

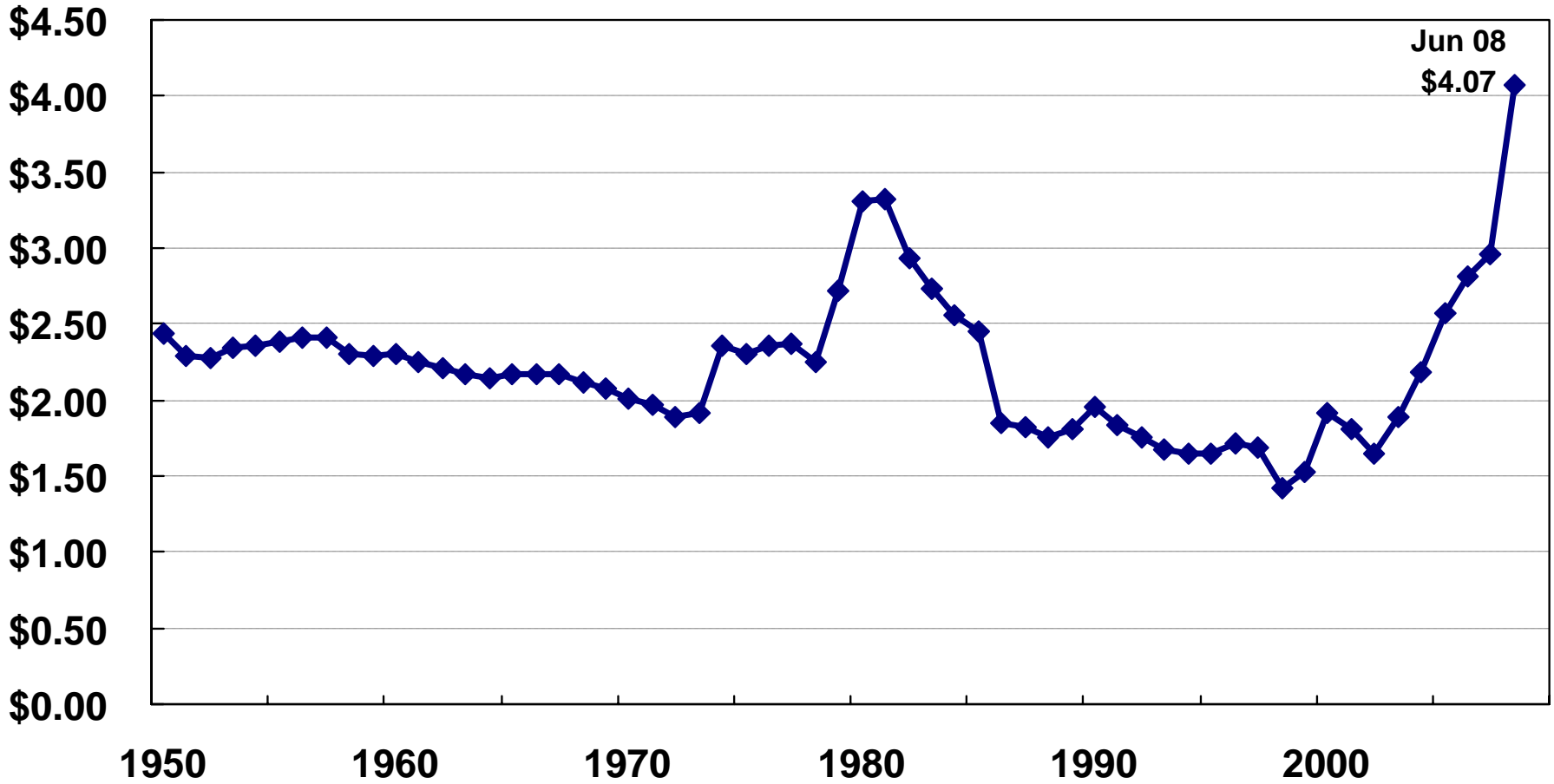
Fuel Prices and CAFE: Myths and Impacts

2008 Management