Transport and energy policies

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OUTLINE

- Start with critical appraisal of EU policy
- CO_2 emission reductions in transport sector remain very costly
- Vehicle technologies for CO_2 emission reduction
- Other policies for CO_2 emission reductions
- What happens in the rest of the world
- How are EU and rest of world linked?

EU’s transport and energy policy

(selection based on White Paper on transport(2011))

- Halve the use of conventionally fuelled cars in urban transport by 2030 and phase them out in cities in 2050
- By 2050 complete the HSR network (triple length of network by 2030) and majority of medium distance trips by rail
- Main motivations for this policy:
    - High oil dependence (90%)
    - Climate goals (transport emissions keep growing)
    - Increasing congestion

Problems

- Focus on strong carbon emission reduction in transport sector is wrong and costly
- Focus on modal choice for medium distance trips is also problematic

Focus on carbon emission reduction in transport sector is wrong and costly 1

- Why is it costly?
- Simplest answer:
  - present EU gasoline and diesel taxes act as a +200 €/ton carbon tax
- This implies that
  - car manufacturers consider this tax and invest in more fuel and smaller vehicles as long as it costs less than 200 €/ton
  - Car users make efforts (costs) to save fuel and CO2 emissions as long as it costs less than 200 €/ton
- This is clearly much more costly than the 5 to 25 €/ton cost in the industry

Focus on carbon emission reduction in transport sector is wrong and costly 2

- Possible fallacies in this argument?
  - Car drivers are myopic, they are badly informed etc. so they buy the wrong cars…
    - No good empirical evidence
    - At 200 €/ton they can afford to make a small mistake
    - (McKinsey famous CO_2 abatement cost curve got it very wrong as they used after tax prices)
  - We should discourage driving as there are other external costs associated to car use
    - Yes: mainly congestion and other air pollution
    - Congestion in peak periods and in urban areas: more fuel efficient vehicles are cheaper to drive per mile and would lead to more driving
    - For this reason, many economists prefer gasoline or mileage taxes to fuel efficiency standards – fuel efficiency standards discourage driving less than high gasoline taxes

Diagnosis of road transport problems

	Source	Nature of costs	Orders of magnitude of costs[a] (cents/mile, 2005 prices)	Public abatement and supply-type policies	Policies affecting demand and vehicle characteristics
Congestion	Volume of use approaches or exceeds design capacity per unit of time	Mainly time and schedule delay costs	4.2–35.7	Network capacity	Congestion charges, fuel taxes, access restrictions, land-use regulation, quantity controls
Climate change	Greenhouse gas emissions from fossil fuel use	Wide-ranging and uncertain adverse impacts from climate change	0.3–3.7		Fuel efficiency standards, CO_2 or fuel taxes, cap and trade
Traffic safety	High traffic density and heterogeneity in vehicle weight and speed, increase average accident risk	Mainly health and loss of life; material damage	1.1–10.5	Adaptation of road infrastructure, emergency services, mandatory insurance	Traffic rules and procedures, risk-dependent insurance premiums
Air pollution	Fuel combustion and exhaust	Mainly health, loss of life, and environmental degradation	1.1–14.8		Standards (vehicle equipment, fuel quality), access charges
Noise	Engines and movement	Health, discomfort	0.1–9.5	Sound barriers, silent road surfacing, curfews	Standards, curfews, tradable

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Vehicle technology policies for cars

- Has been very successful for reduction of conventional pollution (NOx, VOC, PM10, ..) using catalytic converter and better fuels
  - Emissions per carkilometer have been reduced by factor 10 or more
- Mistake 1: taxation policies still favor diesel cars in many countries
  - Diesel cars have 60 to 70% market share in B and FR
  - Are more polluting and pay less taxes per carkm because diesel is cheaper and they need less liter/km
  - These days they receive extra subsidies because they emit less CO_2 per km
- Mistake 2: still too much emphasis on electric cars

