Evaluating the impact of standards and fiscal policies on CO_2 emissions of cars in Europe

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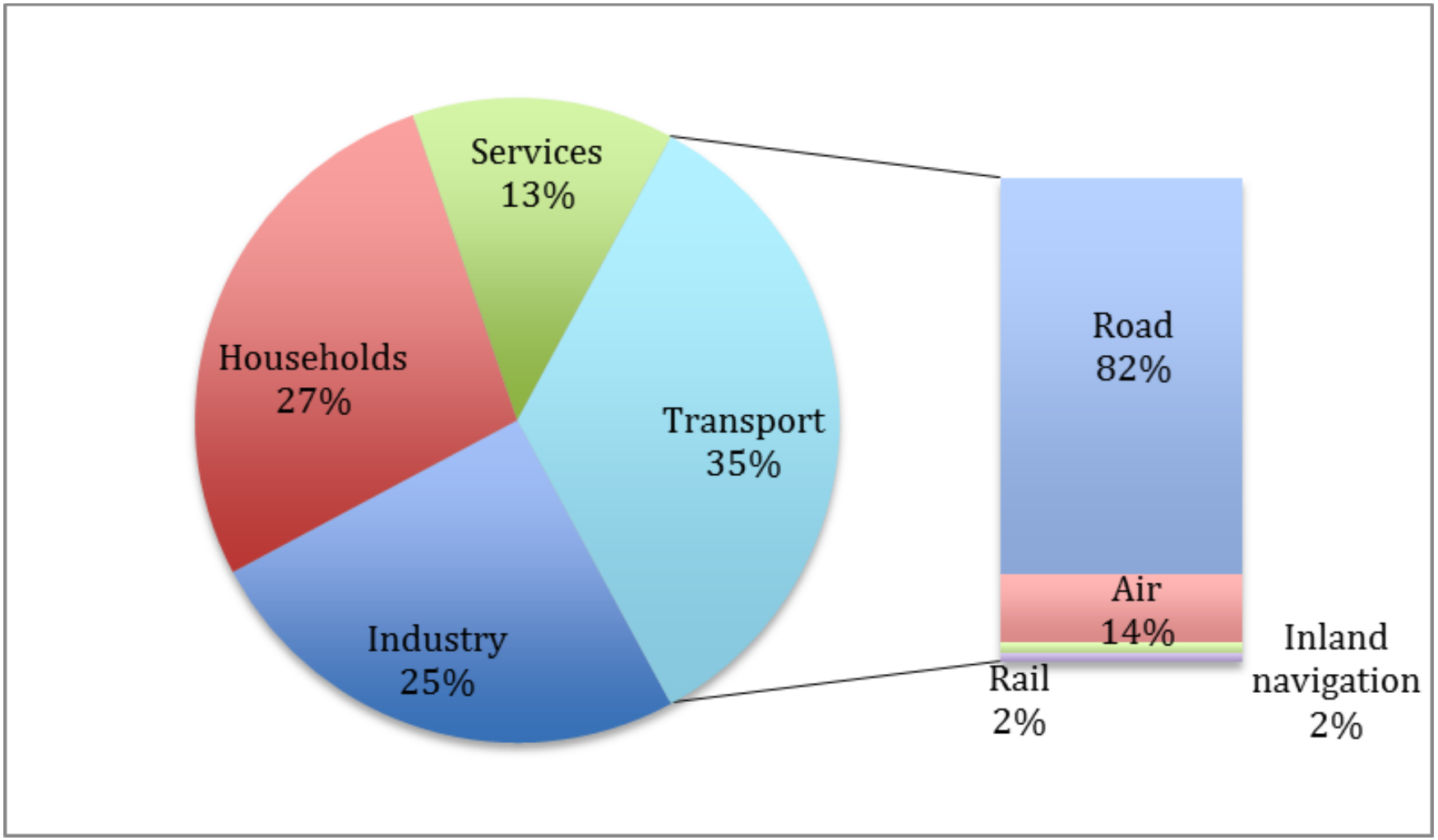
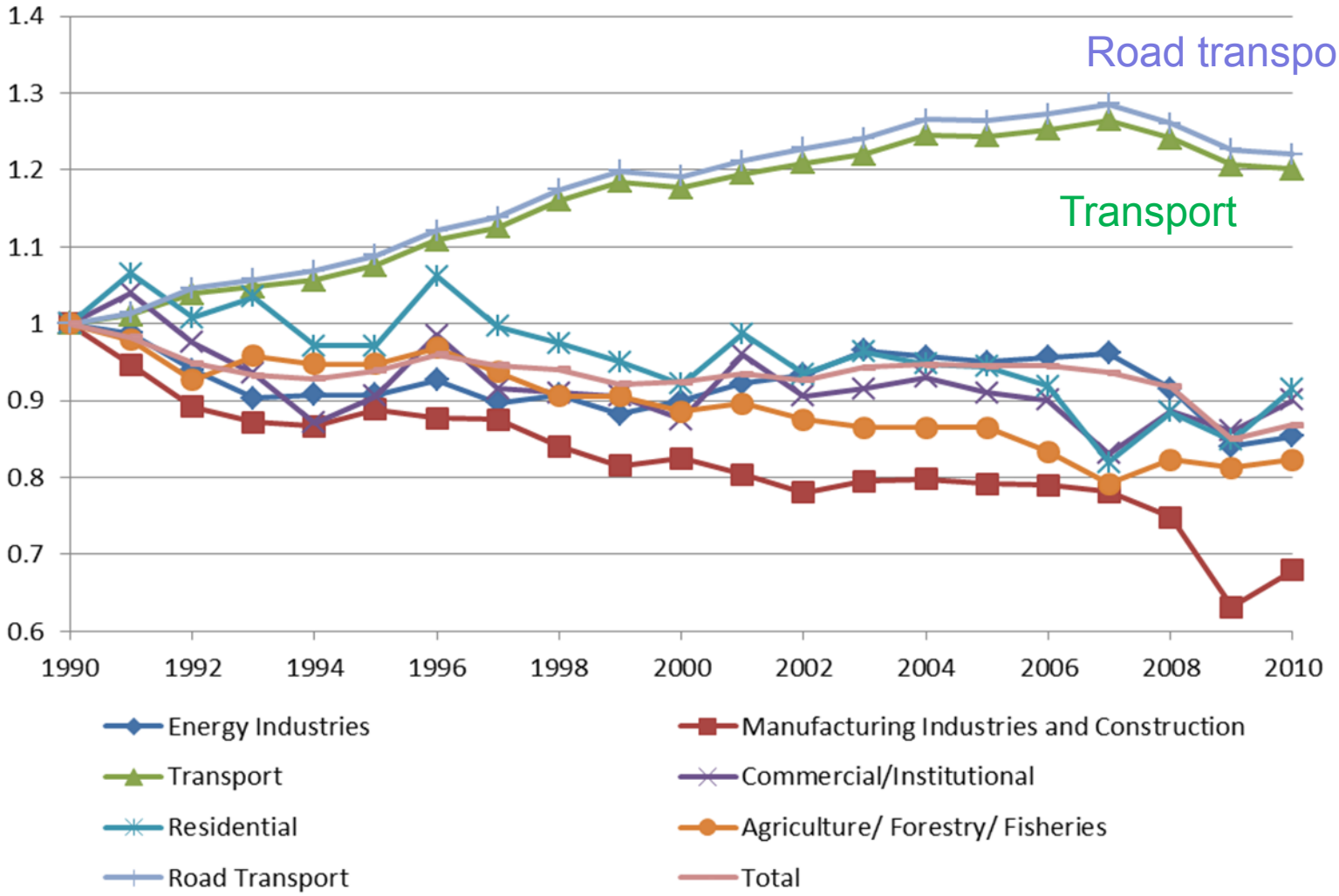
Introduction



