

TRB 24 January 2007

**Market Perturbations in the Fossil Fuel
Marketplace: Global Perspective**

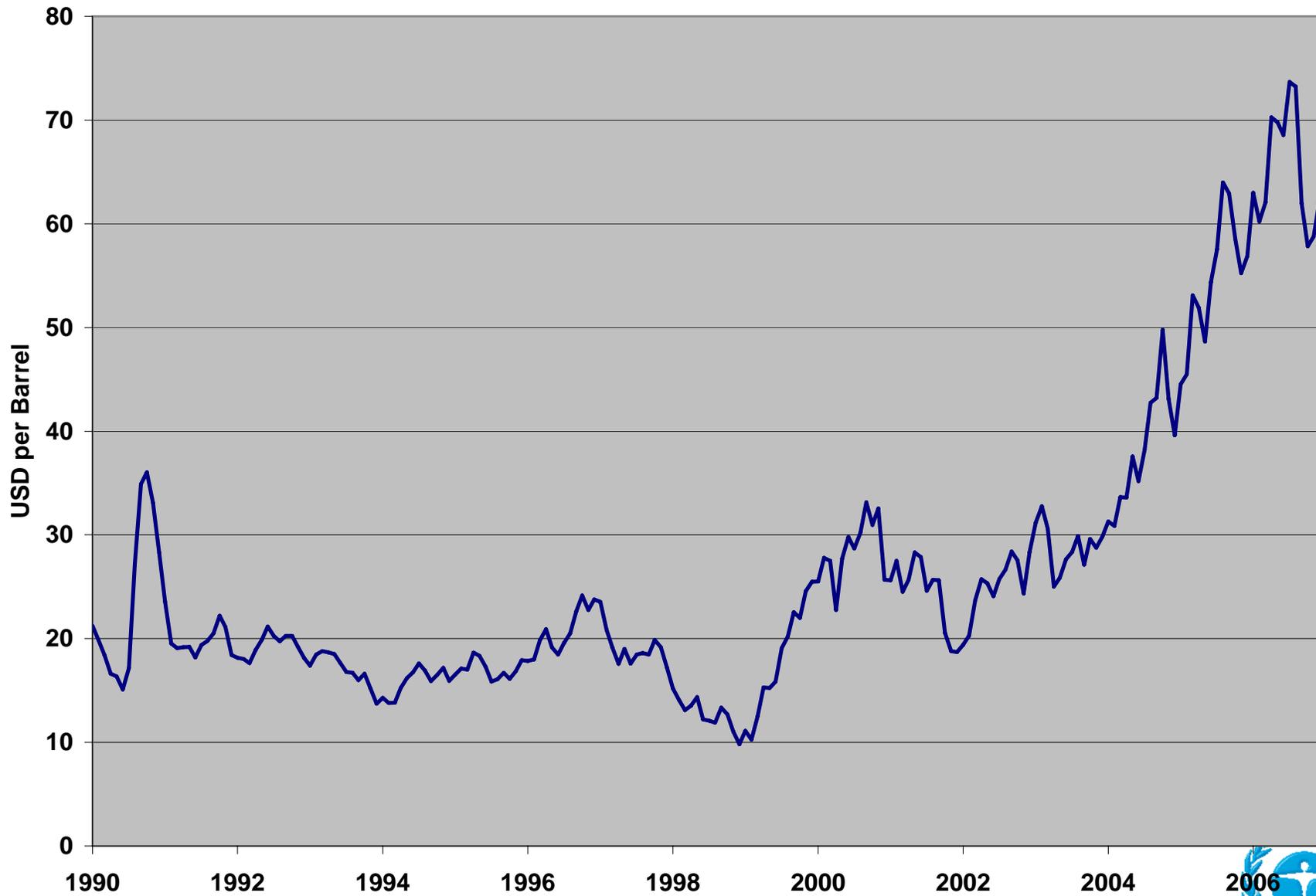
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Talk to cover:

- Recent international trends
- Some data relationships
- Some observations
- Some tentative conclusions
- Ground rules:
 - Mainly focusing on light-duty vehicles (LDVs)
 - Work in progress, this is a partial analysis;
 - Some needed data not yet available