Briefing Seminars

John German

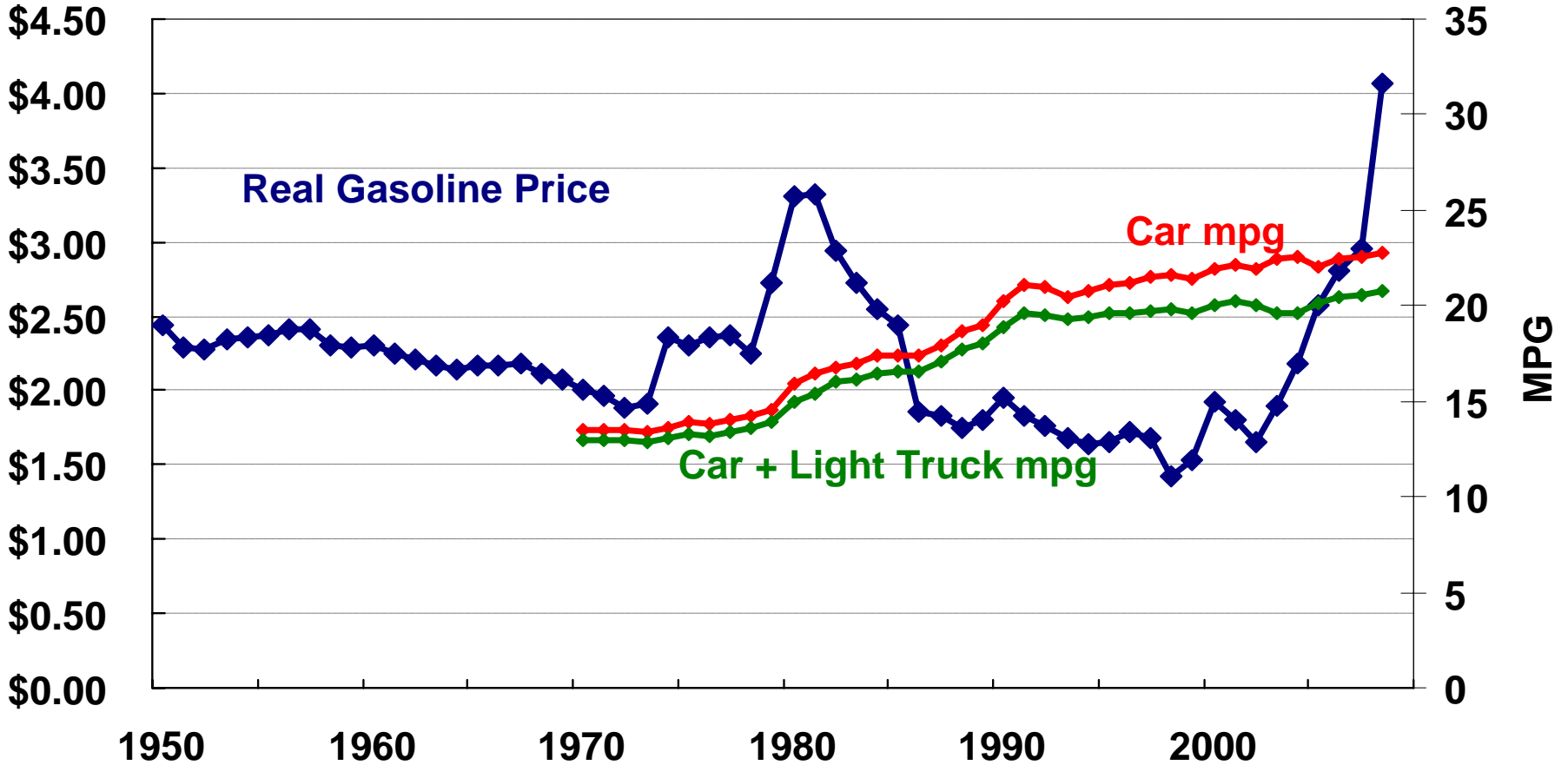
American Honda Motor Co., Inc.

