

FUEL PRICE ELASTICITIES OF CAR TRANSPORT IN EU MEMBER STATES

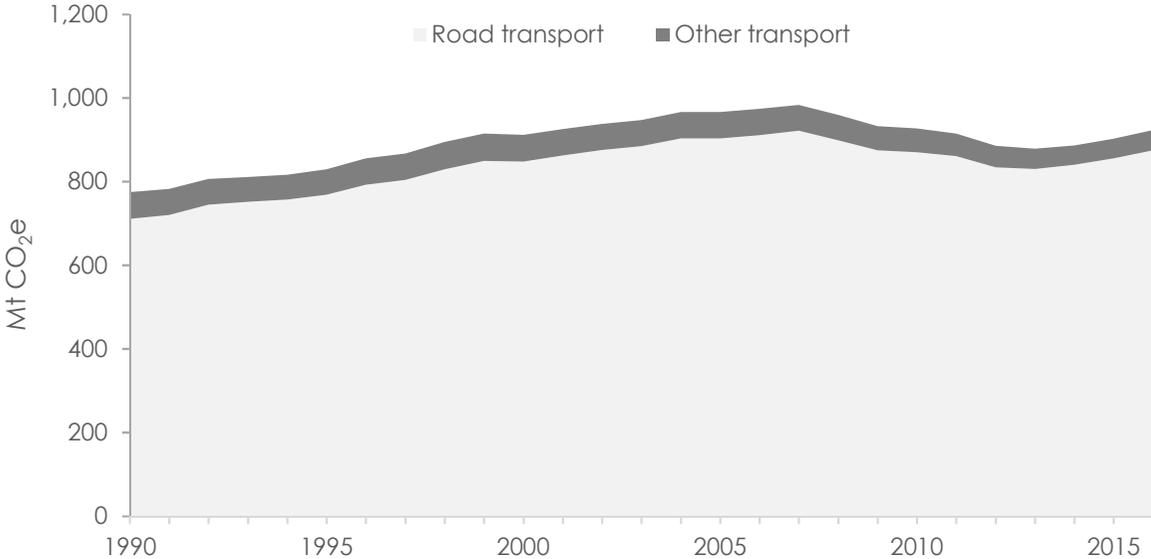
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19th Global Conference on Environmental Taxation

