

Distance-based road taxes – pros and cons

Jonas Eliasson

Professor Transport Systems, Linköping University

Director of Transport Accessibility, Swedish National Transport Administration

Chair Div. of Civil Engineering, Royal Academy of Engineering Sciences

Vice chair Governmental Expert Group for Public Economics (ESO)

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)

$$\text{net benefits} = (\text{externalities} - \text{tax}) * (\text{traffic reduction}) - (\text{system costs})$$

- 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 → 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)

net benefits = (unpriced externalities)(traffic reduction) – (system costs)*

60 M€

80 M€

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)

Road traffic externalities (average in Sweden) excl. congestion

SEK per km	Passenger car (gasoline)	HGV (diesel)	HGV + trailer (diesel)
Wear & tear	0.04	0.43	1.76
Accidents	0.02	0.26	0.26
CO2 emissions	0.19	0.73	1.10
Other emissions	0.01	0.10	0.10
Noise	0.02	0.07	0.18
TOTAL	0.26	1.59	3.43
TOTAL excl. emissions	0.07	0.76	2.23
<i>TAX</i>	<i>0.48</i>	<i>1.29</i>	<i>1.94</i>

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?

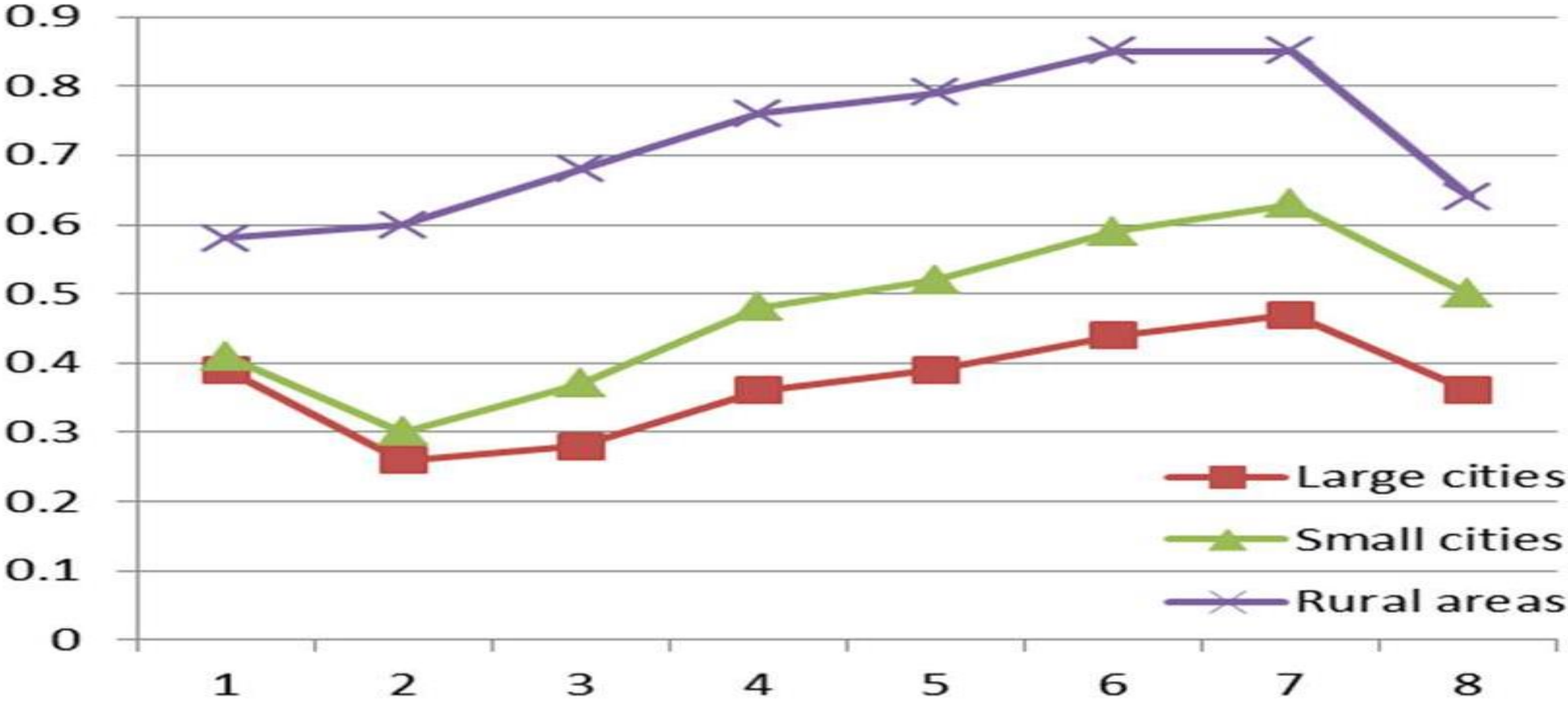
Road user taxes as a revenue source

- 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)