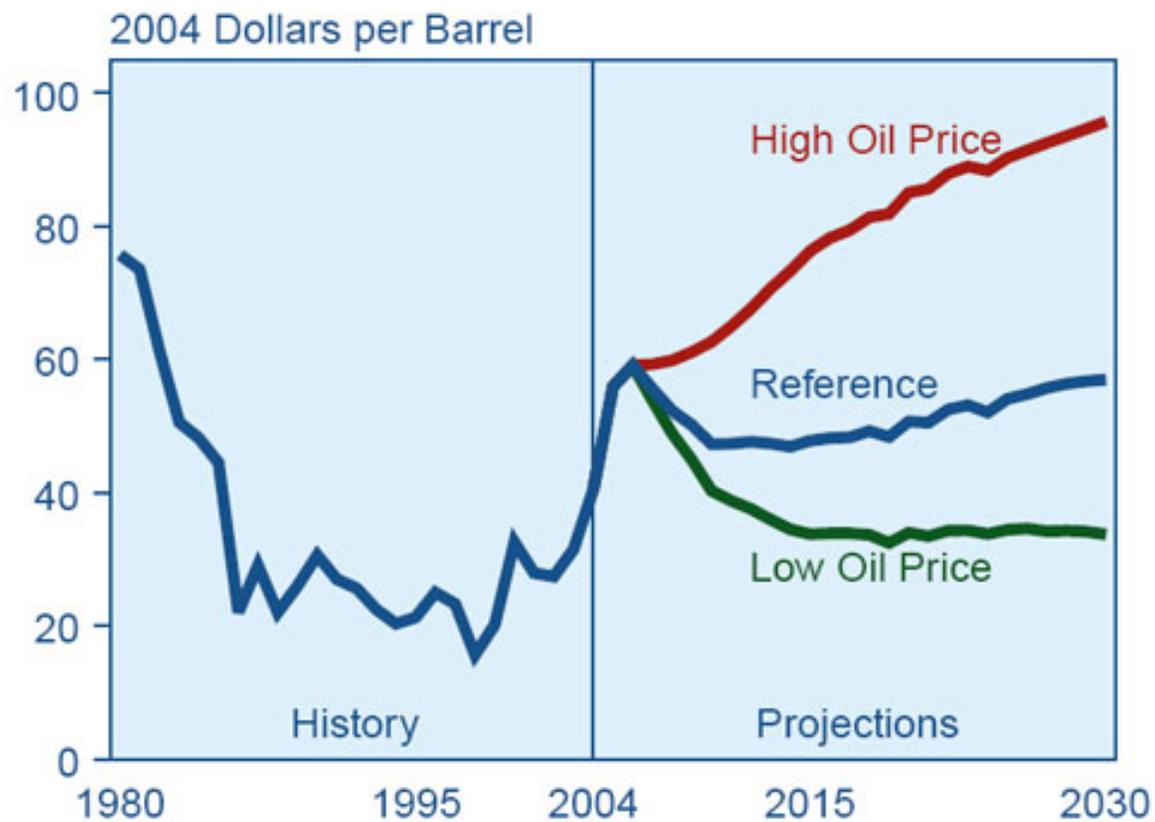
World Oil Price, 1990-2006



Source: US EIA data

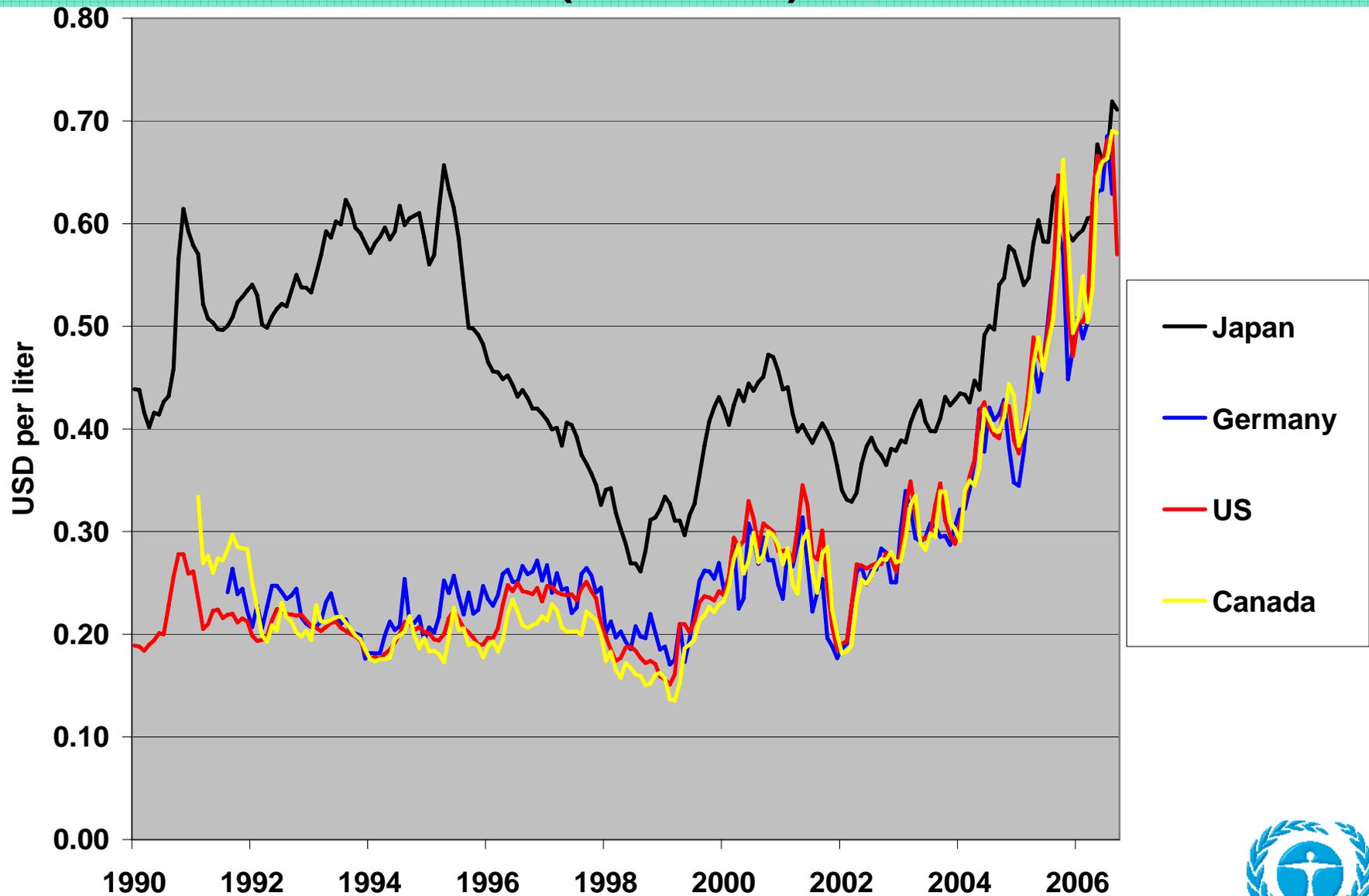


Figure 32. World Oil Prices in Three Cases, 1980-2030



Sources: **History:** Energy Information Administration (EIA), *Annual Energy Review 2004*, DOE/EIA-0384(2004) (Washington, DC, August 2005), web site www.eia.doe.gov/emeu/aer/. **Projections:** EIA, *Annual Energy Outlook 2006*, DOE/EIA-0383(2006) (Washington, DC, February 2006).

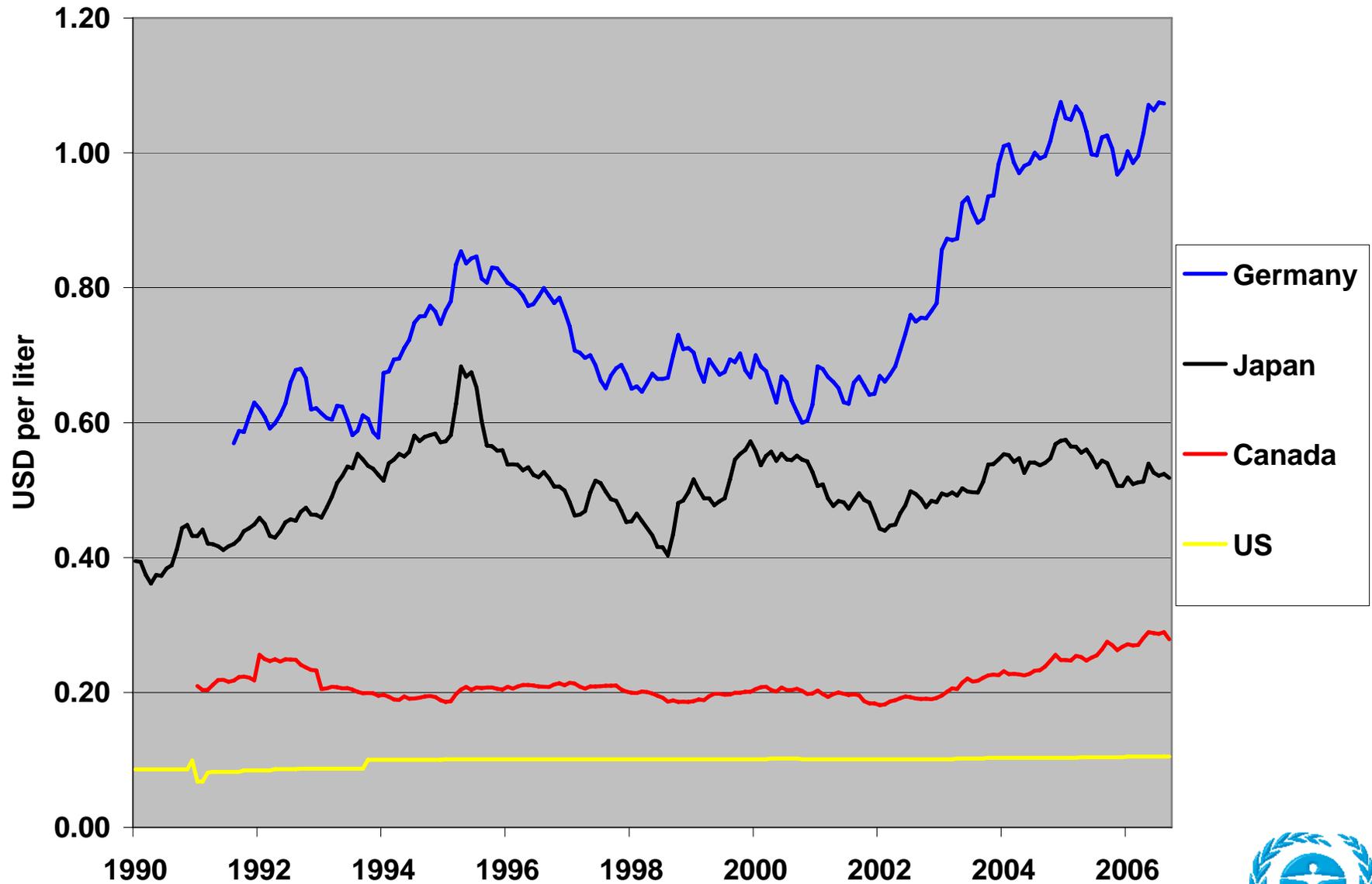
Household Gasoline Prices in Four Countries, 1990-2006 (Ex Taxes)



Source: IEA data, unleaded regular gasoline fuel



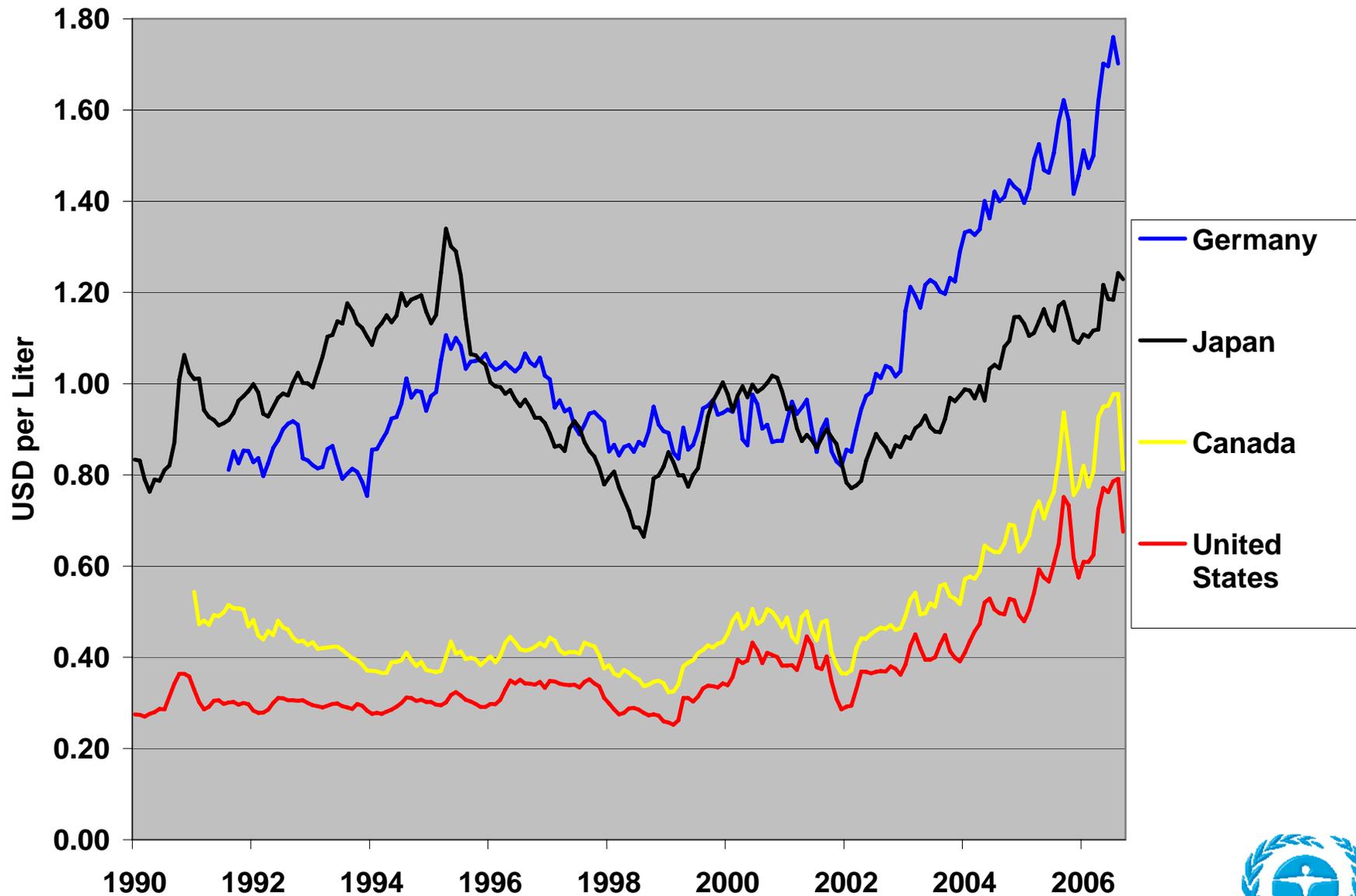
Gasoline Taxes in Four Countries, 1990-2006