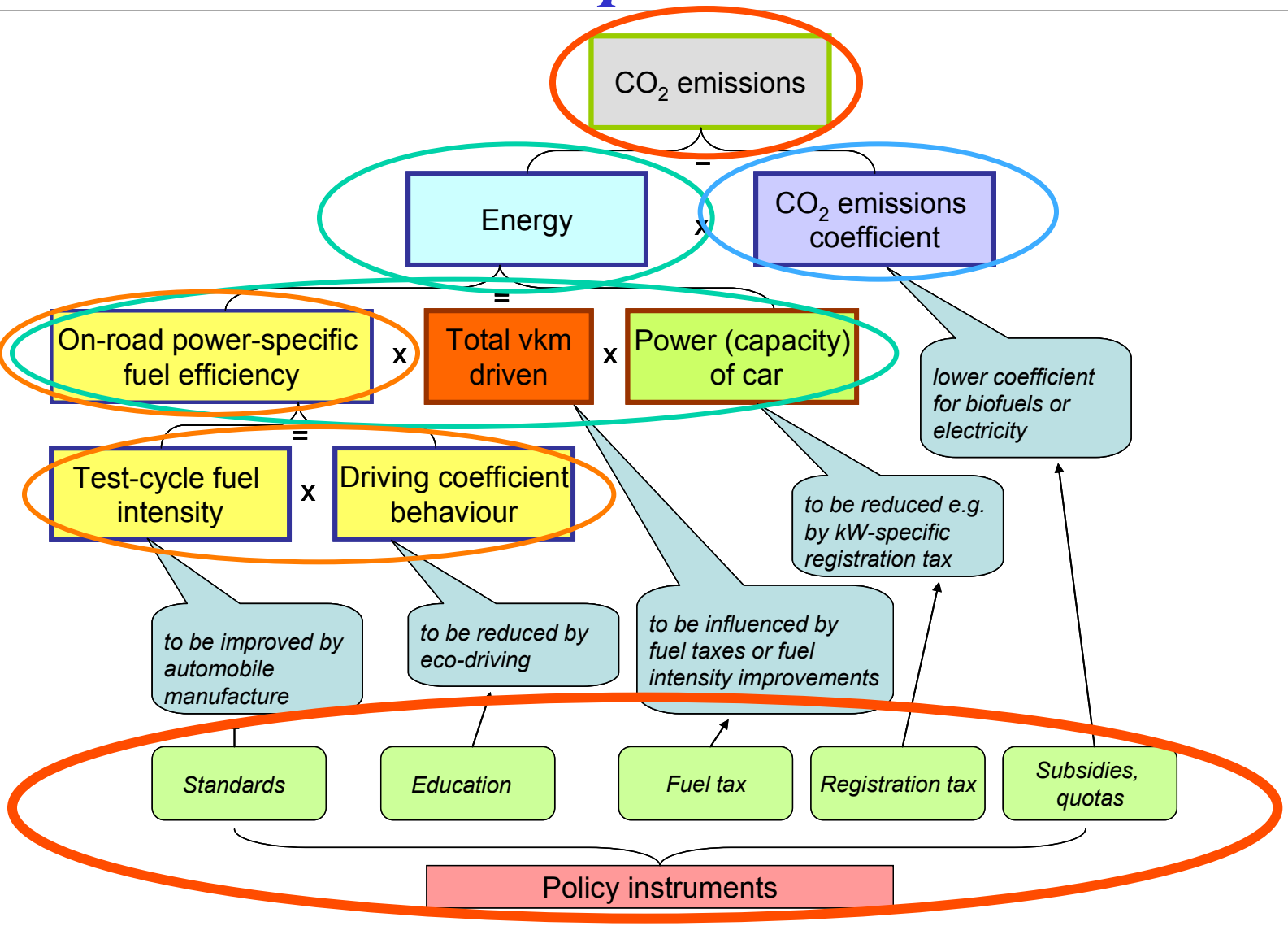
EU-27 Final energy consumption in 2009, by sector