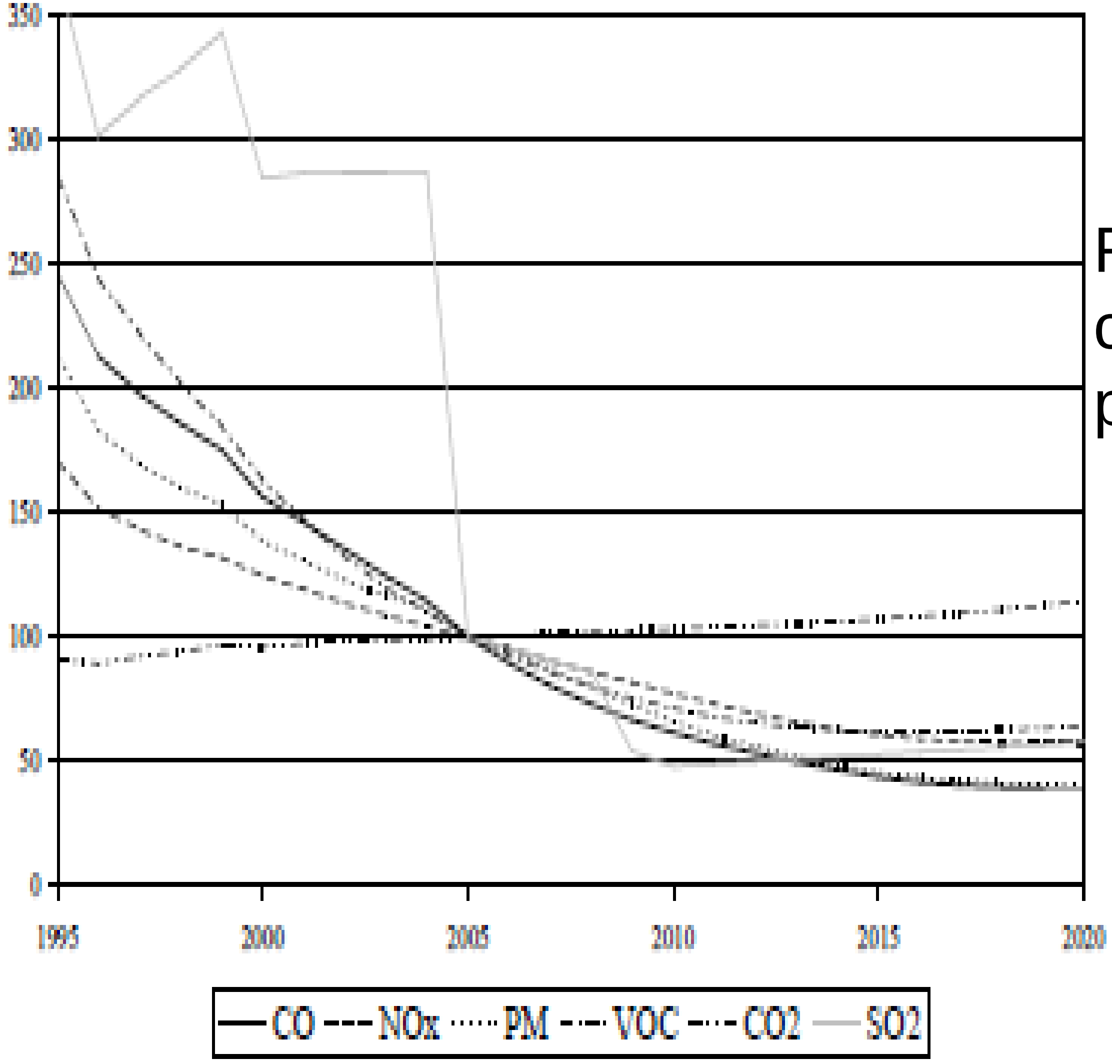

Figure 3.10. Baseline evolution of overall transport emissions (index: 2005 level = 100)

Regulation of conventional pollutants is a success

Source: Phd Jasper Knockaert with TREMOVE, 2010

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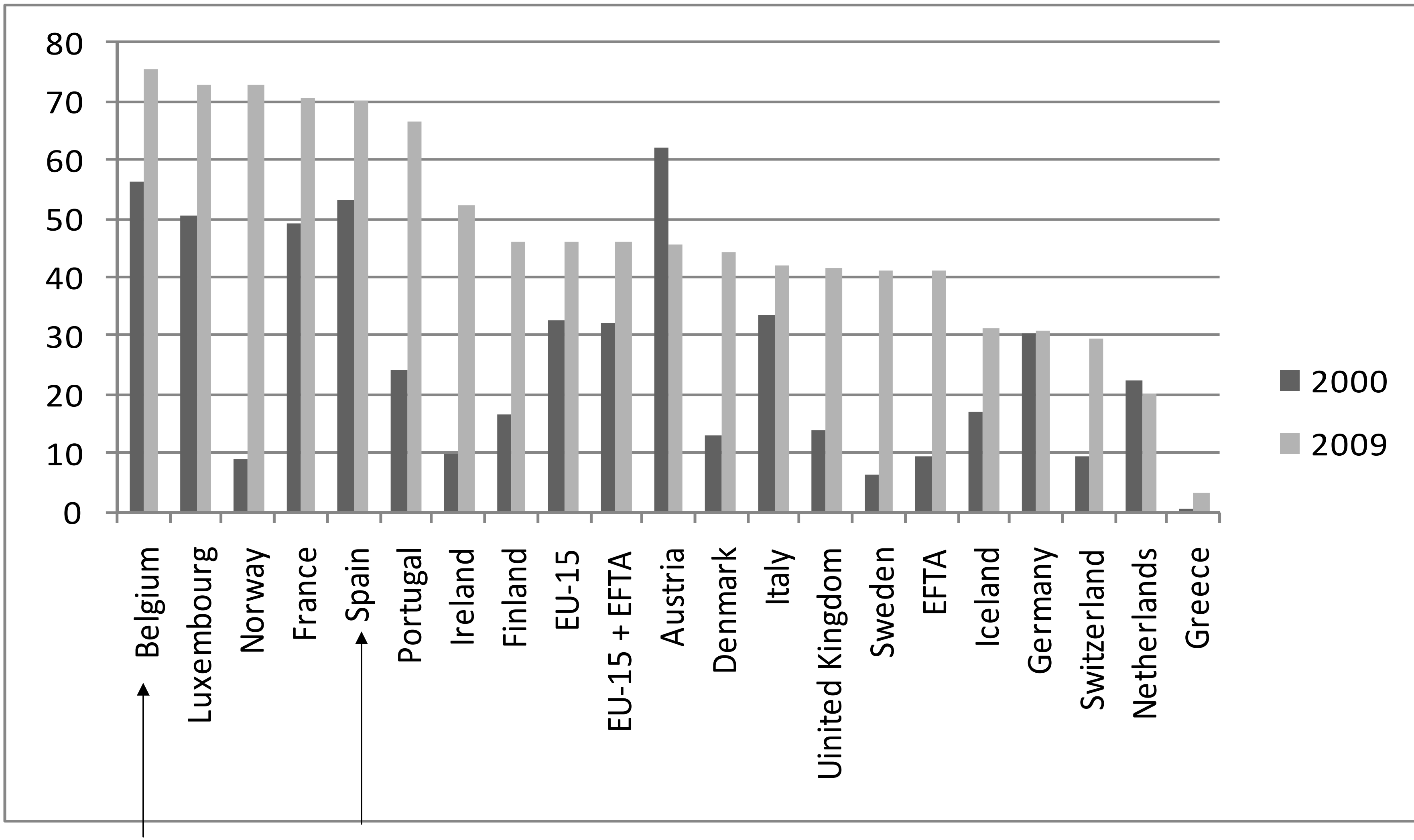
Share of diesel in new passenger car registrations (%)(2000 and 2009)

