

Road pricing

An ultra-brief primer

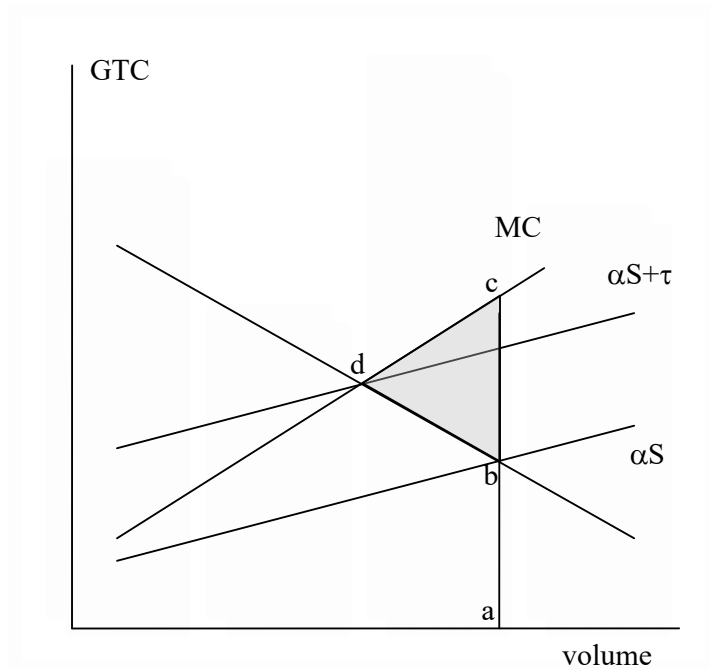
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Marginal cost pricing

- Easy to understand: $MECC = S'(D) \cdot D$
- (effect of additional traveler on travel time x no. of travelers)

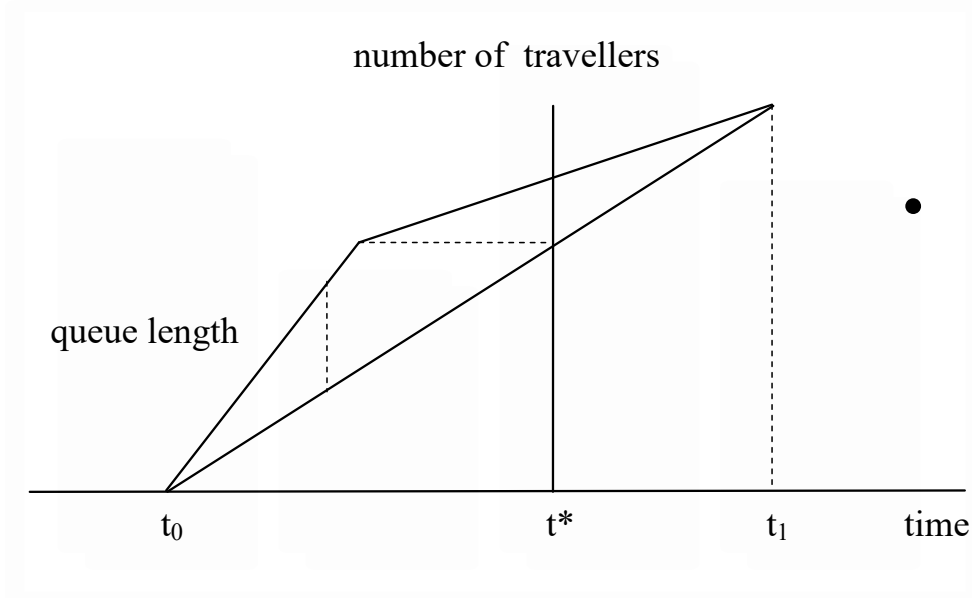


But a lot is missing

- Dynamics
- Heterogeneity
- Supply curve assumed known
- No network, no 2nd best constraints
- No distortions outside the transport system