Real Gasoline Prices (2008 \$ per gallon)



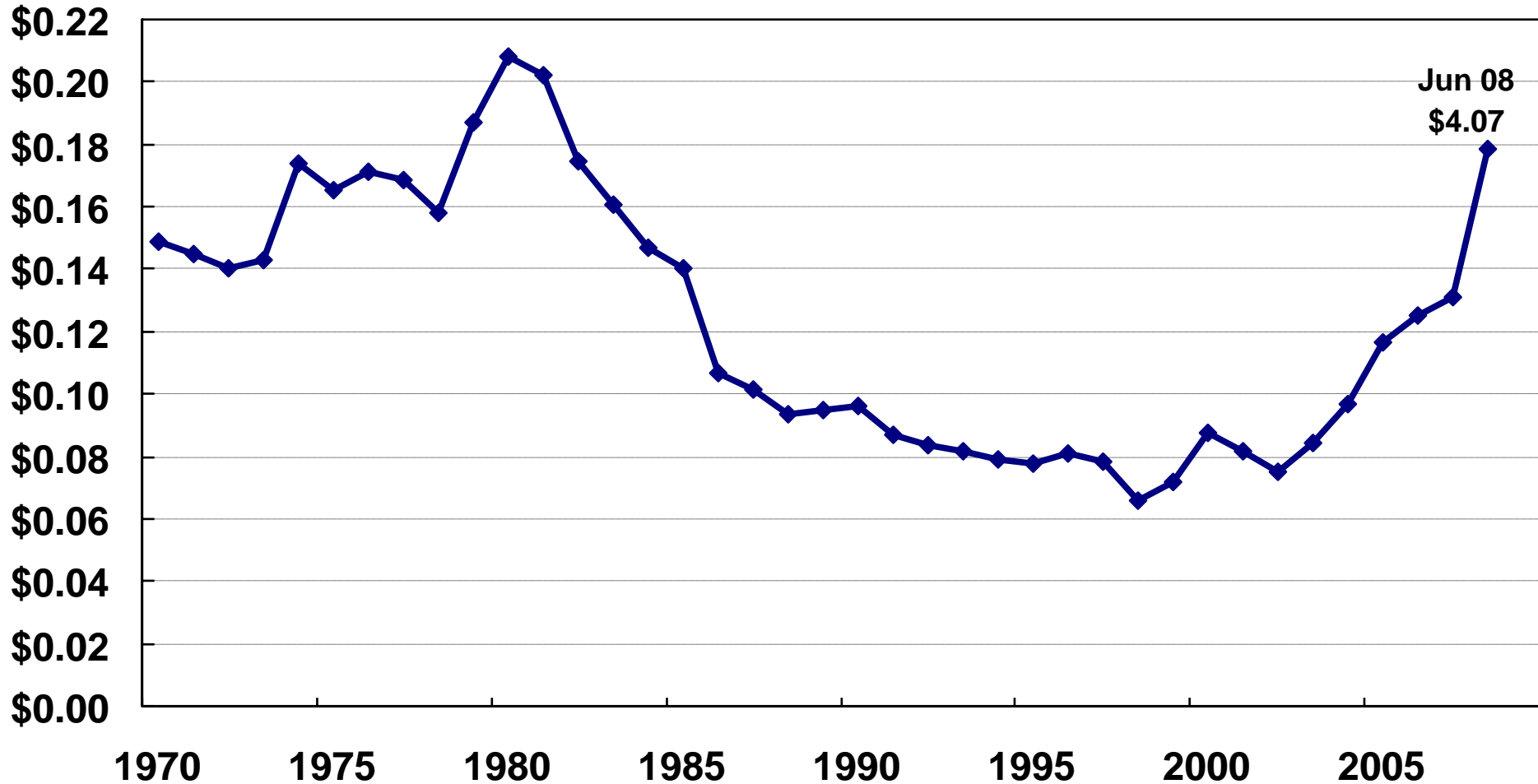
Motor Gasoline Retail Prices, U.S. City Average, adjusted using CPI-U

Real Gasoline Prices and In-Use Fleet MPG (2008 \$ per gallon)