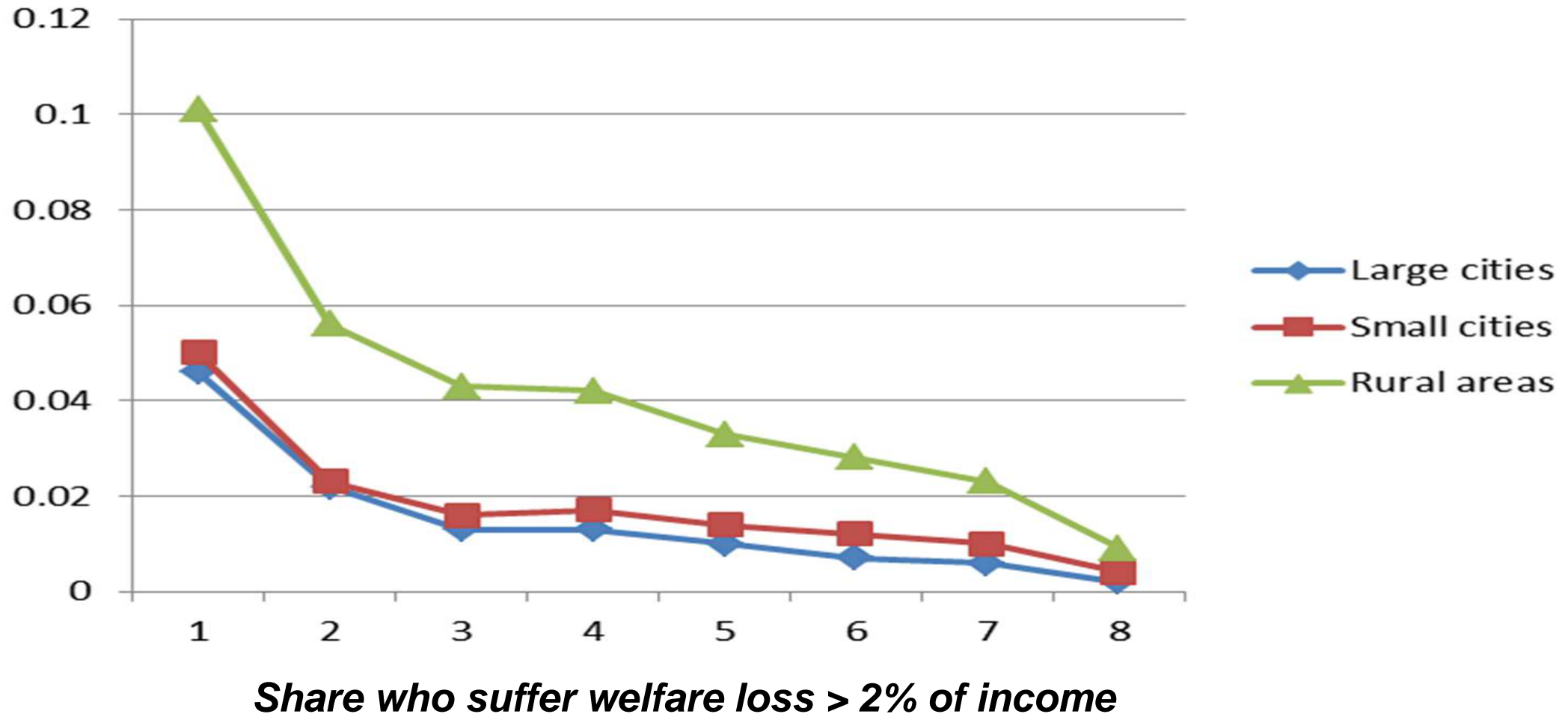
Welfare loss from km tax, relative to income, by income octile



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]”?
 - Public transport? Bike lanes? Libraries? Opera houses? Museums?
 - 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!