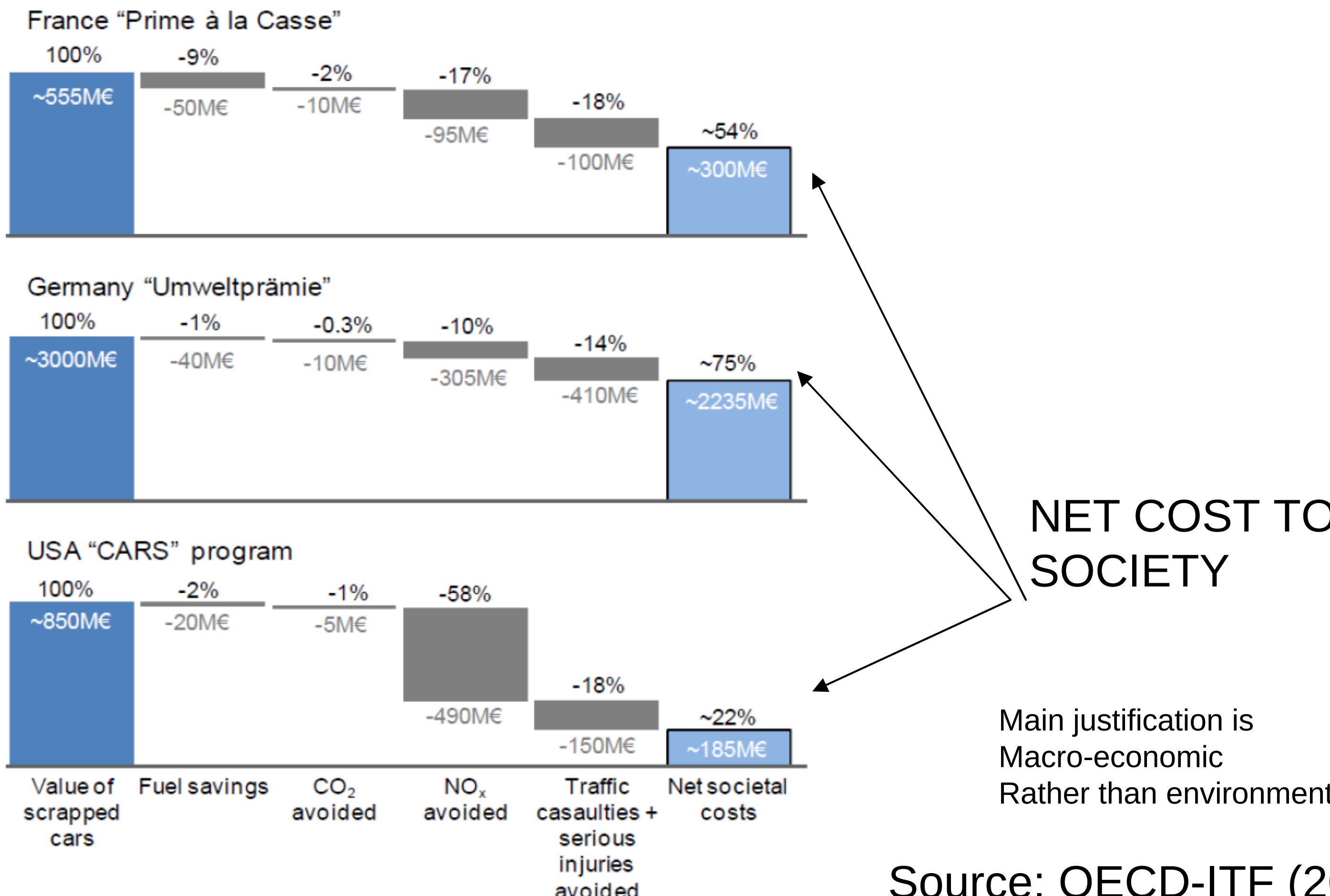


Example of tax and subsidy advantages for diesel cars in Belgium – differences with standard gasoline car

