Market solutions to transportation problems

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Why market solutions ?

- Environmental (and transportation) problems are examples of market failures
- These occur when individuals or organizations benefit while forcing unwanted cost onto other people
- They originate from violation of market principles

Market Principles

- Consumer options (preferences)
- Efficient pricing (reflect marginal cost)
- Neutrality (comparable goods treated equally)

General Solutions to Environmental Problems

- Command and Control
- Moral Suasion
- Environmental taxes and fees
- Subsidies
- Cap-and-trade

Command and Control

- Traditional regulation: target well defined sources and penalizes failure to comply
- Ex: US Clean Air Act (93% reduction in lead between 1980 and 2000)
- Drawbacks: (i) economically burdensome, (ii) no incentive to innovate (actual disincentive to exceed the standard)
- Best used to complement other solutions

Ex: congestion in Sao Paulo

- Since 1997, vehicles are only allowed to circulate in Sao Paulo during certain days of the week, depending on their license plate.
- In principle, reduces traffic by 20%.
- The policy was not complemented by other improvement plans (bus, subway, etc).
- In practice, the number of cars increased by 23% in the past 10 years (3 times the population growth).

Moral Suasion

- voluntary, flexible, inexpensive
- inherent free rider problem
- effective for information building to complement other policies

Taxes and fees

- bring prices in line with social costs
- obeys the polluter-pay principle
- can be revenue neutral
- generally political hotbeds

Subsidies

- Intended to lessen the burden of emission reduction
- Tax shifting violating the polluter-pay principle
- Should only be consider when leading to behavior change

Ex: Federal transit tax break

- 16% reduction in cost for monthly pass holders
- Average $153 annual savings
- Not enough to persuade car users to switch to public transit
- Costs $2000/ton of reduction
- Compare with $16/ton for Aircanada - zerofootprint program (as of May 2008)

Cap-and-trade

- aligns incentives with goals
- financial benefits for successful participants
- polluter-pay principle satisfied
- no restrictions on technology

Requirements for C&T

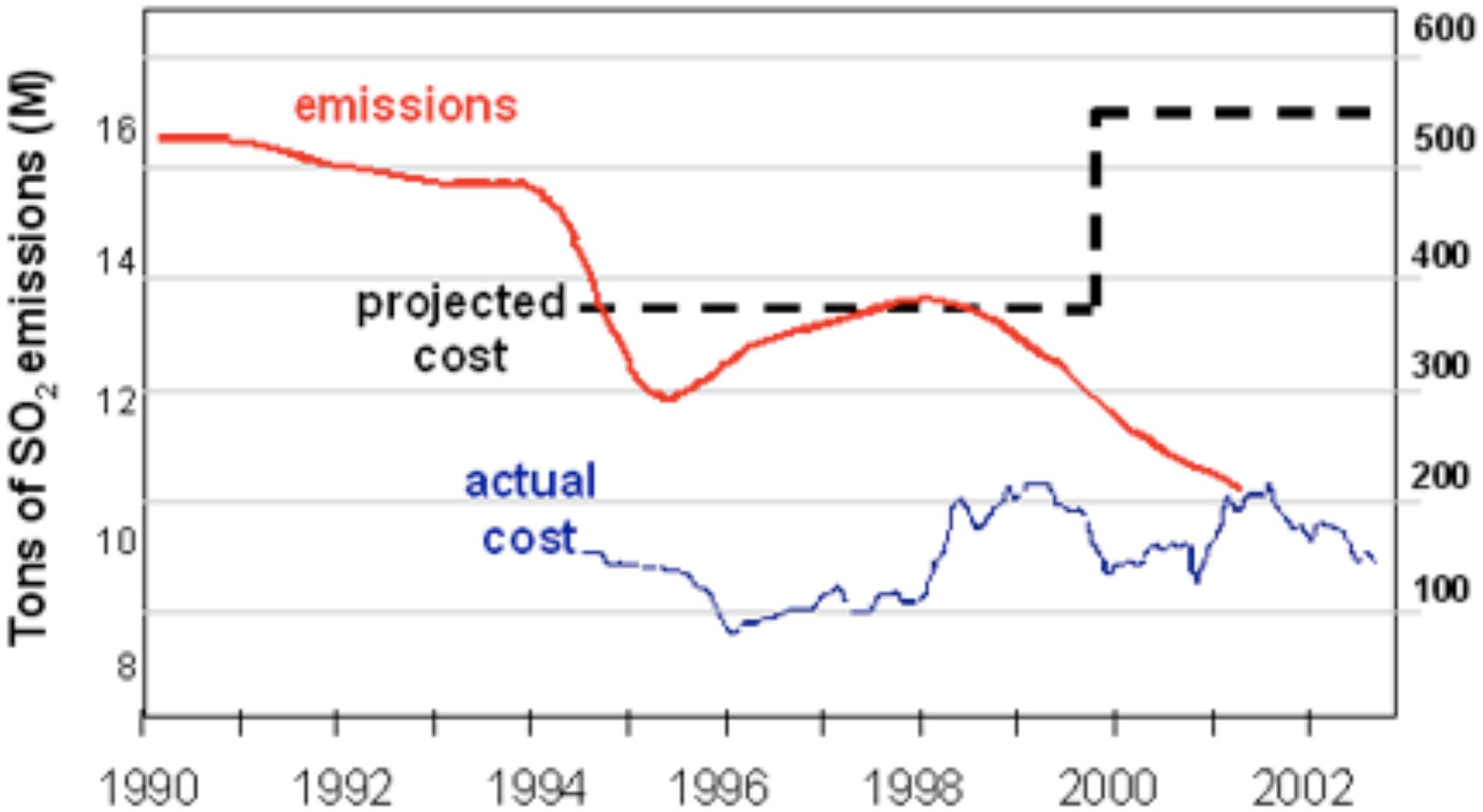
- restricted supply of permits
- large number of participants
- mandatory compliance
- monitoring mechanism
- credible penalties
- creation of a market

