Efficiency versus Fairness In Energy Policy

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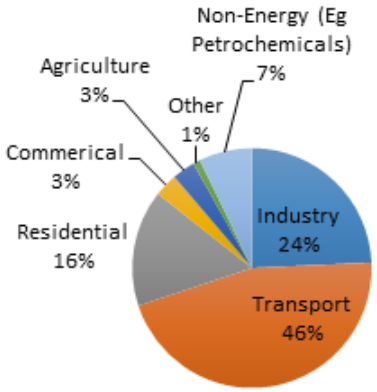
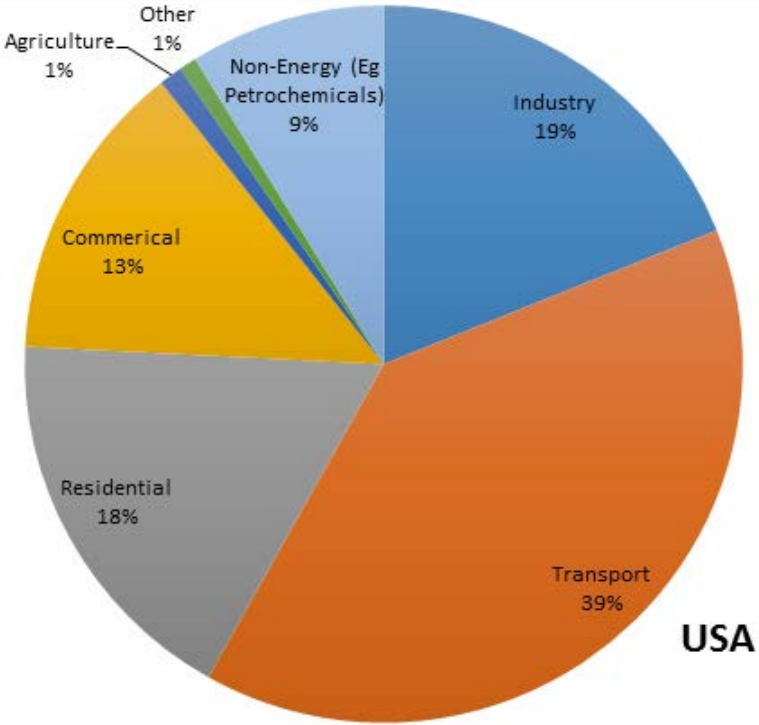
Focus

- Trade-offs between efficiency and fairness
  - How to reduce or avoid the trade-off
- Concentrate on urban transportation policies
- Consider experiences in US and Mexico

Energy Consumption by Sector, Mexico and US

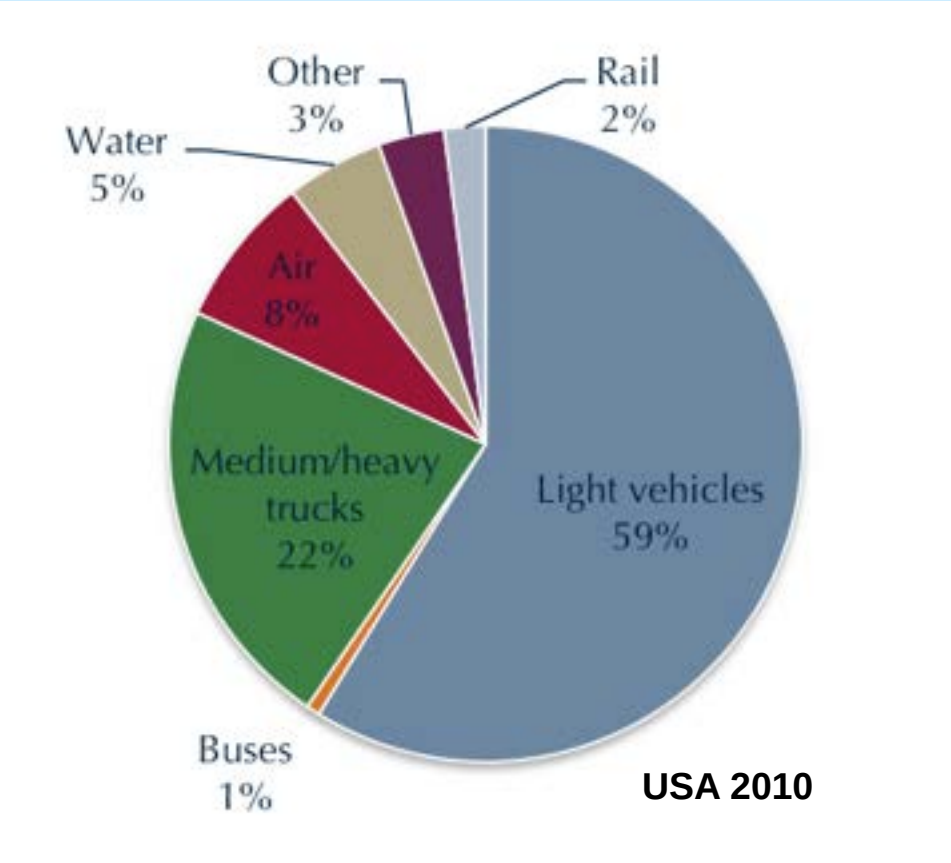


Mexico - 2010



USA 2010

Light Vehicles Occupy a Large Share of Energy Use from Transport Sector



What Is the Justification For Government Intervention?

