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Technology and policy drivers of the fuel economy of new light-duty vehicles

Comparative analysis across selected automotive markets

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Content

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- GFEI benchmarking analysis
- Methodology
- What's new
- Results: policy influence, comparative assessments, technology deployment
- Examples of insights from country profiles
- Conclusions

Global Fuel Economy Initiative

International Energy Agency
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Target: improve the fuel economy of cars

- 50% lower fuel use per km by 2030 (new registrations) and 2050 (stock) – benchmark 2005

Activities

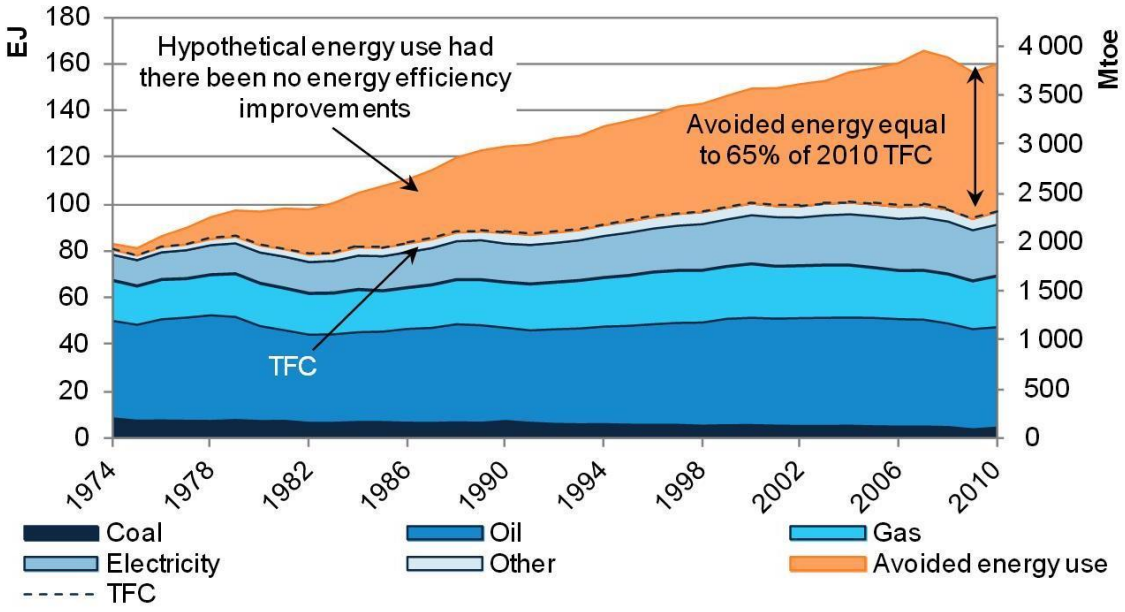
- Analysis: data gathering, modeling, baseline development
- Evaluation: policy tools and options
- Strategy development: organization of dialogues
- Outreach: Awareness raising, communication

Core partners

FIA Foundation for the Automobile and Society
icct
iea International Energy Agency
International Transport Forum
UNEP
ITS UCDAVIS Institute of Transportation Studies

IEA role in GFEI

- GFEI message fully aligned with IEA message on energy efficiency (first fuel, need to scale up)
- GFEI target developed on the basis of IEA analysis (ETP scenarios)
- IEA performing GFEI benchmarking analyses

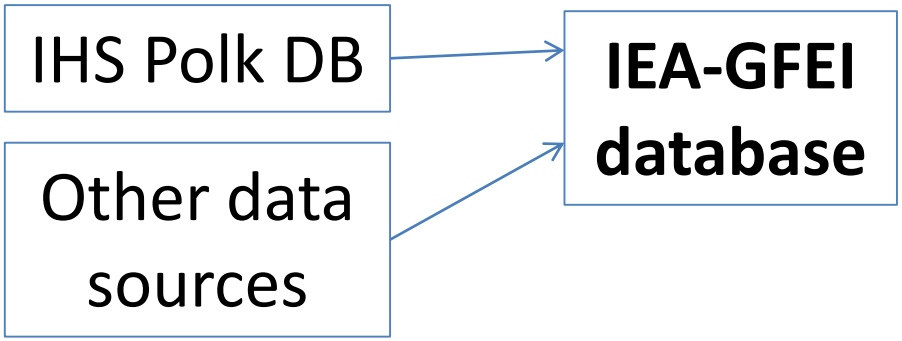


GFEI benchmarking analysis

- Aiming at monitoring developments against GFEI target over time
- Unique compilation of OECD and non-OECD data
- Covers more than 80% of the global car market
- Information available for 2005, 2008, 2010-13
- **4th edition since 2010**

Methodology

- Analysis based on vehicle registration data from IHS Polk
  - New registrations by brand, model, powertrain and other specs
- Data coverage not complete: missing information is completed using other sources



Coverage >80% for segment, weight, footprint, CO_2/km, fuel economy

2005, 2008, 2010-13

- Fuel economy and CO_2/km normalized to the WLTP
- Results evaluated for all light duty vehicles: no arbitrary split between cars, light trucks and LCVs
- Results shown as sales-weighted averages

What's new

- Increased coverage
  - This was limited to segment, powertrain/fuel type, fuel economy and CO_2/km in earlier editions
  - Now it covers also weight, footprint, power and displacement
- Comparative analysis across markets
- Country reports
  - Market profile (size, income, fuel prices and taxes, fuel economy policy review)
  - Vehicle characteristics (CO_2/km, fuel economy, shares by powertrain & fuel type, power, weight, footprint, displacement)
  - Analysis linking key parameters and relating trends to the policy context

Results

Fuel economy - regions

		2005	2008	2011	2013	2030
OECD average	average fuel economy (Lge/100 km)	8.9	8.4	7.8	7.5	
	annual improvement rate (% per year)		-2.1%	-2.5%	-1.9%	
				-2.2%		
Non-OECD average	average fuel economy (Lge/100 km)	8.5	8.5	8.4	8.2	
	annual improvement rate (% per year)		-0.1%	-0.4%	-1.2%	
				-0.5%		
Global average	average fuel economy (Lge/100 km)	8.8	8.4	8.0	7.8	
	annual improvement rate(% per year)		-1.7%	-1.6%	-1.4%	
				-1.6%		
GFEI target	average fuel economy (Lge/100 km)	**8.8**				**4.4**
	required annual improvement rate (% per year) 2005 base year			**-2.7%**		
	required annual improvement rate (% per year) 2014 base year			**-3.3%**		

