

# Consumer Responses to Energy Prices

John German, ICCT

RFF Energy Policy Symposium

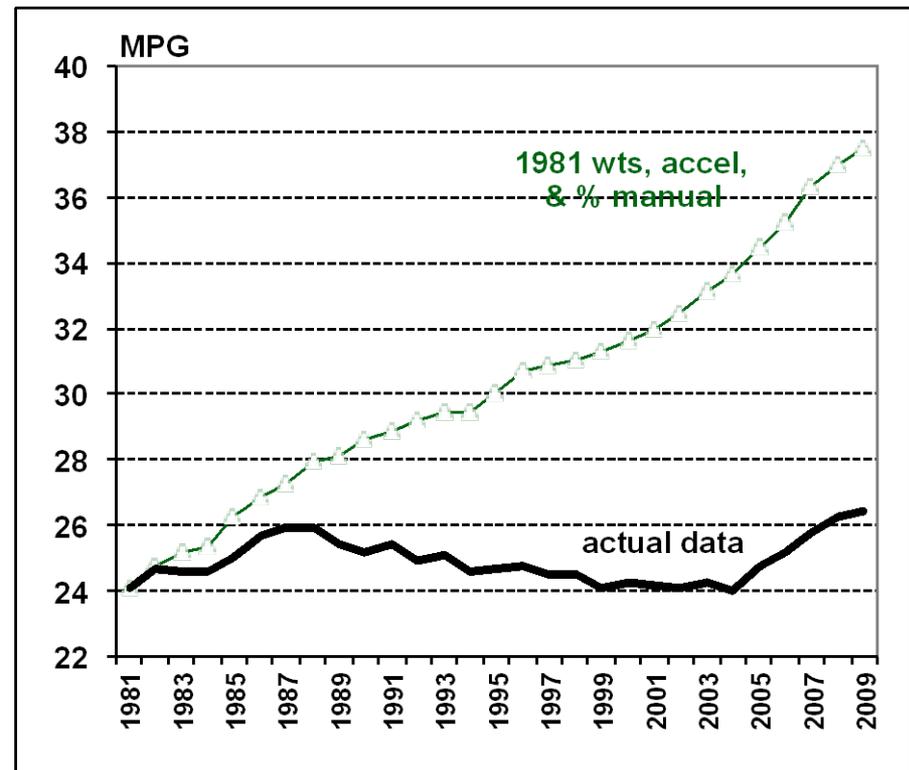
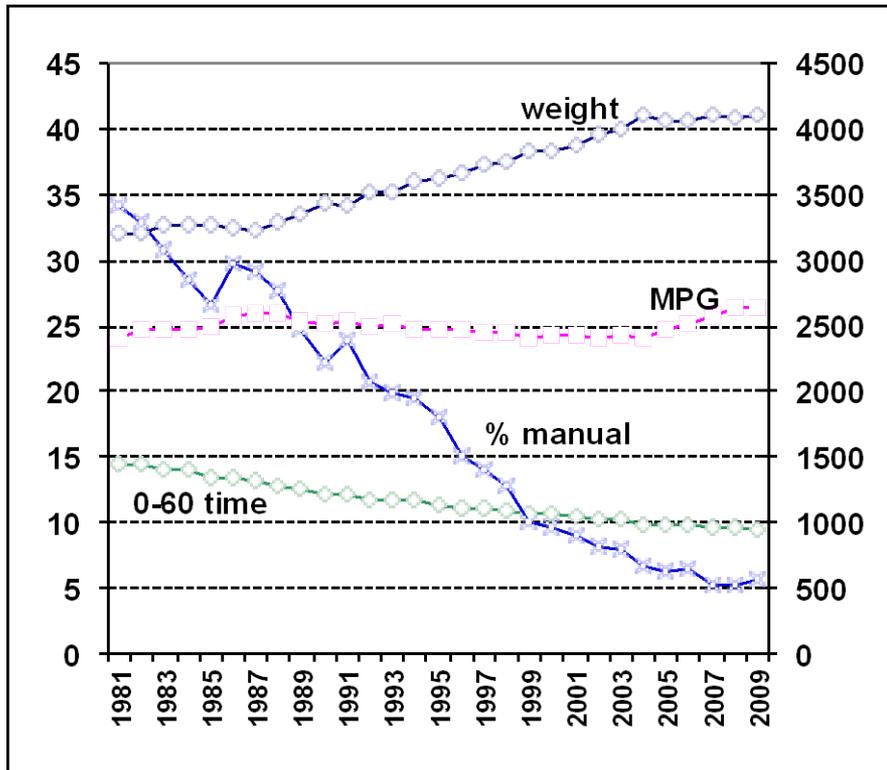
June 21, 2011



# Fuel Economy Trends

Car & Light Truck Data from EPA's 2009 FE Trends Report

- Since 1987, technology advances have been used to improve attributes other than fuel economy