Trip timing – bottleneck congestion

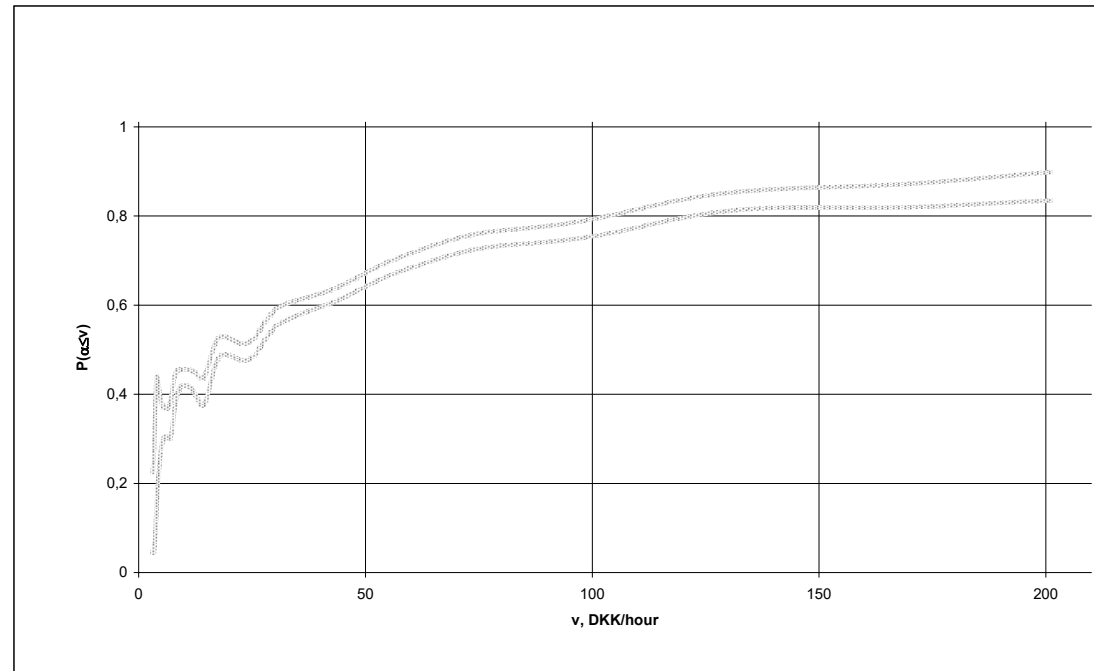
- Redistribution of trips over time can remove congestion completely (in principle)



- Time varying charge can induce changed distribution over time
 - As for planes, trains and boats
- Congestion can (in principle) be reduced without making anyone worse off

Heterogeneous travelers

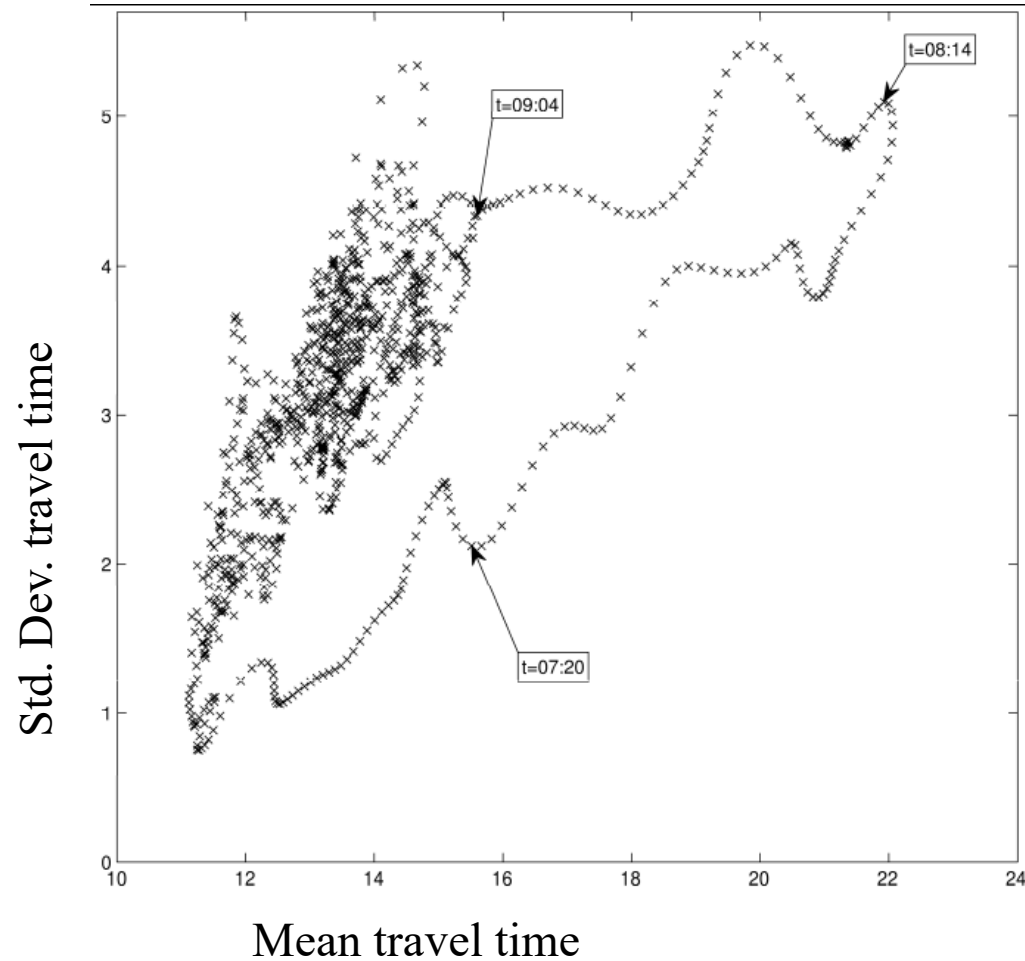
- Lots of heterogeneity
- The value of time varies by more than a factor 10
- Distribution has long tail