Introduction



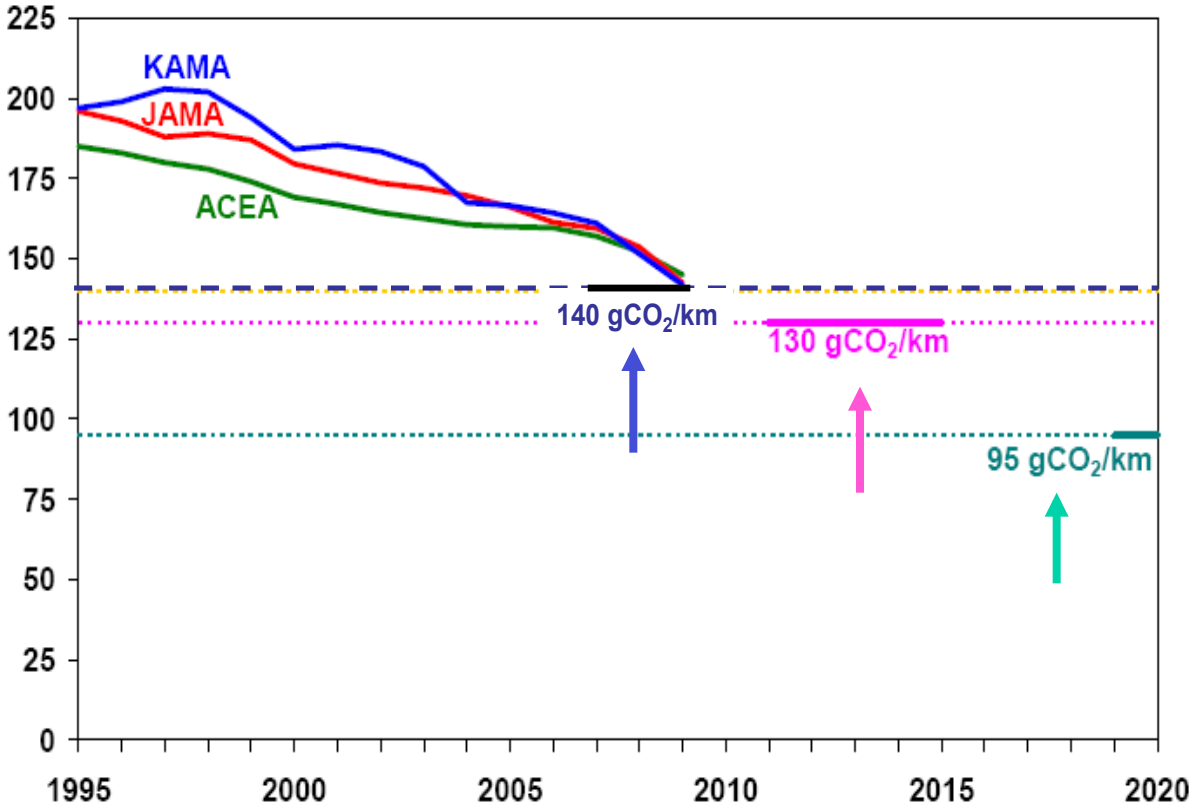
GHG emissions (1990=1)

CO_2 emissions in passenger car transport



Impact factors on CO_2 emissions in the car passenger transport

Standards



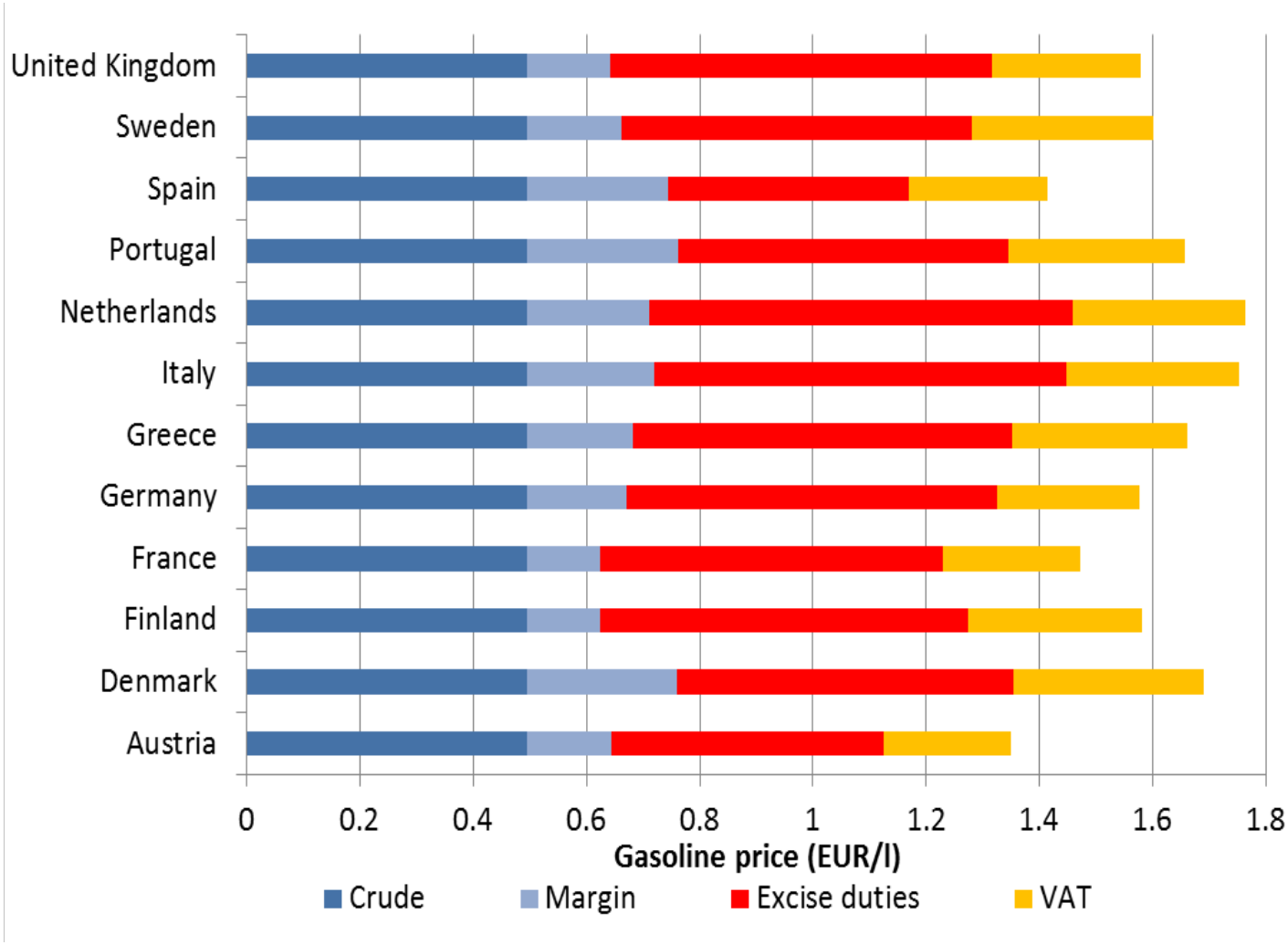
Evolution of CO_2 emissions from new passenger cars by manufacturer associations