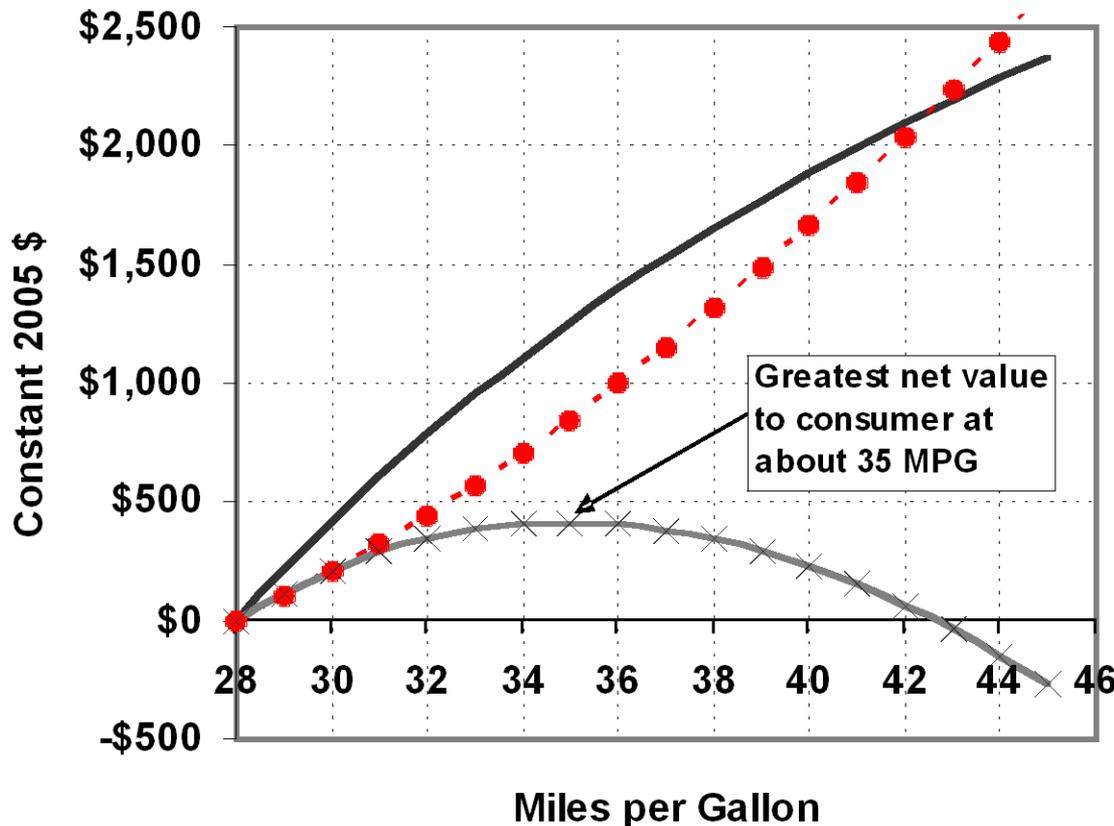


- Fuel **efficiency** has increased by about 1.4% per year since 1987
- Gains have all been used to increase other attributes whose value is more certain – such as performance, comfort, utility, and safety

# “Energy Paradox”

## 2002 NAS/NRC CAFE Report Technology Cost Curves

Price and Value of Increased Fuel Economy to Passenger Car Buyer, Using NRC Average Price Curves



$$PV = \int_{t=0}^L P_t M_o e^{-\delta t} \left( \frac{1}{E_o} - \frac{1}{E_1} \right) e^{-rt} dt$$

- Fuel Savings
- - - Price Increase
- x — Net Value

Assumes cars driven 15,600 miles/year when new, decreasing at 4.5%/year, 12% discount rate, 14 year vehicle life, \$2.00/gallon gasoline, 15% shortfall between EPA test and on-road fuel economy.

# Turrentine & Kurani, 2004

**In-depth interviews of 60 California households' vehicle acquisition histories found *no evidence* of economically rational decision-making about fuel economy.**

- Out of 60 households (125 vehicle transactions) 9 stated that they compared the fuel economy of vehicles in making their choice.
- 4 households knew their annual fuel costs.
- None had made any kind of quantitative assessment of the value of fuel savings.

# Consumers are, in general, LOSS AVERSE

2002 Nobel Prize for Economics

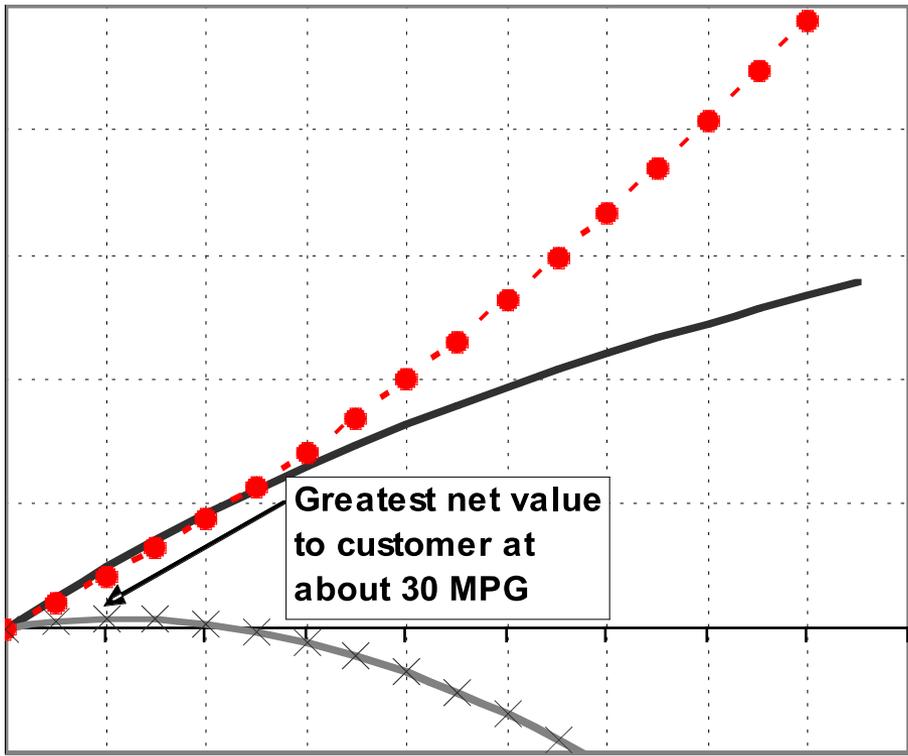
(Tversky & Kahnemann, J. Risk & Uncertainty 1992)

- **Uncertainty** about **future** fuel savings makes paying for more technology **a risky bet**
  - What MPG will I get (your mileage may vary)?
  - How long will my car last?
  - How much driving will I do?
  - **What will gasoline cost?**
  - What will I give up or pay to get better MPG?