closest to target

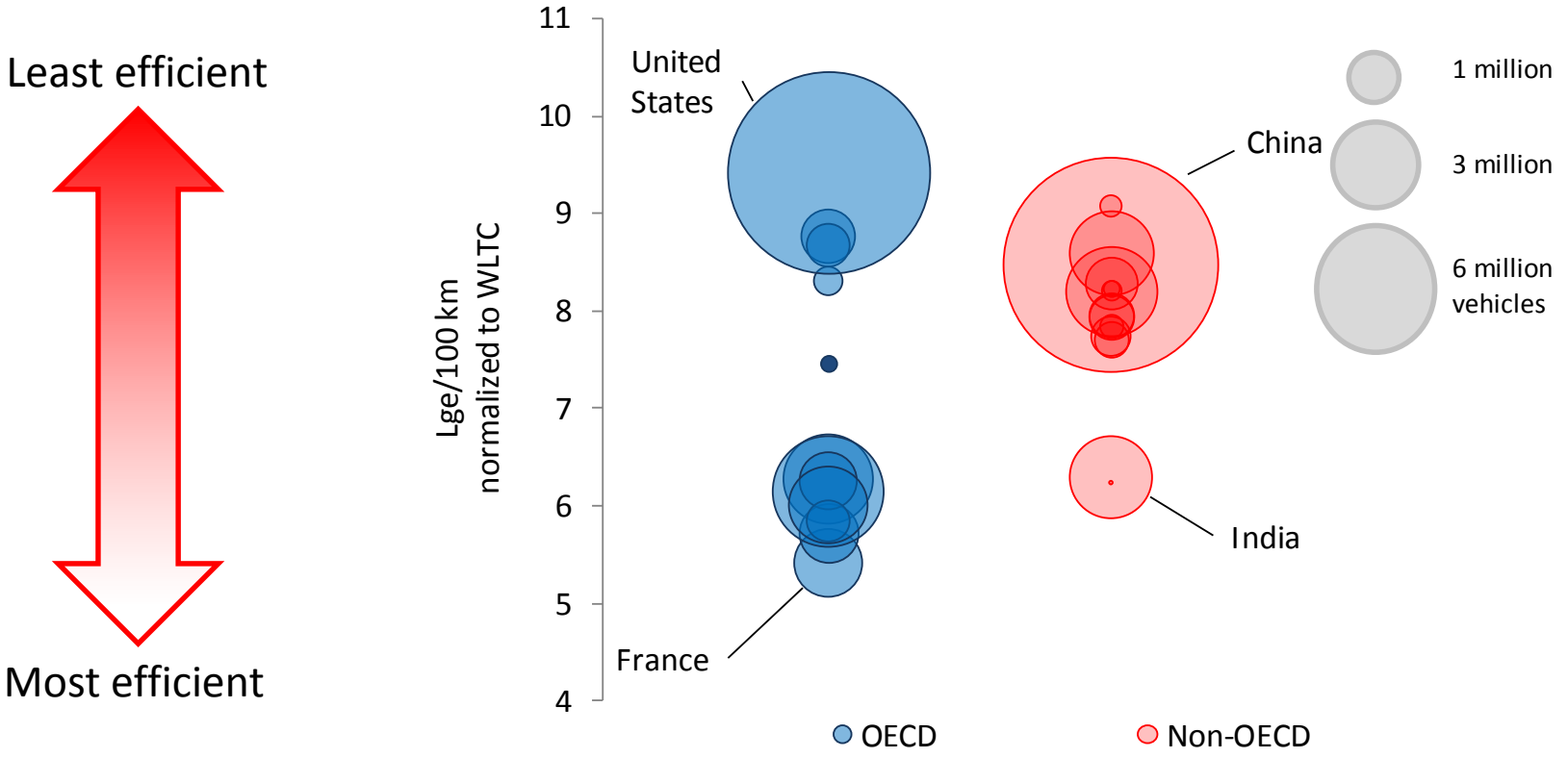
little improvement

slow pace, right direction

%0% better by 2030

- Absolute values are higher than in earlier assessments (LCV inclusion and WLTC), the on-road gap factor is lower (WLTC)
- The OECD still ahead of the non-OECD, but the gap is narrower (WLTC conversion stronger for markets focused on gasoline)
- The global improvement lower than earlier assessments
- Why WLTC? Acknowledgement to its future relevance

Fuel economy – main markets

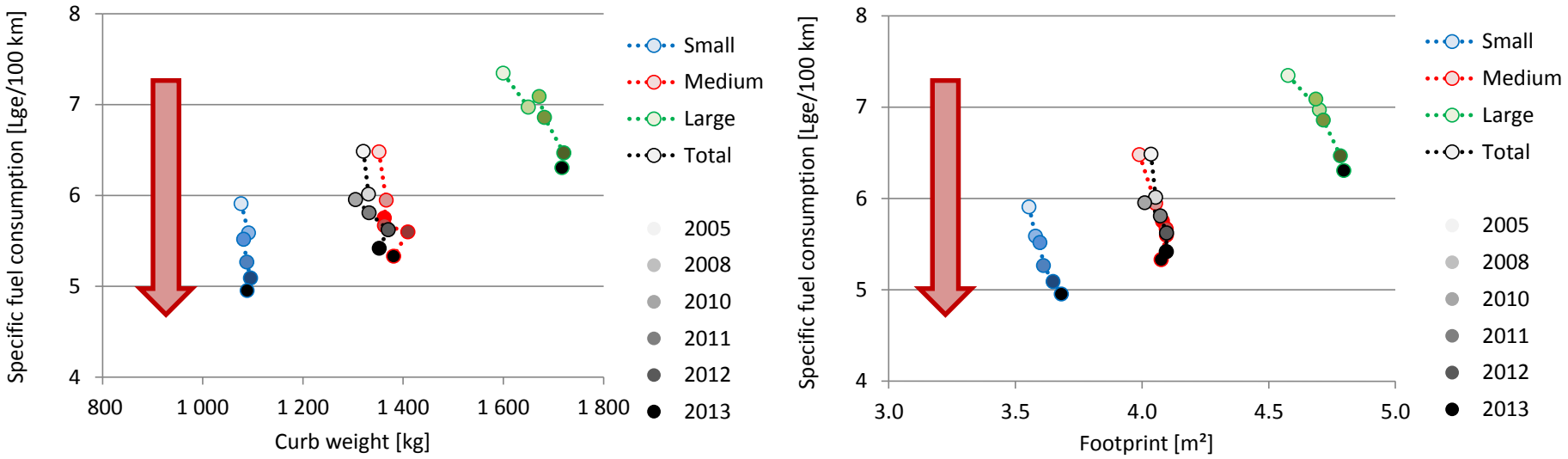


- Heterogeneous situation across markets
- Values influenced by income, fuel taxes, vehicle taxes, consumer preferences, policy context…
- OECD: both most efficient and least efficient markets

Impacts of policies

Case 1

- stringent fuel economy regulations in place
- monetary incentives (feebate, differentiated vehicle taxation based on CO_2/km)