		VW Golf (77 kW)		BMW 320 (120 kW)	
	units	Diesel	Fuel efficient diesel	Diesel	Fuel efficient diesel
Difference w.r.t. gasoline version					
Resource costs (excl. taxes and subsidies)	euro/year	65	140	168	94
External air pollution costs	euro/year	24	9	19	14
External costs due to mileage	euro/year	0	0	0	0
Social costs of raising public funds[a]	euro/year	139	376	336	443
Net social cost	euro/year	228	526	523	551
CO_2 emissions savings	ton/year	0.225	0.525	0.575	0.975
Cost per ton of CO_2 savings	euro/ton	1012	1002	910	565

Assessment of vehicle scrap subsidies of last 3 years

Figure 26. **Cost-effectiveness of the French, German and US Car Fleet renewal Schemes**



Main justification is
Macro-economic
Rather than environmental

Source: OECD-ITF (2011)

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- **Mistake 2: still too much emphasis on electric cars**

Table 2 Characteristics of new car technologies in OECD countries

Technology	GHG emissions index (well to wheel) per unit distance, OECD 2010 = 100	Major consumer disadvantages and costs	Other externalities
OECD 2010			
OECD	100		
Gasoline (United States)	115		
Gasoline (EU)	90		
Diesel (EU)	80		More conventional air pollutants
OECD 2020–2040			
Gasoline	80–45	Extra cost of 0–$2,000/vehicle	
Diesel	80–45	Extra cost of 0–$2,000/vehicle	More conventional air pollutants
Hybrid gasoline	60–34	Extra cost of $2,000–$4,000/vehicle	
Hybrid diesel	50–34	Extra cost of $2,000–$4,000/vehicle	More conventional air pollutants
Plug-in hybrid	30–19 Lower bound requires CCS or renewables	Extra cost of $7,500/vehicle	Less conventional emissions in urban areas
Electric car	45–14 Lower bound requires CCS or renewables	Smaller range, slower and more frequent refueling + extra cost of $10,000–$20,000/vehicle and requires adaptation of electricity distribution	Less conventional emissions in urban areas
Compressed natural gas, hydrogen, biofuels	With current technologies not certain that there is a decrease in GHG emissions	Requires new distribution network extra vehicle adaptation costs and smaller trunk space	

Source: Proost & Van Dender

Cost efficiency of CO_2 emission reductions via electric vehicles

compared to industry benchmark of 20 $/ton

- Hybrid (no plug in): saves 0.4 ton CO_2 per year at cost of 500 to 1000 €/ ton CO_2/year
- Hybrid (plug in): saves 1 ton of CO_2 IFF electricity is renewable or nuclear at cost of close to 1000 €/ton CO_2
- Electric car (but small range and small market): saves 2 ton of CO_2 IFF electricity is renewable or nuclear at cost of close to 1000 €/ton CO_2

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What else can be done to save CO_2 and is not too expensive?

- Land use planning?
  - Empirical studies are not conclusive – more urbanisation means less car ownership and less driving but is this a good policy to reduce emissions?
- Reduce driving in peak periods and urban areas
  - Via road pricing
  - Not only via cheaper public transport as this generates a lot of additional traffic
  - Milano, London, Stockholm

	London	Stockholm congestion trial	Milan Ecopass
Congestion			
Traffic volumes	−34% cars, +22% taxis, −12% all vehicles[a]	−22% across cordon, −16% within cordon[f]	−12.3% in RZ, −3.6% outside[i]
Travel times	−30% congestion delay as of mid-2005[a]	Congestion delays dropped 1/3 to 1/2 on arterials, lesser reductions inside cordon[f]	
Speeds	+17% in RZ, averaged over whole day[a]		+4% in RZ for private vehicles, +7.8% for buses[h]
Accidents	−2% to −5% for personal injuries[b]	−5% to −9% injuries[f], −3.6% accidents[g]	−20.6%[i]
Emissions			
NO_x	−12%[c,d]	−8.5%[g]	−14%[h]
PM10	−12%[c,d]	−13%[h]	−19%[h]
PM			−18%[i]
Air-borne pollutants		−10 to −14%[g]	
CO2	−19%[c,d]	−14%[f]	−15%[h]
Public transport [person trips]	+30% within RZ during first two years[e]	+4.5% across cordon[g]	+7.3% surface PT[i], +9.2% exits in RZ[h]

