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Estimation of Urban congestion costs

Background

- Part of a project for EC DG MOVE

- Purpose: estimating cost of road congestion in Europe (urban and non-urban)

- Full report delivered and accepted, not public yet

# Estimation of Urban congestion costs

Methodology

- Congestion costs: impact on travel time (no additional energy consumption or second order effects like e.g. damages to business).

- Two definitions of costs:
  - Delay costs
  - Deadweight loss

- Estimation based on real traffic data (TomTom – Inrix) and other exogenous parameters

Graph axes: Travel cost (y-axis), Demand (x-axis). Labels: SC_0, SC_1, PC_0, points A, B, C, D, E, F, and D_1, D_0.

Legend: —— Av. Cost   - - - Marg. Cost   —— Free Flow cost   —— Demand curve
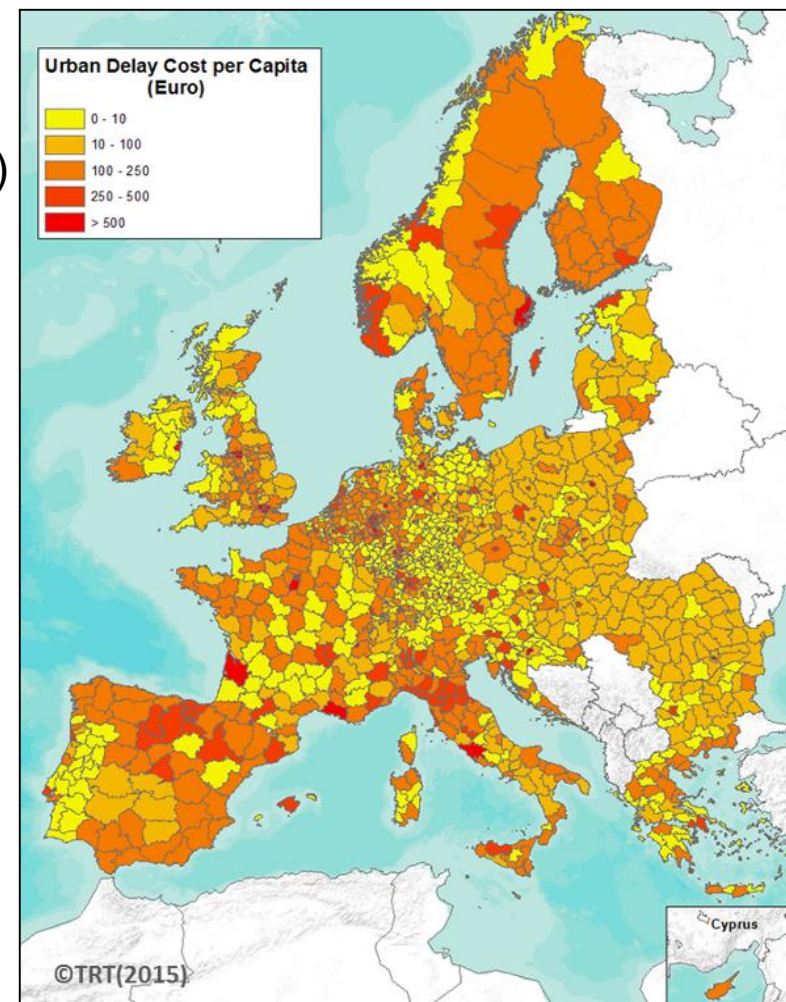
Estimation of Urban congestion costs
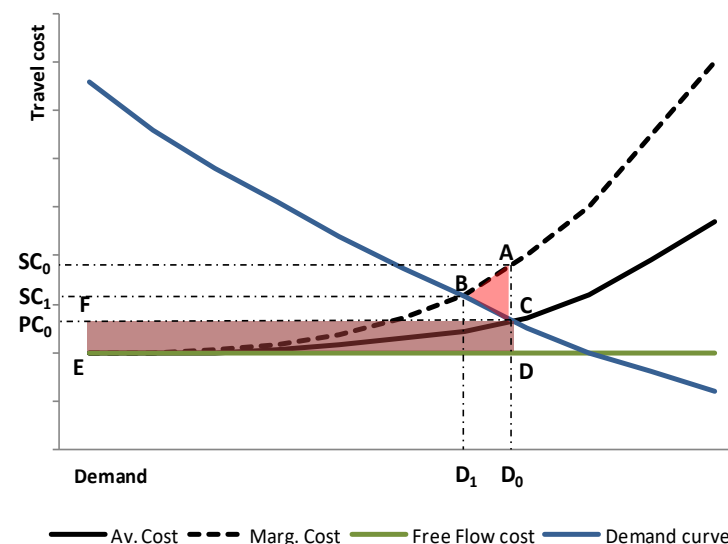
Methodology