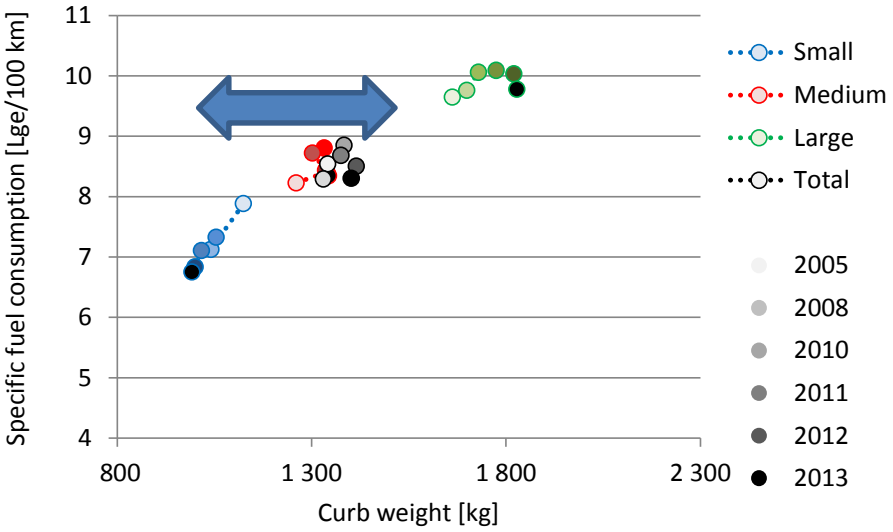


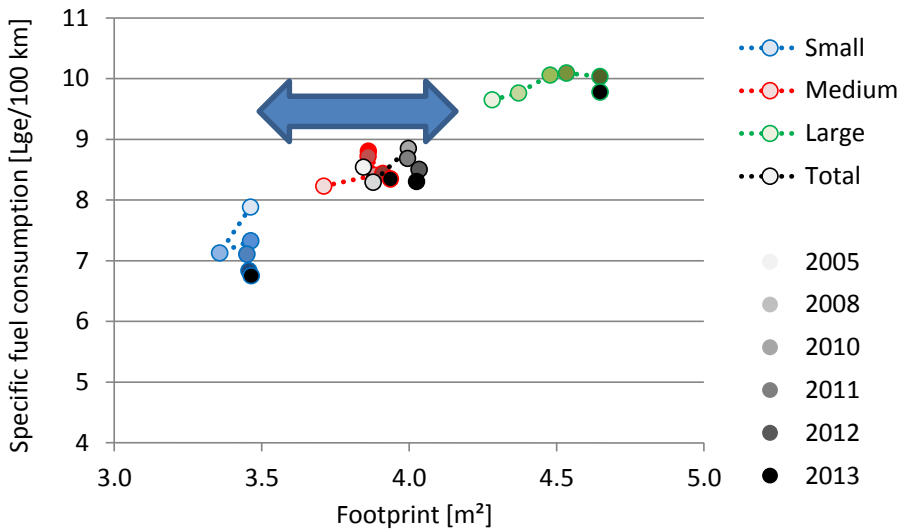
- Example in the figure: France

Impacts of policies

Case 2

- NO fuel economy regulations
- NO monetary incentives





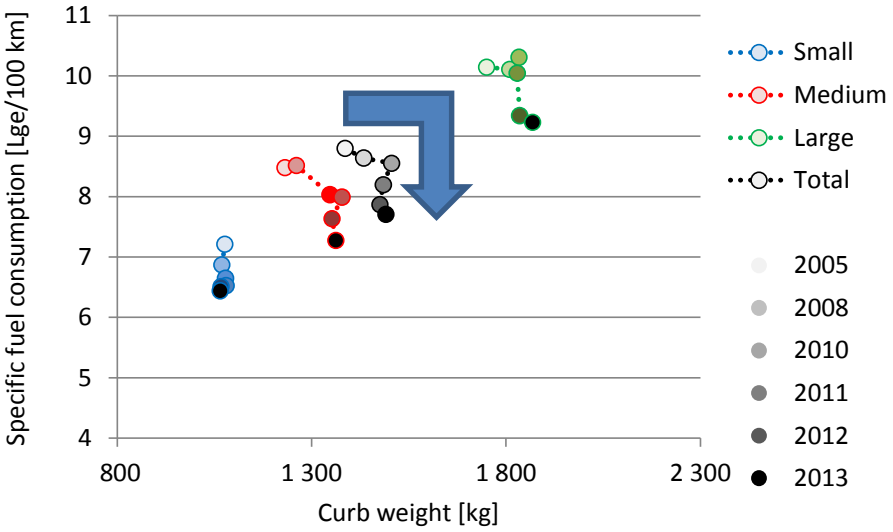
- Example in the figure: Chile (prior to the reform of 2015)

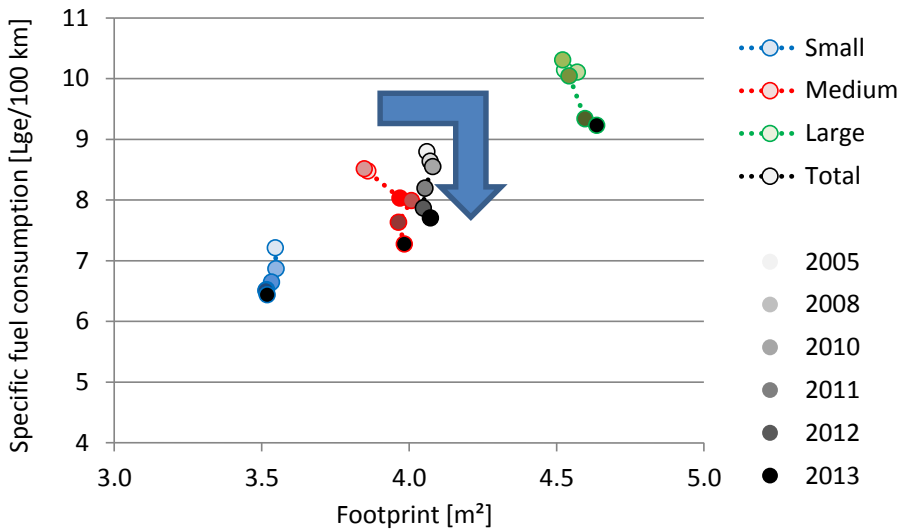
Results

Impacts of policies

Case 3

- NO fuel economy regulations
- Monetary incentives as of 2010





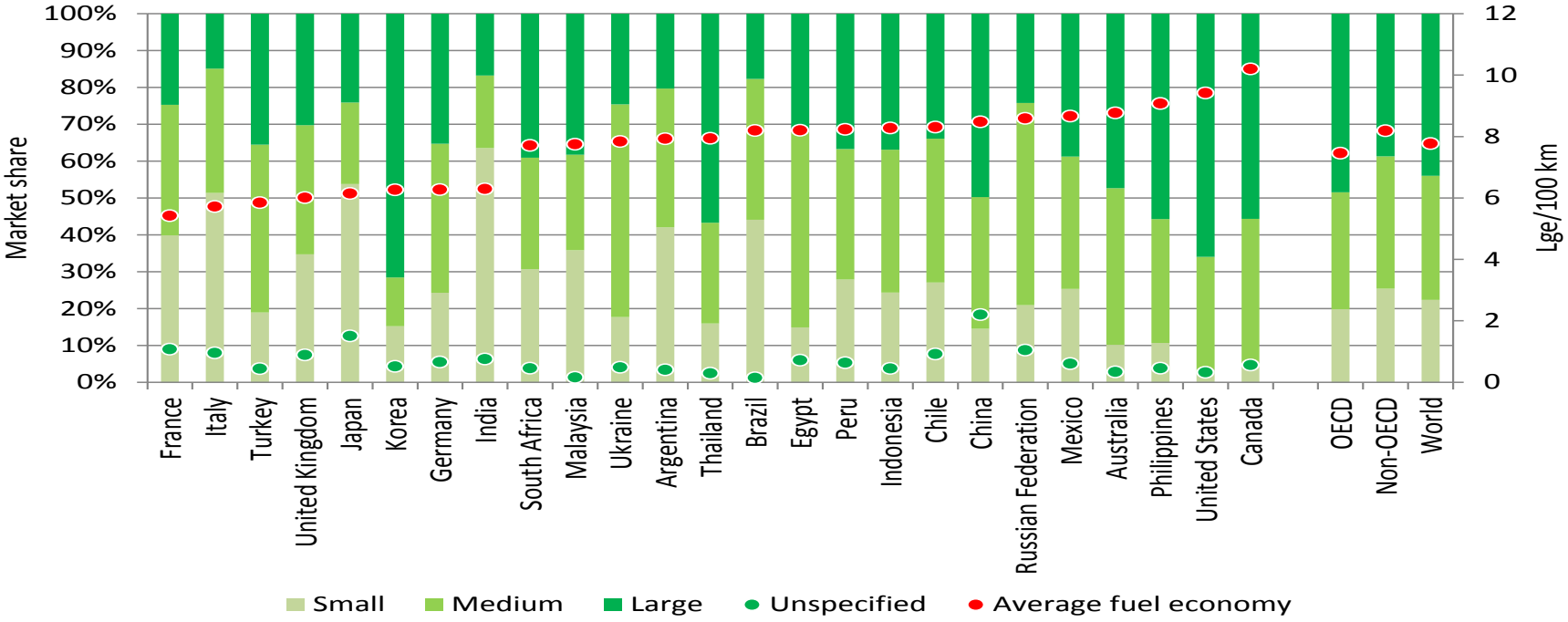
- Example in the figure: South Africa

Impacts of policies 1/4

- Ambitious policy frameworks can effectively improve fuel economy and limit carbon emissions of cars
- Fuel economy policies had little effect on the weight or size of vehicles
- Differentiated vehicle taxation demonstrated a good capacity to improve fuel economies, even in the absence of regulatory measures
- In the absence of policies, the tendency for most vehicle attributes (including fuel use/km is to stagnate)