“A bird in the hand is worth two in the bush.”

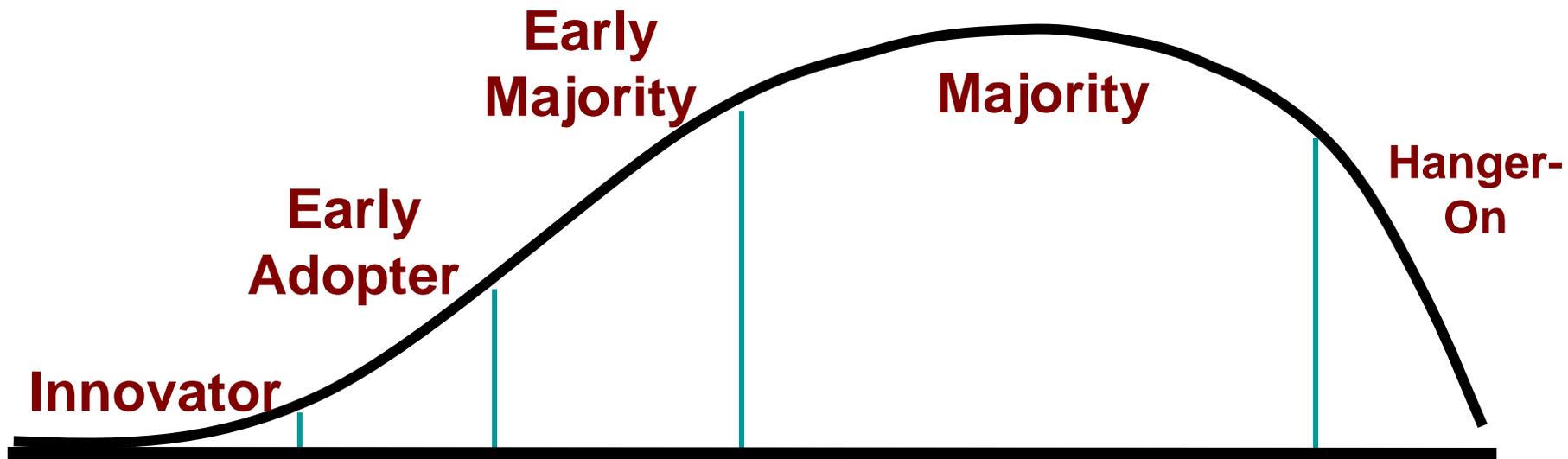
Causes the market to produce less fuel economy than is economically efficient

# The implications of a 3-year payback requirement and uncertainty+loss aversion are the same.



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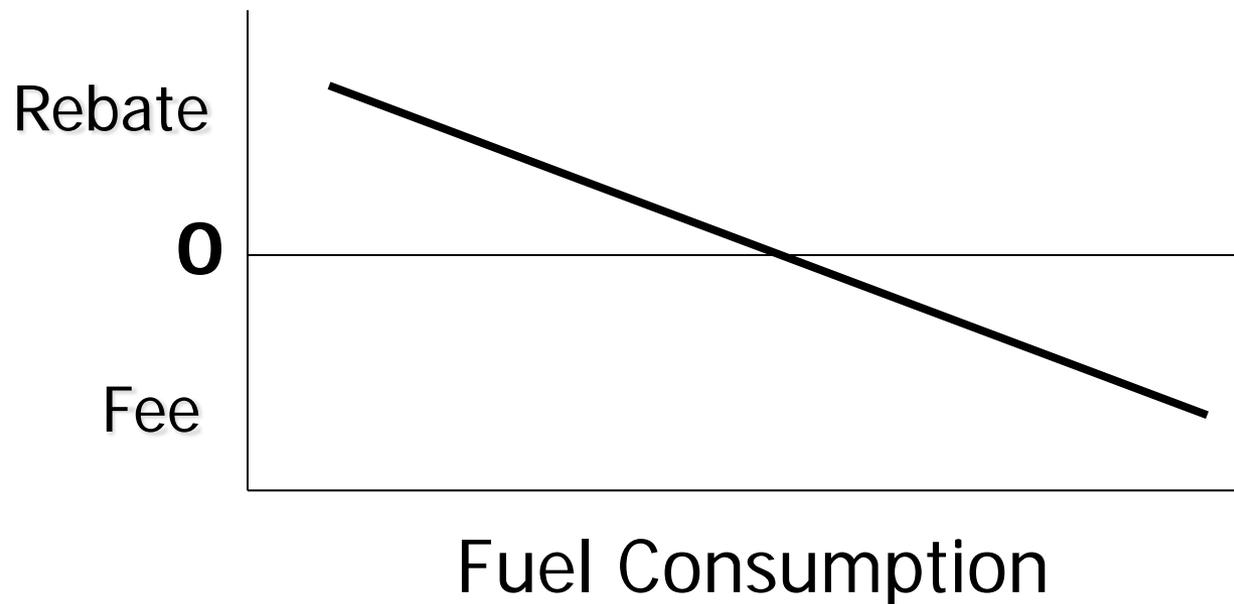
# New Customer Profile



**Increasingly risk averse**

# New Consumer Discounting is Fixable

- Increase fuel taxes
- Feebates: Pay manufacturers and consumers up front for value of the fuel savings