Fiscal measures

The mostly used fiscal policy measures in the EU:

- **Taxes on registration** - A tax on registration is tax paid once, by each vehicle owner, for each vehicle purchased and entered into service.
- **Taxes on ownership** - Taxes on ownership are paid annually, regardless of how often the vehicle is used.
- **Taxes on fuel** - Excise duties on fuels and VAT.

Fiscal policy measures



Composition of gasoline prices including taxes in 2013

Fiscal policy measures

Registration tax based on:	
Fuel consumption	AT
Car price	FI,NL
CO_2 emissions	FI,FR,NL,PT,ES
Cylinder capacity	GR,PT
Kilowatt/weight/seats	IT
None	DE,SE,UK

Fiscal policy measures

Ownership tax based on:	
Fuel consumption	DK
Weight	DK,FI,NL,SE
CO_2 emissions	FI,DE,GR,NL,PT,SE,UK
Cylinder capacity	GR,PT,UK
Kilowatt	AT,IT
None	FR

Formal framework

$$E = vkm \cdot FI$$

$$CO_2 = E \cdot f_{CO_2} = vkm \cdot FI \cdot f_{CO_2} = vkm \cdot CO_{2\_SP}$$

with

CO_2.....total CO_2 emissions [ton CO_2/yr]
f_{CO2}.....CO_2 emission factor of fuel [kg CO_2/litre]
FI .....fuel intensity [litre/100 km]
CO_{2_SP}...specific CO_2 emissions [kg CO_2/km]