Source: IEA data



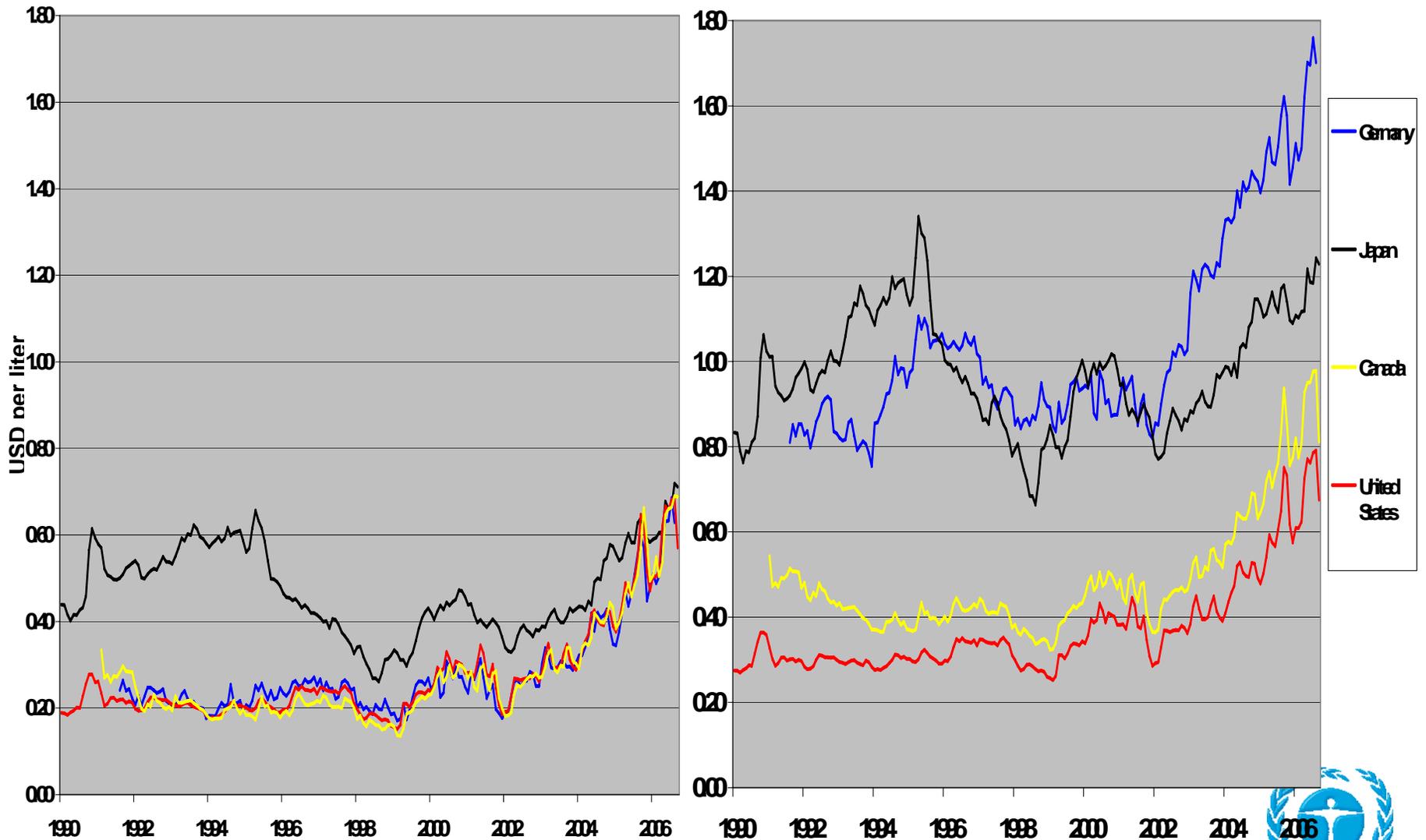
Gasoline Prices with Taxes



Source: IEA data



Comparison of prices with and w/o taxes

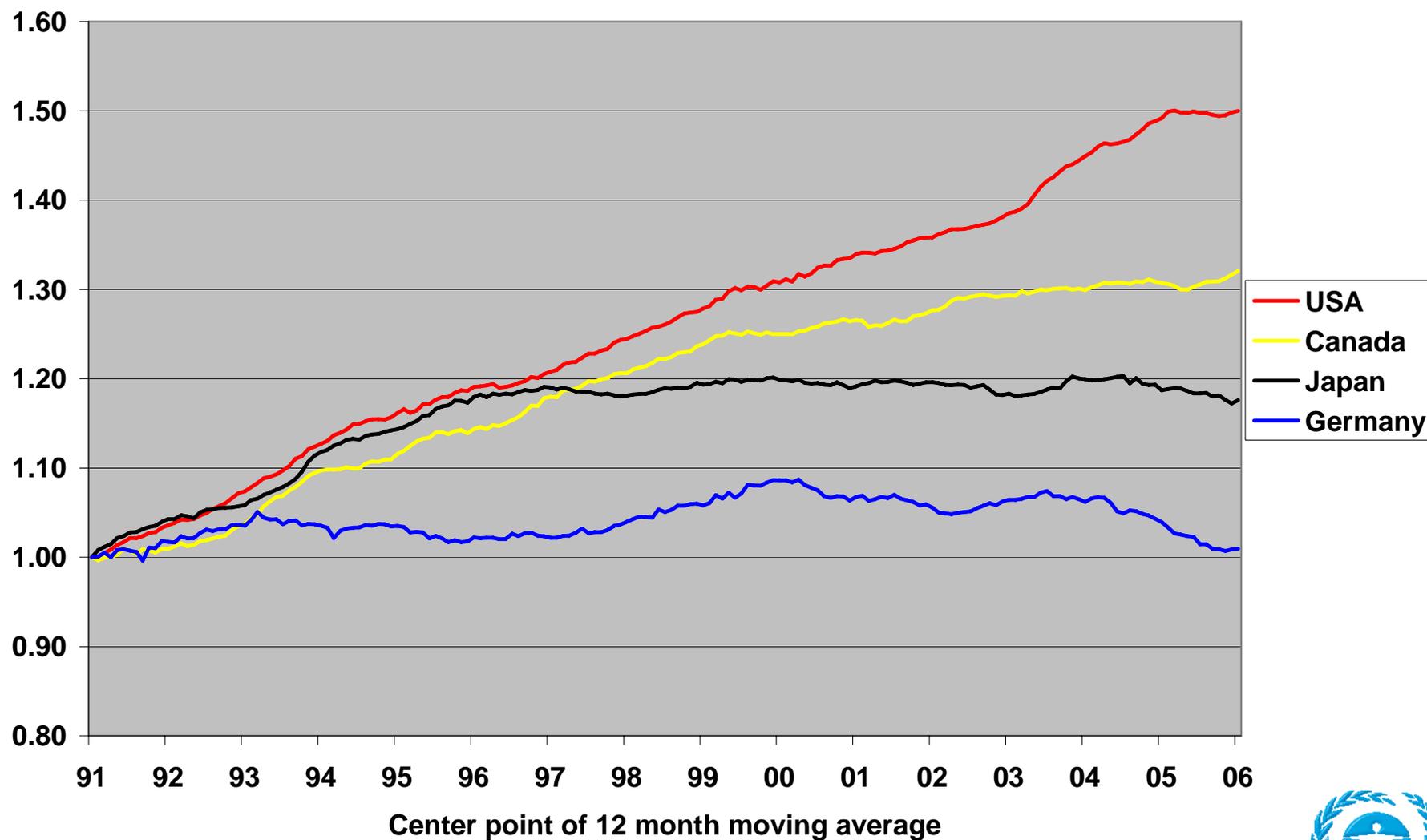


Source: IEA data



Transport Fuel Consumption Trends

Motor gasoline + diesel use, 1990-2006,

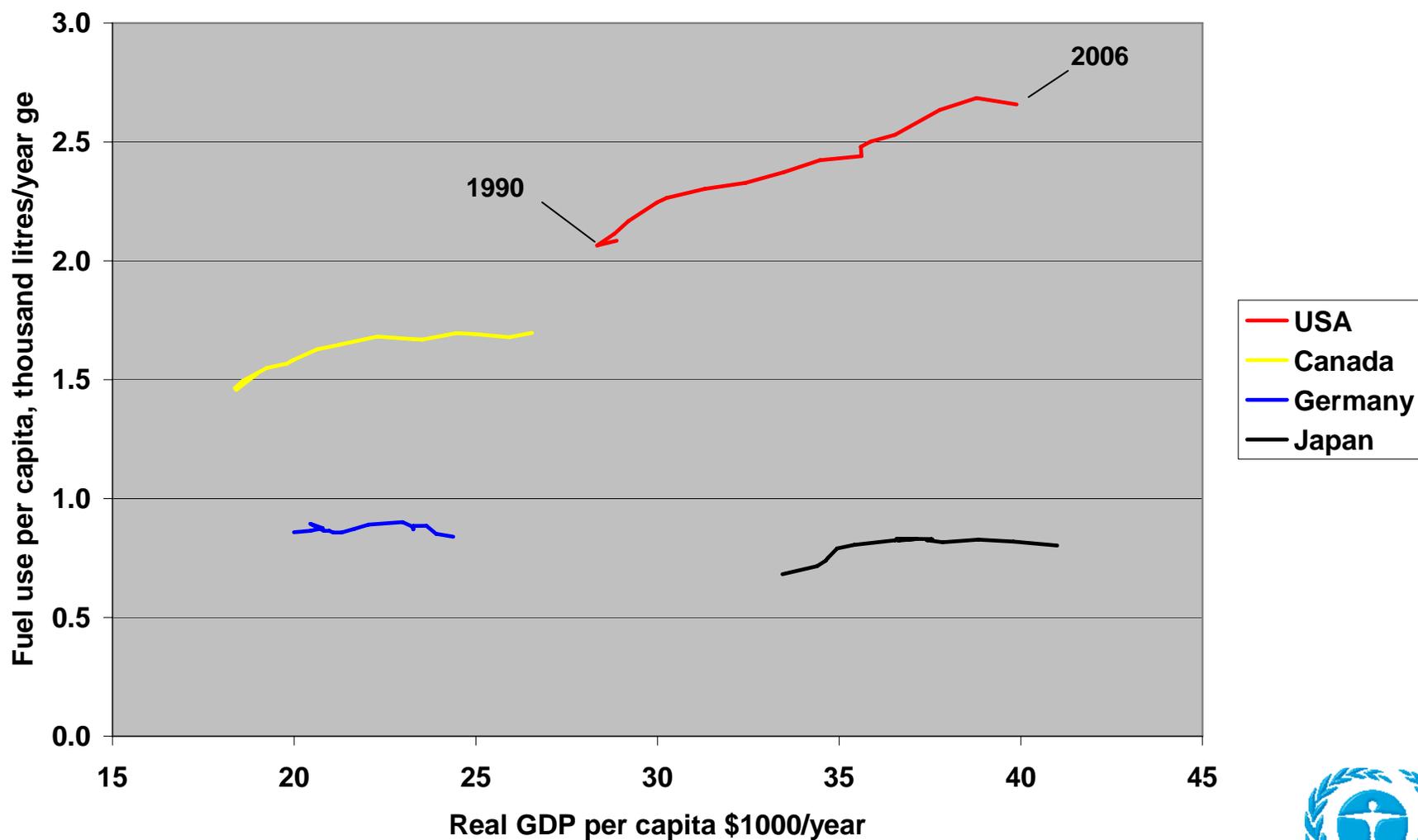