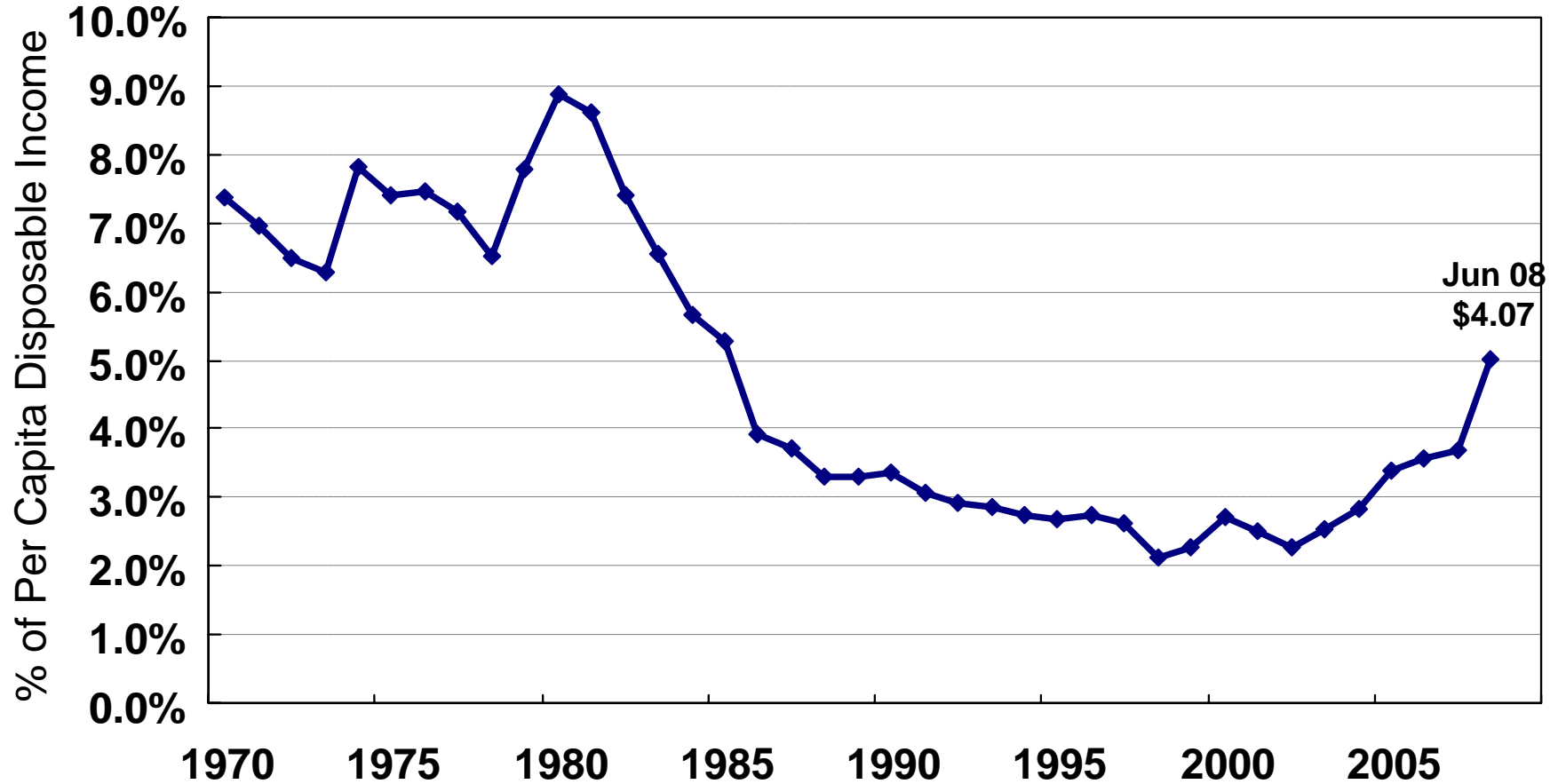


In-Use MPG from Transportation Energy Data Book: 2007

Real Gasoline Cost for Cars - Cents per Mile
(2008 \$ per gallon)



Real Fuel Cost of Driving a Passenger Car 10,000 Miles % of Per Capita Disposable Income