Consumer's decision-making model

$$\max_{E,\eta} u(vkm) - p_f \cdot E(\eta) - \rho I(\eta)$$

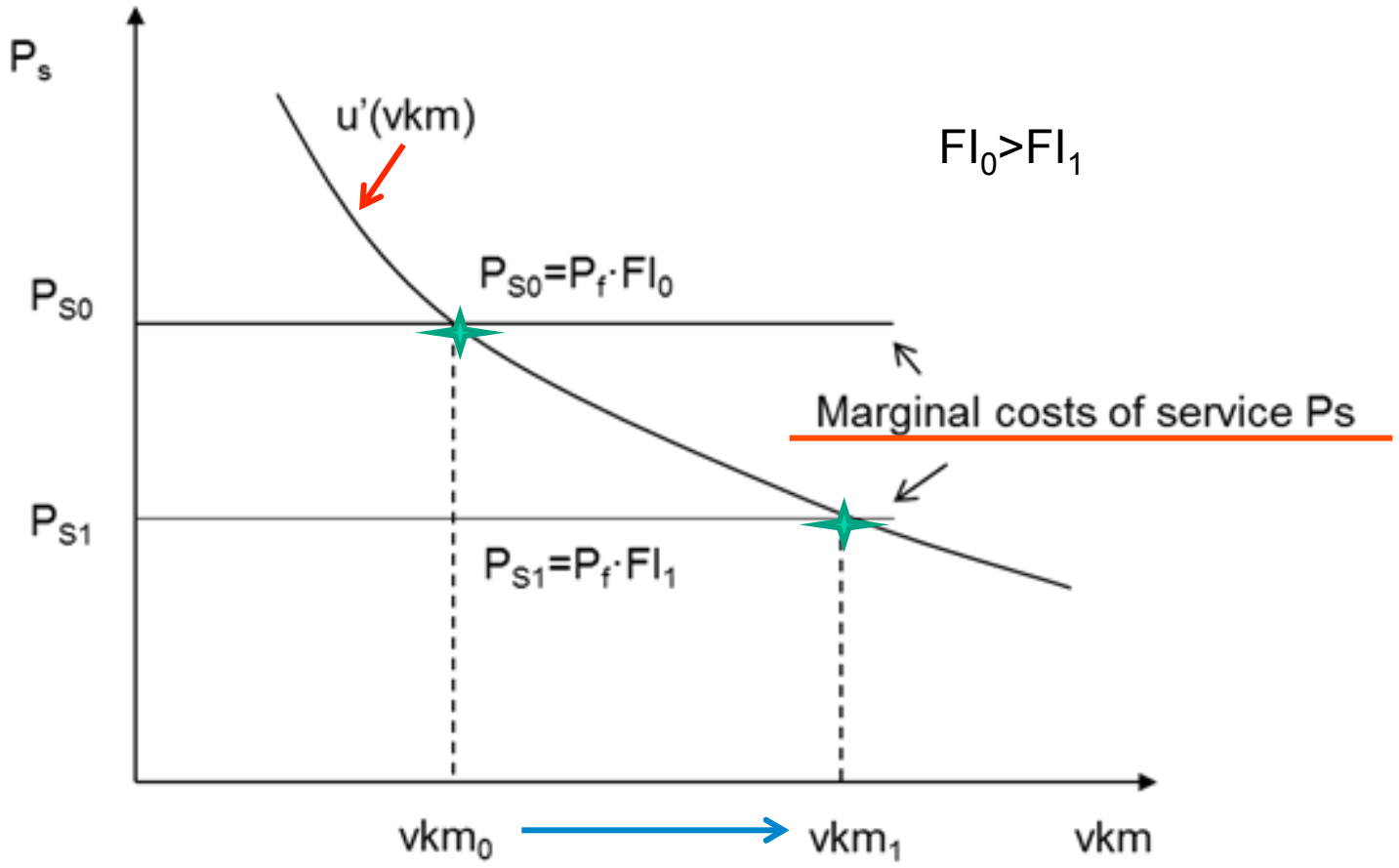
P_f.....fuel price including tax

ρ ....Annuity factor

I(η).....Investment costs

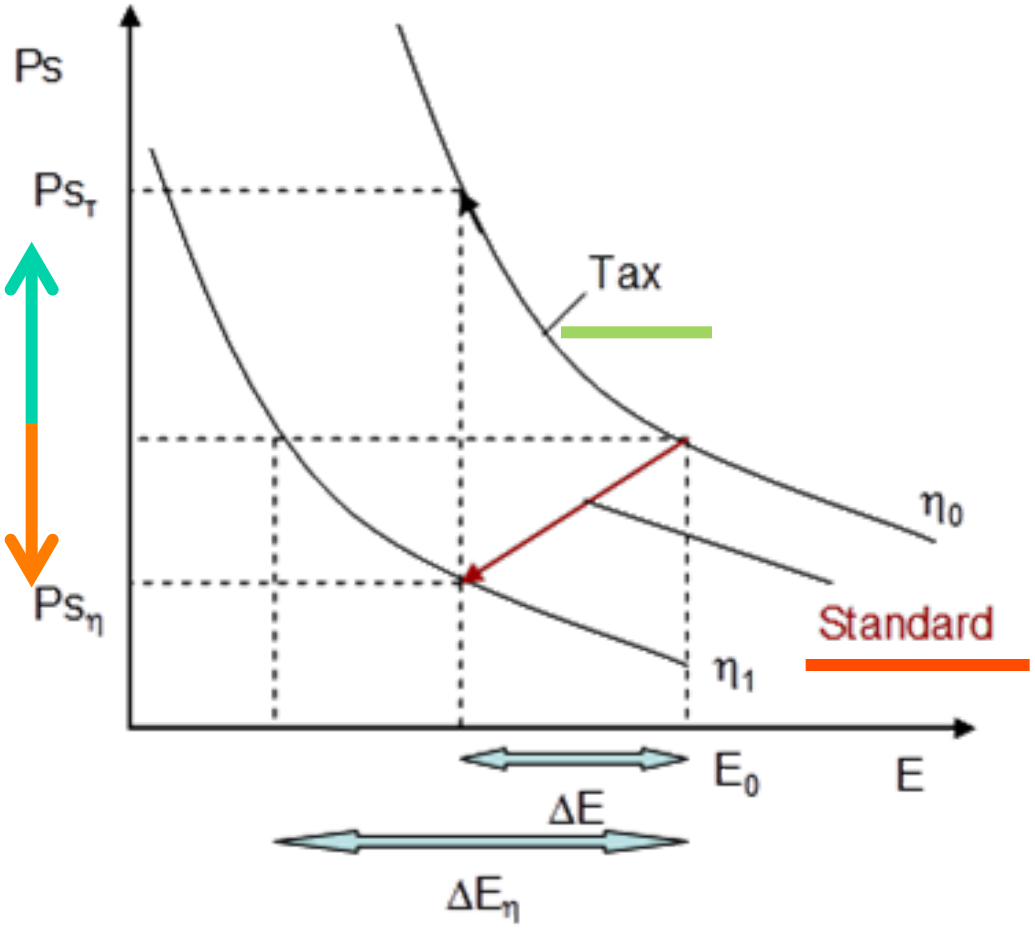
$$\max_{E,\eta} u(vkm) - (p_f + \tau_f) \cdot E(\eta^*) - \rho(I(\eta^*) + \tau_R)$$