Comparative results

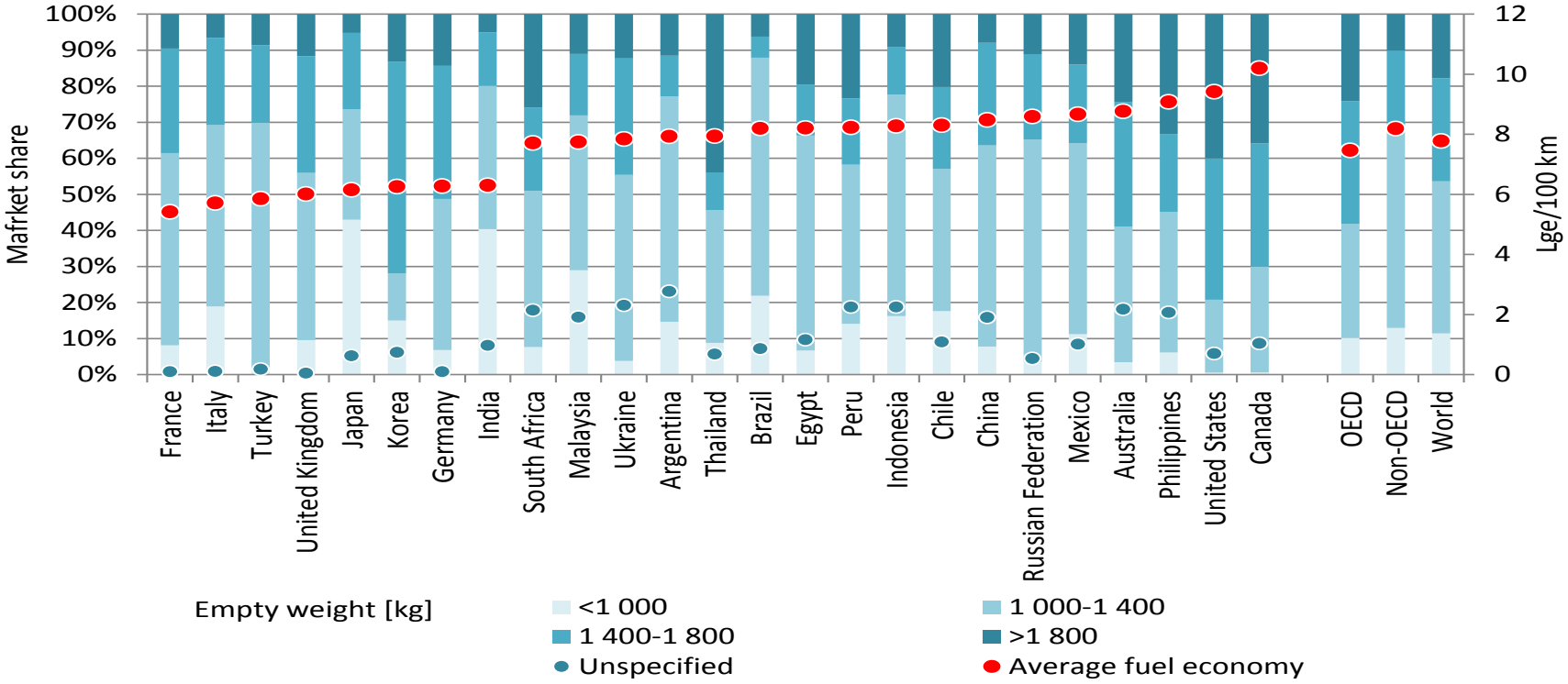
Market segment



- Japan has the largest share of cars in the small segment, the United States is at the opposite end
- Small vehicles consistent with low fuel use (France, Italy…)
- Germany & India (same fuel use/km, very different segments) show that this is not the whole story

Comparative results

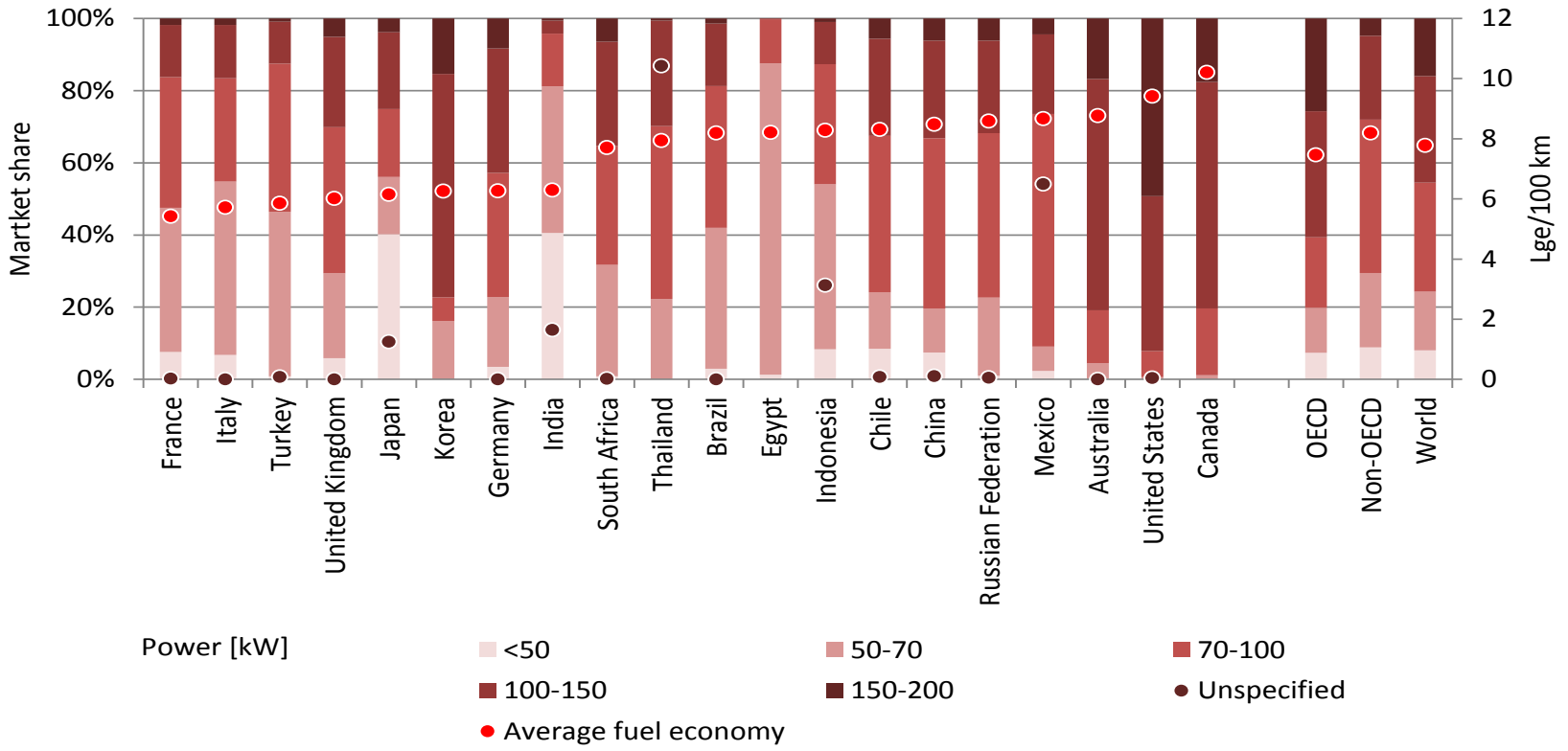
Weight



- Small segments tend to be coupled with lower weight
- Weight matters for fuel economy: fuel use is affected by inertial forces, but there is an influence of dieselization (comparatively heavier cars)
- Technology also matters: German cars much heavier than in India, but have similar fuel use