Ex: US acid rain

- From 1990 to 2005, achieved a 44% reduction in SO_2 and 31% reduction in NO_x compared to 1980 level.
- 100 % compliance
- reductions well bellow mandated level
- $0.8 billion/year operating cost (initially estimated at $25 billion/year)

The Acid Rain Experience

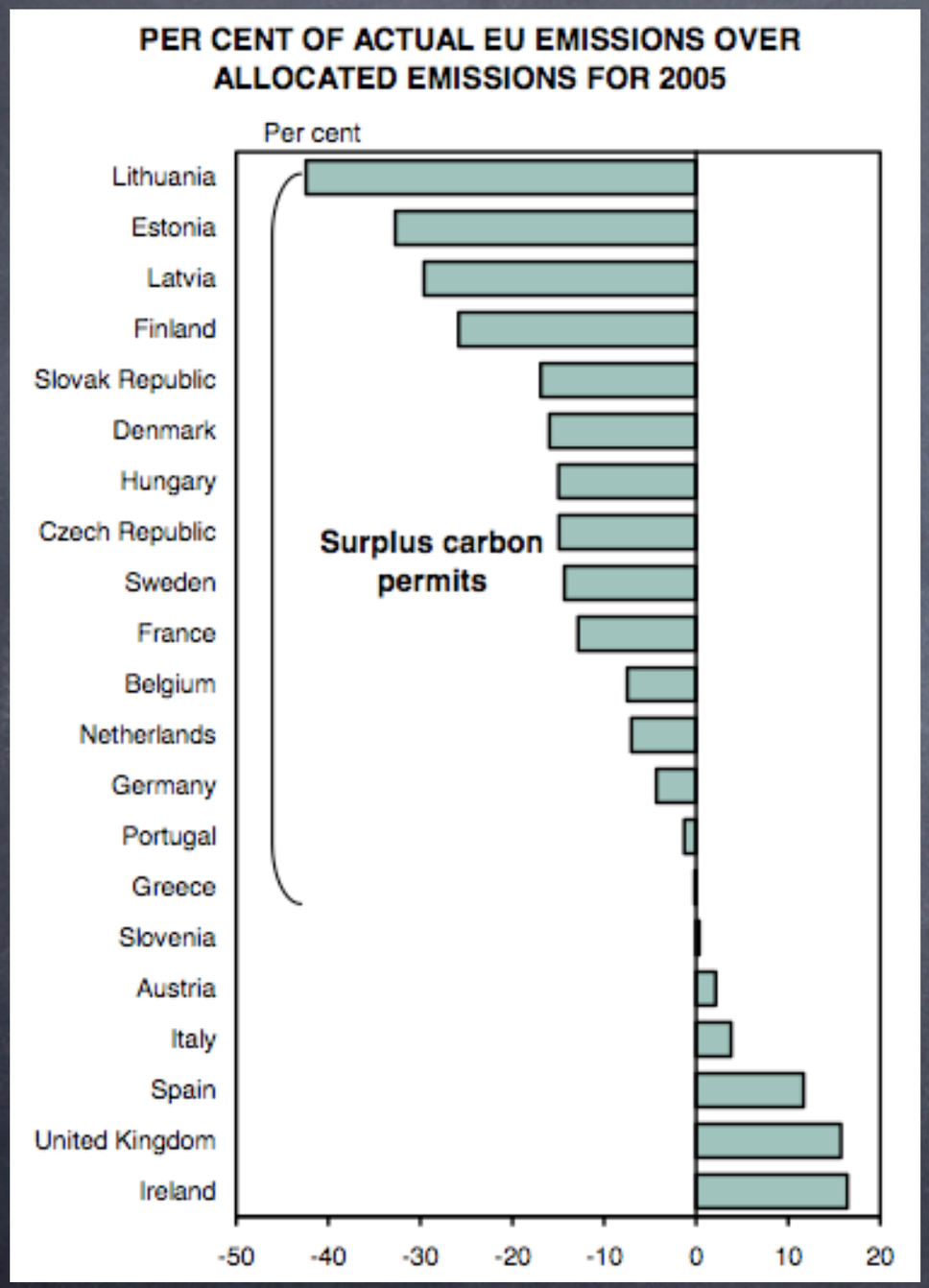
Unprecedented Environmental Protection at Unmatched Cost Efficiency

