Winners and Losers: Distributional Impacts of Highway User Fees

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“Good economics does not help produce informed decisions if it is not understandable to the policymaker.” (Joint Committee on Taxation)
Highway User Fees and Asset Management: Policy to generate revenue for Infrastructure

Road user charges are fees (taxes) collected to cover road costs vs.

Congestion fees which are to deal with externalities
Case Study: Oregon

Proposed Change in Highway User Charges: From a Gasoline Tax to Vehicle Mile Fee

**Purpose of Tax:** To Collect Road User Fees (We will not consider congestion fees here)

**Intent:** Revenue Neutral Fee

VMT tax set at $.012/mile to replace $.24/gallon gasoline tax ($0.012 = $0.24/20 mpg)
Oregon legislature has realized the futility of trying to fund highways with the current 24 cent/gallon tax. No political support for raising the tax. Given trend towards more fuel efficient vehicles, fuel tax no serves as a road user fee as light vehicle road damage is more related to miles rather than fuel consumed. Suggestion by legislatively appointed Road User Fee Task Force (RUFTF): Replace gasoline tax with a Vehicle Mile Tax (VMT).
Who Gains and Loses From This Change?

Distribution of Costs:
- Between Income Groups
- Between regions (urban/rural)

Identification important for decisions regarding revenue distribution
Regressive, Progressive, and Proportional or Neutral Tax/Fee Structures

- A regressive fee takes a greater percentage of income from lower income groups and higher income groups pay a smaller percentage of income.

- A progressive fee means that higher income groups pay a progressively higher percent of their income in fees.

- In a proportional or neutral fee structure all income groups pay the same percent of their income in fees.
The change from a Gas Tax to a VMT will result in an increase in the cost per mile of driving to some; a reduction in the price of driving to others.

Price Increase: Vehicles with MPG > 20
Price Decrease: Vehicles with MPG < 20
No Change: Vehicles with MPG = 20
Is the Proposed Change in User Fee Structure a Regressive Change?

- **Static Analysis**: Assumes that behavior is not affected by a change in fee structure; each driver drives exactly the same amount with each vehicle as before the fee was implemented.

- **Dynamic Analysis**: Tries to account for the fact that consumers will change driving behavior in response to the change in the price of driving that the tax change causes.
Effect of a Tax change: Static Model

Price ($p$)

$q_G/q_{VMT}$  Quantity ($q$)

$p_{VMT}$

$p_G$
Change in consumer surplus, tax revenue, and social welfare

- Note that the change in consumer surplus (CS) in this case is exactly equal to (and opposite to) the change in tax revenue (TR).

The Change in Overall Welfare in the static model is:

\[ CS + TR = 0 \]
### Average Change in Tax Revenue by Income ($/Household) – Static Model Results

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Tax Revenue = -CS Change/HH ($/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14,999</td>
<td>7.81</td>
</tr>
<tr>
<td>15,000-29,999</td>
<td>5.19</td>
</tr>
<tr>
<td>30,000-44,999</td>
<td>-4.40</td>
</tr>
<tr>
<td>45,000-59,999</td>
<td>.23</td>
</tr>
<tr>
<td>60,000-74,999</td>
<td>-25.24</td>
</tr>
<tr>
<td>75,000-200,000</td>
<td>-6.00</td>
</tr>
</tbody>
</table>
Conventional Wisdom

The static model will overestimate the impact of a tax increase, underestimate the impact of a tax decrease.

Static model assumes that the change in tax revenues paid is the only impact that a tax change will cause --- a direct transfer from consumer to the government.
DYNAMIC ANALYSIS:

Once behavior changes by the consumer are considered (movement along the demand curve), the relevant measure of the change in welfare for consumers is the change in **consumer surplus (CS)**---not simply the change in tax revenue (TR).

For a tax increase, consumers may end up paying less in taxes, but they may do so by driving less---and that involves another loss.
Change in Consumer Surplus with Demand Response

\[ \text{Price (p)} \]

\[ P_{\text{vmt}} \]

\[ P_{\text{gas}} \]

\[ Q_{\text{vmt}} \]

\[ Q_{\text{gas}} \]

\[ \text{Quantity (q)} \]
Total Change in Revenue for an Increase in Price: B-A

Price change to agency from price increase = B - A; price decrease = A - B
Changes in Total Social Welfare
CS change + TR Change

In the dynamic model the overall social welfare may rise or fall, depending on the signs and relative sizes of the change in CS and change in TR.

However, the total social welfare gain or loss does not tell us whether individual income groups are impacted differently.

(Remember, in the static model there is no overall change in social welfare, but there is a distributional impact.)
To get dynamic response, we need a model that take into account the behavioral responses ---which may differ by income group

In this example we use We use an OLS model ---this gives an estimation of demand
## Comparison of Static Model and OLS Model Change in Revenue

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Static Model Fee Change</th>
<th>Dynamic Model Fee Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14,999</td>
<td>7.81</td>
<td>4.97</td>
</tr>
<tr>
<td>15,000-29,999</td>
<td>5.19</td>
<td>5.30</td>
</tr>
<tr>
<td>30,000-44,999</td>
<td>-4.40</td>
<td>-4.37</td>
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<td>45,000-59,999</td>
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<td>6.37</td>
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<tr>
<td>60,000-74,999</td>
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<td>-10.12</td>
</tr>
<tr>
<td>75,000-200,000</td>
<td>-6.00</td>
<td>-2.68</td>
</tr>
</tbody>
</table>
Apparent Conclusion

• The Dynamic Model Comparison of the change in tax revenues makes the policy impact appear less regressive than in the static model (consistent with conventional wisdom)

Lower income groups still pay more; higher income groups pay less, but amounts are smaller. **However**

This is NOT the full impact of the policy change on consumers:
To see this, you need to look at consumer surplus changes
## Change in Consumer Surplus (loss to consumers) in Dynamic Models ($/HH/year)

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Dynamic Model CS Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14,999</td>
<td>-7.36</td>
</tr>
<tr>
<td>15,000-29,999</td>
<td>-6.40</td>
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<tr>
<td>30,000-44,999</td>
<td>+9.44</td>
</tr>
<tr>
<td>45,000-59,999</td>
<td>-2.34</td>
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<tr>
<td>60,000-74,999</td>
<td>+28.69</td>
</tr>
<tr>
<td>75,000-200,000</td>
<td>+12.74</td>
</tr>
</tbody>
</table>
When the dynamic incidence takes into account the consumer responses to a change in tax and uses *consumer surplus* as the change in consumer welfare, the incidence results look very close to that obtained from the static model---

The problem is that policymakers seem to focus on the change in tax rather than the total change in consumer surplus when calculating incidence.

Maybe this is an argument for using the static analysis?
The change in tax revenues paid by a consumer group as a result of tax/fee change does not tell the whole story. The appropriate measure to use to determine the incidence of policy change such as this is the change in consumer surplus. While it is correct to recognize demand response to the change in tax, basing the consumer incidence on tax revenue changes alone may be misleading.