Comparative results

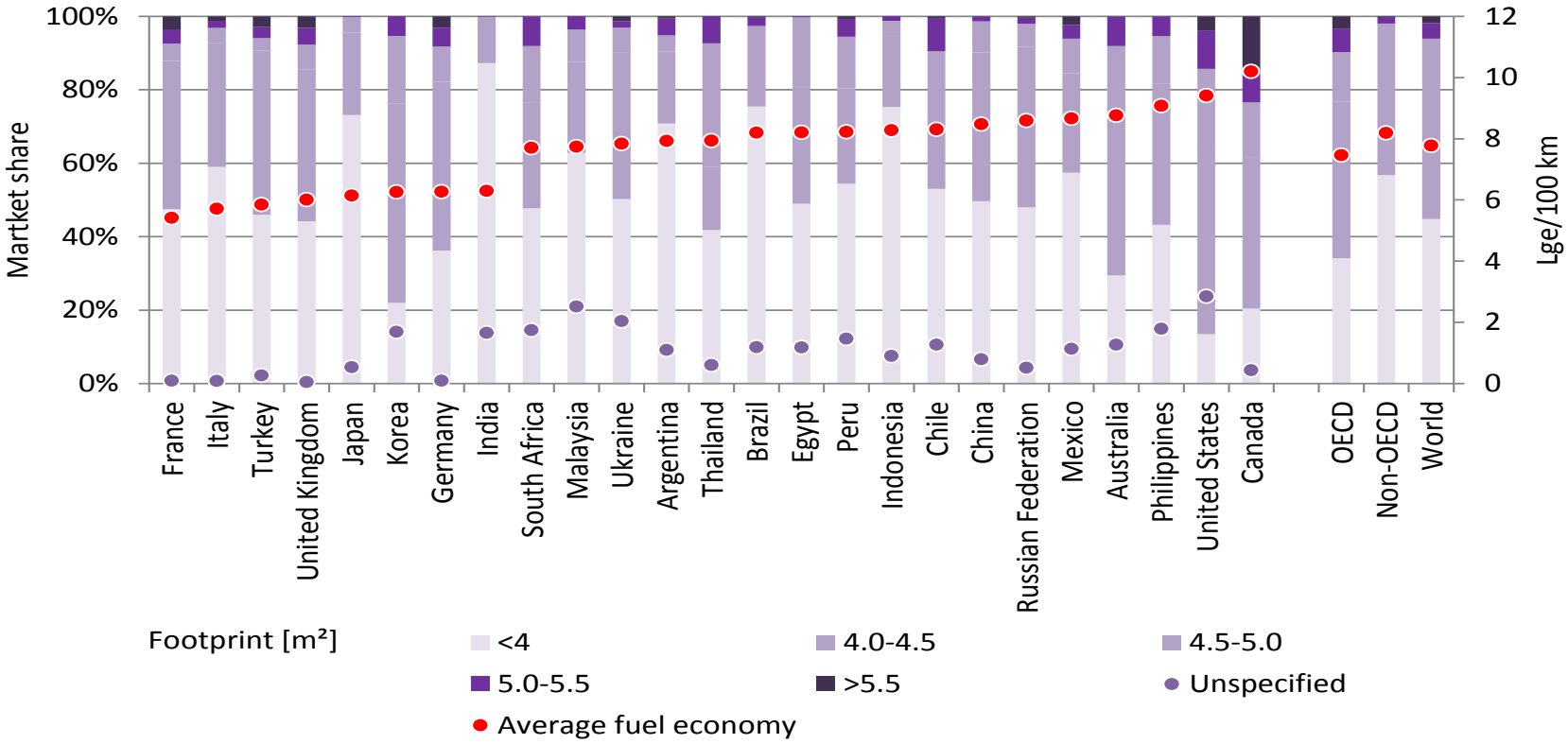
Vehicle power



- Larger segments and higher weight tends to go hand in hand with larger power ratings to keep performances up
- North America & Aus: higher power rating than rest of the World
- Germany-India: similar FE, very different power: lower income tends to be coupled with lower performances

Comparative results

Footprint



- Exceptions exist for footprint: Germany & North America have similar footprints, not weight
- No surprises on Germany & India comparison

Insights on country clusters 1/2

OECD markets: two main clusters also in drivers

- Europe, Japan (on the low end for size, power, weight, footprint) – consistent with comparatively higher fuel and vehicle taxation, plus presence of feebate/differentiated vehicle taxes
- North America & Australia on the high end for the same characteristics – low fuel and vehicle taxes
- Germany and Korea main exceptions
  - Germany influenced by strong car industry with hi-tech profile and prices regional above average
  - Korea needs further investigation

Comparative results

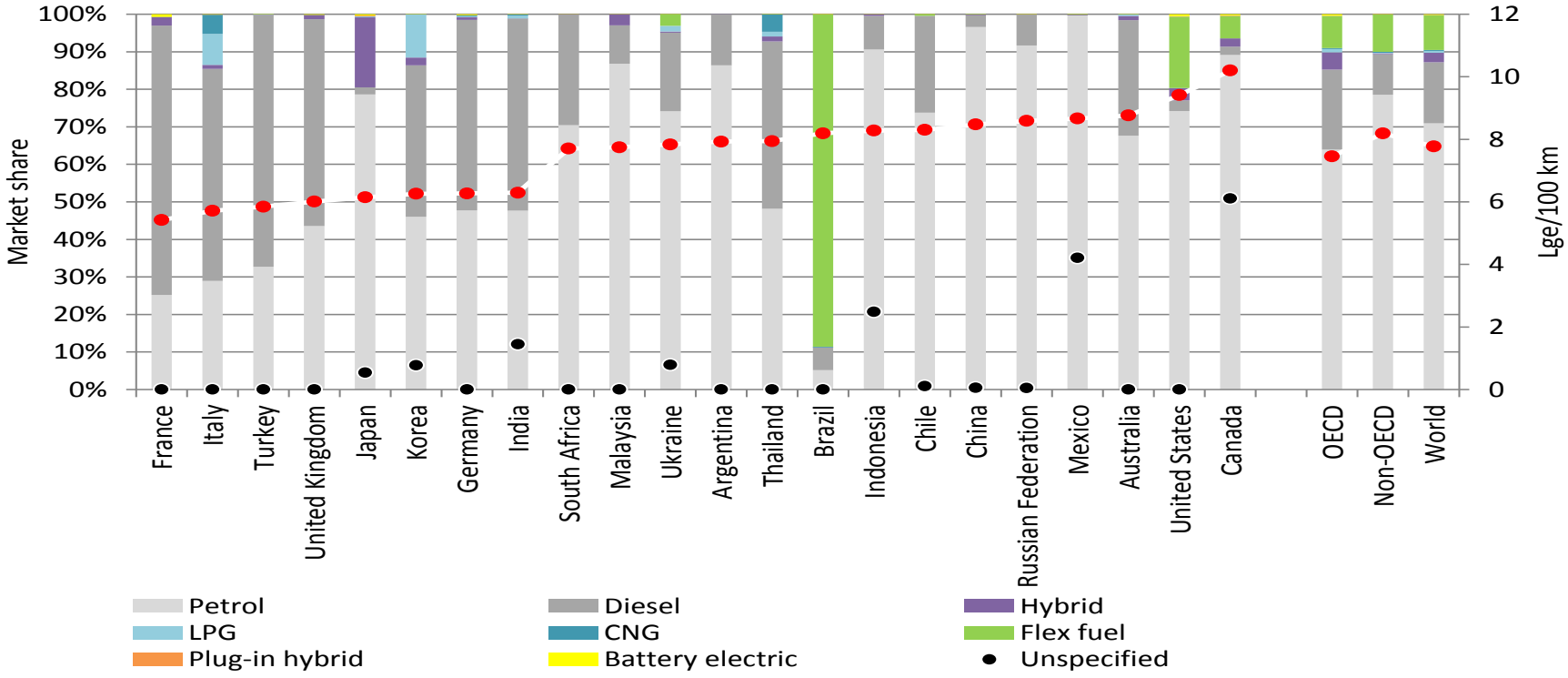
Insights on country clusters 2/2

Emerging economies mostly between OECD clusters

- Thailand, Philippines, Mexico tend to be on the high-end for fuel use/km, weight, power and footprint
- Russia, China in a central cluster, between EU-Japan & North America
- Brazil and Indonesia closer to Europe for power, weight and footprint
- India has small and light vehicles (also the lowest income), leading to better fuel economy, but not on par with OECD vehicles having similar features – technology gap