- Real traffic data available for a sample of cities:
  congestion index and time loss

- Delay cost based on time loss

- Delay cost estimated for less restrictive conditions than free-flow

- Deadweight loss based on aggregated speed-flow curves

Variation of average delay cost per capita

$y = -1.0706x^2 - 0.0202x + 1.0015$
$R^2 = 0.9995$

Variation of average delay cost per capita (y-axis: 0.00 to 1.20)
reference flow/capacity ratio (x-axis: 0 to 0.7)

- Sensitive analysis made to test influence of uncertain parameters

- Data generalised to all cities > 50,000 inhabitants (based on cost per capita and cities' population)

- Estimates extended to smaller cities with a more aggregate calculation based on zone typology (urban, rural, mixed) as for Eurostat definition

Estimation of Urban congestion costs
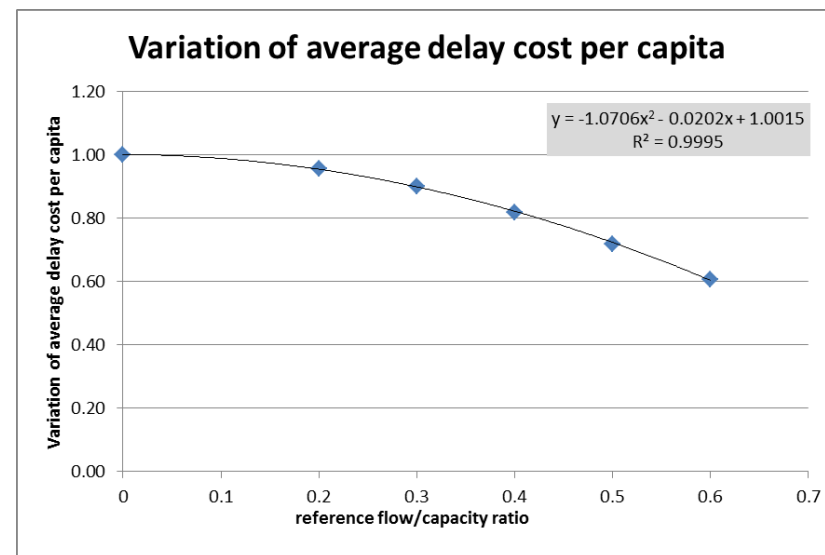
Key results

- Urban Congestion delay cost:
  110 billion Euros/year (0.8% EU28 GDP)

- Urban Congestion deadweight loss cost:
  11 billion Euros/year

- Absolute cost higher in Western European countries…

- … but cost/GDP ratio often higher in Eastern European countries

- Highest cost/GDP ratio:
  - BG (1.8%)
  - HR (1.7%)

- Lowest cost/GDP ratio:
  - LU (0.3%)
  - AT (0.4%)

Urban Delay Cost per Capita (Euro)

- 0 - 10
- 10 - 100
- 100 - 250
- 250 - 500
- > 500

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Estimation of Urban congestion costs

Lessons

- Congestion cost much depends on definition. What is the most appropriate?

- Delay cost
  - is based on ideal usually unrealistic conditions
  - However it makes reference to a clear and common reference
  - Useful to answer the questions "what is the cost of road congestion?"

- Deadweight loss
  - Concept based on theoretical assumptions
  - Reference is more realistic but dependent on local conditions: very difficult to compare cities
  - Useful to measure benefits of policy interventions to alleviate congestion and compare with costs of measures

Lessons

- Congestion costs at urban level seems strictly related to local conditions of each specific city.

  - No apparent correlation between congestion cost per capita and variables describing cities (e.g. population size, car mode share, public transport mode share).

  - Only a minor correlation found between deadweight loss per capita and population of the cities: the higher the population size the lower the average congestion cost per capita.

- As the availability of real traffic data is expected to grow in the future, the methodology could be replicated and refined (e.g. with larger sets of delay data) to update the estimates and monitor the trend of congestion costs in Europe and European cities over time.

Thank you!

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