

Assessment of the Impact of Motor-Fuel Taxation on Transport Behaviour and Climate Change in the Czech Republic Using an Estimated Econometric Model

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GCET Conference, September 2014, Copenhagen

Outline of the presentation

This presentation:

1. overviews motor fuel taxation in the Czech Republic
 - ▶ and compares it to the situation in neighboring countries
2. presents an econometric model of motor fuel taxation
 - ▶ that takes into the account the fuel tourism
3. derives tentative implications for policy.

Motor Fuel Taxation in the Czech Republic

European Framework

- ▶ VAT Directive 2006/112/EC
 - ▶ minimal standard rate is 15 %
- ▶ Energy Taxation Directive 2003/96/EC
 - ▶ minimal rate for diesel 330 EUR/1000 litres from 2010
 - ▶ minimal rate for petrol 359 EUR/1000 litres

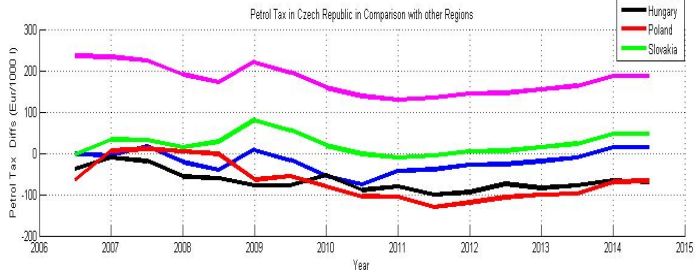
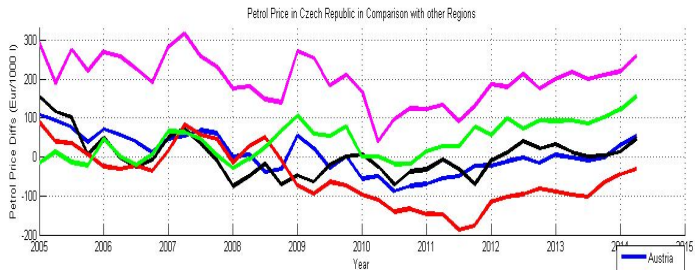
Changes in Taxation of Petrol

- ▶ 2010: VAT 19 % → 20 %
- ▶ 2013: VAT 20 % → 21 %
- ▶ 2010: EXT 11.840 CZK/1000 l → 12.840 CZK/ 1000 l

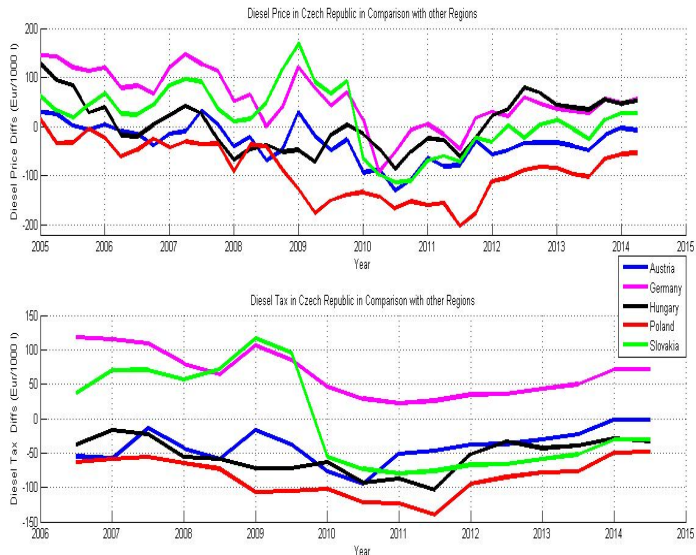
Changes in Taxation of Diesel

- ▶ 2010: VAT 19 % → 20 %
- ▶ 2013: VAT 20 % → 21 %
- ▶ 2010: EXT 9.950 CZK/1000 l → 10.950 CZK/ 1000 l

Petrol Tax and Price Differences with other regions



Diesel Tax and Price Differences with other regions



Motivation for the model

We present and estimate an econometric model of the fuel demand in the Czech Republic:

- ▶ the model takes into the account fuel tourism,
- ▶ fuel tourism can increase price elasticity of fuel demand
- ▶ the changes of fuel demand affect GHG emissions.

Fiscal consequences in the region of interest recently addressed by:

- ▶ Novysledlák and Šrámková (2011) find on the Slovakia case that the effect of fuel tourism is not strong enough to decrease fuel taxes on fiscal grounds.
- ▶ Pisa (2013) confirms this finding on Czech data.
- ▶ Ševčík and Rod (2010) and (2012) provide an opposite perspective.

Evidence is mixed more research can be beneficial.