# Uncertainties Larger Barrier for PHEVs

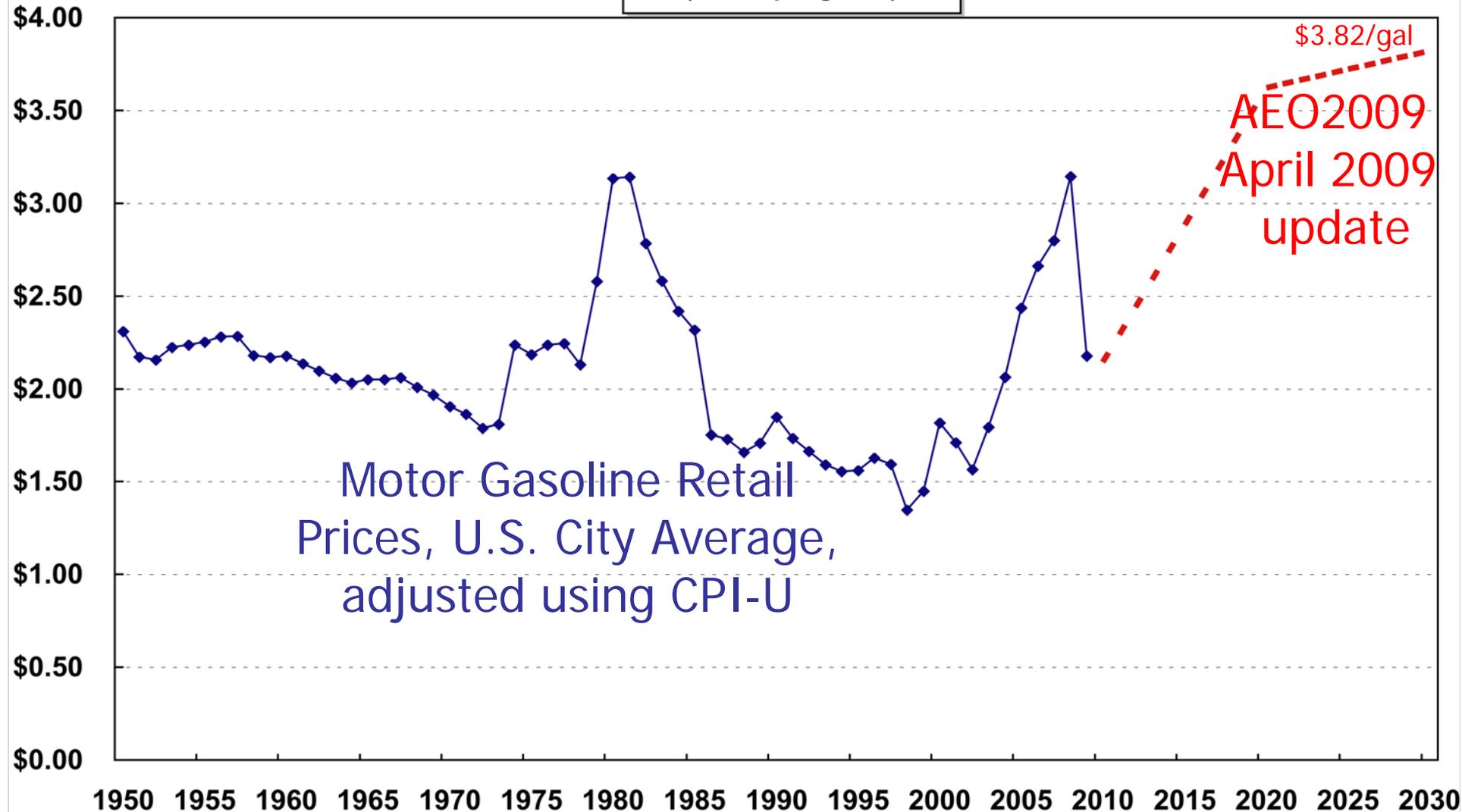
- How much am I going to save on fuel?
- How much will I pay for electricity?
- How often do I need to plug in?
- How much hassle will it be to plug in?
- Can I be electrocuted in the rain or if I work on my vehicle?
- What will it cost to install recharging equipment?
- How long will the battery last?
  - And how much will it cost to replace it?
- How reliable will the vehicle be?
- What will the resale value be?
  - Especially since the next owner also has to install recharging equipment
- What kind of PHEV is best for me?
  - Would a blended strategy be better than electric-only operation?
  - What amount of AER would be best for my driving?
  - What if I move or change jobs?

It's bad enough to  
spend \$300 on a  
Betamax -  
but \$30,000+ ?

