Distance-based road taxes – pros and cons

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Reasons for taxing road transport

• Internalize external effects (emissions, wear & tear, noise, accidents etc.)

• Tax source (fund public spending, e.g. on infrastructure)

• Considerations differ depending on the purpose
Considerations when evaluating transport taxes

• Internalizing external effects
  – Size of unpriced externalities?
  – Price elasticity?
  – System costs?

• Tax source
  – Deadweight loss?
  – Fairness, equity?
  – System costs?

• High price elasticity is *good* when internalizing, *bad* when collecting revenues
Net social benefits of internalization (simplified)

\[ \text{net benefits} = (\text{externalities} - \text{tax}) \times (\text{traffic reduction}) - (\text{system costs}) \]

- Revenues don’t enter – just a transfer (cancel out)
  - (“Double dividend” if revenues are used to lower distortionary taxes)

- “Traffic reduction” (or “modal shift”) is not a benefit in itself – common confusion!
  - This matters since externalities vary a lot between situations

- If tax > externalities \(\rightarrow\) welfare loss
  - In practice, some traffic will be “overtaxed” and some “undertaxed”, since externalities vary
  - Real systems must find “good enough” differentiation where benefits > welfare losses
  - Remember that some externalities are already taxed or regulated
“Good” example: Stockholm congestion charges

• High price elasticity: 20% less traffic across cordon during charged hours
• Large externalities (mainly congestion)
• Relatively low system costs (investment + operations)

\[
\text{net benefits} = (\text{unpriced externalities}) \times (\text{traffic reduction}) - (\text{system costs})
\]

60 M€ \hspace{1cm} 80 M€ \hspace{1cm} 20 M€
Nationwide road user charges?

Passenger cars:
• Rather low price elasticity (large variation, situation specific)
• Small unpriced externalities (on average) if electric
• Very large system costs (for differentiated charges)

Heavy goods vehicles:
• Low price elasticity
• Medium-sized unpriced externalities
• Large system costs (for differentiated charges)
<table>
<thead>
<tr>
<th>SEK per km</th>
<th>Passenger car (gasoline)</th>
<th>HGV (diesel)</th>
<th>HGV + trailer (diesel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear &amp; tear</td>
<td>0.04</td>
<td>0.43</td>
<td>1.76</td>
</tr>
<tr>
<td>Accidents</td>
<td>0.02</td>
<td>0.26</td>
<td>0.26</td>
</tr>
<tr>
<td>CO2 emissions</td>
<td>0.19</td>
<td>0.73</td>
<td>1.10</td>
</tr>
<tr>
<td>Other emissions</td>
<td>0.01</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Noise</td>
<td>0.02</td>
<td>0.07</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>0.26</strong></td>
<td><strong>1.59</strong></td>
<td><strong>3.43</strong></td>
</tr>
<tr>
<td>TOTAL excl. emissions</td>
<td><strong>0.07</strong></td>
<td><strong>0.76</strong></td>
<td><strong>2.23</strong></td>
</tr>
<tr>
<td><strong>TAX</strong></td>
<td><strong>0.48</strong></td>
<td><strong>1.29</strong></td>
<td><strong>1.94</strong></td>
</tr>
</tbody>
</table>
System costs for differentiated road taxes

- Externalities (except CO2) vary a lot in space and time (and HGV weight)
  - Internalizing tax needs to be differentiated – not just based on total distance
  - Odometer readings or vignettes not enough (average externality so low)

- Differentiated tax requires vehicle installment, control, payment collection & enforcement
  - Even if vehicles already have some technology installed (e.g. GPS)

- Many vehicles → installments expensive
- Many users → collection & enforcement expensive
- Large network → control expensive
System costs – magnitudes

• Stockholm & Gothenburg congestion charges (passage-based charge): ~10 M€/year
  – Small network (~50 charged links)
  – No vehicle installments or separate “control” necessary – number plate recognition
  – Many users, but effective vehicle registry and tax collection keeps collection/enforcement costs down

• Proposed Swedish HGV differentiated road tax: investment 200-1500 M€, operations 60-300 M$/year
  – Total external costs for HGVs ~ 2000 M€/year
Comments

- CO2 emissions can be perfectly internalized by fuel tax
- Average passenger car externalities small – but can be large locally
- Cost for nationwide system likely to be very high
- Local externalities cheaper/easier to handle with passage-based charges or local regulations

- HGV externalities sizeable, *but* price elasticity likely low, system costs high
  - Accidents: differentiated insurances?
  - Wear & tear: local charges?
Road user taxes as a revenue source

• Low deadweight loss if price elasticity is low
  – HGVs low price elasticity; passenger cars medium

• Collection costs very high compared to most other tax sources (income, profits, VAT…)

• Equity & fairness considerations important
  – compare with alternative tax sources: income tax, VAT, …
Distributional effects – two perspectives

- **Prices** are usually the same for everyone (for good reasons)
- Income redistribution is usually (and more effectively) carried out by progressive taxation and cash transfers, not subsidies for specific goods (like road use)
  - Trust people to decide for themselves how to optimally allocate their money on e.g. housing, food, clothes, transport and other goods

- **Internalization is a price correction**
  - It adjust transport prices to what they *should* be

- Hence, distributional profile of internalizing tax irrelevant (in the long run)

- **Collecting public funds** is a very different story!
  - Fairness, equity and distributional effects are *highly* relevant!
  - Usually, we want some progressivity (rich contribute a higher share of their income)
  - … and "horizontal equity" (same income → same contribution)
Welfare loss from km tax, relative to income, by income octile

Progressive on average, except highest and lowest octile
Hurts rural areas much more
Horizontal equity a problem – large variation *within* income groups

Larger share of low income groups pay “a lot”, although they pay less on average
Fairness: the “users should pay” argument

- Currently: revenues from marginal cost road pricing > maintenance/investment costs for roads
- With electric cars, marginal social cost pricing will likely not cover fixed costs
- So who should cover fixed road costs?
- Is it fair that road users pay for roads’ fixed costs, rather than all taxpayers?
- When is it reasonable that “users should pay [fixed costs]”?
  - Road users in Stockholm should hardly pay for roads in Northern Sweden, if we take “users should pay” argument seriously…?!
- Highly political/ethical debate; good to aim for (some) consistency…
(Very) Tentative conclusions

- With electric traffic, benefits from reduced externalities are likely small compared to system costs for differentiated road user tax (on average)
  - Either bc. small externalities (cars) or low price elasticity (trucks)
- Local externalities can be substantial, but cheaper/easier to handle by other means than general road used charge (passage-based charges, local regulations)
- Road user tax as source of public funds:
  - Problematic distributional profile (from horizontal equity perspective)
  - High collection cost (compared to alternatives)
  - Relevance of "users should pay" argument dubious
- Caveat: conclusions are situation- and policy-specific!