Choice of service level

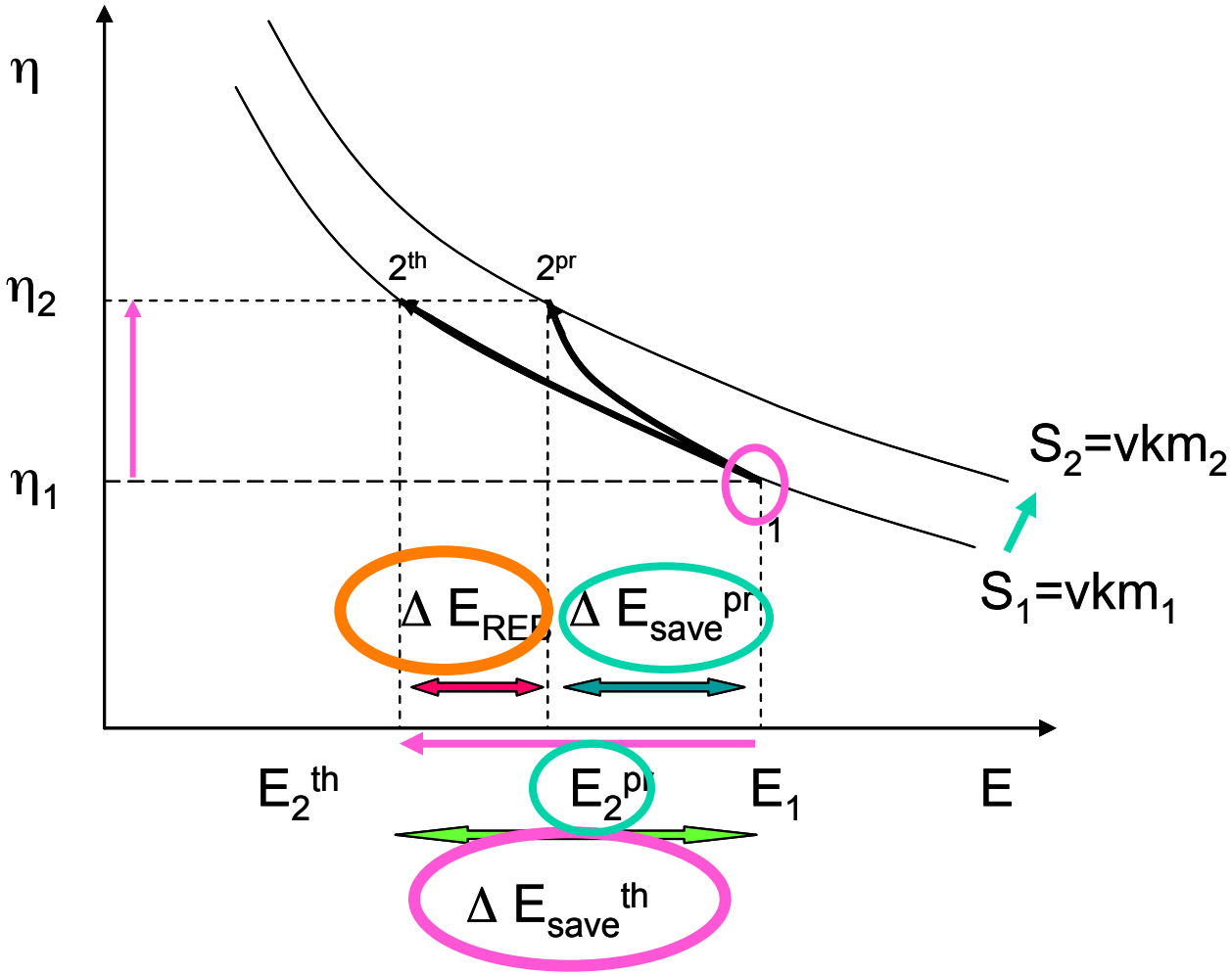


Choice of service level for vkm driven for different fuel intensities of a car

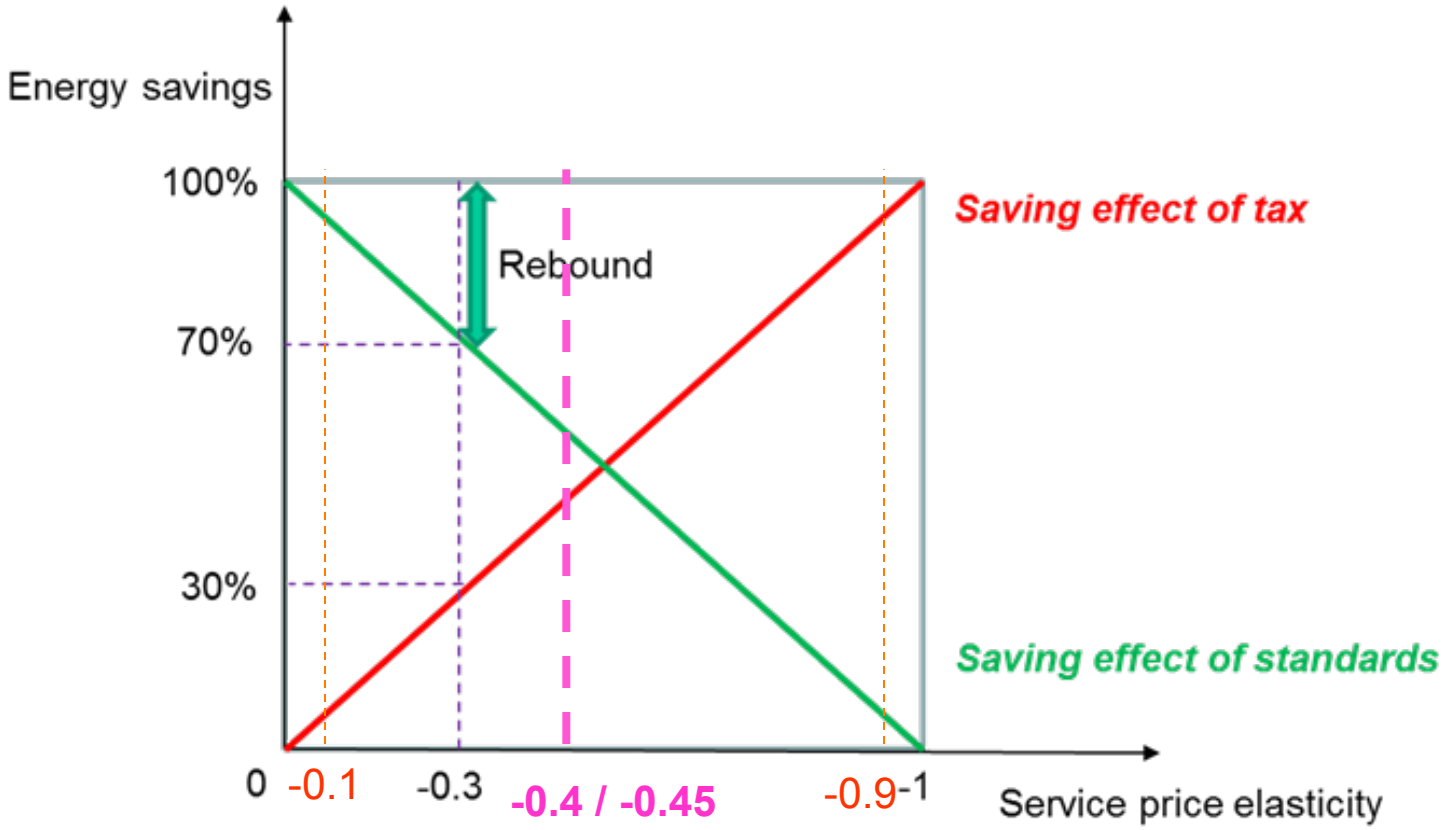
How a tax vs a standard works