Comparative results

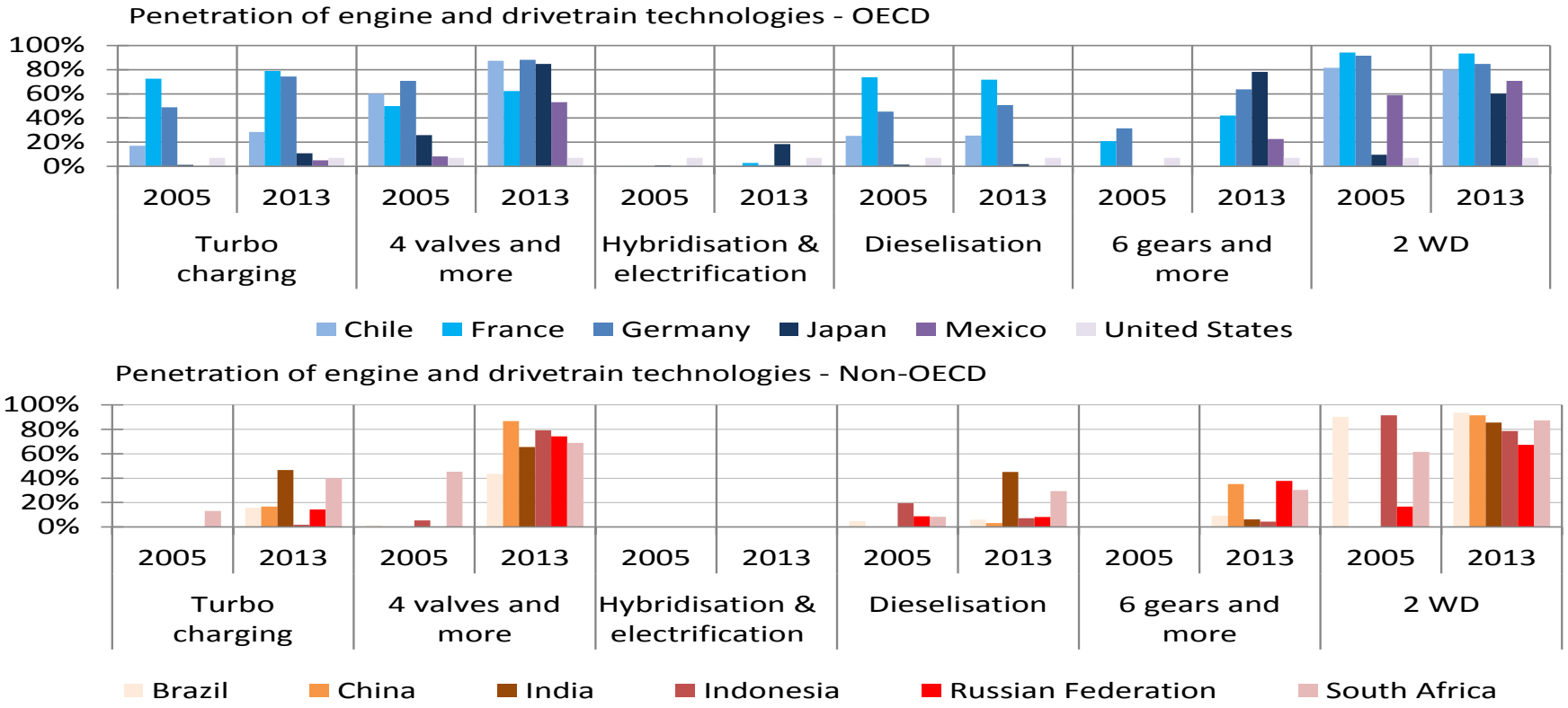
Vehicle powertrain & fuel type



- Diesel matters (see the gap?): Europe, India, Korea and Thailand (pick ups) have the largest shares
- Hybrids most relevant in Japan, flex fuel mainly in Brazil
- Germany & India: about the same diesel shares (!), but…

Comparative results

Engine technologies

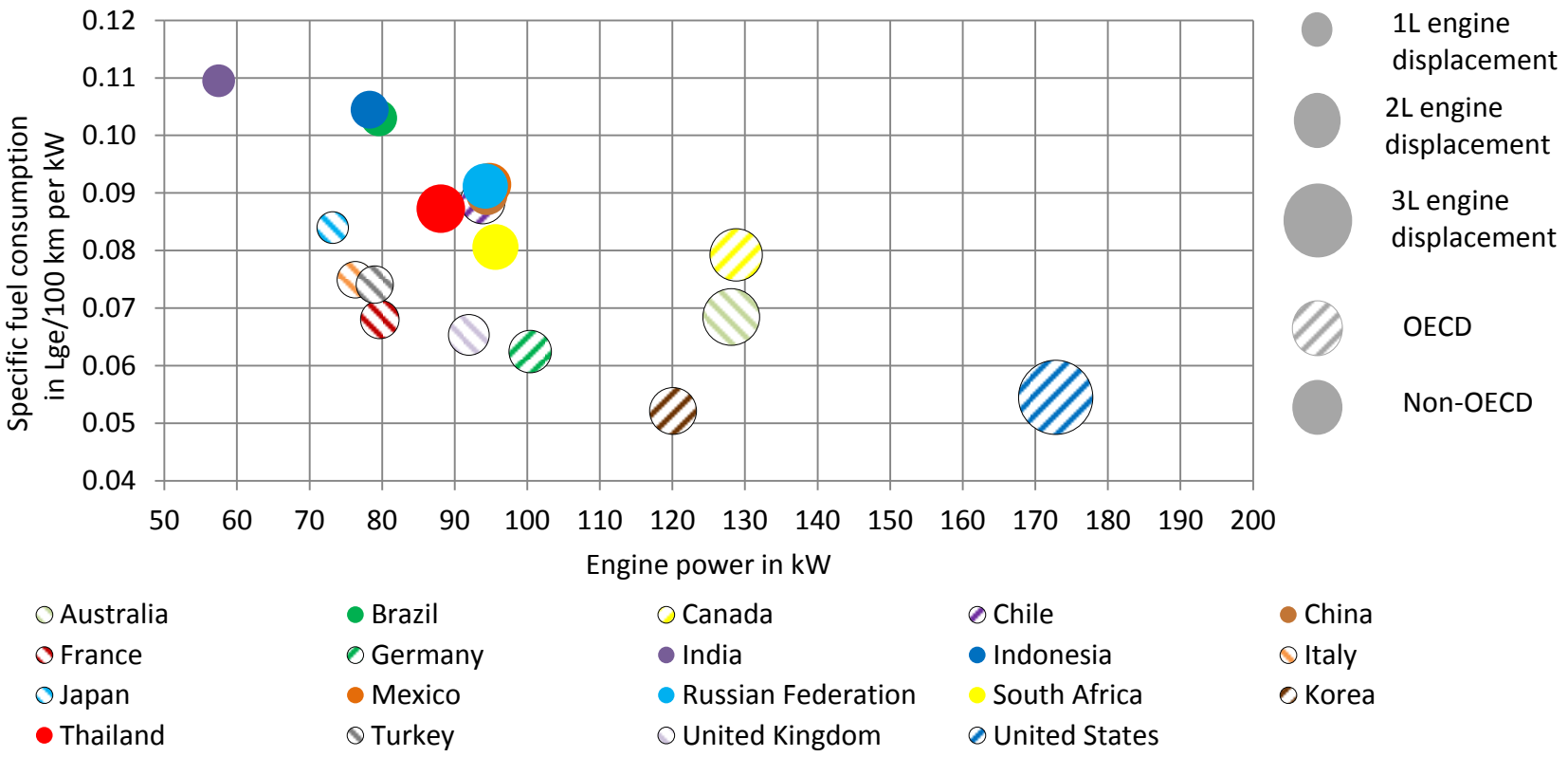


… engine and drivetrain technology shares higher in OECD:

- much higher shares of turbochargers in diesel-intensive countries
- higher penetration of 6 gears or more, earlier use of 4 valves
- larger share of hybrids and EVs (there is still a long way to go…)

Comparative results

Performances vs. fuel economy



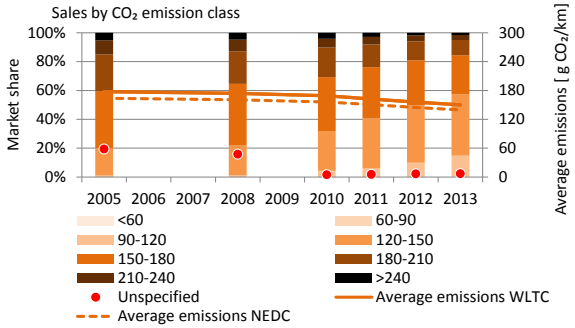
- Cars in the non-OECD tend to have lower power, but also technology that is less up-to-date than in OECD markets (higher fuel consumption per kW)
- Brazil, India and Indonesia have the highest fuel use/kW

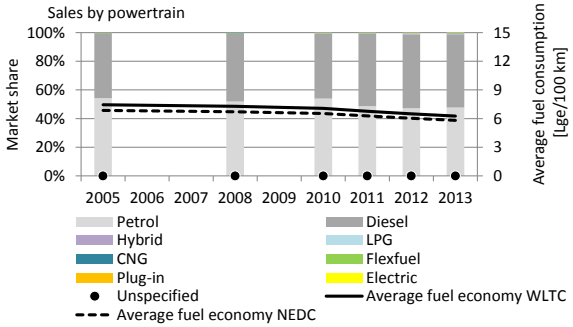
Country reports

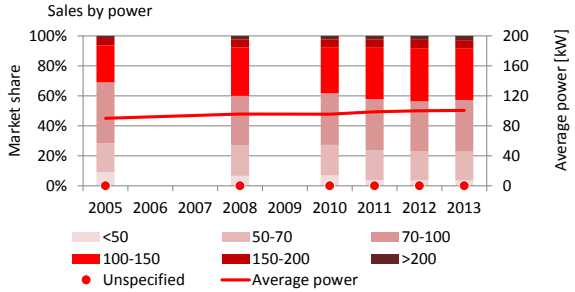
Trends over time

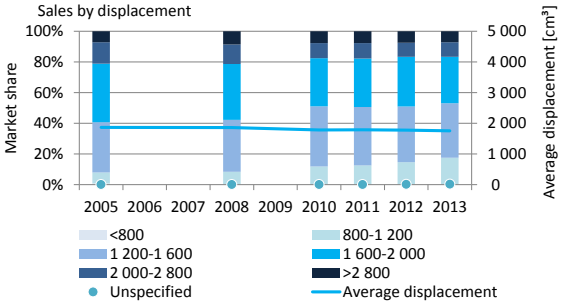
- Fuel economy and CO_2/km
- Powertrain, weight, power, displacement, footprint