Efficiency (address market failures)

- Externalities (local pollution, congestion, impacts on climate)
- Public goods (need for transportation infrastructure)

Fairness

- Low-income households spend larger share of income on energy than do more affluent households
- Public policy can address/avoid potential regressive impacts of energy supply

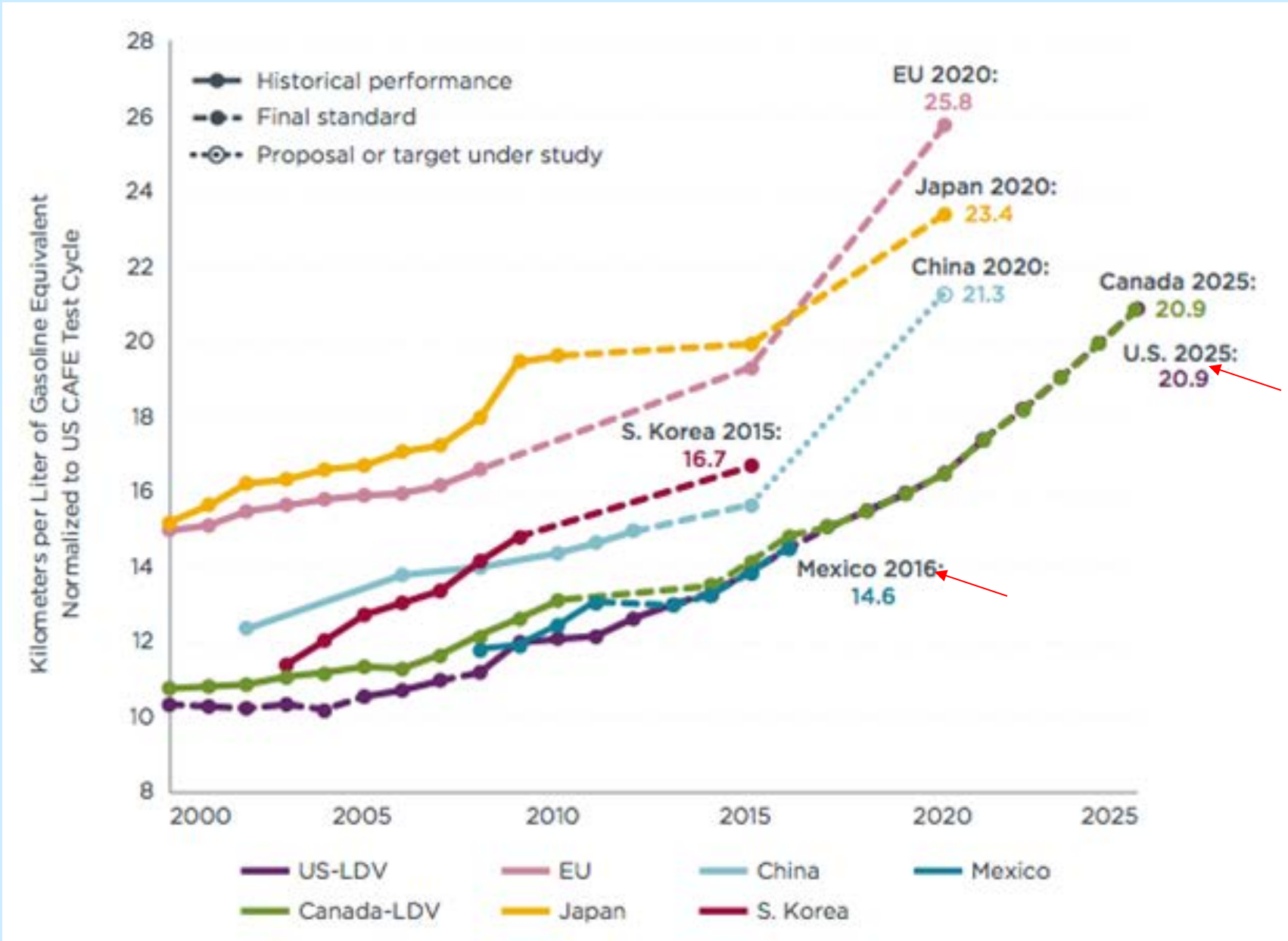
Efficiency and fairness can conflict. How to reduce the conflicts?

I will examine the trade-offs as they apply to government policies oriented to:

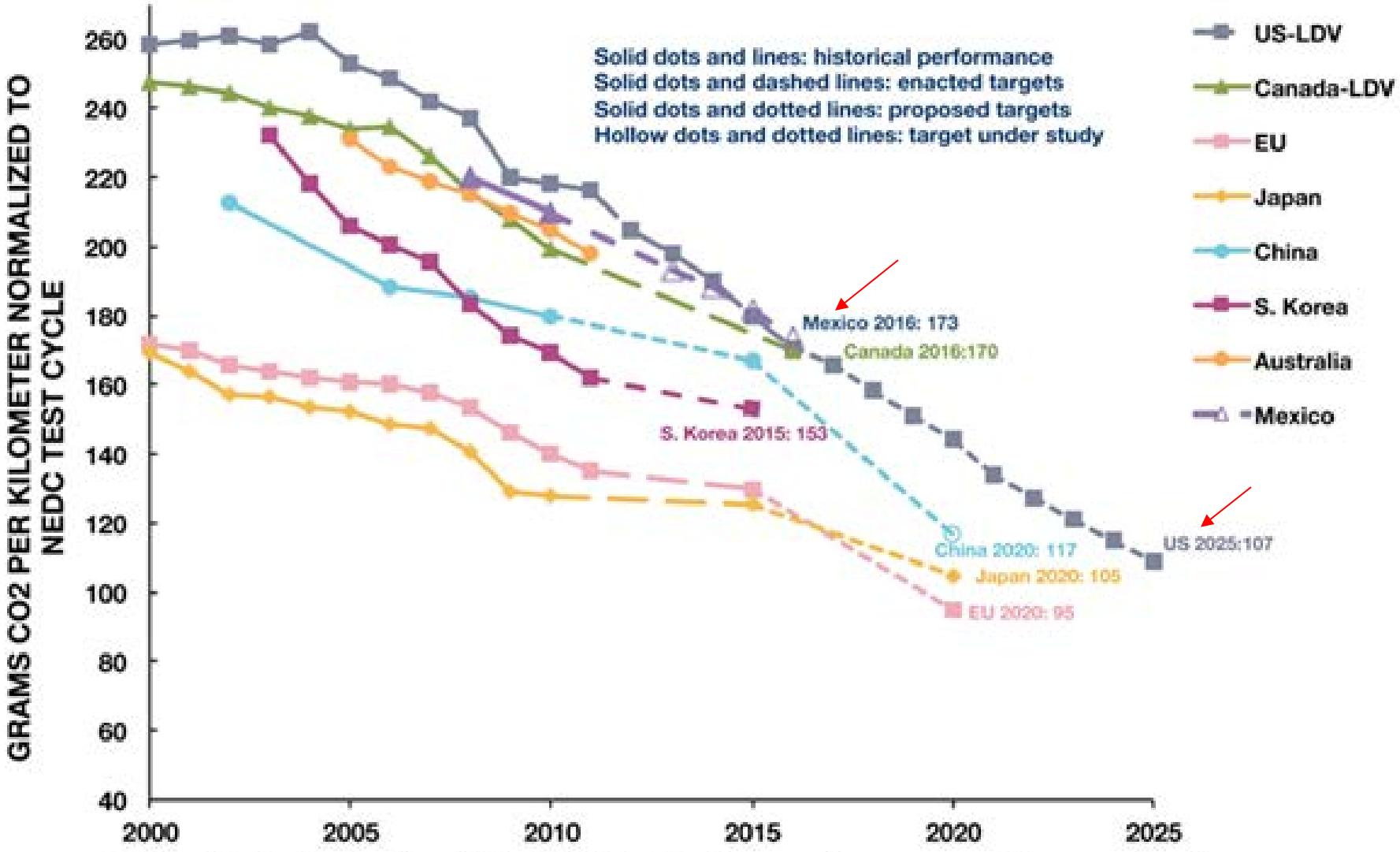
1. Increasing automobile fuel economy
2. Reducing traffic congestion
3. Promoting use of mass transit