Source: Anas & Lindsey, 2011, Review of Environmental Economics and Policy

Table 3 Benefits and costs of LCC, Stockholm congestion trial, Milan EcoPass

	London[a], £ million (2005)		Stockholm congestion trial[b], SEK million (2006)		Milan Ecopass[c], € million (2008)	
Gross benefits						
	230		938		30.2	
Total costs						
	163		284		14.5	
Net benefits						
	67		654		15.7	
Setup costs						
	170		1,900		7.0	
Decomposition of benefits						
Time savings and reliability benefits	185		614		12.8	
Deterred drivers	−25		−74		−0.2	
Subtotal (all drivers)	160	69.6%	540	57.6%	12.6	41.7%
Public transport	42	18.3%	−15	−1.6%	8.6	28.5%
Reduced accidents	15	6.5%	125	13.3%	6.6	21.9%
NO_x + PM10			22	2.3%	1.8	6.0%
Reduced CO_2 emissions	3	1.3%	64	6.8%	0.6	2.0%
Other resources	10	4.3%				
Premium on government revenues			202	21.5%		

Focus on modal choice for medium distance trips is also problematic

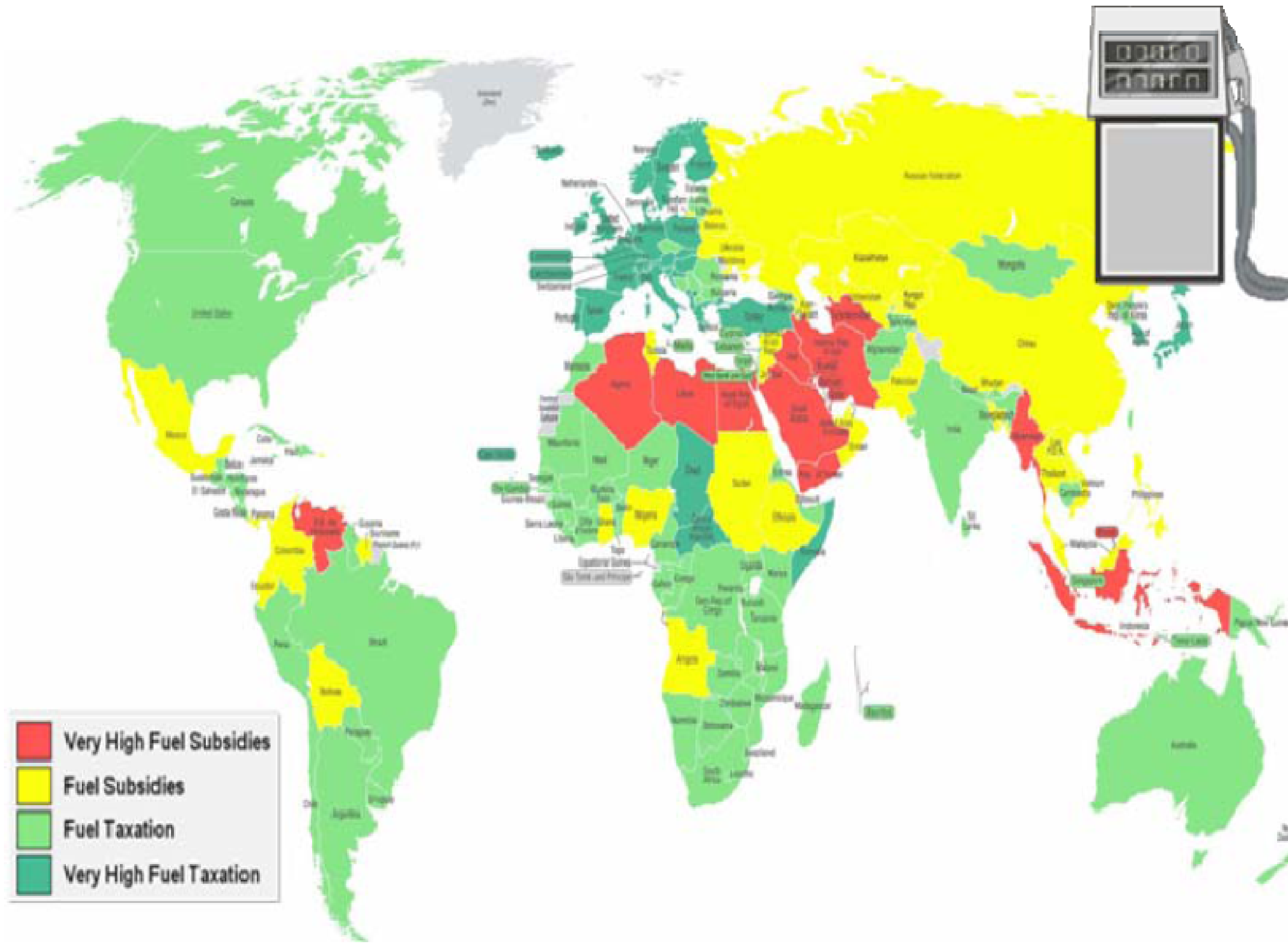
- By 2050 complete the HSR network (triple length of network by 2030) and majority of medium distance trips by rail

