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Fuel Costs, Circulation Taxes, and Car Market Shares: Implications for Climate Policy

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Motivation

Initially: Addressing Climate Change Policy

- Abate global warming
- Reducing CO₂ emissions
- Driving more efficient cars

Here: The fundamental issue of new car registrations

- Looking at the structure in particular
- New cars affect future emissions
- Subject to many policy measures, including fuel and circulation taxes

New Legislation for CO₂ Reduction in Europe

- ➔ **1995: New car fleet average of 120g CO₂/km by 2010**
 - Commitments of the automobile industry (140g 2008)
 - Fuel efficiency by fiscal measures
 - fuel-economy labelling of cars

- ➔ **February 2007: Strategy review led to a proposal for a renewed Community strategy**
 - objective of 120g from the new car fleet will not be met by 2012 in the absence of additional measures
 - Commission would propose a legislative framework

- ➔ **December 2007: Proposal for a regulation**

Instruments to influence purchasers' behavior

Emission limits address mainly what the automakers offer

- Motivation to introduce more efficient models and versions
- Indirect influence on consumer

➔ Influencing purchasers with

- registration tax,
- circulation tax and
- fuel tax

The German Experience

- Most new registrations in Europe (approx. 3.1 million)
- Circulation tax (annual motor tax) is a current political issue

The Econometric Model

Nested logit model to estimate market shares

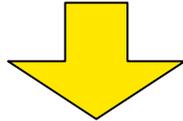
- Recognizing the segment structure of the market
- Model controls for unobserved shocks among cars belonging to the same market segment

Fixed effect estimator

- Exploit the panel structure of the data
- Fixed effects estimator controls for unobserved car attributes that remain fixed over time

Proper Data Processing is a Key Issue

- Integration of registrations from 1995 to 2005
- Very detailed registration data indicating all relevant specifications for every model, version and style
- 6000 version/styles annually