1. Promoting Automobile Fuel-Economy

Fuel-Economy Performance or Requirements

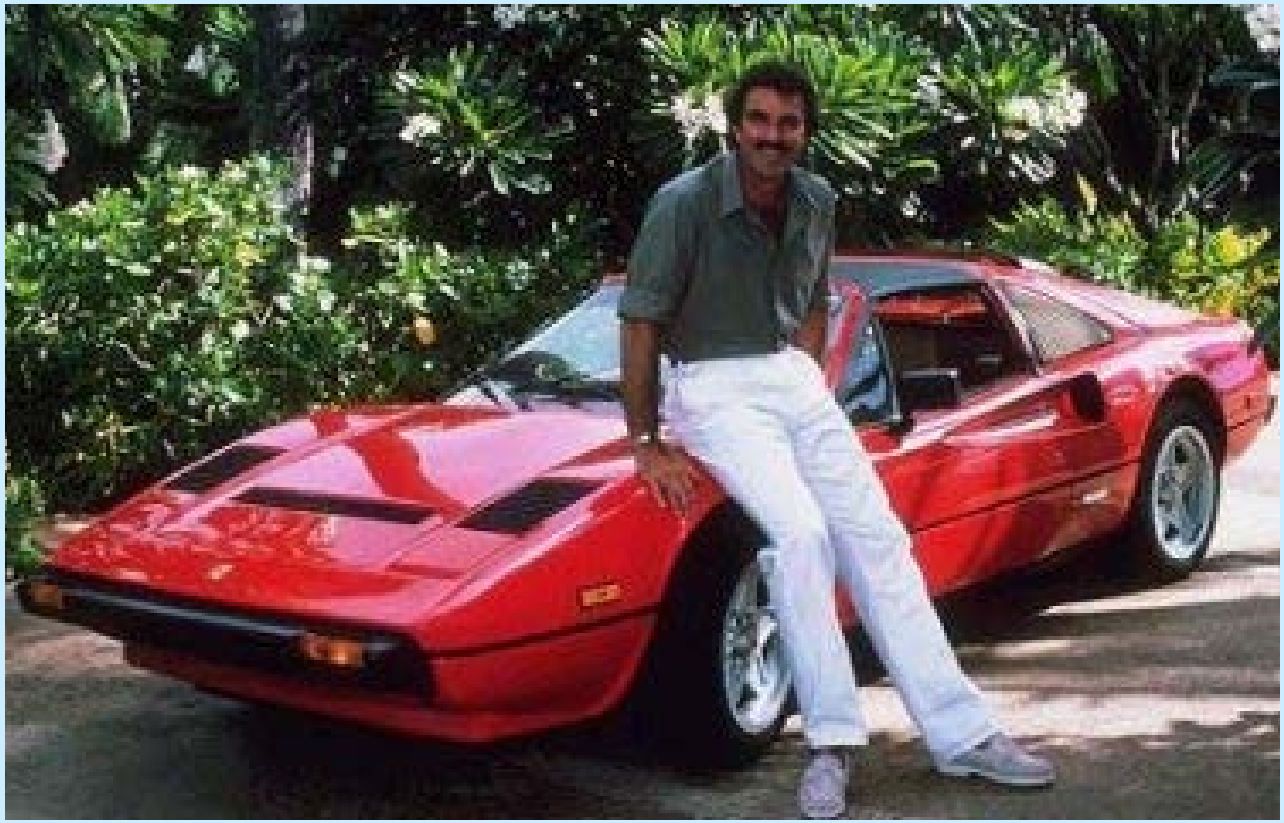


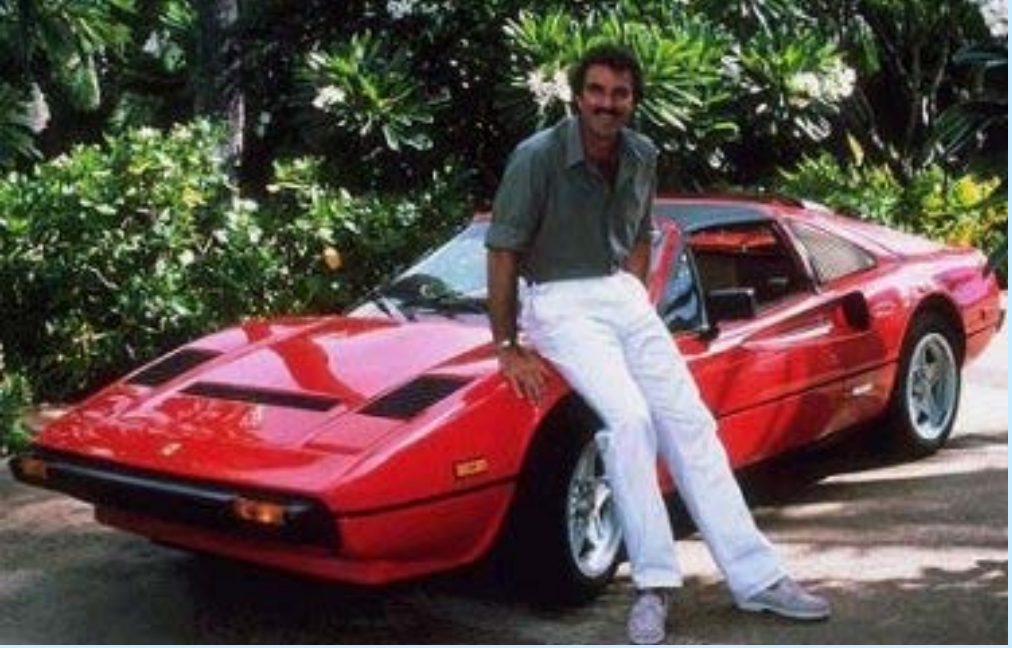
CO_2 per Kilometer



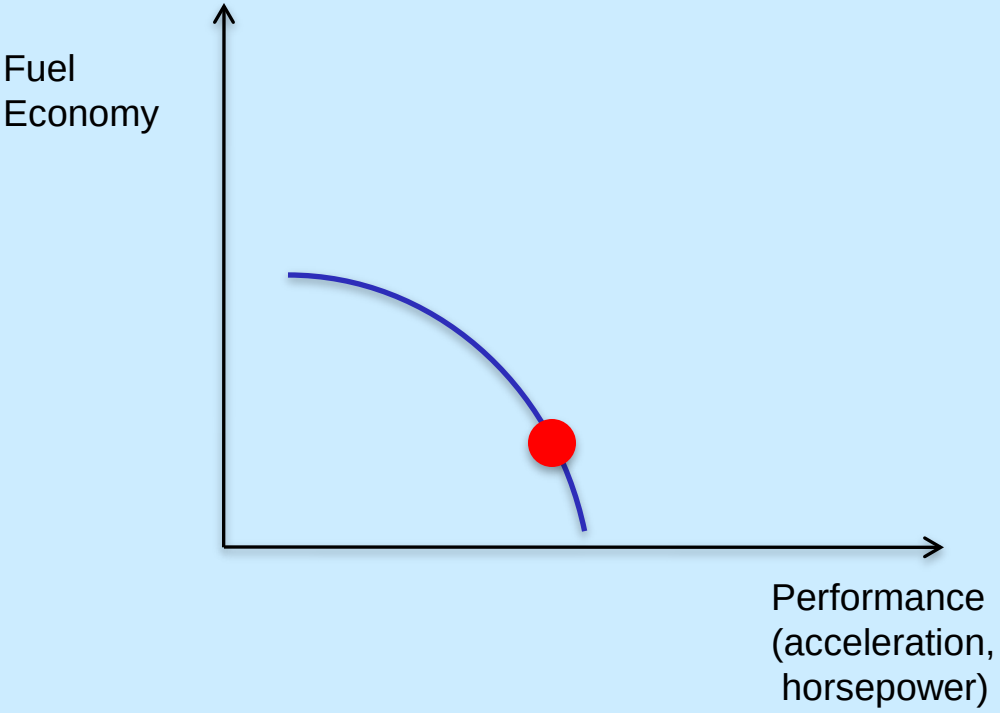
[1] China's target reflects gasoline vehicles only. The target may be lower after new energy vehicles are considered.
[2] US , Canada, and Mexico light-duty vehicles include light-commercial vehicles.