- Many of our investments in Trans European Network (for Transport) do
  - Not pass Cost benefit test
  - Have no EU value added

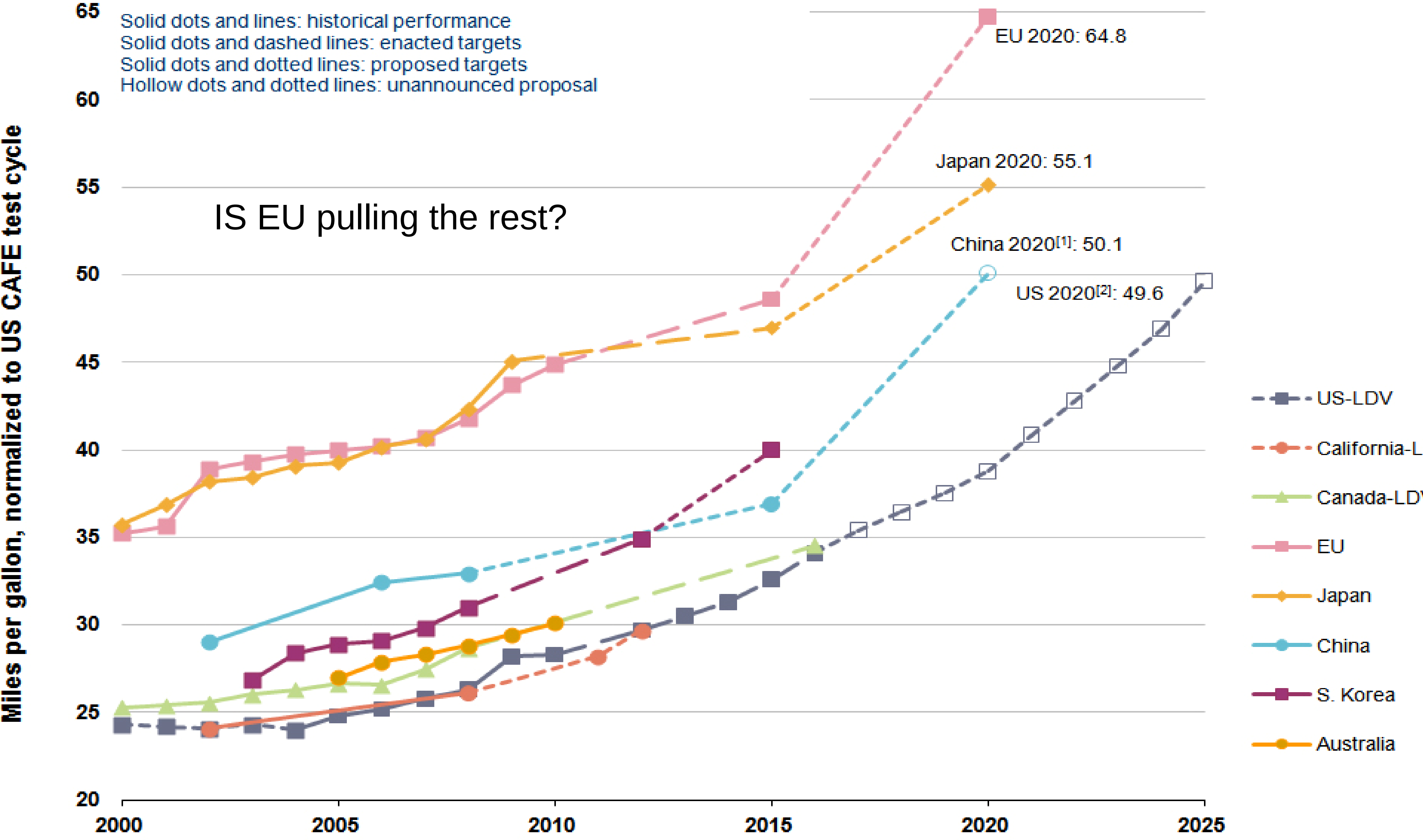
Transport and energy policies world wide

- Non-cooperative world
  - EU shows good example but is not followed (except CA?)
  - Probability of a grand coalition is very small as it is a global public good
- Does this mean that US, China etc will do nothing?
  - No as all rich countries will want to avoid climate damage but they will all make suboptimal efforts (10 to 20%) because they only look at their own damages avoided

Diverging gasoline tax policies



Different fuel efficiency policies



[1] China's target reflects gasoline fleet scenario. If including other fuel types, the target will be higher.
[2] US and Canada light-duty vehicles include light-commercial vehicles.