- Time varying charge can increase the average value of time considerably and thereby affect the efficient charge
- Differentiated charge can induce travelers to sort, which may imply additional benefit relative to case with homogeneous travelers

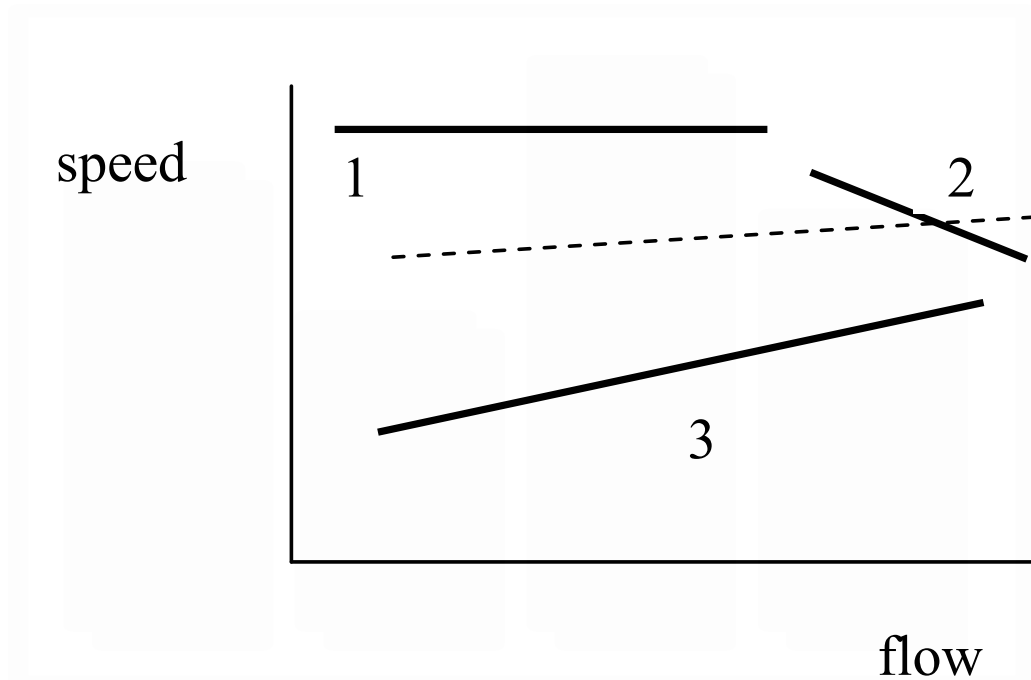
Random travel time variation

- A significant cost
- Methods exist for quantification
- Varies strongly by time of day
- Additional to marginal external cost of congestion



Supply

- Not easy to assess supply, i.e. how travel time (distribution) depends on traffic volume
- Naive measurement can be completely off
- Should take random travel time variability into account
- Should take dynamics and spillbacks into account



1. Free flow
2. Congestion
3. Hypercongestion

Implementation

- We lack intuitive rules for optimal design of road pricing under realistic constraints
- Large scale experiment is fantastic!
- Traffic models are indispensable for evaluating results
- Consider not just route choice, but also overall demand, destination choice and trip timing

Conclusion

- A complicated field. Many mechanisms at play simultaneously
- Large gap between simple text book and more complicated reality
- Differences tend to strengthen case for road pricing
- Clear potential for large economic benefit
- It will be very exciting to see data from large scale experiment!