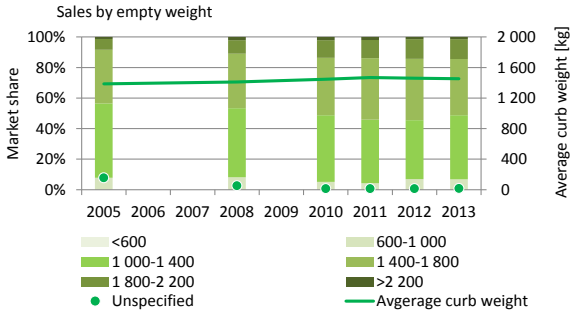
Example: Germany

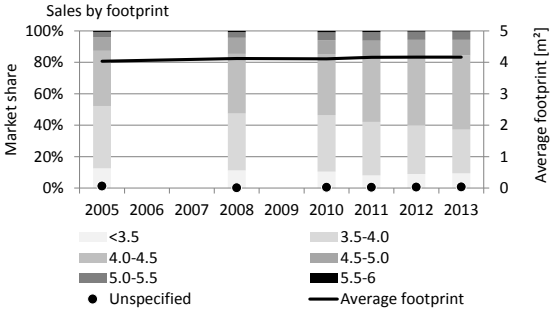








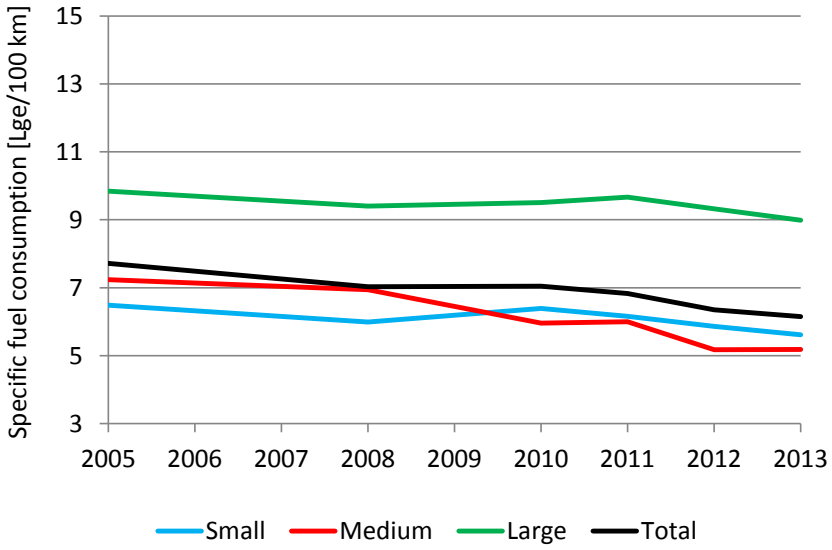


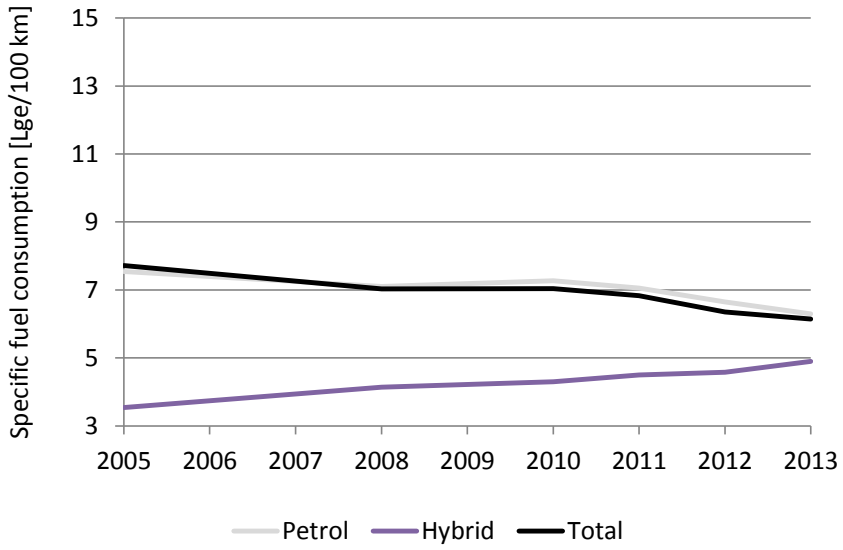


Country reports

Trends over time

- Fuel economy by vehicle segment an powertrain





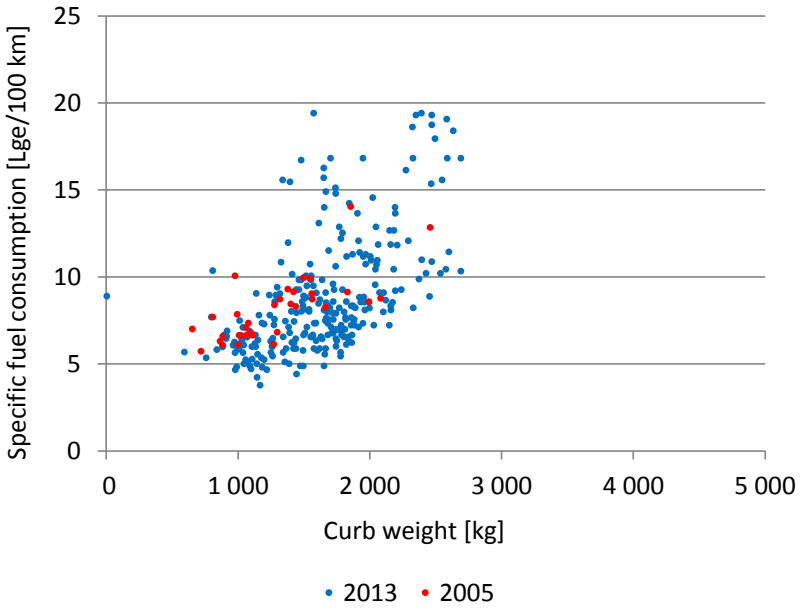
Example:

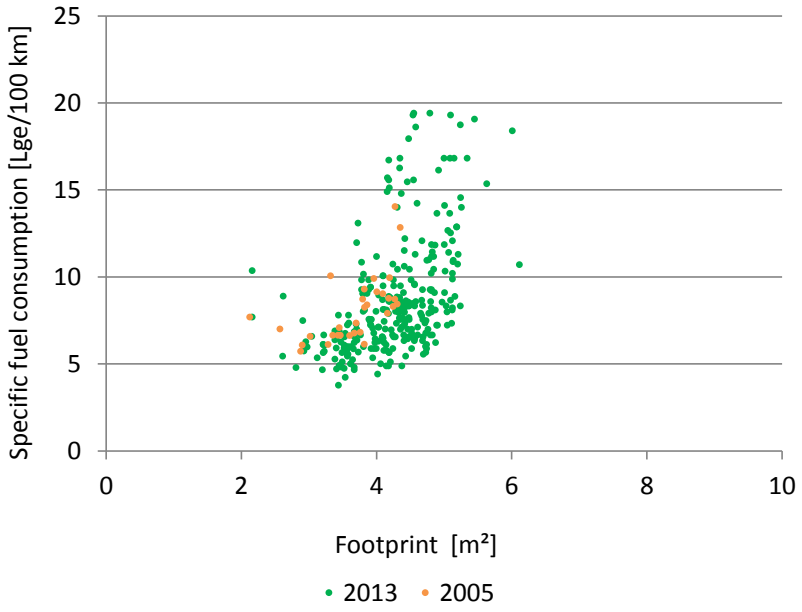
- Average fuel economy strongly influenced by small segments
- Narrowing fuel economy gap between hybrids and national average as hybrid share grows

Country reports

Fuel economy versus weight and footprint

- Values by model at different points in time, showing evolution of the diversity of the offer and changes over time





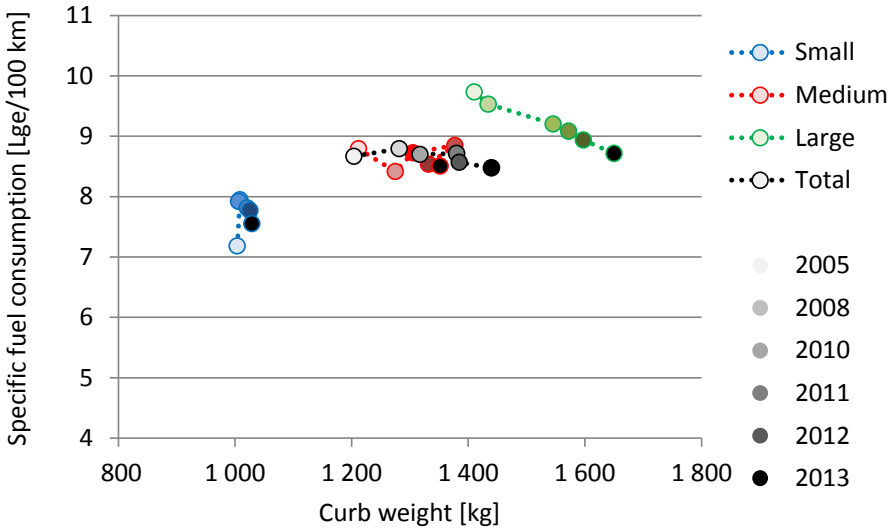
Example: market diversification in India

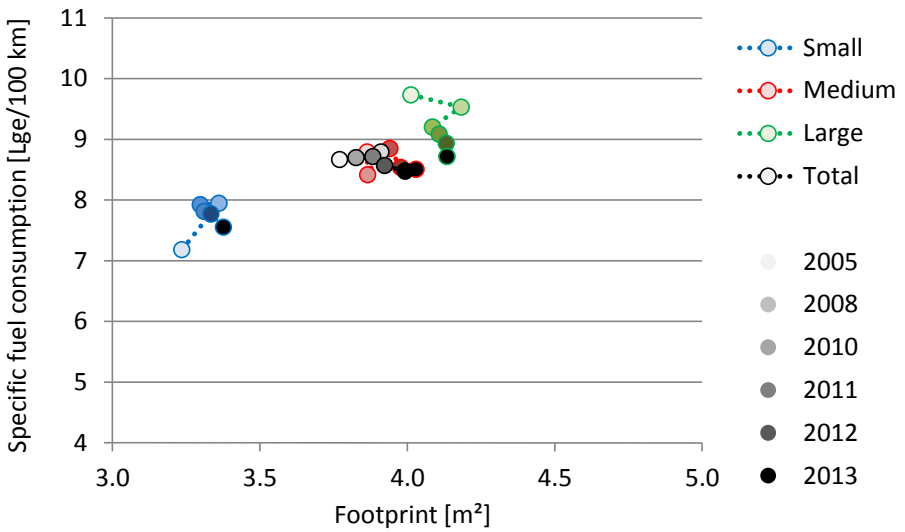
- Diversification resulted in improved fuel economy, but also led to weight and footprint growth

Country reports

Evolution of fuel economy, weight and footprint for major market segments

- Tendencies towards improved fuel economy, vs. stagnation, size shift, weight increases…





Example: weight increase in China

- Easier to shift up a class than to save fuel?
- CAFE standard in place since 2015 (Phase III)

Conclusions

- Confirmation of key trends (OECD improve faster than non-OECD), even with methodological revisions
- Market shifts (non-OECD growth in market share) are less beneficial for global average than assessed before
- Policies matter: both fuel economy regulations and differentiated taxation worked. Combined use was very effective (e.g. in France)
- Fuel prices have an impact on absolute values (OECD clusters, plus the case of Turkey)
- Monitoring matters (e.g. to understand policy formulation issues and revise strategies)
- The report provides a new format for future updates
- 2014-15 data analysis now ongoing: the next report will keep country insights ad will include an analysis of prices

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Thank you!

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