Strategic trade and environment arguments

1 the technology breakthrough question

- make a large collective R&D effort to develop a new GHG lean engine and to make the patents available to everybody
  - S.Barrett: this runs into the same problem as a Kyoto agreement because there are very strong spillovers and there will be a too low level of funding of individual countries
  - Green Paradox for fossil fuel markets:
    - if main exporters of oil expect a real breakthrough in car technology (cheap electric engine), they understand that the demand for their product (and price) will fall in the future and they may prefer to sell much more now
    - This will not necessarily stop the development of the new technology but will take away part of the GHG emission gains that are expected
    - This type of strategy can be avoided by an agreement of the main oil users to use an import tariff – the OECD never succeeded to do this

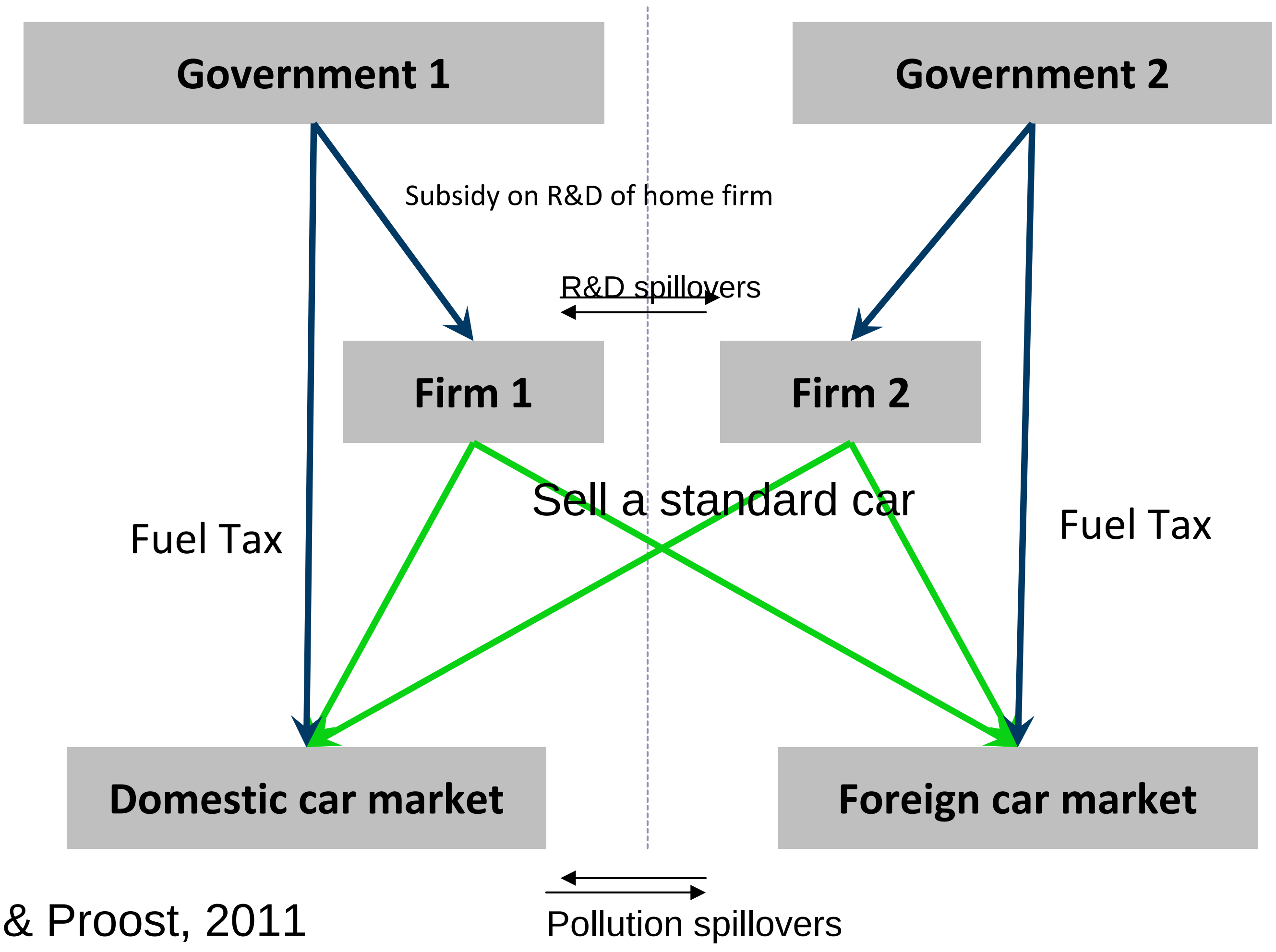
Strategic trade and environment arguments

2 limited efforts in a non-cooperative world

- Breakthrough technology produced by a global coalition
- Limited efforts of each of the big blocks
    - On of the arguments for a strong fuel efficiency policy for cars in the EU is that the EU can through technology spillovers improve emissions of cars in the rest of the world
    - Study problem in a model where each continent has a home producer (of cars, or aircrafts) and where the government (say EU or US) set gas taxes and give subsidies for more fuel efficient cars to their home firm, taking into account that their product is sold on both markets

MODEL

Setup



Source: Benoot & Proost, 2011

MODEL

Approach

Stage 1: Each Government sets taxes and subsidy

MAX CS home

+PS home +PS on foreign market

-Env Damage home

Stage 2: Firms decide on the abatement level x, taking into account the revenues they can expect from the output stage of the game and the costs of R&D for fuel efficiency