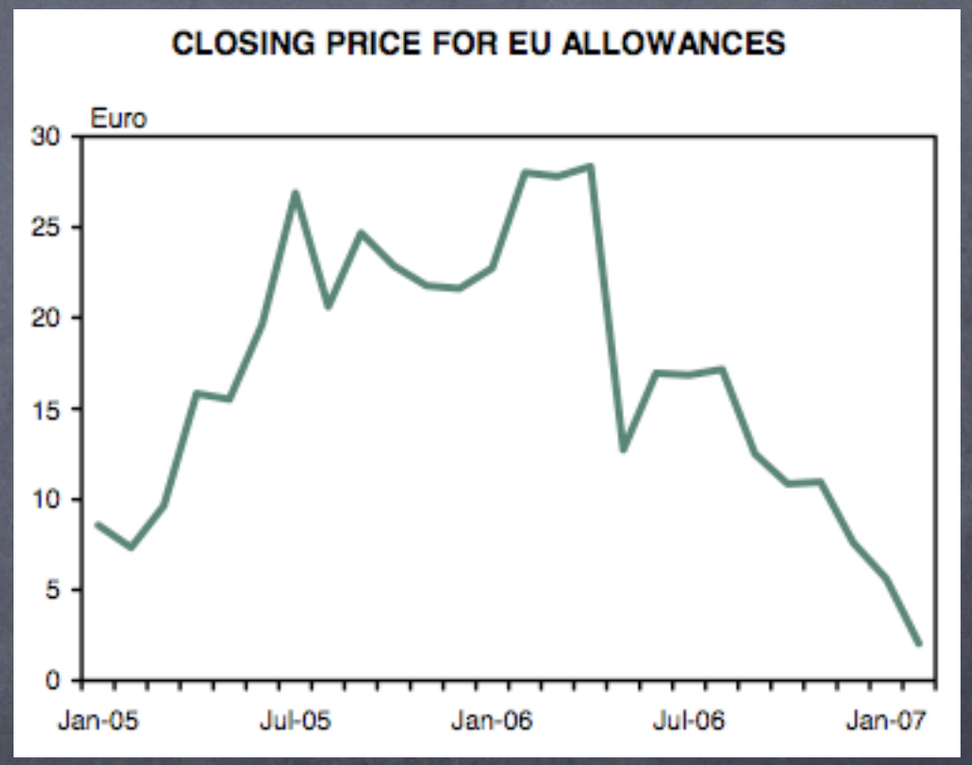


Source: The Economist, July 6th, 2002

Ex: EU - ETS

- Carbon dioxide
- 25 countries
- First phase: 2005-2007
- Second phase: 2008-2012