Source: IEA; 12 month moving average through Oct 2006, indexed



Transport Fuel Consumption v. Income

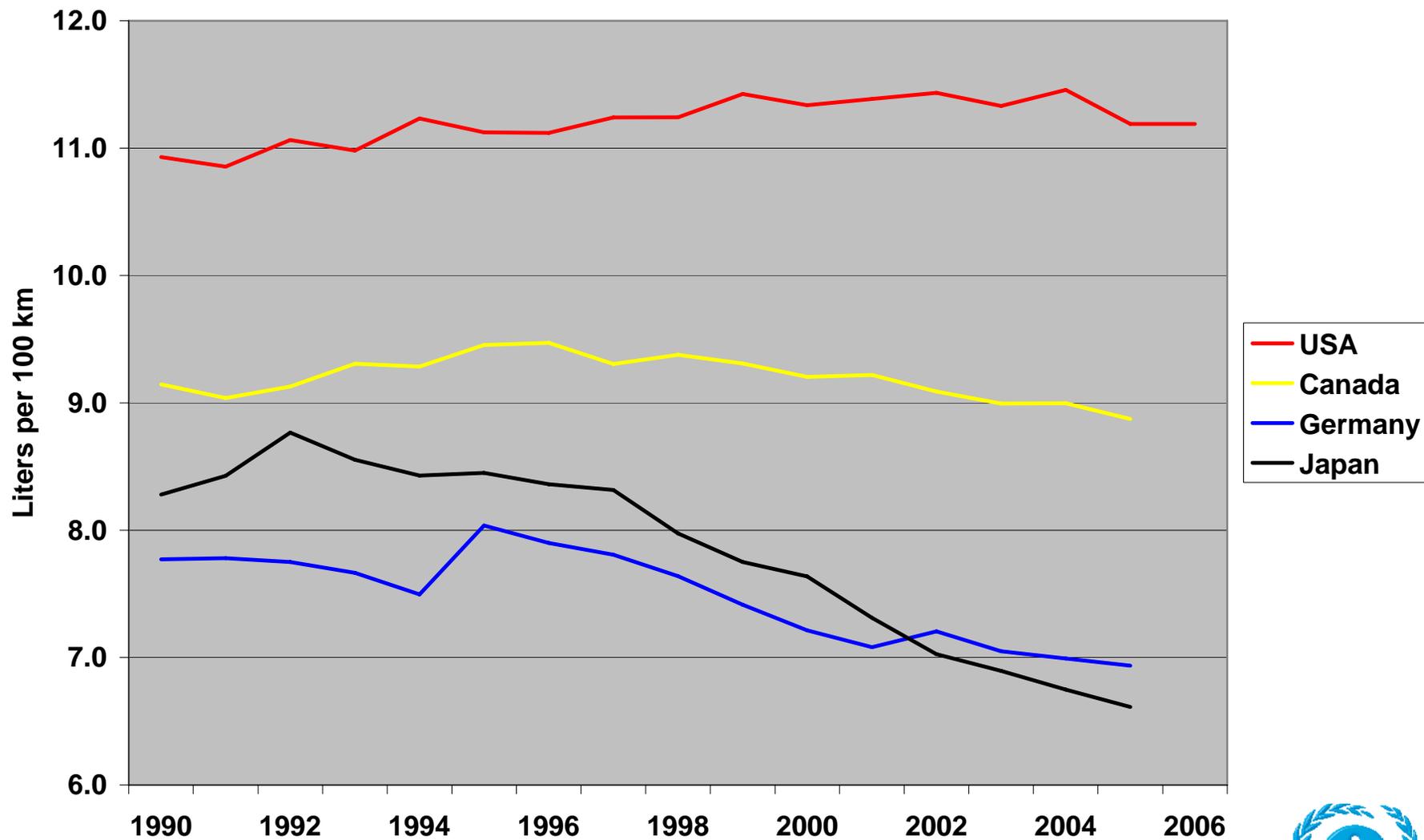
Gasoline/diesel per capita v. income per capita, 1990-2006



Data sources: fuel use: IEA, population: UN; GDP: World Bank



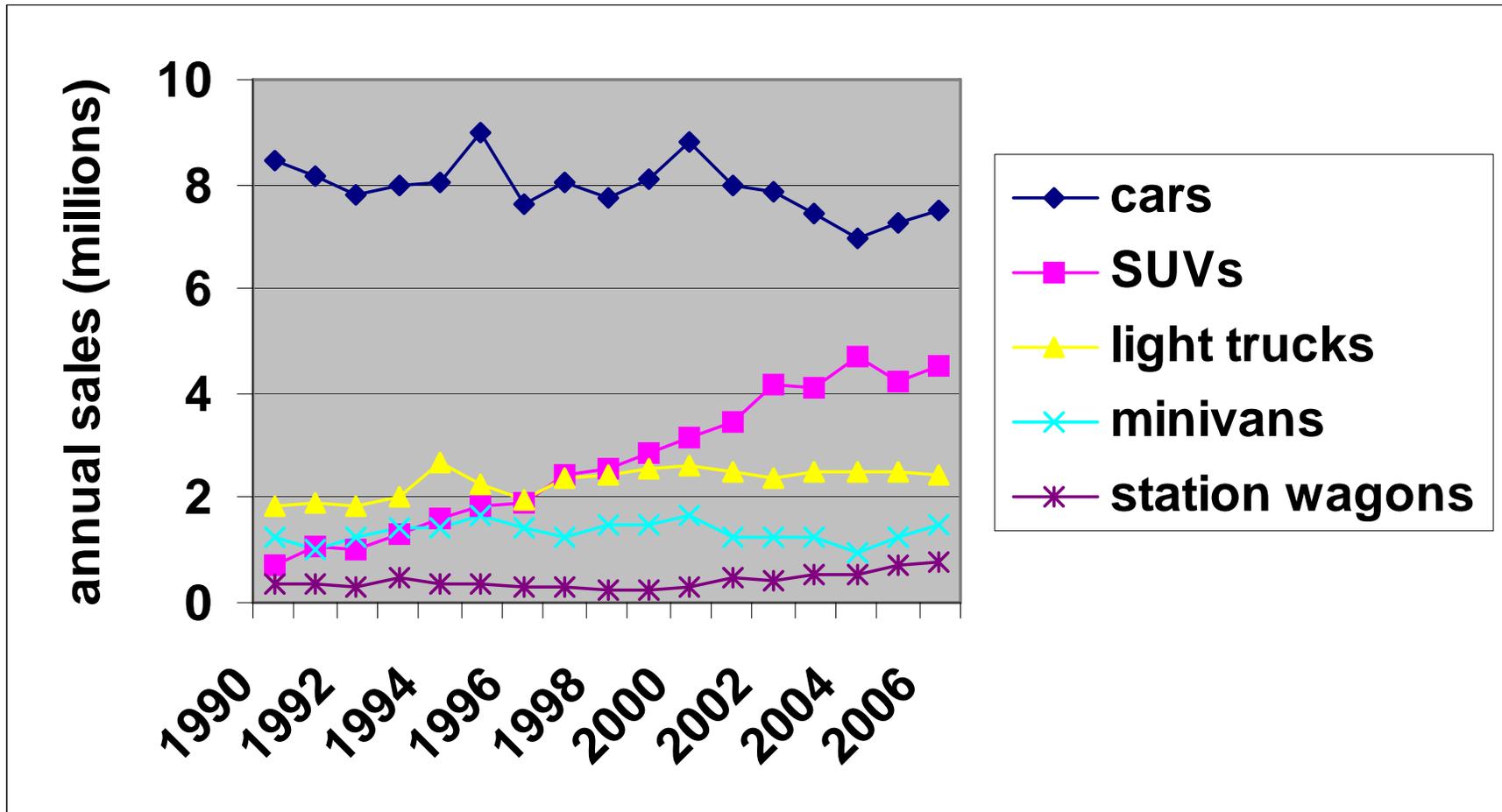
New LDV Fuel Economy, 1990-2005(6)