The rebound effect

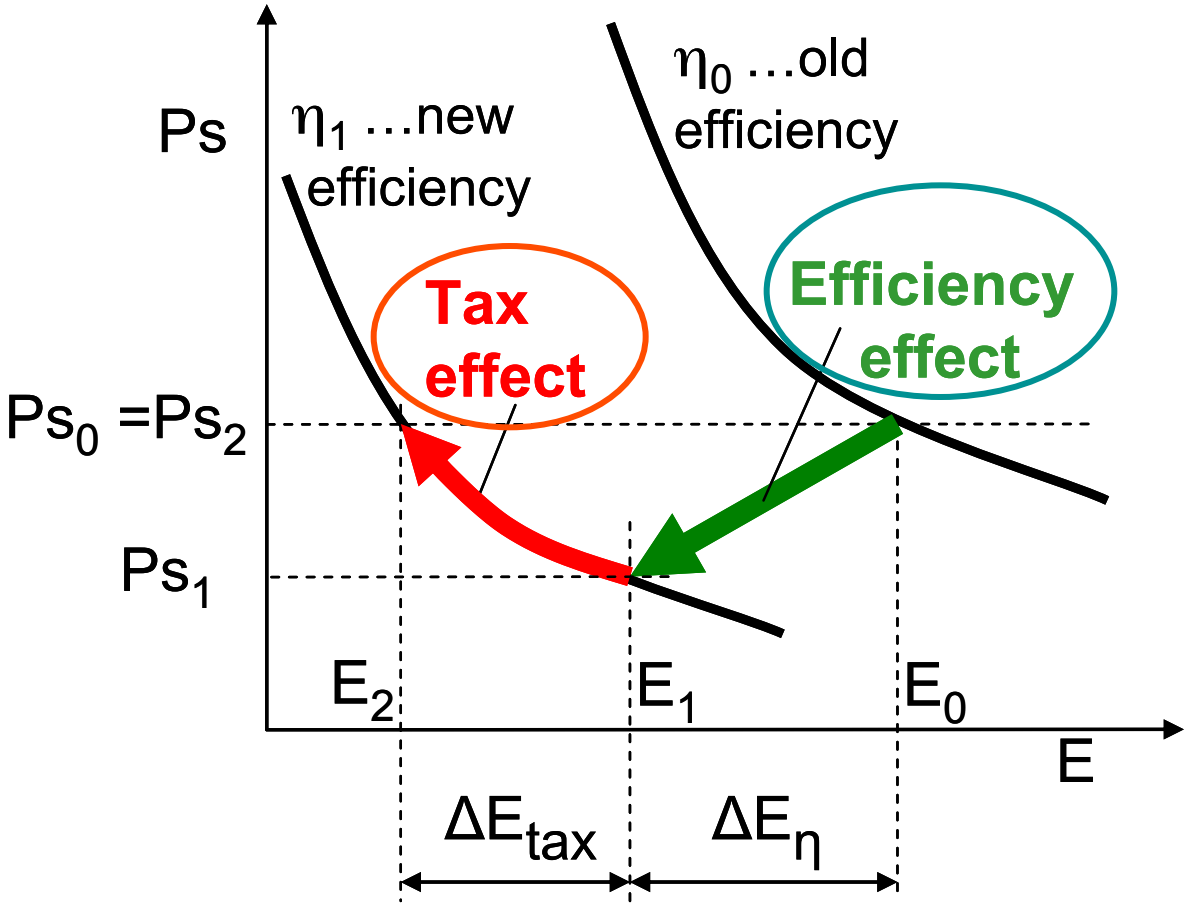


Service price elasticity



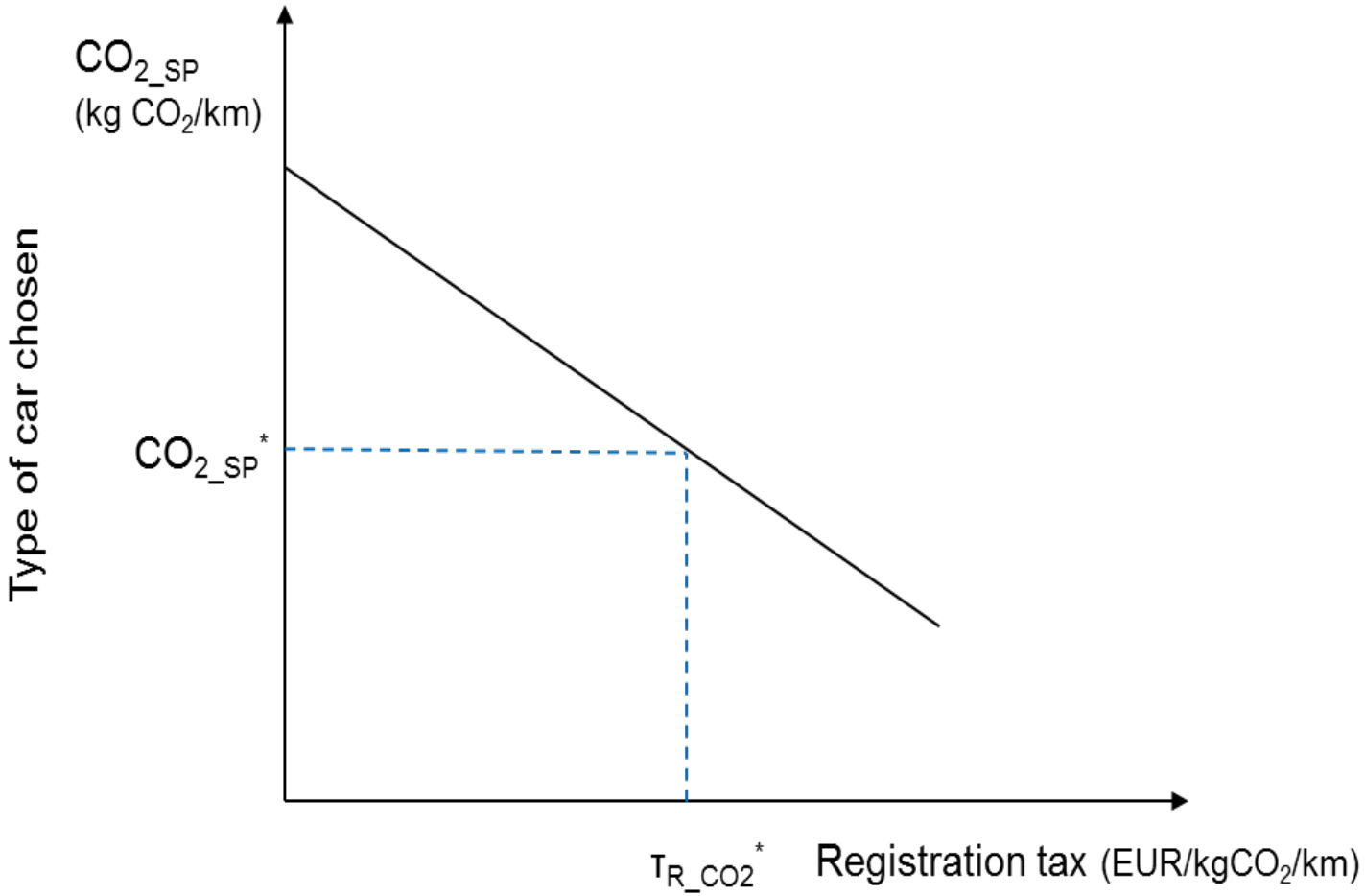
Effect of a tax versus standard depending on service price elasticity