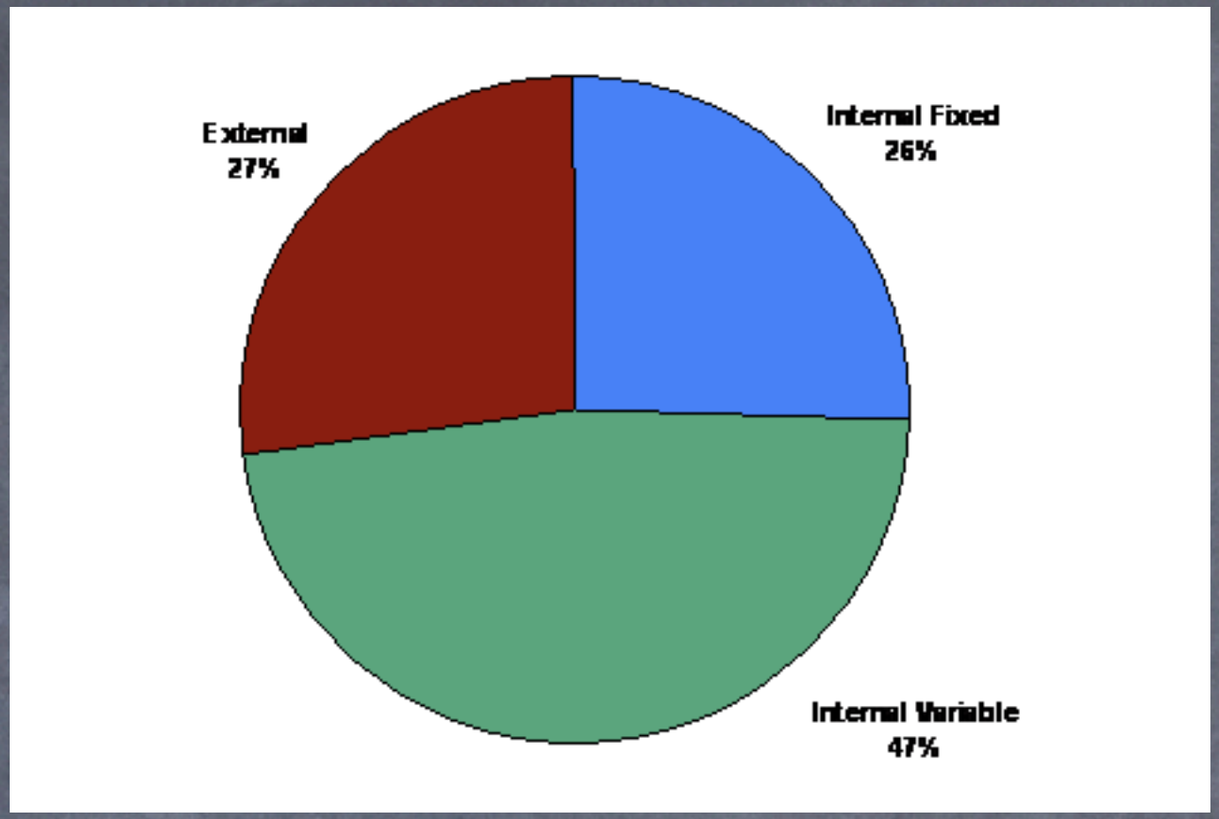


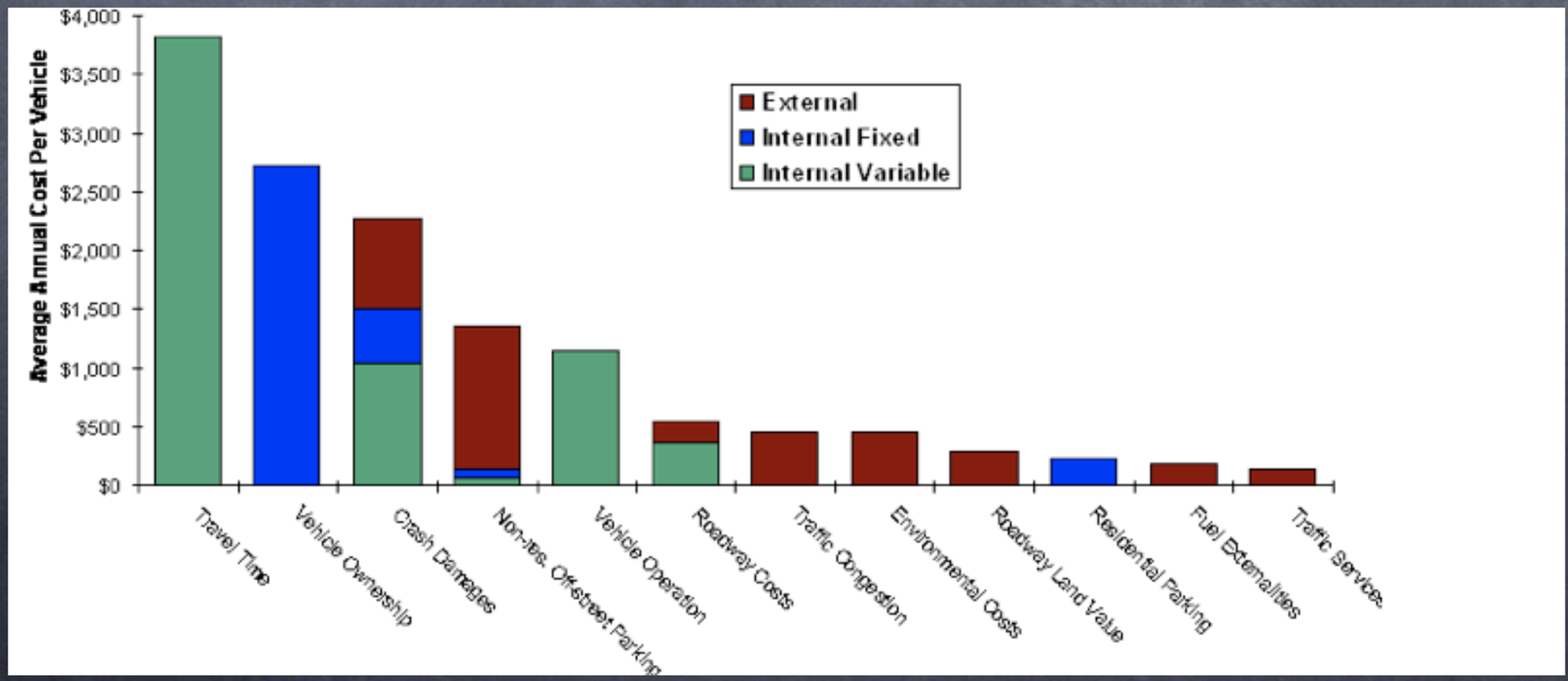


Source: European Commission

Cost x Price

- Costs can be fixed (registration fee, residential parking ...) or variable (fuel, road tolls)
- Costs can be internal (vehicle operating costs) or external (pollution emissions, general taxes...)
- When pricing travel, drivers consider perceived, internal, variable costs.


External
27%
Internal Fixed
26%
Internal Variable
47%


Average Annual Cost Per Vehicle
$4,000
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
External
Internal Fixed
Internal Variable
Travel Time
Vehicle Ownership
Crash Damages
Non-res. Off-street Parking
Vehicle Operation
Roadway Costs
Traffic Congestion
Environmental Costs
Roadway Land Value
Residential Parking
Fuel Externalities
Traffic Service