# Real Cost of Driving

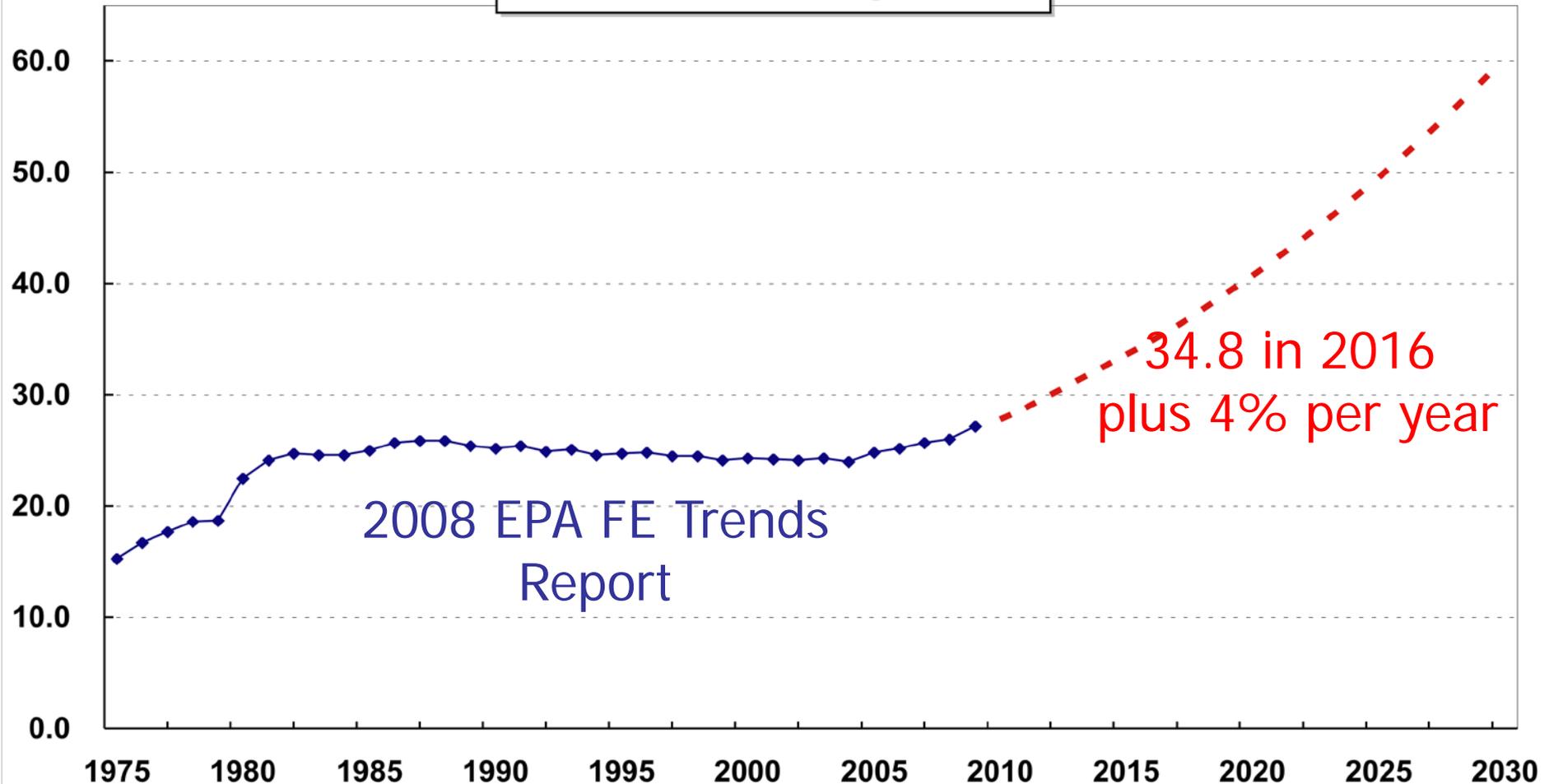
# Real Gasoline Price

Real Gasoline Prices  
(2007 \$ per gallon)