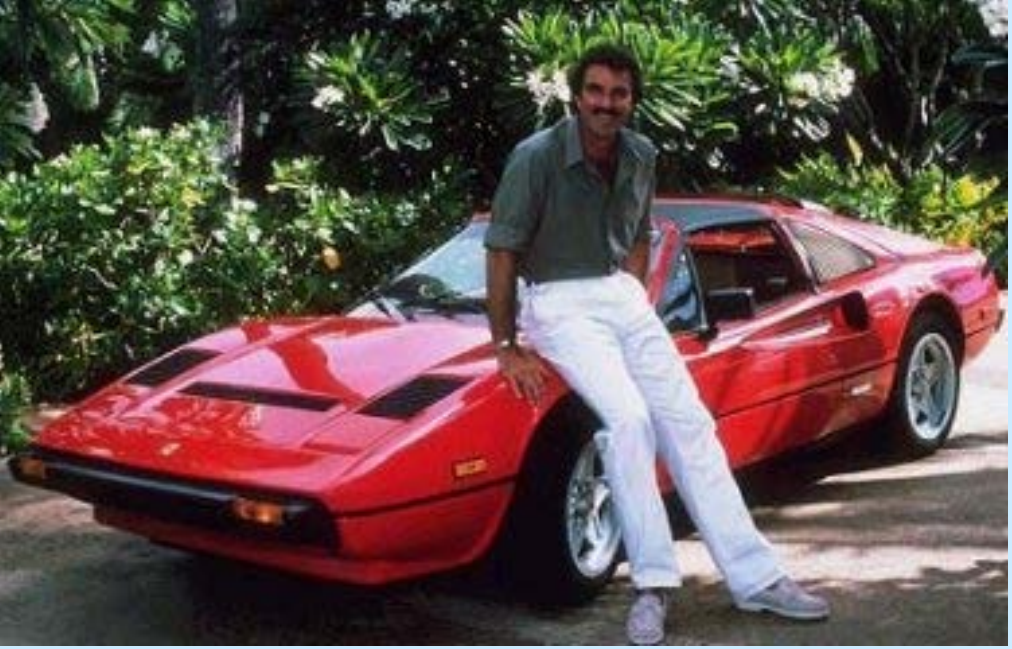
Are CAFE Standards a Success Story?





1980 Ferrari GTS
price (today's dollars): $160,000
performance:
acceleration (0-60 mph): 12 seconds
horsepower: 240
fuel economy: 15 mpg





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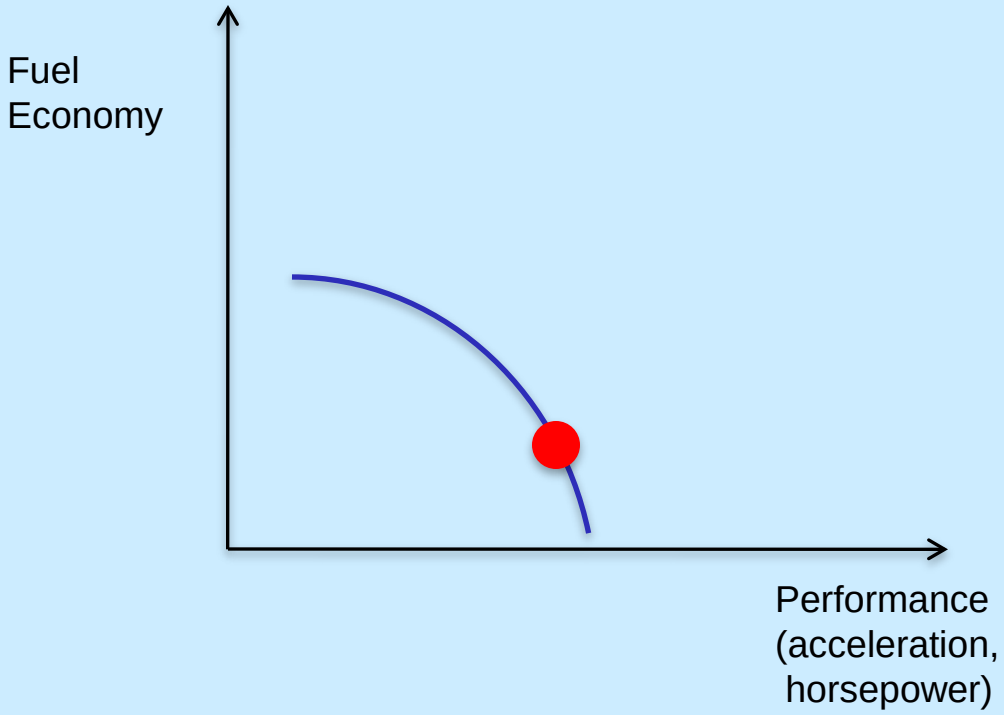