Source: IEA, from country submissions and reports. USA 2006 estimated

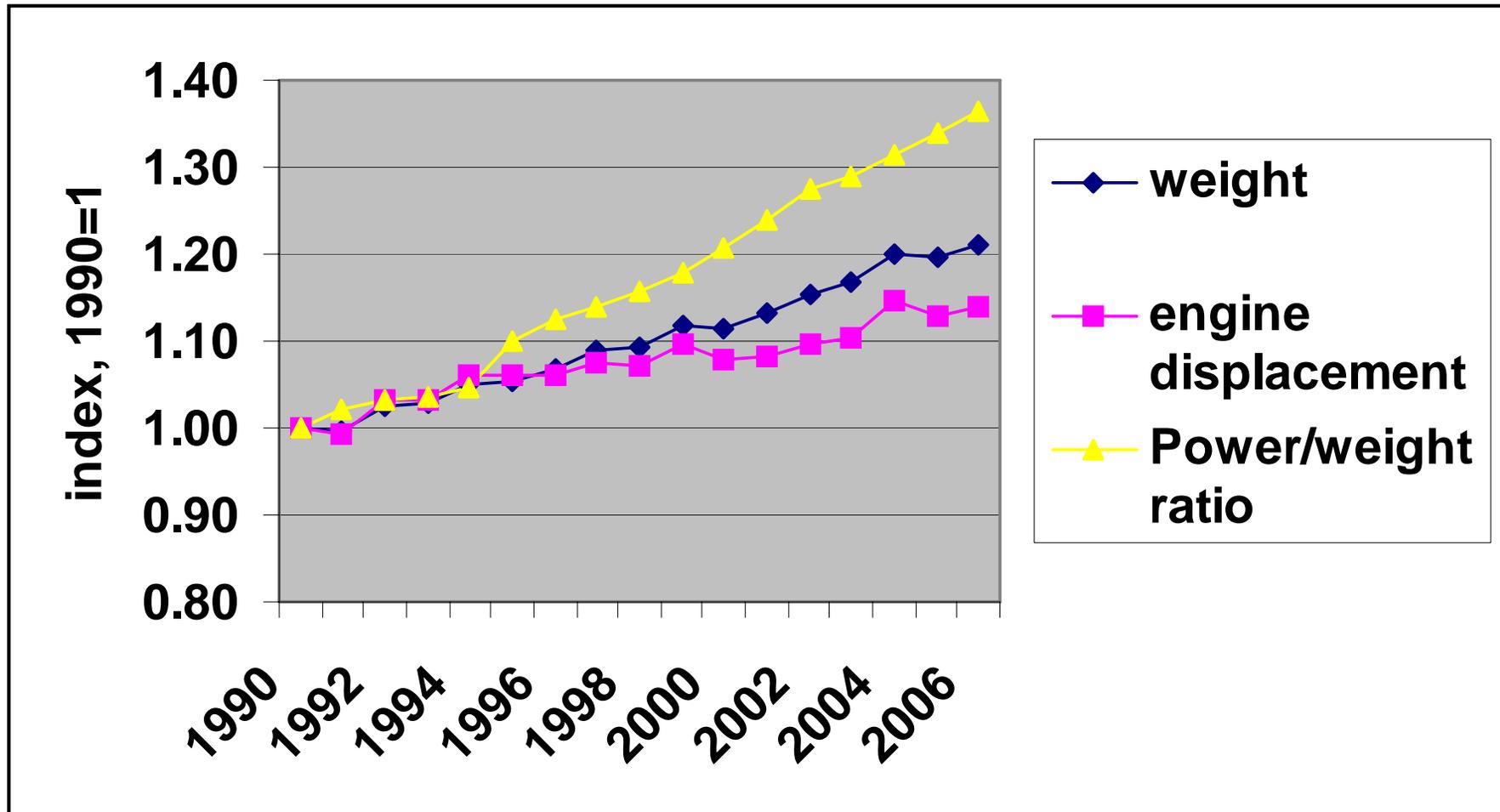


Trends in US LDV market sales shares



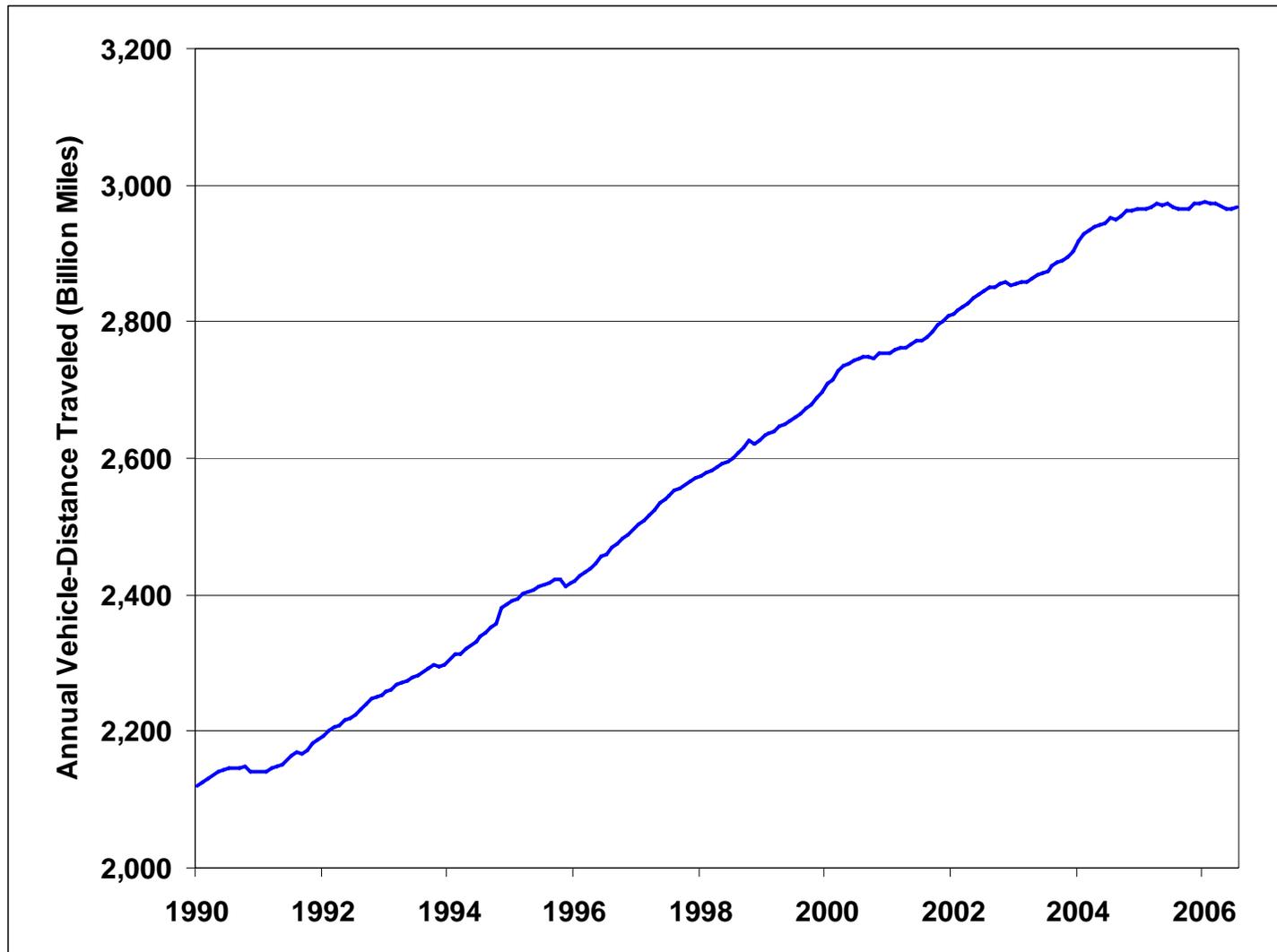
Source: EPA, Heavenrich, data for 2006 preliminary