# New Vehicle Fuel Economy

New Vehicle MPG (CAFE values)  
Combined car and light truck

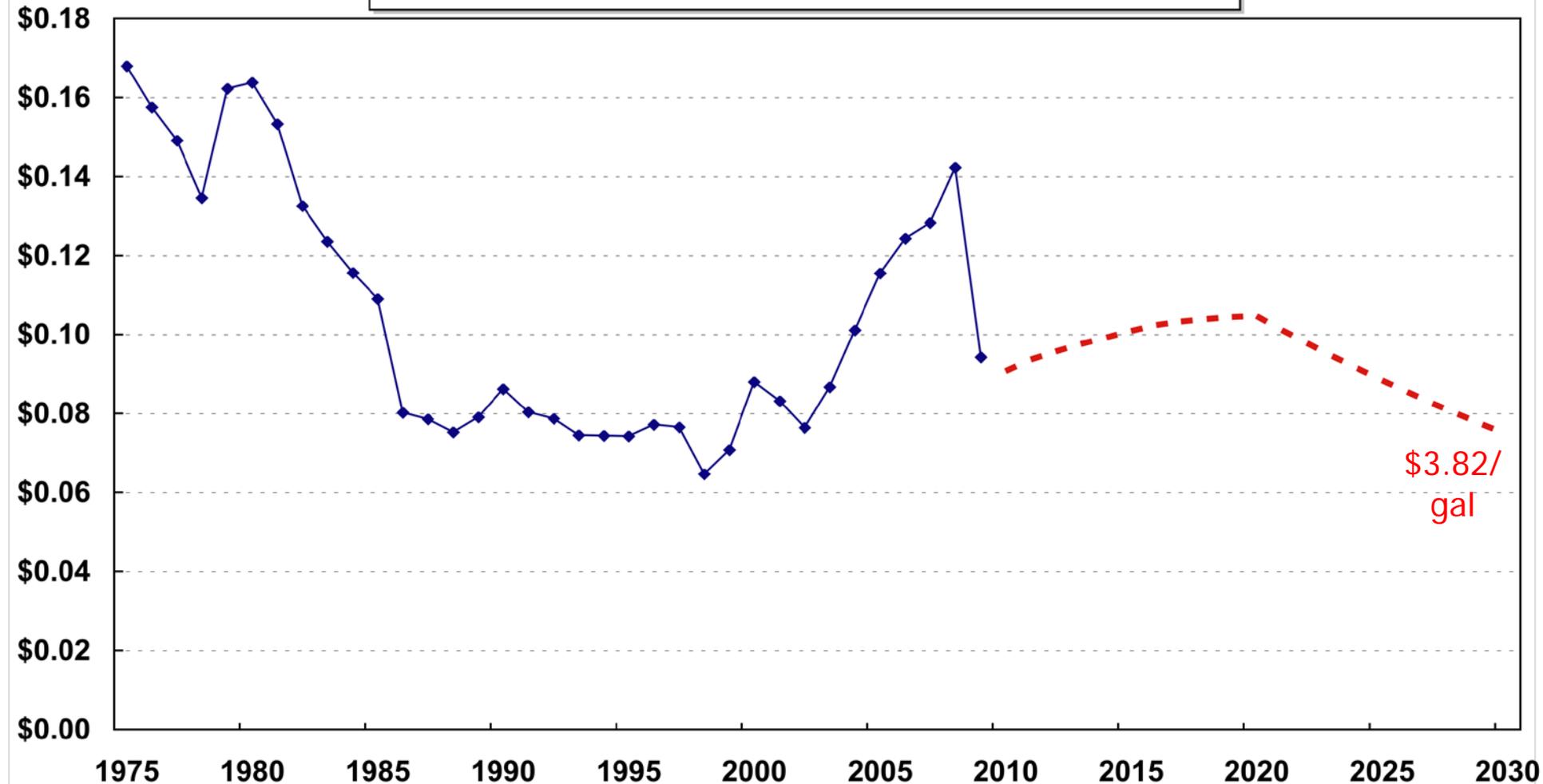


2008 EPA FE Trends  
Report

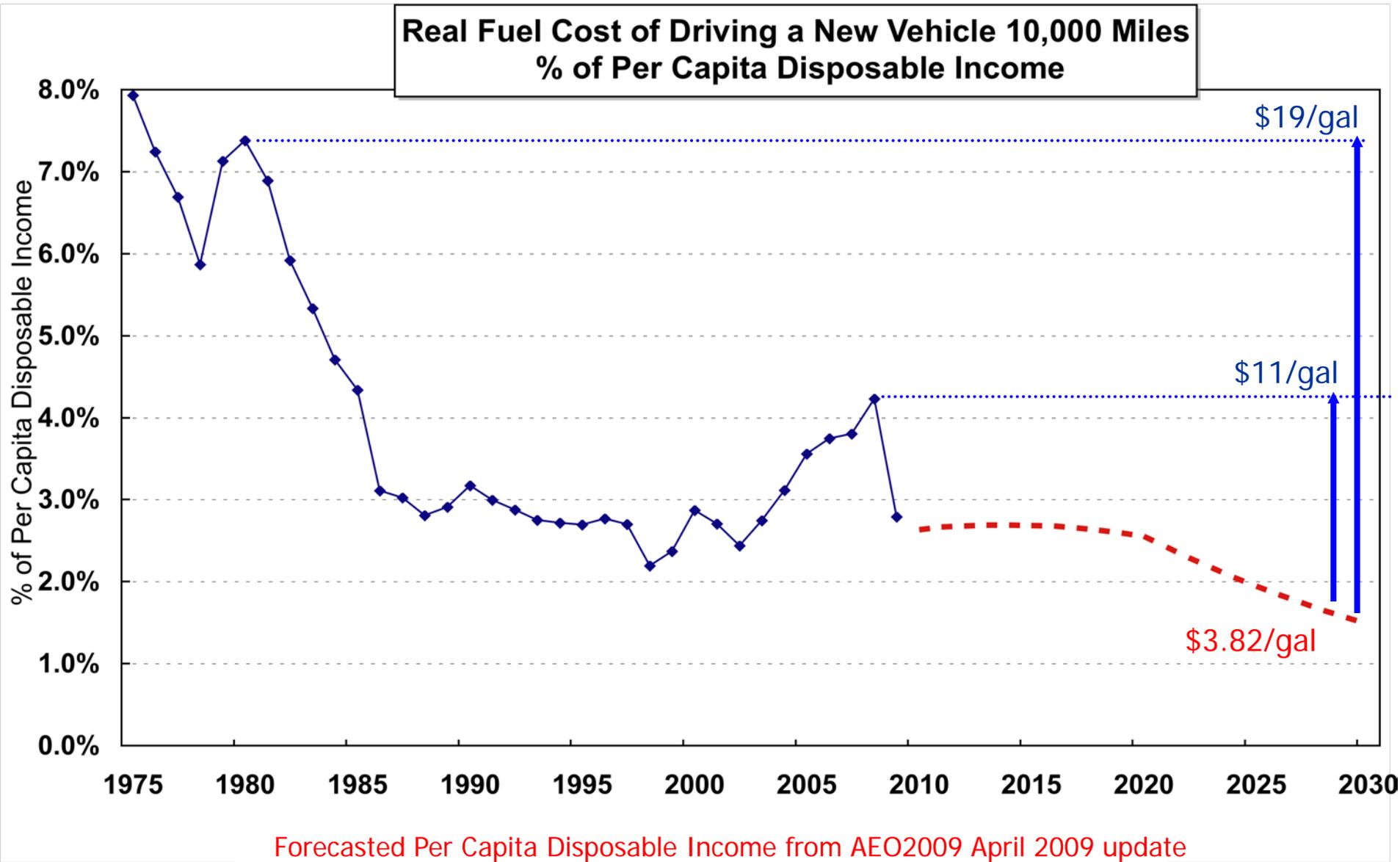