Efficient pricing

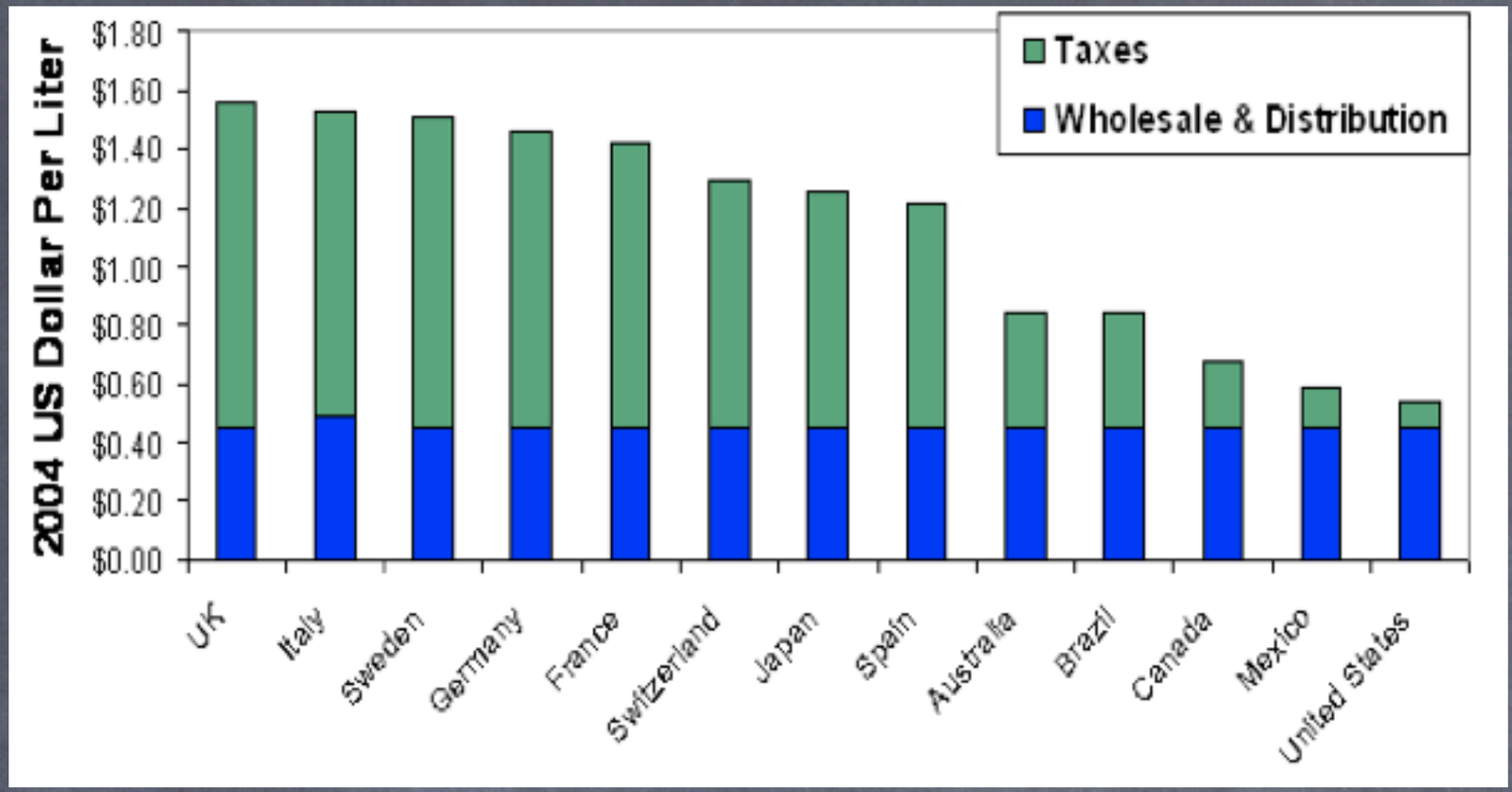
- price (perceived internal variable cost) = marginal cost (total resources used)
- at minimum: expenditure in roadway and traffic
- ideally: cost of land use, congestion, pollution, crash damage, parking costs
- underpricing creates: higher general taxes, higher prices for commercial goods, increased injury and illness expenditure, lower residential property value, ...