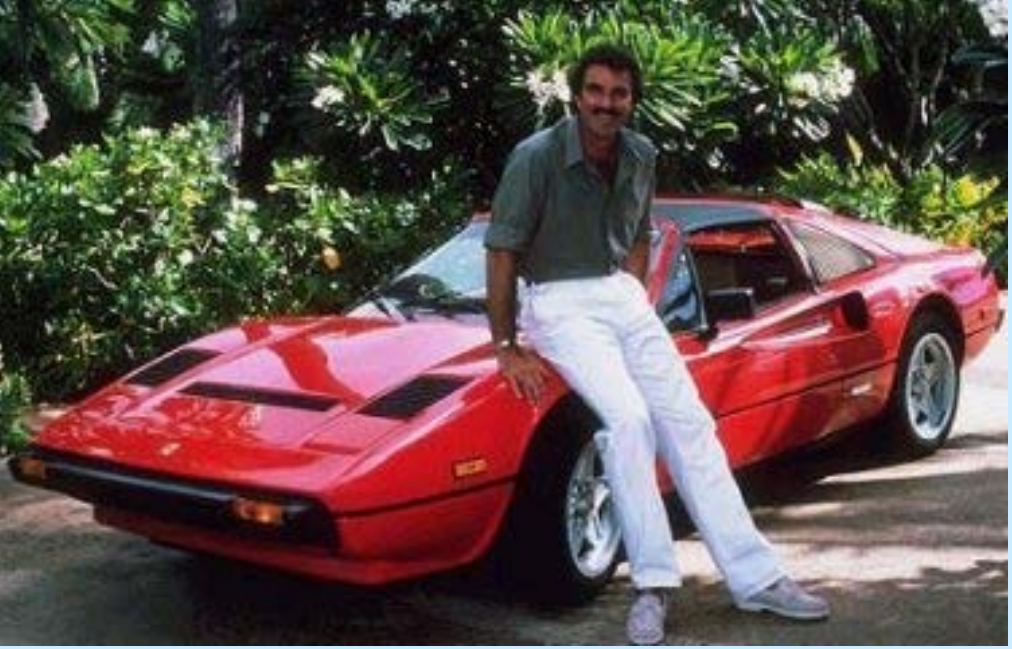

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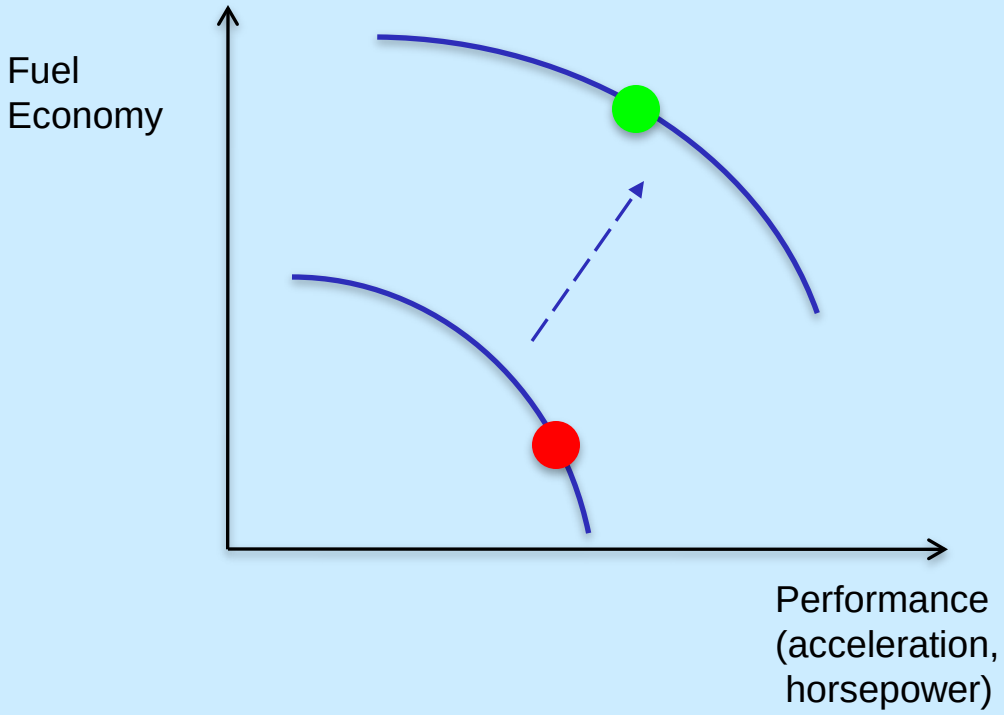


A Success Story?

Plusses:

- Despite tighter CAFE standards, real automobile prices have not increased
- The standards have reduced fuel use and emissions
  - Kleit (*Economic Inquiry,* 2004): 3 mpg increase in CAFE standard -> reduction of 5.2 billion gallons of gasoline, or 246 million tons of CO_2, per year

Two concerns:

- Offsetting increases in amount of driving (vehicle miles traveled)
  - This is the “rebound effect”
  - Studies suggest rebound is 10-20% offset
- CAFE standards don’t apply to current used cars

Is There a Better Alternative?