New LDV Fuel Economy Trends in vehicle characteristics



Source: EPA, Heavenrich, data for 2006 preliminary

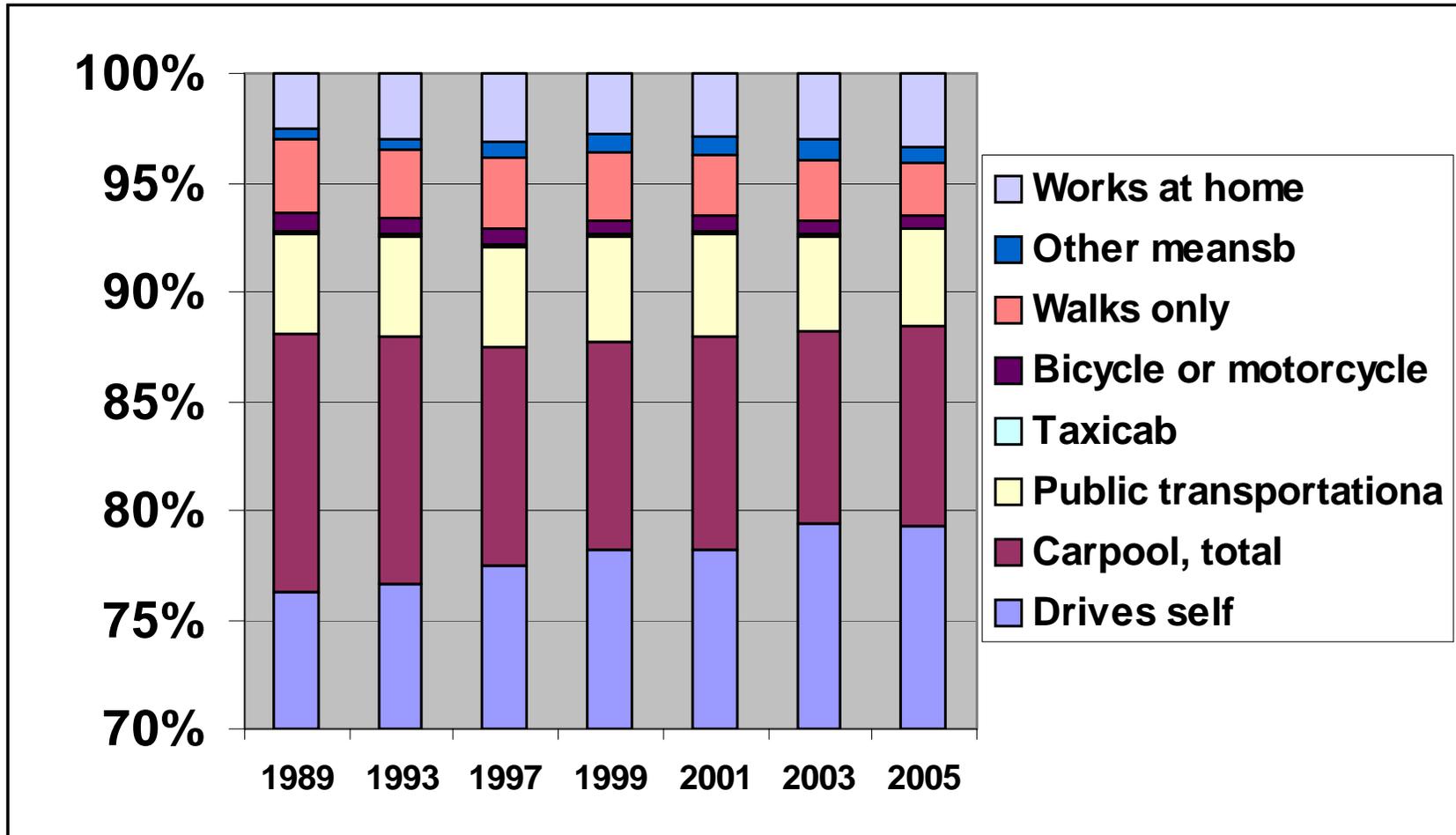
US Vehicle Distance Travelled, 1990-2006



Source: US FHWA, monthly reports



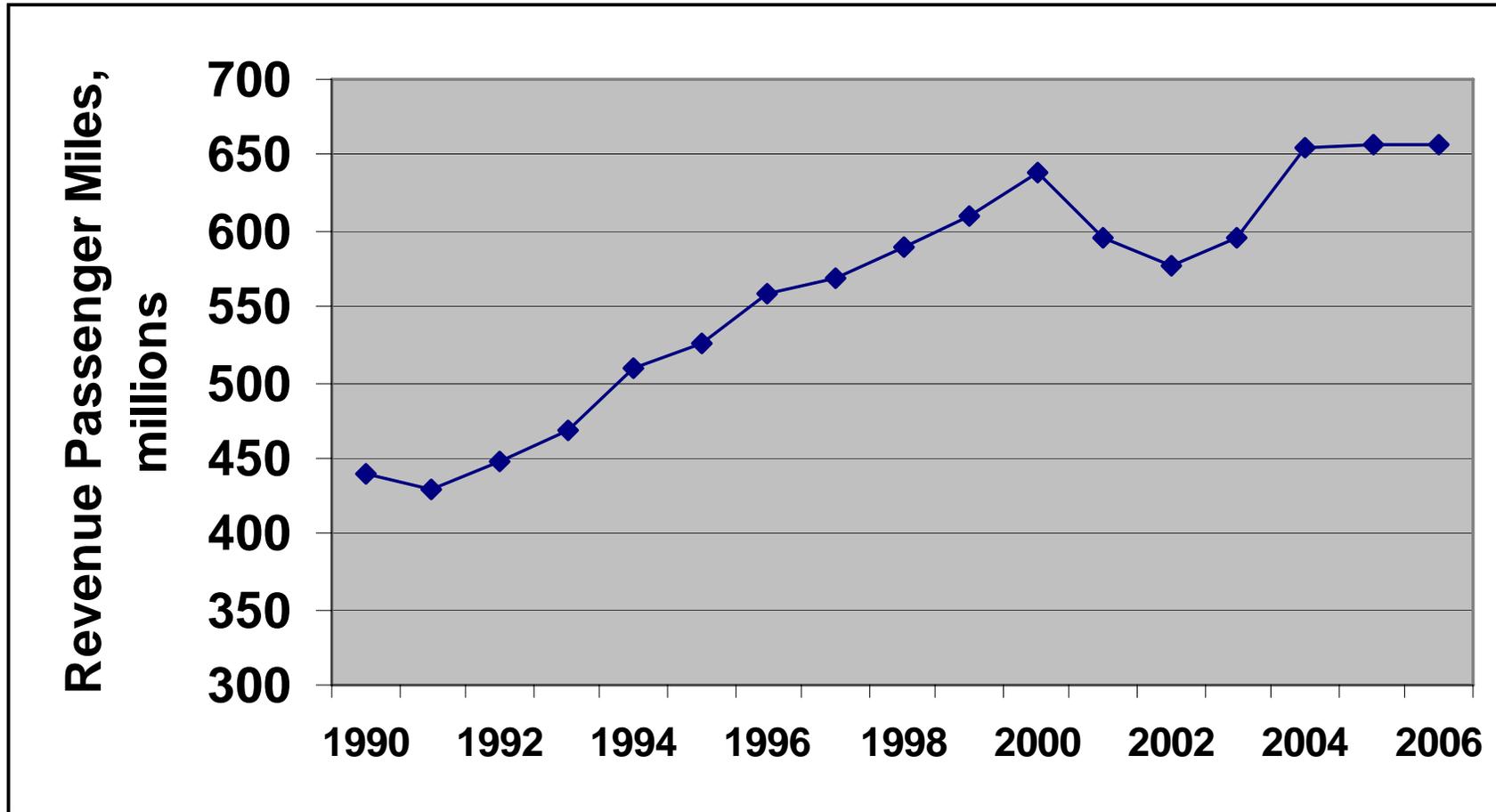
US commuter mode share trends



Source: US Dept. of Housing and Urban Development; Note: "drives self" not fully shown, accounts for 75%+ of mode share in all years



A Look at air: US Air travel trends



Source: US DOT/BTS, includes all US and international commercial air carrier flights with involving a US airport; data for 2006 is preliminary



Average travel, efficiency, fuel use and fuel cost per vehicle

Approximate (indicative) data for 2004

Despite fuel price variations, average vehicle fuel costs per year were not so different across countries

	LDV stock average economy, L/100km	Average travel, vkt / year	Avg. fuel use per year, litres	Taxed gasoline Price / litre, Aug 2004	Avg. fuel cost per year	Avg. fuel cost for a 10km trip
USA	12.0	17,000	2,040	\$0.50	\$1,014	\$0.60
Canada	10.5	16,000	1,680	\$0.63	\$1,059	\$0.66
Germany	8.0	12,000	960	\$1.40	\$1,344	\$1.12
Japan	7.8	10,000	780	\$1.03	\$806	\$0.81

Sources: various, mainly IEA with some separate assumptions to reflect situation in 2006 (data is indicative). Includes gasoline and diesel vehicles.