Data

Countries

- ▶ Austria
- ▶ Czech Republic
- ▶ Germany
- ▶ Hungary
- ▶ Poland
- ▶ Slovakia

Source of Data

- ▶ European Commission (Oil Price Bulletin, Excise Duty Tables, Regulation (EU) No 601/2012)
- ▶ Jodi Database (Oil consumption)
- ▶ Eurostat (GDP, HICP)
- ▶ ECB (Exchange rates)
- ▶ Internet (length of borders)

Model formulation

Model formulation:

$$\log C_{it} = \beta_0 + \beta_X X_{it} + \beta_y \log y_{it} + \beta_p \log p_{it} + \beta_\varphi \log \varphi_{it} + \varepsilon_{it},$$

where C_{it} is fuel consumption in country i in year t , X_{it} are additional regressors (such as time trend), y_{it} is the real GDP, p_{it} is the real fuel price, and φ_{it} is the relative average price of fuel in neighbouring countries defined as follows:

$$\varphi_{it} = \frac{P_{it}}{\sum_j w_{ij} p_{jt}},$$

where p_{jt} is fuel price in region j in year t and w_{ij} are weights.

Similar model to Píša (2013), but estimated using Bayesian methods.

Model estimation

The estimation of parameters β is the goal:

- ▶ bayesian panel data model.

The quantity of interest is $\beta_p + \beta_\varphi$, where

- ▶ β_p measures the 'direct' price elasticity,
- ▶ β_φ measures the elasticity due to international differences in fuel prices.

Estimation results

	Petrol			Diesel		
	2.5% HPD	Posterior mean	97.5% HPD	2.5% HPD	Posterior mean	97.5% HPD
β_0	3.15	3.37	3.57	3.91	4.13	4.34
β_p	-1.18	-0.99	-0.84	-1.02	-0.80	-0.59
β_y	0.82	0.87	0.93	0.80	0.86	0.92
β_φ	-0.12	-0.08	-0.04	-0.17	-0.09	-0.01

- ▶ Both motor fuels are rather elastic ($\beta_p \cong 1$), but the coefficient β_p measures elasticity ignoring the international price competition.
- ▶ The coefficient β_φ captures the effect of international price differential.

Simulation scenarios

Based on these estimation results, we consider two *hypothetical* scenarios:

1. In the Czech Republic, the excise tax on motor fuels will increase on the level of Germany.
2. The increase to the same target (Germany) will occur in all CEE countries, with the exception of Poland
 - ▶ Poland has relatively low motor fuel tax rates and has relatively long borders with third countries (Ukraine, Belarus, Russia with low motor fuel prices)

We evaluate the impact on:

- ▶ motor fuel consumption;
- ▶ budget revenues;
- ▶ approximation of CO₂ emissions (fuels can be purchased or consumed in other regions).

We stress that the goal is not to assess a concrete policy proposal, but to show the potential of our framework.

Scenario I – results

	Petrol			Diesel		
	2.5%	Posterior	97.5%	2.5%	Posterior	97.5%
	HPD	mean	HPD	HPD	mean	HPD
Change in the fuel end price in CR (in %)		+14.9			+6.0	
Change in fuel consumption in CR (in %)	-19.8	-16.0	-13.2	-7.3	-5.4	-3.5
Change in fuel consumption in CR (mil l.)	-415.9	-337.2	-274.8	-359.0	-264.1	-172.4
Change in CO2 emissions (thousand tCO2)	-944.8	-766.0	-624.3	-960.1	-706.9	-461.4
Change in budget revenues in CR (in mld. CZK)	+4.04	+5.74	+7.09	+6.14	+7.62	+9.05

- ▶ In this scenario, we do not consider the external uncertainty (in oil prices, in exchange rate).
- ▶ In the paper, we will describe how to deal with it.
- ▶ Hence, we only consider uncertainty in parameters.

Scenario II – results

	Petrol			Diesel		
	2.5%	Posterior	97.5%	2.5%	Posterior	97.5%
	HPD	mean	HPD	HPD	mean	HPD
Change in the fuel end price in CR (in %)		+14.9			+6.0	
Change in fuel consumption in CR (in %)	-18.7	-15.4	-12.6	-6.7	-5.1	-3.5
Change in fuel consumption in CR (mil l.)	-393.9	-324.6	-265.0	-329.3	-249.2	-172.4
Change in CO2 emissions (thousand tCO2)	-894.9	-737.4	-602.0	-881.3	-667.0	-461.4
Change in budget revenues in CR (in mld. CZK)	+4.52	+6.01	+7.30	+6.62	+7.85	+9.14

- ▶ In this scenario, the fuel consumption in the CR decreases less because other countries increase the fuel tax.
- ▶ Given the same increase in the tax rate, this implies higher budget revenues.

Conclusion

This presentation is a brief sample of our research:

- ▶ in the presentation we briefly summarized the grounds of the model and basic estimations
- ▶ the parameters indicate 'right' values and signs
- ▶ the positive fiscal consequences of increasing excise tax are implied by the model (taking in mind fuel tourism)
- ▶ an increase of excise tax causes (roughly) significant reduction of CO₂ emissions in the Czech Republic ('environmental' part of the research is currently being upgraded)
- ▶ in the presentation we rigorously deal with uncertainty in estimated parameters, external uncertainties are currently being incorporated into the model).

Contacts

Thank you for your attention!

Acknowledgements

The research on this paper has been supported by the grant of the Czech Scientific Foundation *No. 14-22932S*. The support is gratefully acknowledged.

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