Consider a gasoline tax – 2 attractions

1. It encourages both:
   (a) better fuel economy (as with CAFE standard)
   and
   (b) conservation of miles driven (no rebound)

2. It promotes conservation of driving in both new and used car markets.

Thereby achieves greater reductions in fuel use and emissions per dollar

- Small and Dender study *(Energy Journal*, 2007), and Austin and Dinan (*Journal of Environmental Economics and management,* 2005) *:* achieve same fuel reductions at less than 30% of the cost.

But Is a Gasoline Tax (Increase) Unfair?

Tighter fuel economy standards imposed on new vehicles. These are disproportionately purchased by people with relatively high income.

Gasoline tax increase applies to both new and used vehicles.
→ Greater impact on low-income households.

Empirical studies indicate the gasoline tax's impact is more regressive. (See, for example, Bento *et al., American Economic Review,* 2009.)

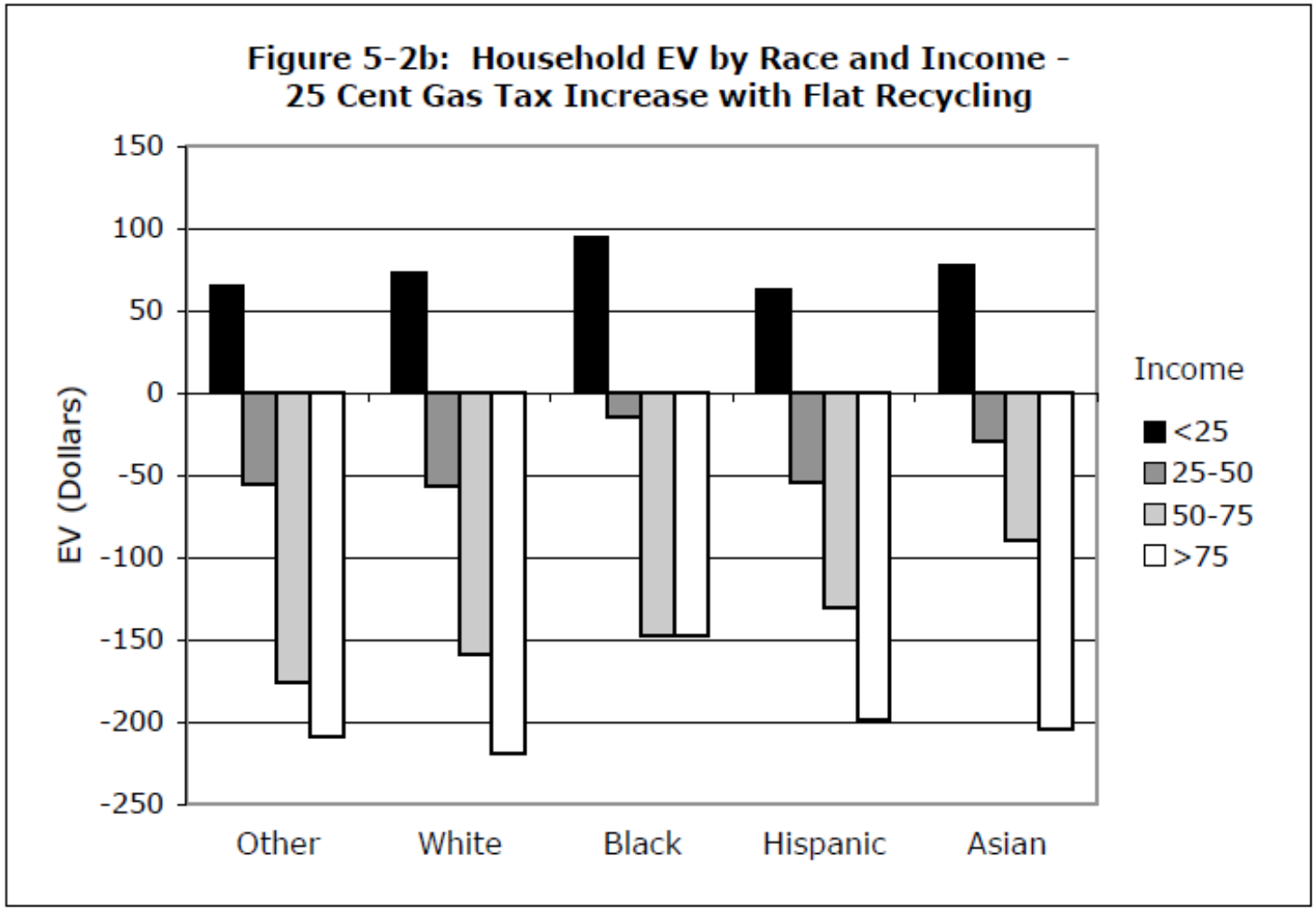
Thus we have an efficiency-fairness trade-off

Can the trade-off be eliminated, or at least reduced?

Yes – via revenue-recycling.

Devote gas tax revenues to:

- Across-the-board “flat” rebate to all households, *or*
- Income or sales tax cuts targeted to low-income households, *or*
- Expenditures on public goods (subsidies to mass transit) that especially benefit low-income households



from Bento *et al.*, 2006

The rebound effect can result from any energy or environmental policy in the form of an intensity standard.

It may be more important in other energy contexts (e.g., home appliances).

2. Reducing Traffic Congestion

A CAFEE standard or gasoline tax doesn’t address the congestion problem very well.

2 problems justify 2 instruments.

But what instrument?

