

An International Comparison of Modal-Split Determinants: Exploration using the Urban Audit

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Outline of the presentation

- Motivation
- Urban Audit
- Econometric model and results
- Direction for future research

Motivation of the research

Social costs of transport

Social costs of transport have been increasing during past decades.

To regulate, various tools are possible:

- tool taxation,
- congestion charging,
- administrative regulation.

Regulation choice

To choose rationally, one has to understand factors behind the volume and the modal split.

Contribution of the paper

The contribution of the paper is to use the Urban Audit Statistics to inquire the factors of the work-journey modal split.

Hypothesis

Are fuel prices a statistically significant predictors of the modal split on the urban-level data?

We use the URBAN AUDIT statistics for the statistical exploration

The rationale for the Urban Audit

Most instances of statistical analyzes of the modal split is either on individual data (cross-sectional household units), or on aggregate data (time-series perspective on a city or on a country).

- MICRO DATA allows to identify a number of determinants (costs), but hard to generalized.
- MACRO DATA enables to analyze only few selected determinants (wealth, density).

Urban Audit

We opt for a complementary approach: a cross-section of city data.

The Urban Audit in Theory and Practise

The Urban Audit is

'a joint effort by the Directorate-General for Regional Policy and Eurostat to provide reliable and comparative information on selected urban areas in Member States of the EU and Candidate Countries'

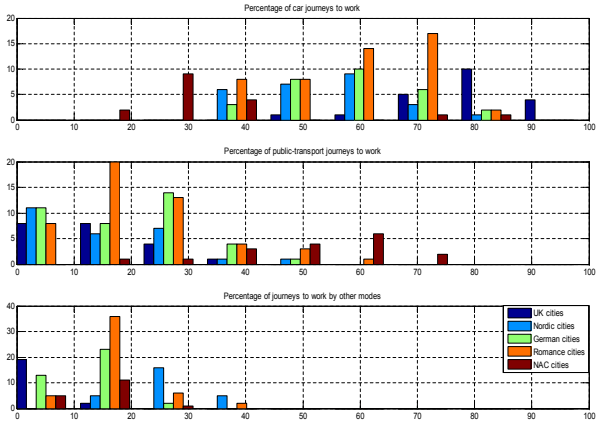
In Theory

A nice panel of European cities (> 250) on many important variables (economy, demography, civic evolvment, transport, environment)

In Practise

A less nice panel: many missing and suspect data

The modal split of to-work journeys



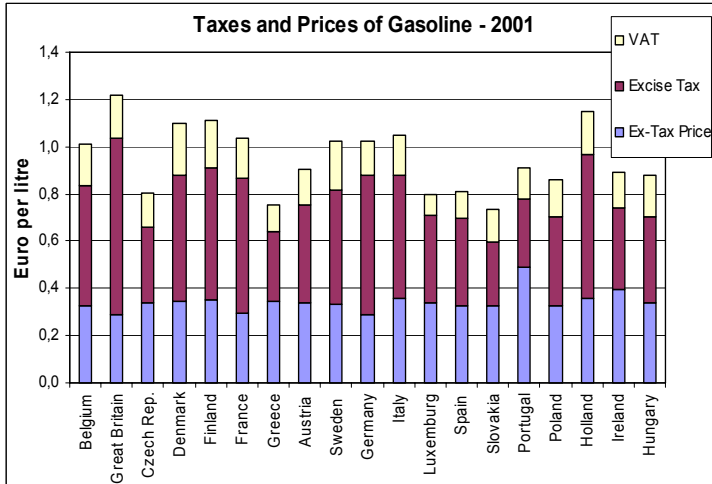
Are fuel prices among significant determinants?

Hypothesis

Are fuel prices among statistically significant determinants of the to-work journey modal split?

We are left with 151 observations to answer the question.

Fuel prices and fuel taxes across countries



Model

We use the multinomial logit model:

$$\pi_{tj} = \frac{\exp(X_t \beta_j)}{\sum_k \exp(X_t \beta_k)},$$

where π_{tj} is the share of the mode j in city t , X_t is the vector of city t characteristics, and β_j are unknown coefficients.

Our model:

- 3 modes, 151 cities;
- included regional dummies;
- normalization $\beta_3 = 0$.

Estimation

Coefficients are estimated using a pseudo maximum likelihood:

$$\hat{\beta} = \arg \max \sum_t \sum_j \left\{ p_{jt} \left[X_t \beta_j - \log \left(\sum_k \exp(X_t \beta_k) \right) \right] \right\},$$

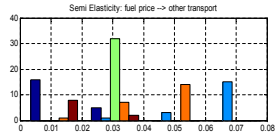
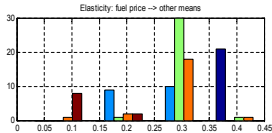
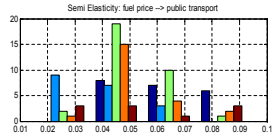
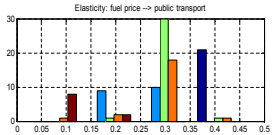
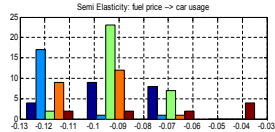
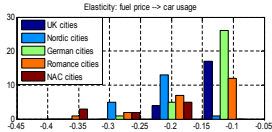
where p_{jt} are observable shares.

The standard errors are estimated using the non-parametric bootstrap.

Estimation results

	Coefficient	P-values	t-statistics	Elasticity (aver.)	Elasticity (med.)
<i>β_{cars}</i>					
Registered cars p. c.	1.980	0.007	2.526	0.300	0.283
Density	-0.131	0.000	-3.587	-0.162	-0.116
Log of City Size	-2.779	0.000	-3.725	-0.509	-0.480
Fuel Price	-4.391	0.006	-2.894	-0.152	-0.139
Dummy - UK	4.336	0.000	7.629		
Dummy - Nordic	2.221	0.000	4.217		
Dummy - German	3.193	0.000	5.397		
Dummy - Romance	2.654	0.000	4.254		
Dummy - NAC	2.015	0.000	3.964		
<i>β_{public}</i>					
Registered cars p. c.	-0.487	0.350	-0.420	-0.699	-0.702
Density	0.164	0.000	3.475	0.473	0.401
Log of City Size	0.375	0.200	0.483	1.117	1.135
Fuel Price	0.032	0.550	0.025	0.313	0.324
Dummy - UK	0.725	0.100	1.193		
Dummy - Nordic	-0.943	0.050	-1.282		
Dummy - German	0.062	0.500	0.085		
Dummy - Romance	-0.172	0.350	-0.207		
Dummy - NAC	1.077	0.000	1.610		

Elasticities



Concluding remarks

Findings:

we find an empirical support for idea that the fuel prices predict the modal split.

Caveats:

- data less than ideal (many missing data);
- statistical correlation does not imply causality;
- we have reduced-form results only;
- multinomial logit model is restrictive.

Direction for future research

Directions for future research:

- to use mixed logit and multinomial probit to inquire whether the results are robust;
- to confront our findings with studies based on different methodology;
- to apply statistical methods for missing data.

A challenging task for future research:

- to try to get a structural estimates.

Comments are welcome

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