Stage 3: Firms decide on output levels in both countries, taking the output of the other as given

→ Solving backwards to find an optimal tax and optimal subsidy – we do the analysis first for the optimal tax

Cooperative versus non-cooperative equilibrium

High fuel tax
Has important
Role to extract foreign profits

External costs: 0.20 € local + O.20 € global

Correct too high price
of cars

	No subsidy policy		Subsidy	
	Cooperative	Non-cooperative	Cooperative	Non-cooperative
Fuel Tax	0.21	0.39	0.16	0.38
Subsidy rate			0.34	0.12
Total welfare	$6.71 * 10^7$	$4.06 * 10^7$	$6.74 * 10^7$	$4.03 * 10^7$

Table 4.4.Welfare and tax comparison if a subsidy policy is used by governments (2 companies in each country)

Relative importance of different mechanisms

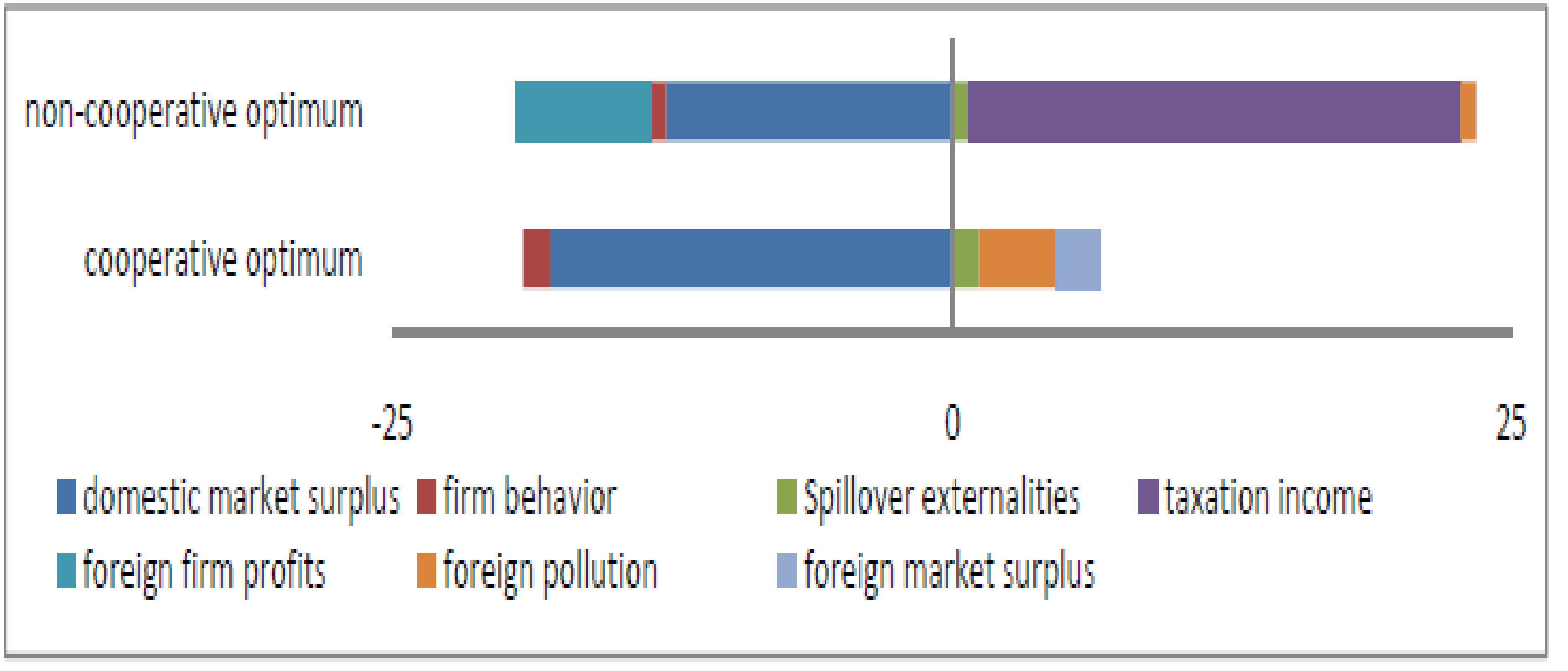


Figure 4.1. The relative importance of different strategic incentives on the optimal tax level of governments. The horizontal axes represents the marginal incentive to increase or decrease the fuel tax, expressed in €cent/l

Different experiments

	Domestic fuel tax	Foreign fuel tax
Benchmark	0.42	0.42
Only foreign firm has R&D spillovers	0.51	0.35
Foreign government values only local pollution	0.44	0.18
2 domestic firms, 1 foreign firm	0.28	0.5

Table 4.3. optimal fuel taxes in a non-cooperative equilibrium with asymmetric structure

Transport & Energy – summary

- Slow down on energy efficiency & carbon efficiency
- Speed up on other issues (road pricing etc)