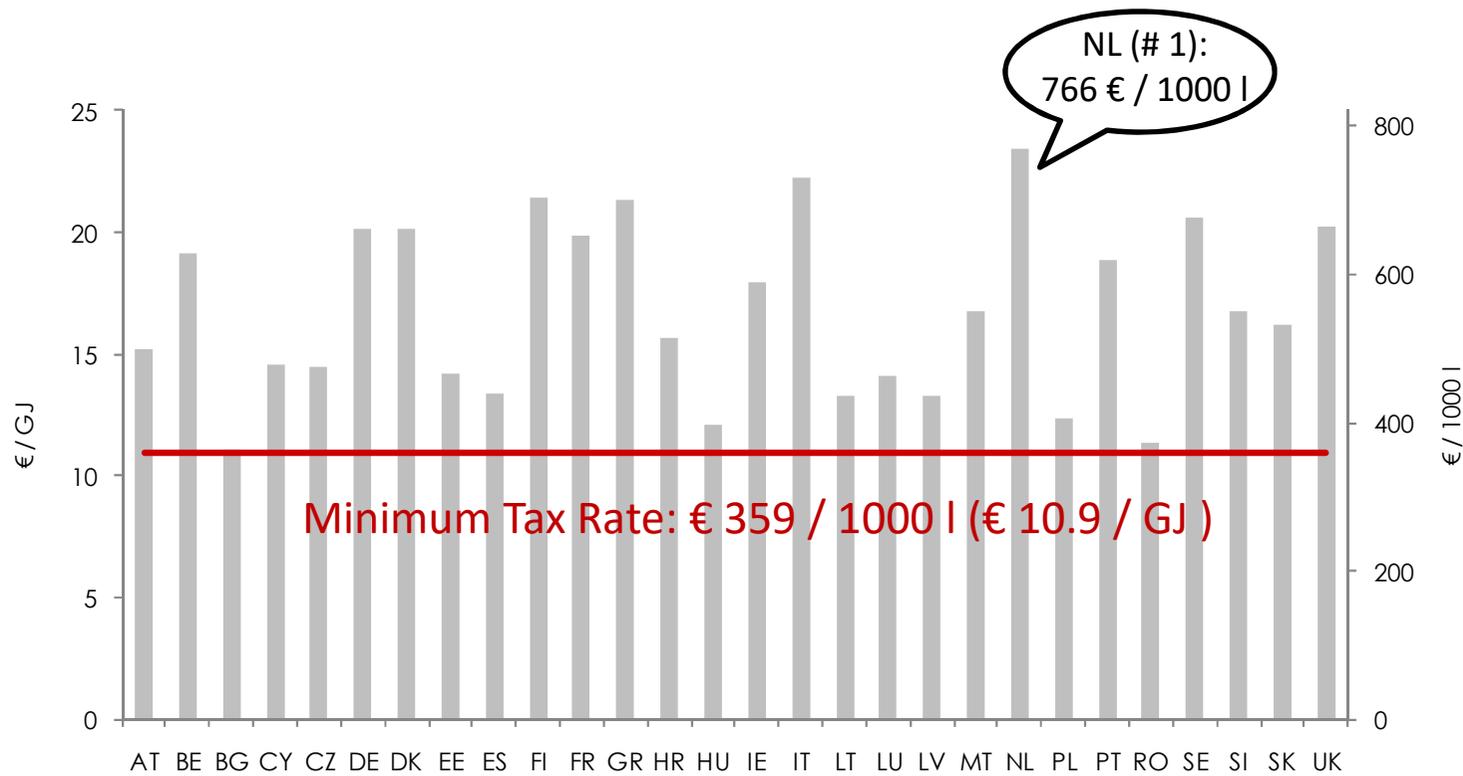
Madrid, September 28th, 2018

- EU has committed itself to ambitious climate targets
- Market-based instruments shall contribute to achieving these targets
 - EU CO₂ emissions from industry and energy supply are regulated under the EU ETS
 - GHG emissions from private households, transport and other small sources are regulated on MS level
 - Minimum energy tax rates for the MS are defined in the 2003 energy taxation directive

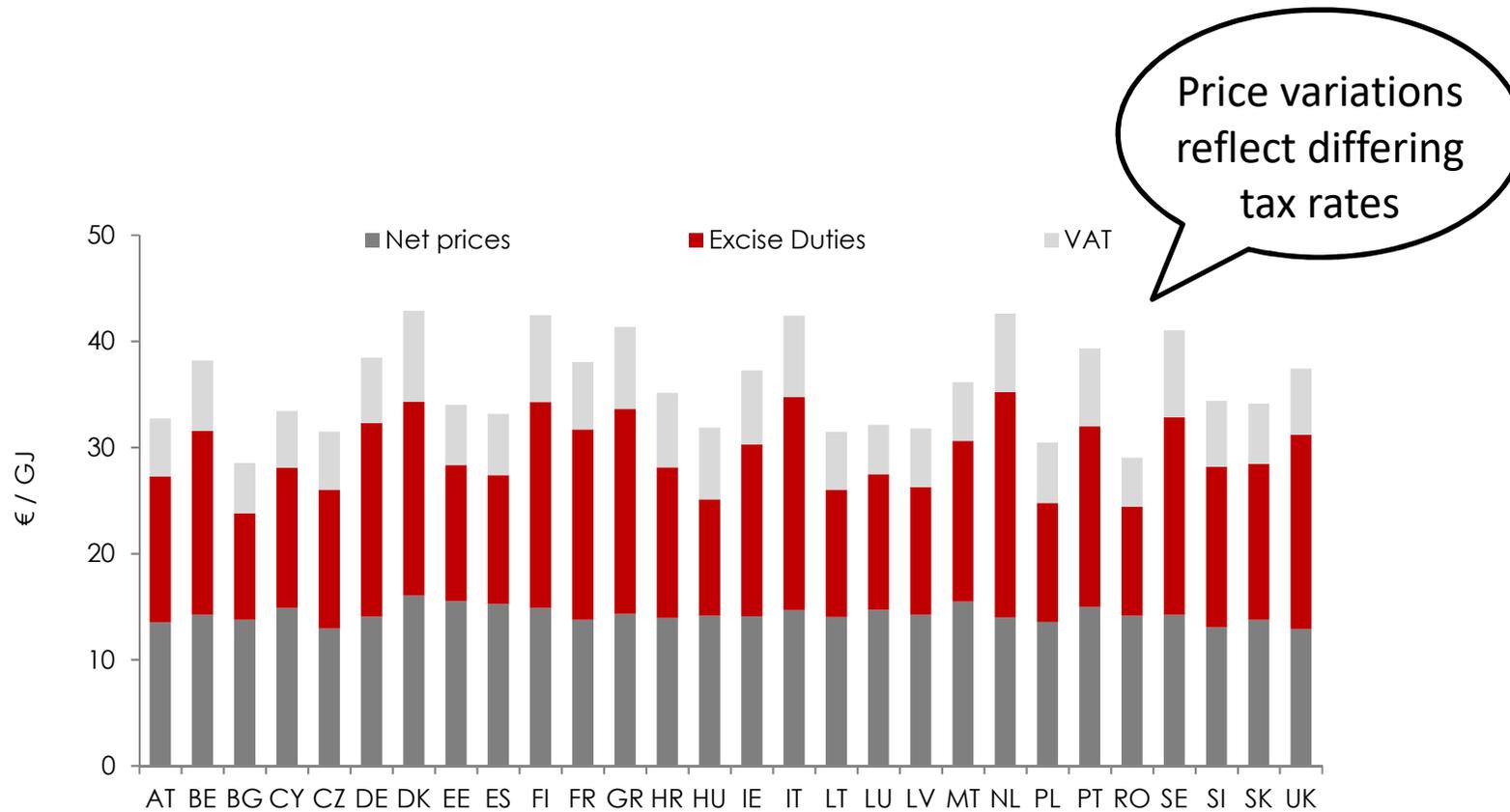
Development of transport emissions in EU 28