34.8 in 2016  
plus 4% per year

# New Vehicle Gasoline Cost per Mile

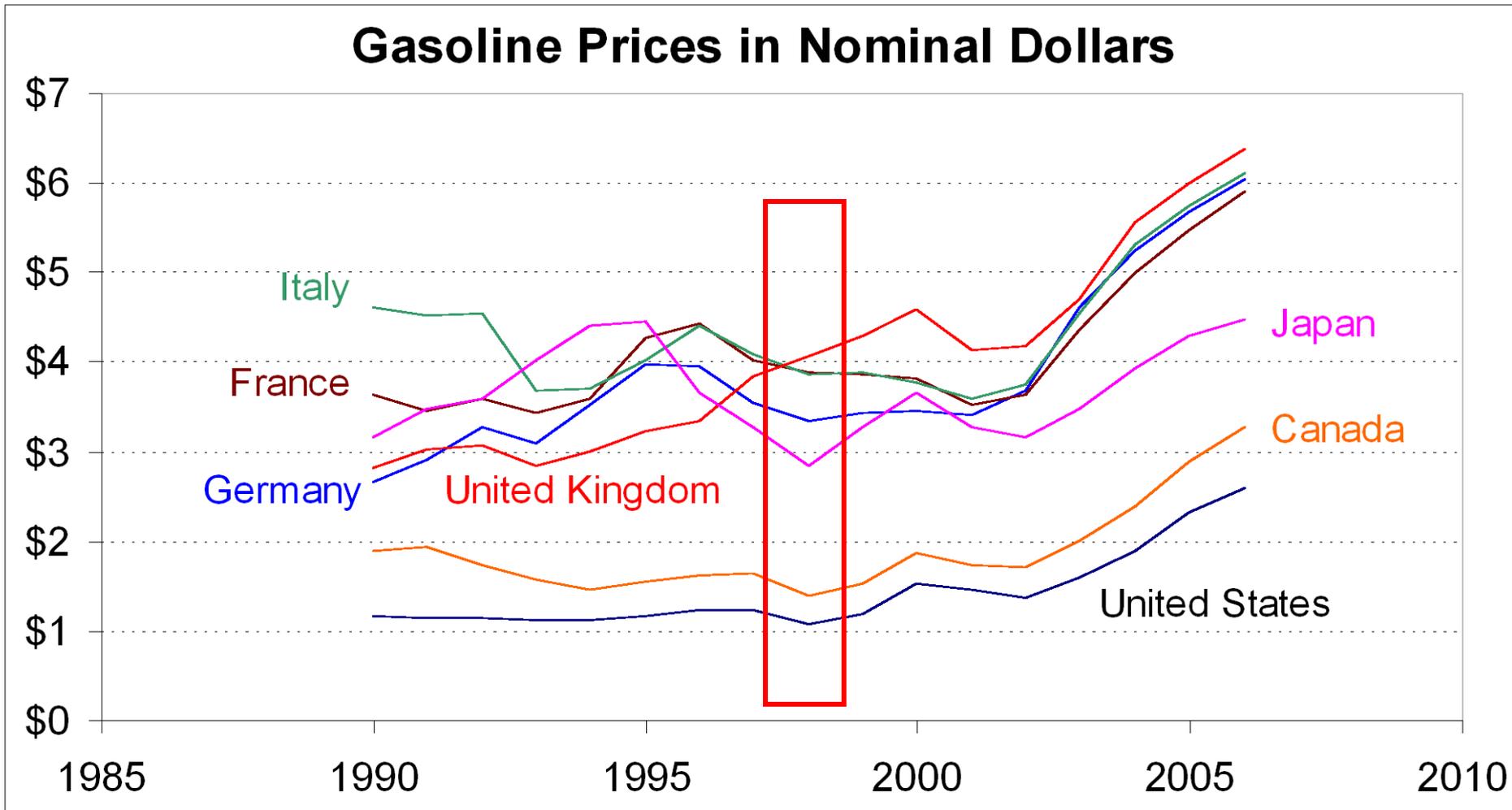
**Real Gasoline Cost for New Vehicles - Cents per Mile**  
(2007 \$ per gallon)