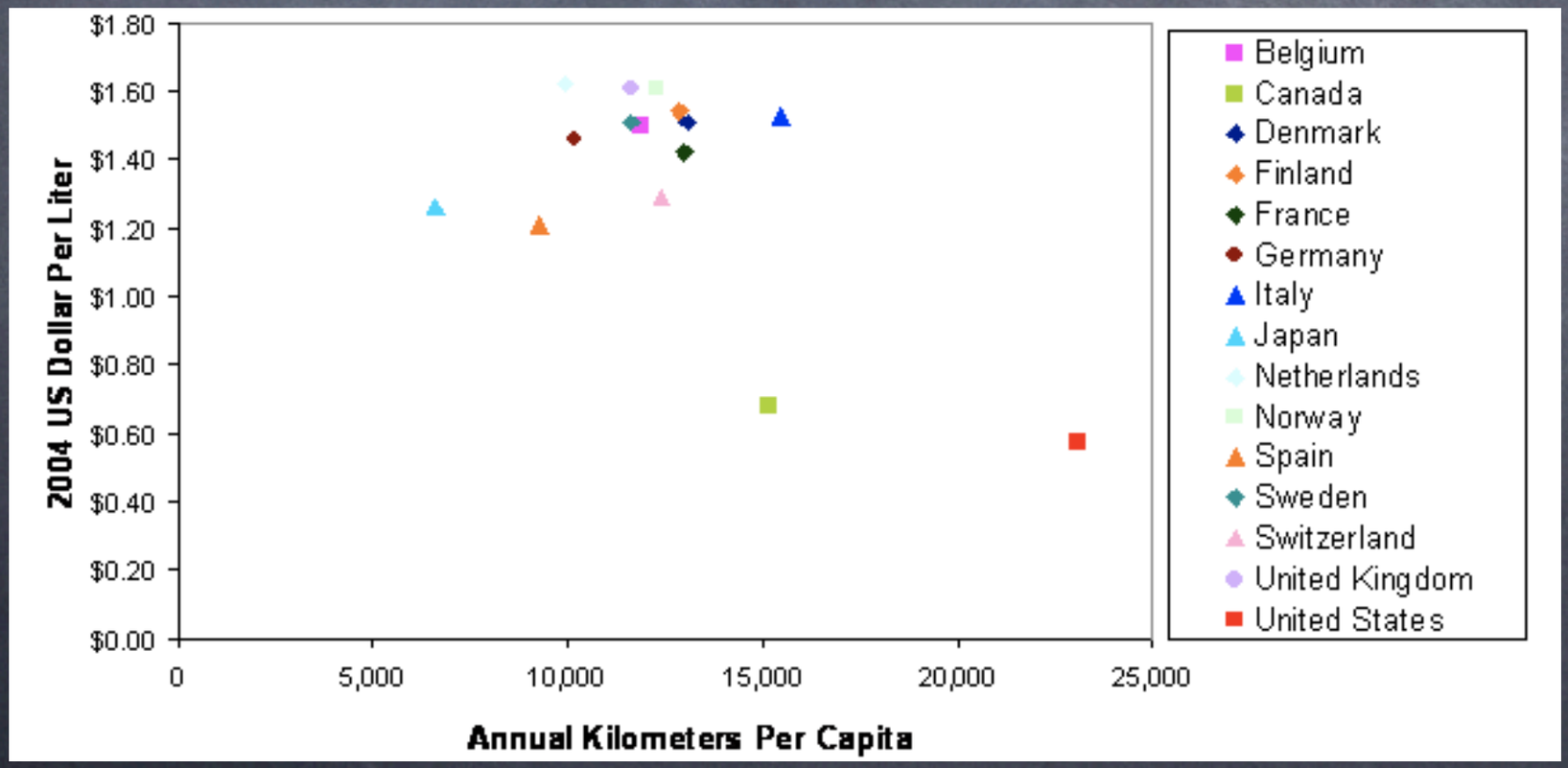
Pricing mechanisms

- Internalize externalities and turn fixed cost into variable costs
- Fuel taxes
- Distance based fees
- Parking pricing
- Road pricing

Fuel taxes

- Targets a visible operating cost
- Easy to implement
- Fuel elasticity: -0.27 (short term) to -0.7 (long term)
- Mileage elasticity: -0.1 (short term) to -0.5 (long term)
- Increases should be predictable and gradual
- Revenue used to improve transportation, rather than just highways


2004 US Dollar Per Liter
$1.80
$1.60
$1.40
$1.20
$1.00
$0.80
$0.60
$0.40
$0.20
$0.00
Taxes
Wholesale & Distribution
UK
Italy
Sweden
Germany
France
Switzerland
Japan
Spain
Australia
Brazil
Canada
Mexico
United States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$0.80
$0.60
$0.40
$0.20
$0.00
0
5,000
10,000
15,000
20,000
25,000
Annual Kilometers Per Capita
Belgium
Canada
Denmark
Finland
France
Germany
Italy
Japan
Netherlands
Norway
Spain
Sweden
Switzerland
United Kingdom
United States

Distance based fees

- Pay-as-you-drive insurance: calculate premium based on risk factors and prorate according to mileage
- PAYD registration fee
- PAYD purchase tax
- PAYD lease fee
- Weight-distance fee

Parking pricing

- charge motorist directly
- if subsidized, offer cash-out options
- use variable rates for time and location
- avoid cheap monthly rates
- set prices to equal or exceed public transit
- unbundle parking from housing