Source: UNFCCC National Inventory Submissions (2018)



Source: EC Excise Duty Tables January 2017



Source: EC Excise Duty Tables January 2017, Weekly Oil Bulletin

- According to economic theory pricing negative environmental effects (like GHG emissions) helps attain certain environmental targets
- In contrast to the command-and-control policy price based instruments like carbon taxes aim at internalizing the environmental effects through completing the market system
- Higher prices incentivize behavioral changes of customers
- ➔ How do prices influence emissions from car transport?
- ➔ How can price-based instruments contribute to achieving emission reductions from car transport?

- Flow Adjustment Model
- Panel econometric framework with bias corrected Within estimator (LSDVc - Kiewiet, 1995) as estimator for small datasets
- Established in literature:
e.g. Baltagi & Griffin (1997), Pock (2010), Danesin & Linares (2012)

- Based on “Ideal demand” (Houthakker & Taylor, 1966) of fuel per car as function of income p.c. (y), fuel price (f) and number of cars p.c. (c) (e.g. Sweeney, 1978; Baltagi, 1983)
- Here “ideal emissions” per car (e)

$$(1) \quad e^* = \alpha y^\beta f^\gamma c^\delta$$

$$(2) \quad \frac{e_t}{e_{t-1}} = \left(\frac{e_t^*}{e_{t-1}^*} \right)^\theta, \text{ with } 0 < \theta \leq 1$$

$$(3) \quad e_t^* = \left(\frac{e_t}{e_{t-1}^{1-\theta}} \right)^{\frac{1}{\theta}}$$

$$(4) \quad \ln e_t = \theta \ln \alpha + (1 - \theta) \ln e_{t-1} + \theta \beta \ln y_t + \theta \gamma \ln f_t \\ + \theta \delta \ln c_t + u_t$$

$$(4) \ln e_{i,j,t} = \theta \ln \alpha + (1 - \theta) \ln e_{i,j,t-1} + \theta \beta \ln y_{j,t} + \theta \gamma \ln f_{i,j,t} \\ + \theta \delta \ln g_{j,t} + \theta \varepsilon \ln d_{j,t} + u_{i,j,t}$$

$e_{i,j,t}$	CO ₂ emissions from fuel i in country j per car in year t
$y_{j,t}$	GDP p.c. in constant 2010 EUR
$f_{i,j,t}$	Gross fuel prices (in constant 2010 EUR)
$g_{j,t}$	Stock of gasoline cars per capita
$d_{j,t}$	Stock of diesel cars per capita
$u_{i,j,t}$	Error term

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- | | |
|--|------------------------|
| ■ Car stock by fuel type | Odyssee database |
| ■ Cars' CO ₂ emissions by fuel type | Odyssee database |
| ■ GDP | Eurostat |
| ■ Population | Eurostat |
| ■ Gasoline and diesel prices | EC Weekly Oil Bulletin |

→ Period: **2004 - 2015**

→ **EU28** without BG, HR, LT, RO

Preliminary Estimation Results

Short Run Estimates

	CO ₂ emissions per car		
	Gasoline cars	Diesel cars	All cars
$\ln e_{i,t-1}$	0.896*** (-0.0319)	0.741*** (-0.0532)	0.845*** (-0.0382)
$\ln f_{i,t}$	-0.113*** (-0.0265)	-0.155* (-0.064)	-0.0610** (-0.0219)
$\ln y_t$	0.132** (-0.0408)	0.424*** (-0.129)	0.140** (-0.0445)
$\ln g_t$	-0.0651* (-0.0307)	-0.0761 (-0.103)	-0.0818* (-0.0381)
$\ln d_t$	-0.0304* (-0.0138)	-0.152*** (-0.0406)	-0.0447** (-0.0165)

z standard errors in parentheses
 * p<0.05, ** p<0.01, *** p<0.001

- Estimations confirm the potential of price based mechanisms to curb emissions
- Commission Proposal for New Energy Taxation Directive (COM/2011/169) not adopted
 - Energy (and carbon) tax rates differ pronouncedly between MS, energy sources and sectors
 - Carbon taxes exist only in one third of the MS
- Better alignment of energy taxes with carbon content advisable

Thank you!

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