Mexico City tackles congestion head-on

Posted on January 28th, 2013 in News

By Mary Ebeling

As recently as 2011, Mexico City ranked among the world's worst for traffic congestion. But now, Mexico City's improvements to their transportation system can serve as a model for other municipalities to learn from. The city shines as an international example of a rapidly growing city successfully lowering carbon emissions, reducing the severity of traffic jams, increasing public space, and improving overall quality of life.

Source: State Smart Transportation Initiative, 2013

Recent efforts:

- Bus Rapid Transit system (EMBARQ estimates this has reduced number of passenger car travelers in Mexico City by 6%)
- Increased bike lanes
- Expanded bike-sharing system (Ecobici)

- Mexico City earned Sustainable Transport Award from Institute for Transportation and Development Policy

Would be very useful to evaluate costs per avoided car on the road for these and other potential policies

Congestion Costs

Parry and Small (*American Economic Review,* 2005): congestion costs in Mexico cities average $.17 per mile. $980/person/year.

Hoy No Circula Program

The program led to important (and underemphasized) behavioral adjustments:

In particular, purchases of an extra vehicle. Studies indicate this significantly reduced the effectiveness of the program.

- Lucas Davis (*Journal of Political Economy*, 2008):
  - Short run:
    - 19% *increase* in vehicle registrations
    - no significant reduction in local pollution

- Juan-Pablo Montero (*Journal of Public Economics*, 2013):
  - Short run: 13% decrease in CO concentrations
  - Long run: 11% *increase* in CO concentrations

An Alternative: Congestion Pricing

- Theoretical attraction:
  - Likely to be more efficient (involve costs per unit reduction in congestion) because it focuses more sharply on the problem – congestion.

- But there are significant practical difficulties:
  - Overlapping levels of political authority
  - A tax based on vehicle miles traveled (via odometer readings) would tax drivers on uncongested roads as much as driving on congested roads.
  - Ian Parry (World Bank Fiscal Affairs Division) recommends GPS-based tax. What you pay depends on degree of congestion**. How avoid "Big Brother Problem?"**

- Another alternative-- more modest but perhaps more feasible: pricing of access to certain roads. Modest success in US. Applies to parts of Periferico in Mexico City (a success?).

An Alternative: Congestion Pricing

Isn’t any form of road pricing unfair, compared with restricted driving days?

- It raises price of driving
  - This can be significant for low-income drivers
- But restricted driving days impose other costs
  - Inconvenience costs
  - Costs of avoiding the regulation by purchasing a second car
- Moreover – and importantly – economic research indicates that if the revenues from the tax are recycled to all drivers, nearly everyone is no worse off financially!

What Are the Lessons Here?

For efficiency, it works best to target closely the externality.

- a gasoline tax better targets fuel use (stemming from both fuel economy and miles driven)
- a congestion tax or road pricing better targets the problem of congestion

What about fairness?

- These policies have potential to be unfair.
- But under both policies, much or all of the unfairness can be offset by judicious revenue recycling

Fuel-Economy by Government-Owned Cars

Note: a gasoline tax might not yield strong incentives for use of fuel-efficient automobiles (and other vehicles) by government agencies.

This is an argument for legislation requiring the use of fuel-efficient automobiles by such agencies.

- Massachusetts: The state designates a municipality as a “Green Community” (eligible for a related subsidy from the state) if they enact legislation that requires municipalities to purchase fuel-efficient vehicles.

3. Promoting Use Of Mass Transit

Public Transportation Use

Mexico City:

- Light Rail: 2.6M passengers / month
- Trolley or Bus: 7M passengers /month
- Metro (underground): 129M passengers /month

- 2nd largest public transportation system by ridership in North America

New York City Subway: 162M passengers/month

There is an efficiency argument for pricing public transportation below its supply cost.

- If the private costs of driving do not incorporate the external costs, then subsidies to public transportation can “level the playing field.”

- On the other hand, if policies (such as gasoline taxes and congestion fees) are already in place to capture the external costs of driving, there is less of an efficiency argument for public transportation subsidies.

Still, as suggested earlier, subsidies can be justified on fairness (income distributional) grounds.

Conclusions

Policies to curb energy use or emissions from autos raise potential conflicts between efficiency and fairness.

- Efficiency calls for pricing the externality
- But the burden of externality-pricing can potentially fall disproportionately on low-income households
- Judicious recycling can reduce or eliminate the trade-off

Automobile Fuel Economy

- Fuel-economy standards have produced substantial reductions in fuel use and associated emissions. They have helped prompt substantial technological progress, thereby preventing significant increases in automobile prices.
- But they lead to rebound, and they apply only to new vehicles
- Consequently the gains have been achieved at substantially higher cost than would have occurred through an equivalent gasoline tax increase
- Fairness concerns about a gas tax can be addressed through targeted recycling

Road Congestion

- In theory:
  - a congestion tax is most efficient (it targets the externality)
  - revenue-recycling can largely offset potential adverse income-distributional impacts
- In practice: serious challenges
- Would a GPS-based tax be feasible in the future? Can privacy concerns be overcome?
- Expanded BRT and bike-sharing are important complements to policies aimed directly at auto traffic.

Mass Transit

- Subsidies to mass transit are justified on efficiency grounds to the extent that other direct auto policies do not fully level the playing field
- Such subsidies also gain support on fairness grounds

Overall

- Great potential for policies that achieve significant improvements in energy efficiency while overcoming potential problems of fairness