGE “GREEN” VEHICLES

Average Vehicle Fuel Economy	Median Vehicle Fuel Economy
21.02 MPG	19.60 MPG

- **Static Model**

- Fuel Econ. < Median \$0.1541
- Fuel Econ. between Median and Mean \$0.1156
- Fuel Econ. > Mean \$0.0771

- **Dynamic Model**

- Fuel Econ. < Median \$0.1974
- Fuel Econ. Between Median and Mean \$0.1480
- Fuel Econ. > Mean \$0.0987

SCENARIO 4: URBAN AND RURAL DISTINCTION

Cost Type	Description	Annual Amount (\$)
Urban Cost	Urban Mobility	7.8 Billion
Rural Cost	Rural Mobility and Safety	0.9 Billion
Shared Cost	Pavement Maintenance	4.0 Billion
Shared Cost	Bridge Maintenance	1.6 Billion

Static Model under 80/20 Assumption

- **Urban Roadway Fee:** \$0.1325 per mile fee
- **Rural Roadway Fee:** \$0.08621 per mile fee

Dynamic Model under 80/20 Assumption

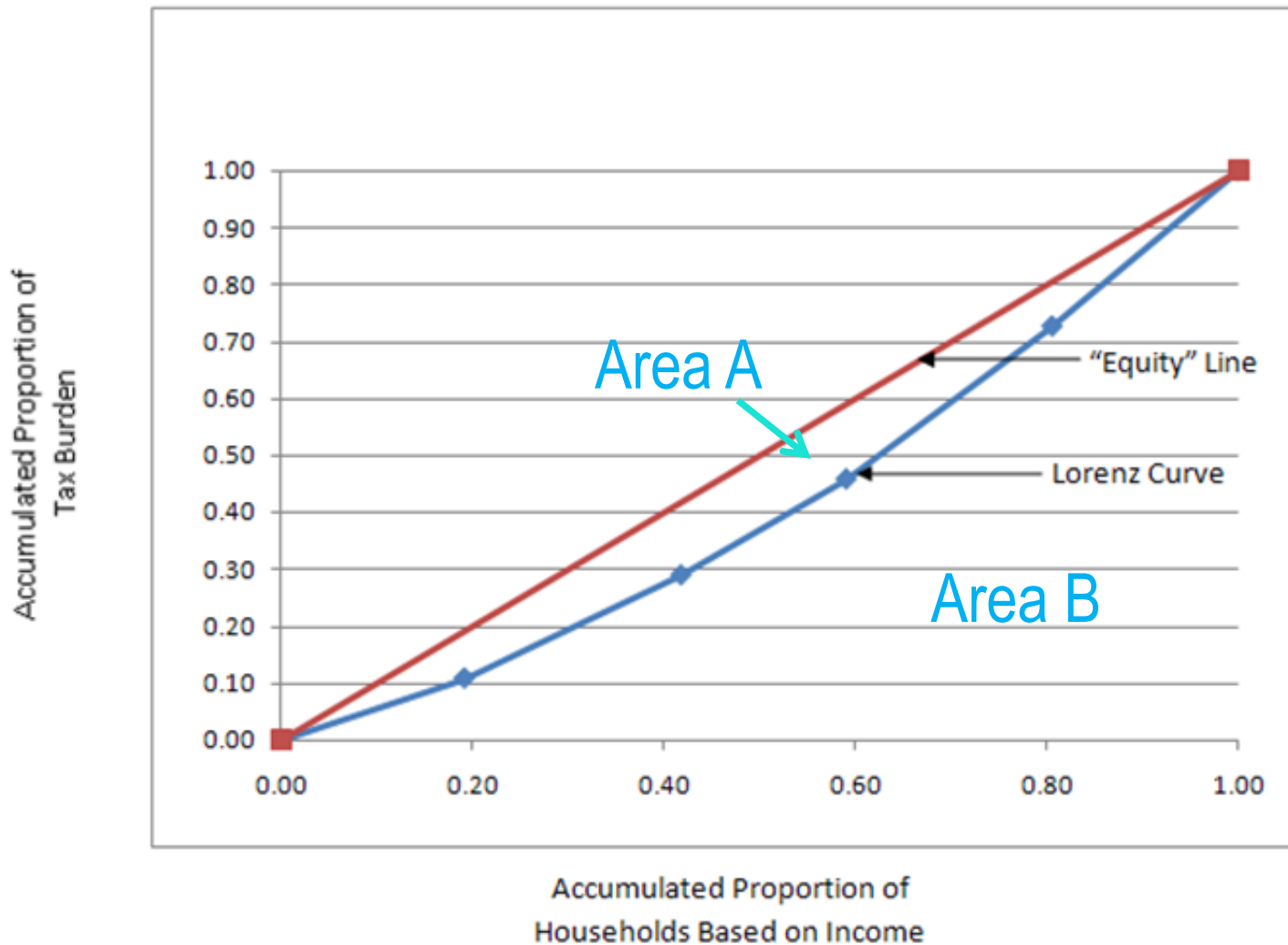
- **Urban Roadway Fee:** \$0.1799 per mile fee
- **Rural Roadway Fee:** \$0.1072 per mile fee

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 (%)

Household Income Level (\$1,000s)	Scenario 1		Scenario 2		Scenario 3		Scenario 4 80/20 Assumption	
	Urb	Rur	Urb	Rur	Urb	Rur	Urb	Rur
<20	41.3	38.6	1,045	1,023	1,030	1,062	1,121	827
20-40	44.8	36.3	1,073	1,005	1,033	1,051	1,151	812
40-60	43.4	39.9	1,062	1,034	1,042	1,058	1,139	837
60-100	43.1	39.3	1,059	1,029	1,056	1,074	1,136	833
100+	43.3	40.2	1,061	1,036	1,059	1,069	1,138	838
Total	43.3	39.1	1,061	1,027	1,047	1,065	1,138	831

VERTICAL EQUITY GINI COEFFICIENT (G)

$$G = \frac{A}{A + B}$$



VERTICAL EQUITY RESULTS: GINI COEFFICIENT

Scenario	Gini Coefficient (G)	Description of Results
Static Scenario 3	0.1734	Most Progressive
Dynamic Scenario 3	0.1712	
Static Scenario 1	0.1697	
Static Scenario 2	0.1697	
Dynamic Scenario 1	0.1692	
Gas Tax	0.1687	
Dynamic Scenario 2	0.1684	
Static Scenario 4, 70/30	0.1672	
Static Scenario 4, 80/20	0.1670	
Dynamic Scenario 4, 70/30	0.1661	
Dynamic Scenario 4, 80/20	0.1656	Most Regressive

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

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

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)