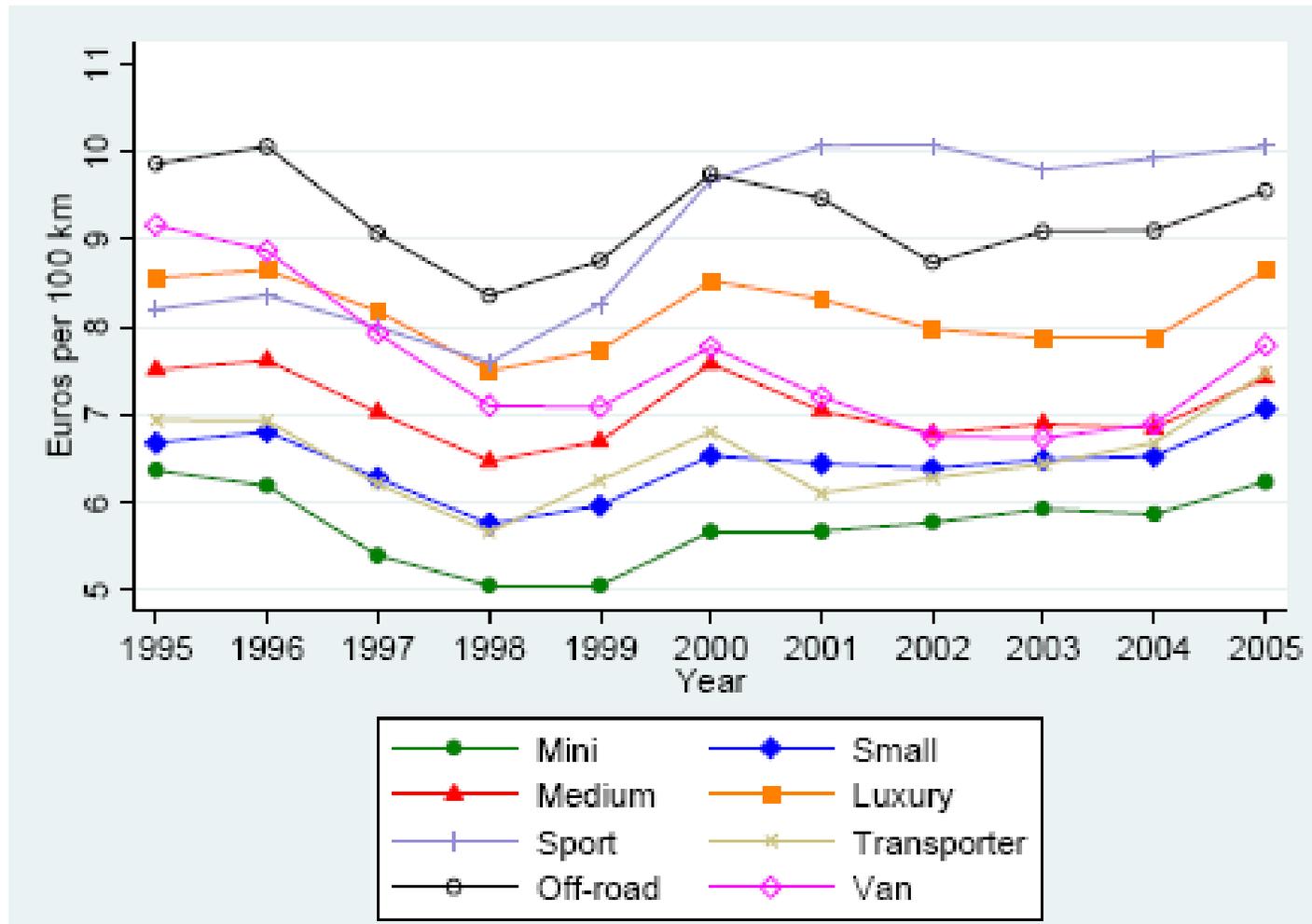


Results to 681 “submodell” considering fuel and transmission types

Volkswagen: Jetta → Vento → Bora → Jetta

Fuel Cost of Driving ranges from 5 to 10 Euros per 100 km

approx. 11 to 22 \$ per 100 miles



Circulation tax from 30 to 700 Euros per year

➤ Due to the low diesel fuel tax higher circulation tax

➤ **Petrol:** 5.11 to 6.75 Euros per 100ccm

➡ **30 to 350 Euros per year**

➤ **Diesel:** 13.80 to 18.97 Euros per 100ccm

➡ **110 to 670 Euros per year**

Results for Logit and Nested-Logit Model

	Logit	Nested logit	
	Model I	Model II	Model III
Circulation tax	-0.850 (0.074)	-0.544 (0.058)	-0.506 (0.055)
Fuel driving costs per km	-0.293 (0.023)	-0.197 (0.018)	-0.186 (0.017)
Car price/income	-0.432 (0.081)	-0.272 (0.055)	-0.255 (0.052)
Engine power (KW)	0.014 (0.002)	0.008 (0.001)	0.007 (0.001)
Size (length*width)	0.021 (0.008)	0.014 (0.005)	0.013 (0.005)
Curb weight	0.315 (0.309)	0.154 (0.200)	0.102 (0.188)
$\ln(s_{jgr})$		0.377 (0.040)	
$\ln(s_{jgft})$			0.431 (0.040)
F(10, 4310) time dummies	14.41		
Chi sq (10) time dummies		87.7	81.42
R ²	0.11	0.66	0.65
Number of observations	5007	5007	5007

Standard errors in parentheses

Elasticity estimates (Model III)

	Circulation tax	Fuel cost
Mini	-0.586 (0.052)	-1.752 (0.135)
Small	-1.230 (0.109)	-2.102 (0.163)
Medium	-1.587 (0.140)	-2.422 (0.188)
Luxury	-2.100 (0.186)	-2.971 (0.230)
Sport	-1.408 (0.124)	-3.346 (0.258)
Transporter	-1.475 (0.130)	-1.934 (0.149)
Off-road	-2.185 (0.193)	-3.307 (0.256)
Van	-1.742 (0.154)	-2.818 (0.218)

Standard errors in parentheses



Simulation with Model 3

- Set circulation tax to zero and calculate resulting market share of the different auto segments
 - Multiply these shares by the average CO₂ by segment to obtain a market level CO₂ level
 - The absence of a circulation tax is found to result in a 4% increase in CO₂ over the observed level of 170.5 g/km in 2005
- ➡ **People buy bigger cars, more Off-Road and Vans**
- ➡ **Resulting in a 6.6 g higher average for the fleet**

Conclusion

- ➔ **Plausible results of the model: Suitable model design and good data processing**
- ➔ **Circulation taxes and fuel costs significantly determine market shares, with a higher sensitivity to fuel costs in car purchasing behavior.**
- ➔ **Focus not only on efficiency standards!**
Circulation taxes and fuel costs may serve as effective instruments in influencing the composition of the car fleet and associated CO₂ emissions as well.

Peak fuel prices 2008: Looking forward to incorporate data



Thank You!

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