Same chart, but with fuel prices as of August 2006

The prices changes 2004-2006 brought the US and Canada up to Germany's cost per year, and to Japan's cost per trip

	LDV stock average economy, L/100km	Average travel, vkt / year	Avg. fuel use per year, litres	Taxed gasoline Price / litre, Aug 2006	Avg. fuel cost per year	Avg. fuel cost for a 10km trip
USA	12.0	17,000	2,040	\$0.79	\$1,614	\$0.95
Canada	10.5	16,000	1,680	\$0.98	\$1,642	\$1.03
Germany	8.0	12,000	960	\$1.70	\$1,634	\$1.36
Japan	7.8	10,000	780	\$1.24	\$969	\$0.97

Note: this chart does not reflect likely changes to stock average fuel economy or travel. It holds these at 2004 levels for comparative purposes.



2004-2006 Price changes by country

The change in costs varies considerably...

	Taxed gasoline price / litre		Change in Avg fuel cost per year	Change in cost for a 10km trip
	Aug-04	Aug-06		
USA	\$0.50	\$0.79	\$600	\$0.35
Canada	\$0.63	\$0.98	\$583	\$0.36
Germany	\$1.40	\$1.70	\$290	\$0.24
Japan	\$1.03	\$1.24	\$163	\$0.16

Based on previous slide; 2006 travel assumptions used, only price change included in cost change

An elasticity perspective

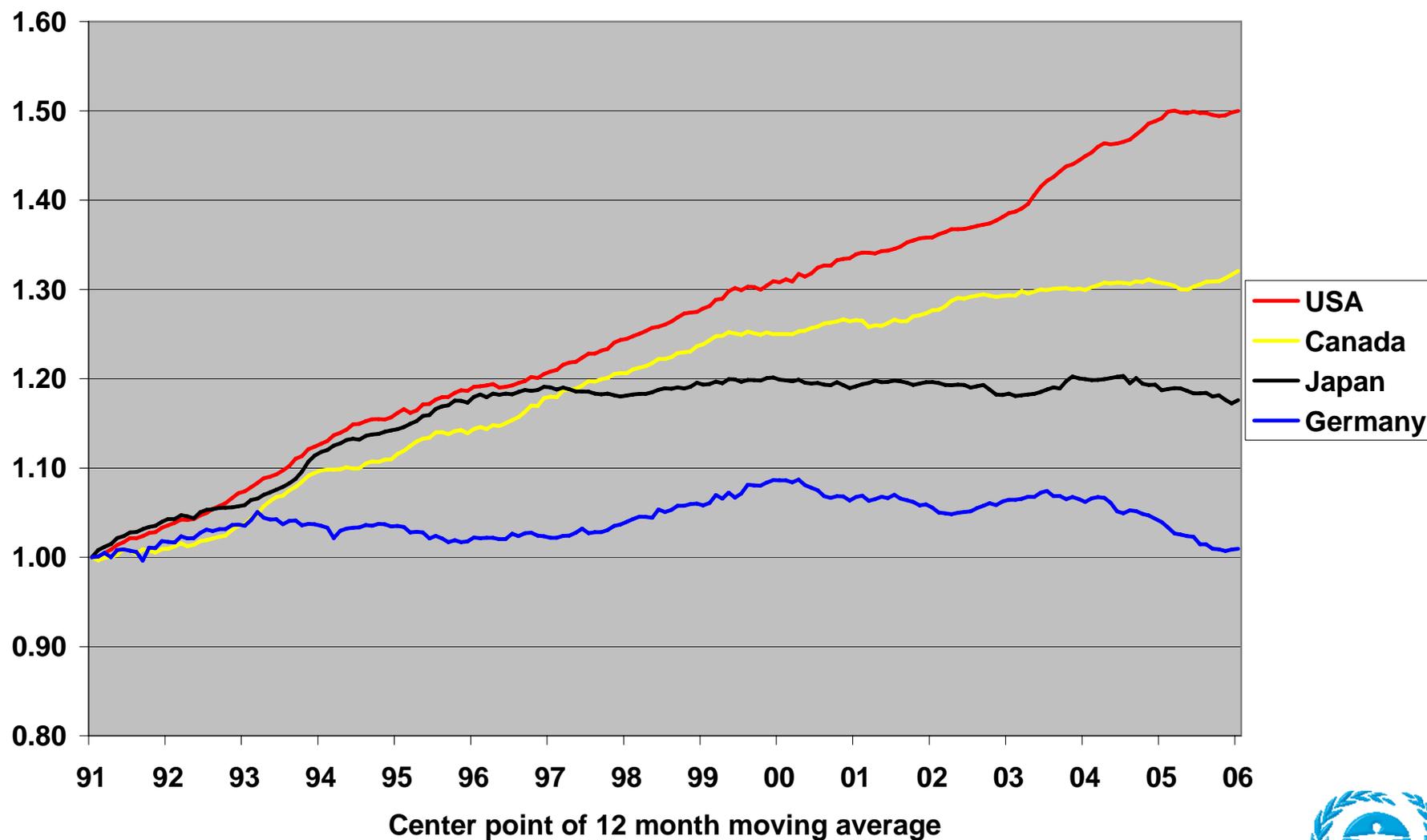
But given different reactive behaviours (e.g. as measured by elasticities), the response patterns may be similar...

Percent Change in taxed price of unleaded gasoline		
	Aug 05 to 06	Aug 04 to 06
USA	22%	59%
Canada	17%	55%
Germany	8%	22%
Japan	6%	20%

		Travel Demand Elasticity			
		-0.1	-0.2	-0.3	-0.4
Pct. Change in fuel price	10%	-1%	-2%	-3%	-4%
	20%	-2%	-4%	-6%	-8%
	30%	-3%	-6%	-9%	-12%
	40%	-4%	-8%	-12%	-16%
	50%	-5%	-10%	-15%	-20%
	60%	-6%	-12%	-18%	-24%