# Real Fuel Cost - % of Disposable Income



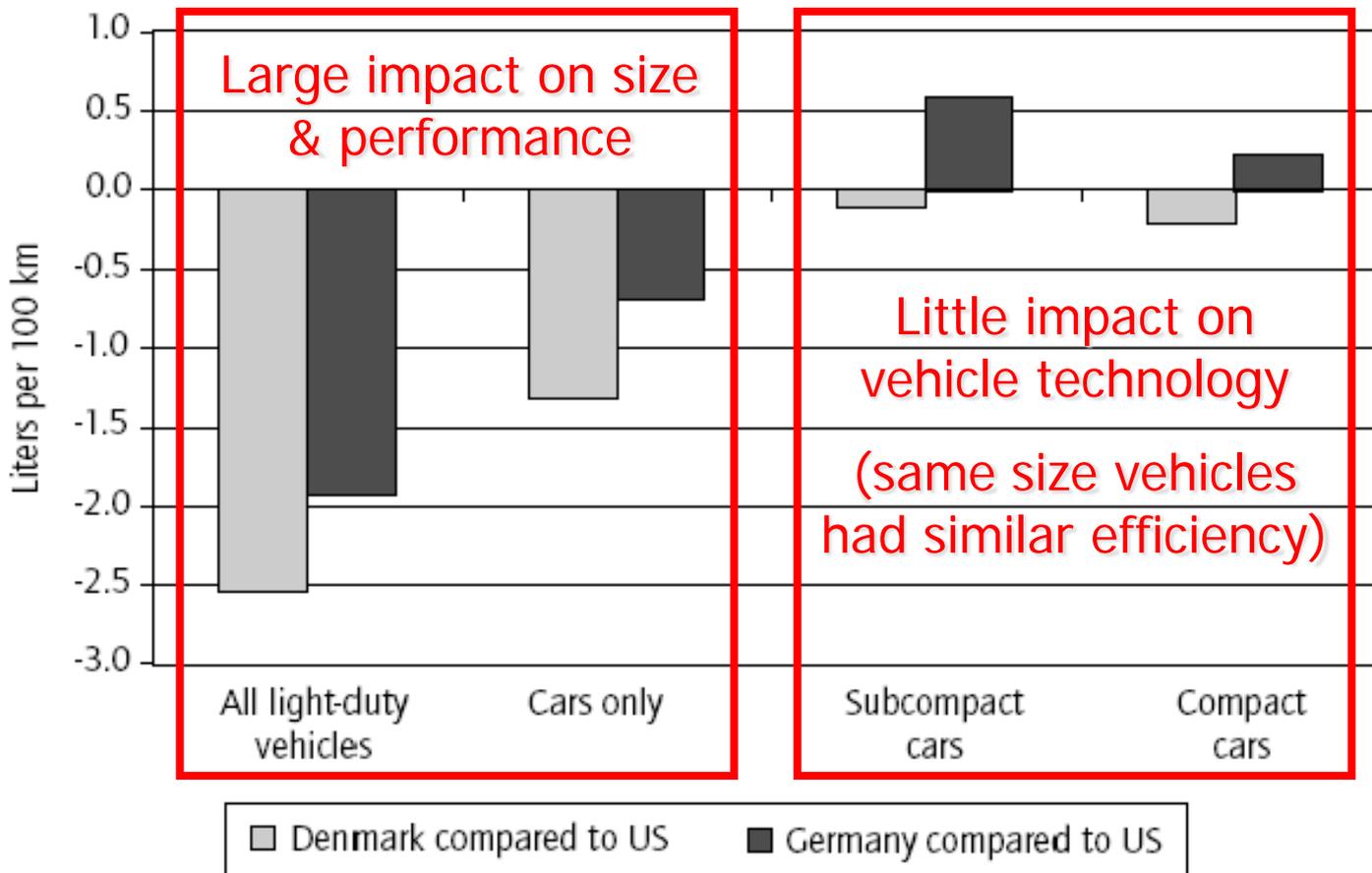
# Gasoline Price Comparison



International Energy Annual 2005, Released June-July 2007, Table 11.8

# Impacts of Fuel Price and Congestion

New Car Fuel Economy Comparison,  
Overall and for Selected Market classes, 1998 Model Year



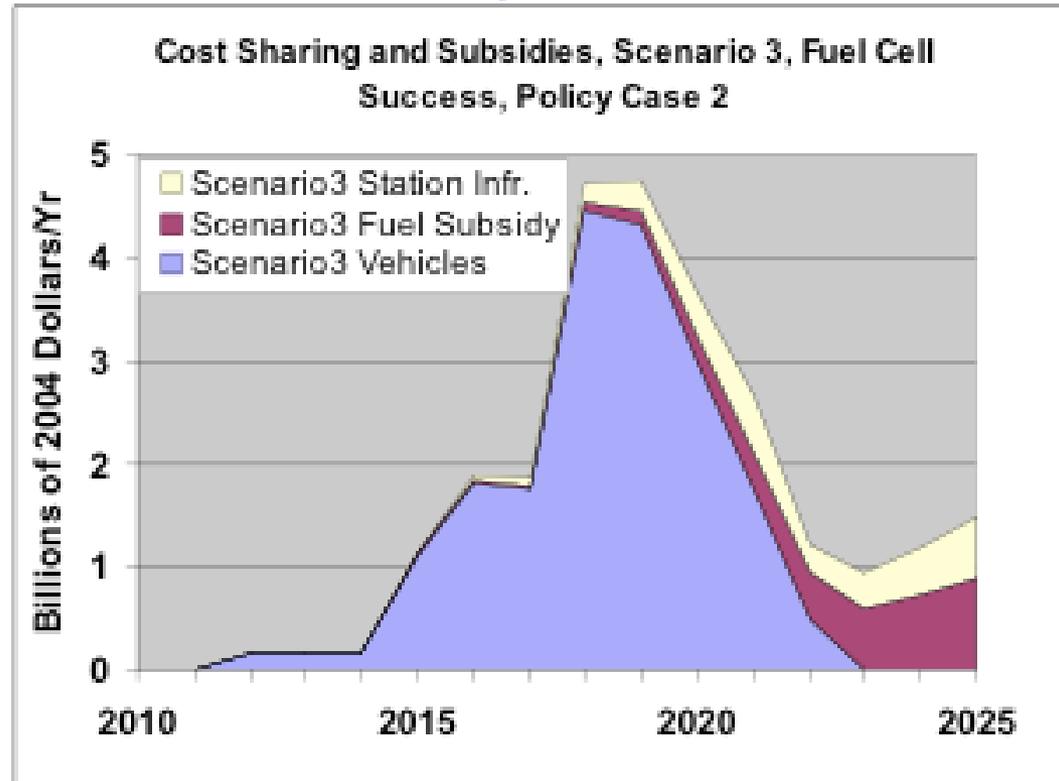
Even 3 years into the European CO<sub>2</sub> requirements (1998) and despite 3 x higher fuel prices in Europe, US **efficiency** still matched that of Europe.

# Fuel Price has Little Technology Impact

- Size/performance reductions reduce initial purchase cost *and* future fuel costs
  - Cost-benefits are clear to purchasers
- Fuel price does not have a major impact on technology penetration
  - Technology increases initial purchase cost, offsetting fuel savings
  - Net benefits are not clear to purchasers, especially since most new vehicle purchasers severely discount future fuel savings
- Fuel price does impact vehicle size, performance and vehicle miles traveled (VMT)

# Natural Market Barriers

- Need for technological advances
- Learning by doing
- Scale economies
- Resistance to novel technologies
- Lack of diversity of choice
- Chicken or egg?
  - Lack of fuel availability
  - Lack of vehicles to use new fuel



DOE's hydrogen study estimated transition costs of \$25-40 billion

# Reality

- Consumer risk/loss aversion challenges:
  - Most customers will continue to value performance, features, and utility higher than fuel savings
  - More difficult to implement advanced technology
- Real cost of driving is low and will drop in future
- Fuel taxes and CAFE/feebates have different impacts – both are needed
- Fuel prices affect VMT and purchase decisions, but have little impact on *technology*
  - Customers greatly discount fuel savings due to uncertainty
- CAFE/feebates needed to fill gap between value of the fuel savings to new vehicle purchasers and to society

Thank You