Standards & taxes



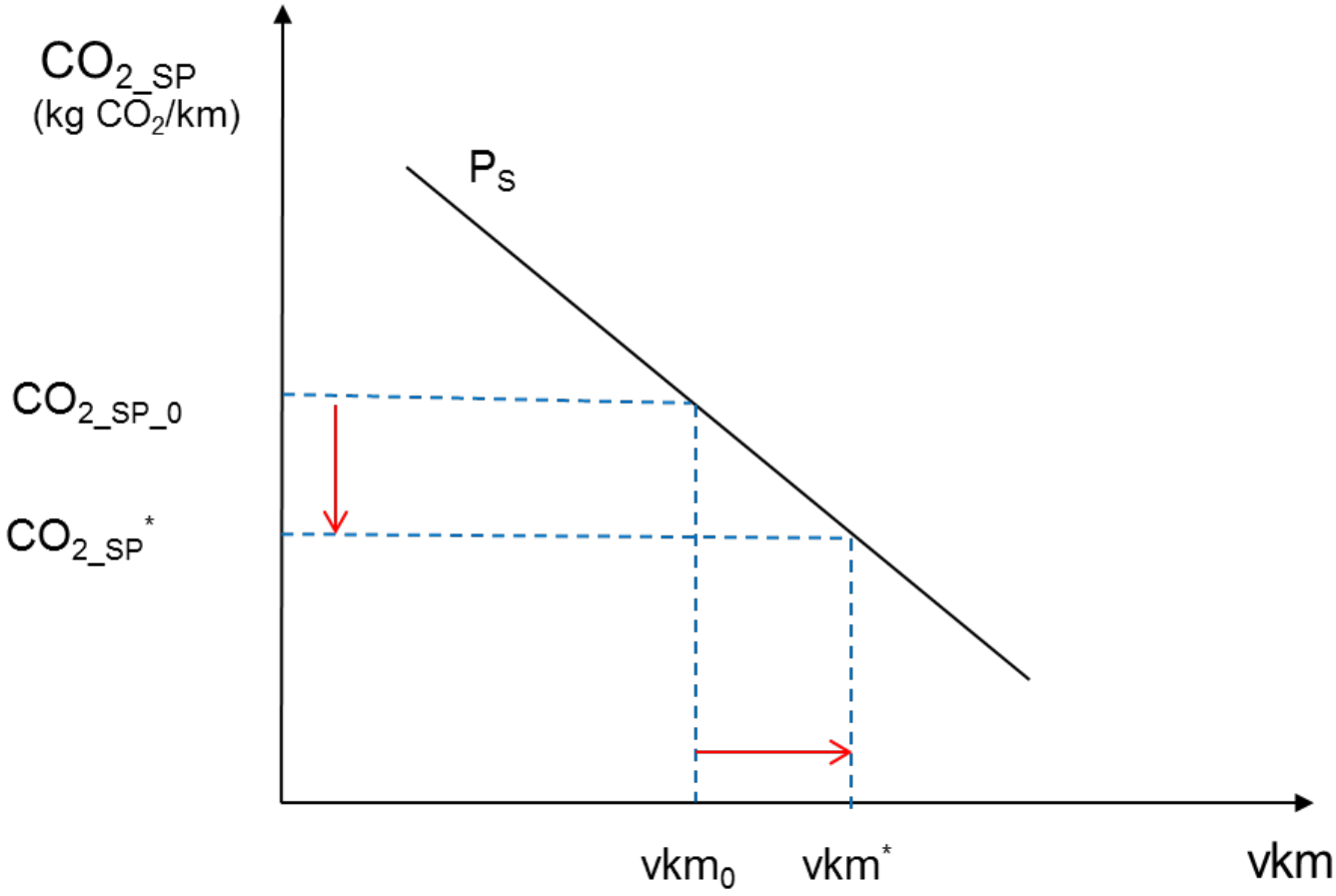
How taxes and standards interact and how a win-win situation is derived for society

Registration tax



Relation between a registration tax and the specific CO_2 emissions of cars

Registration tax



Relation between specific CO_2 emissions and the vehicle km driven

Conclusions

- standards …. rebound effect
- service price elasticity
- standards and fuel taxes are linked via the service price elasticity
- service price elasticity : -0.4 to -0.45
- a combined tax-standard policy = win-win situation for the environment and car drivers
- registration tax = standard ……rebound problems

Conclusions

- a broad portfolio of implemented taxes as well as on criteria of their implementation
- a harmonization of taxes in EU countries and their adaptation to the CO_2 targets could contribute to the reduction of the negative impacts of the rebound effect
- a simultaneous introduction of different policy measures

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