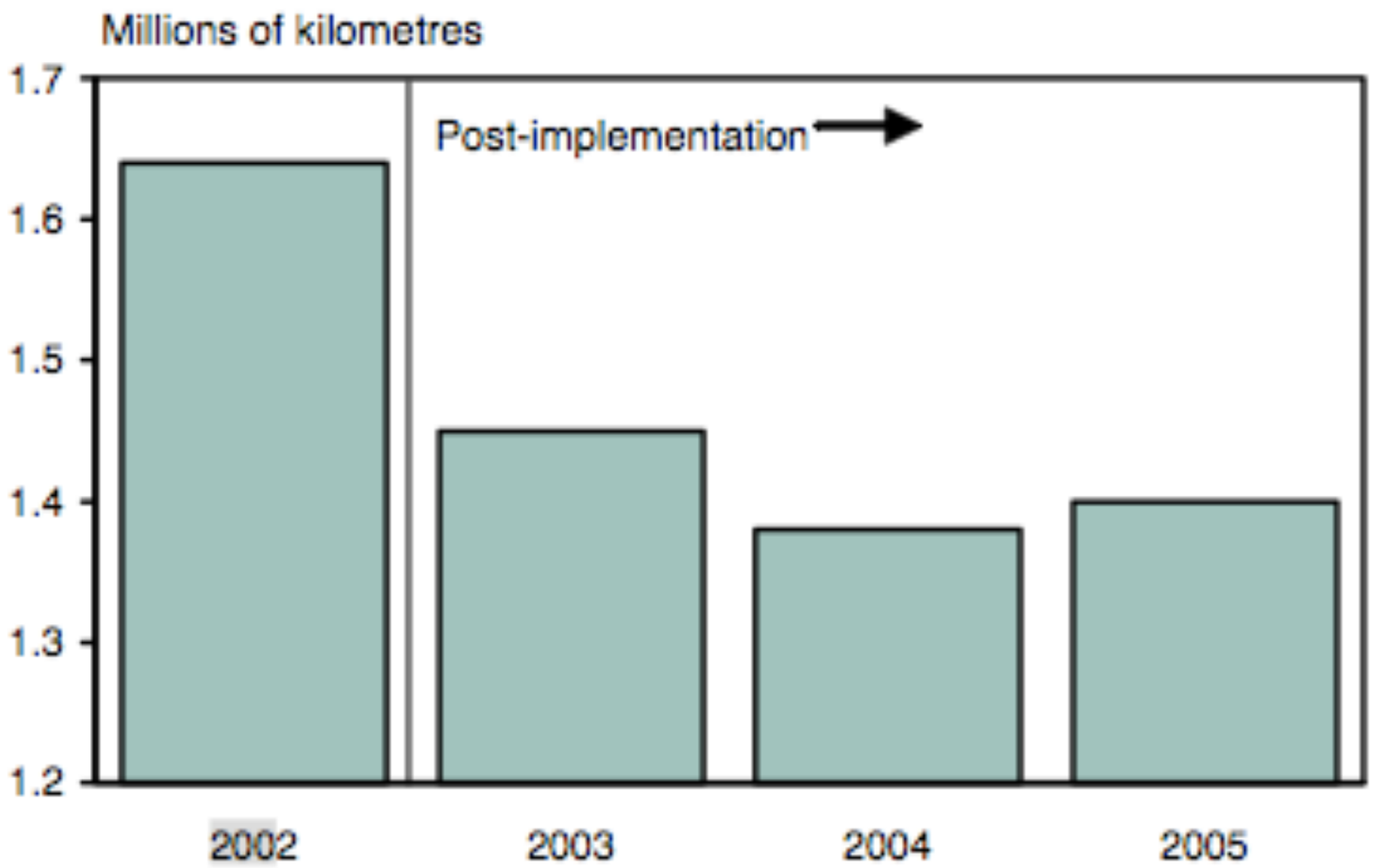
Road pricing

- Road tolls (fee-for-service)
- Congestion pricing (responsive, change pattern)
- Managed lanes (High Occupancy Toll as an alternative to High Occupancy Vehicle)

Congestion charges principles

- reflect marginal social cost of each trip
- vary smoothly over time
- base on trip segment
- no vehicle exceptions
- take into account full trip impact

TOTAL VEHICLE-KILOMETRES DRIVEN WITHIN CHARGING ZONE DURING CHARGING HOURS



Source: Transportation for London

Cap-and-trade for roads ?

- ration peak period vehicle-miles
- use a credit-based system
- most market-based solution of all
- proposed (2004) and polled (2008) in Austin, TX
- extremely cool !!!