Transport Fuel Consumption Trends

Highway gasoline + diesel use, 1990-2006,

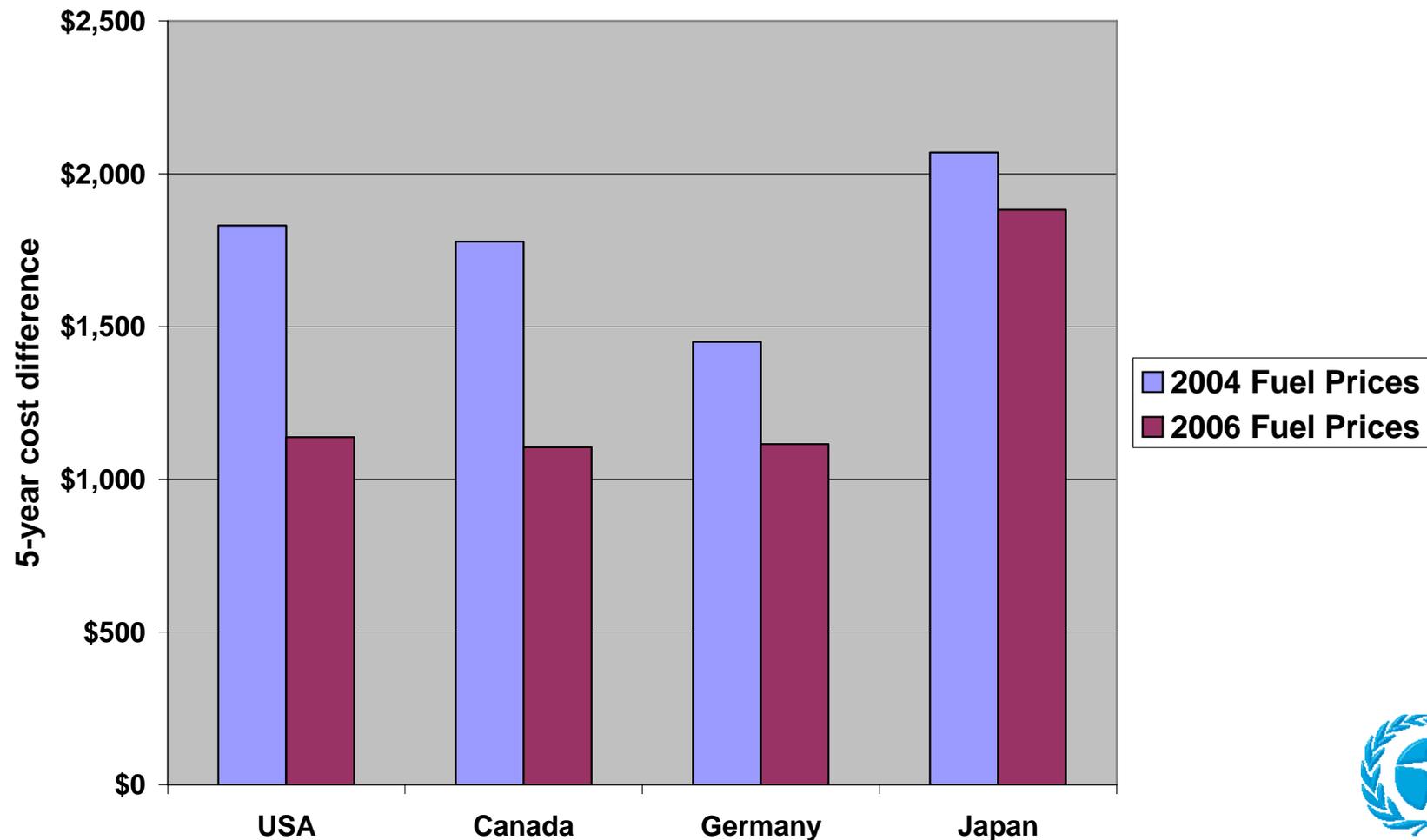


Source: IEA; 12 month moving average through Oct 2006, indexed



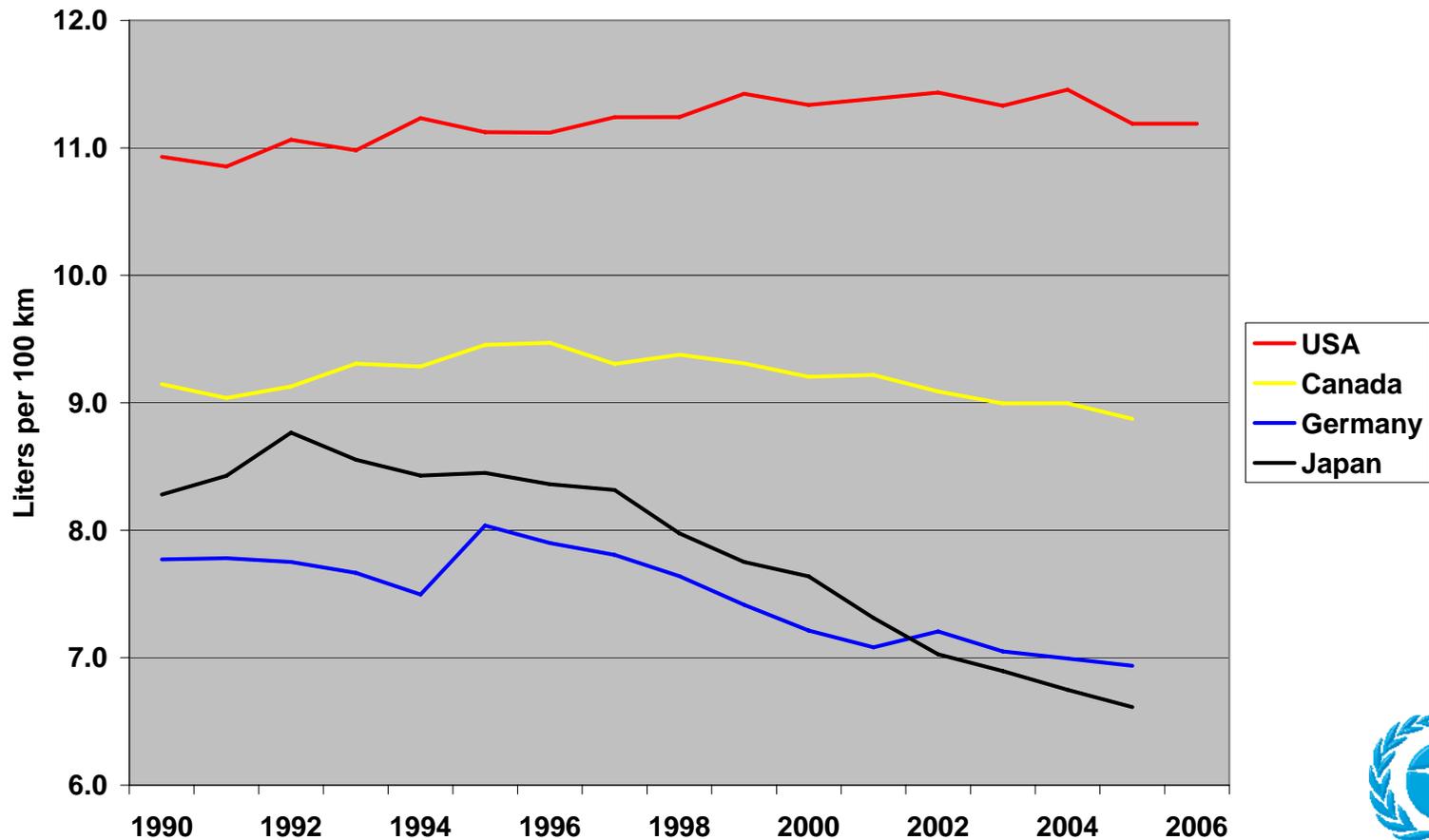
What do these different prices mean for vehicle choice? Hybrid vehicles as an example

Here we look at the cost difference between an average conventional vehicle and a hybrid vehicle, assuming the hybrid costs \$3000 more to purchase and is 30% more efficient. Includes 5 years of fuel savings, vehicles driven the same amount.



Can fuel prices do the job?

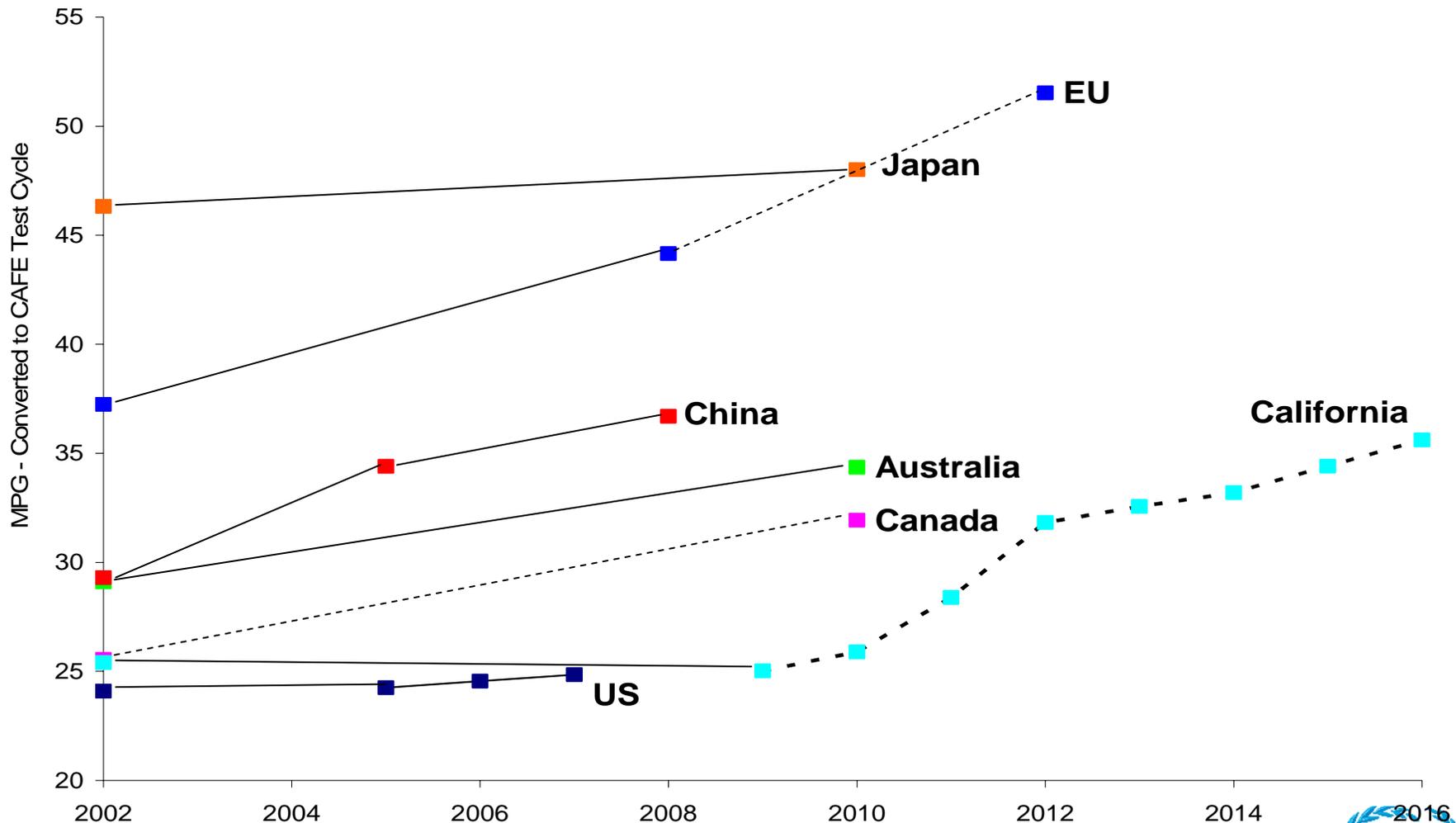
Assuming a long-run (e.g. 5-10 years) fuel economy / fuel price elasticity of 0.3, it would take a sustained doubling of taxed fuel prices to achieve a 30% reduction in new LDV rated fuel use per km (about a 50% increase in MPG). Roughly this implies that the 2006 US fuel prices of \$0.80/liter would need to rise to around \$1.50 (or \$5.80/gallon),



Source: IEA, from country submissions and reports. USA 2006 estimated



Vehicle Fuel Economy Projections Based on proposed and implemented policies



Data sources: Feng An, various papers, rated fuel economy converted to a common system using a driving cycle conversion model; dotted lines represent proposed policies



Some Conclusions

- The changes in motor fuel prices, 2004-2006 have been substantial, but percentage change in different countries varies a lot
- In the US 2006 fuel prices may have reached a level that begins to have significant impacts on travel and fuel use
- In already high fuel-cost countries like Germany, many structural adjustments have already occurred, but reactivity still seems to occur: possibly more options?
- In general, however, elasticities are low and small price changes may have only minor impacts
 - To achieve substantial reductions in fuel use and GHG emissions, we will probably need to see fuel prices go much much higher.
- In terms of vehicle efficiency, other policies, such as fuel efficiency regulations, CO₂-based fees or carbon caps, can be effective complements to fuel-cost approaches.