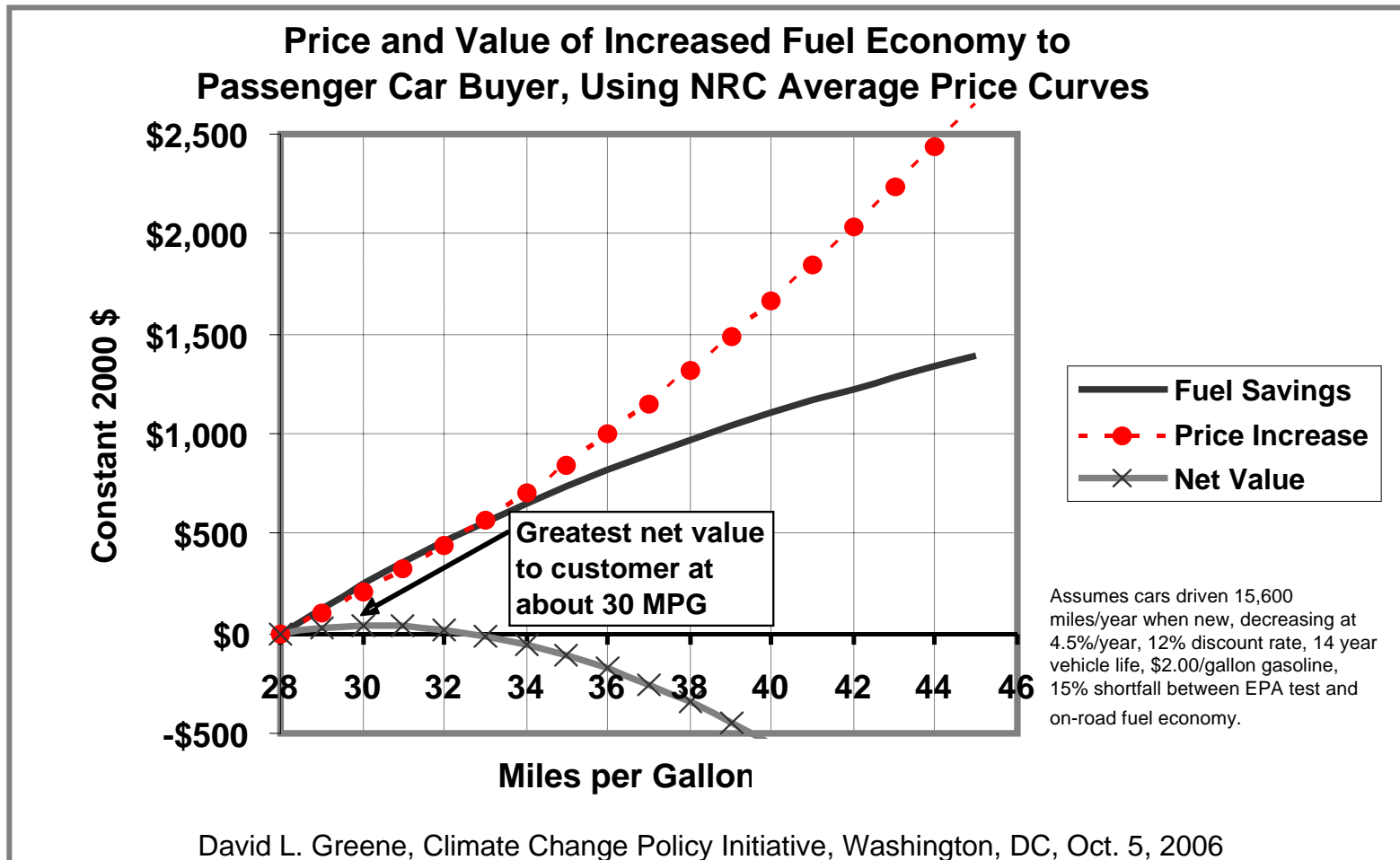
BEA, Table 2.1, Personal Income and It's Disposition

- ◆ Fuel price has little technology impact
 - Fuel price impacts vehicle size, performance and vehicle miles traveled (VMT)
 - Fuel price does not have a major impact on technology penetration
 - Size/performance reductions **reduce** initial purchase cost **and** future fuel costs
 - Cost-benefits are clear to purchasers
 - 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

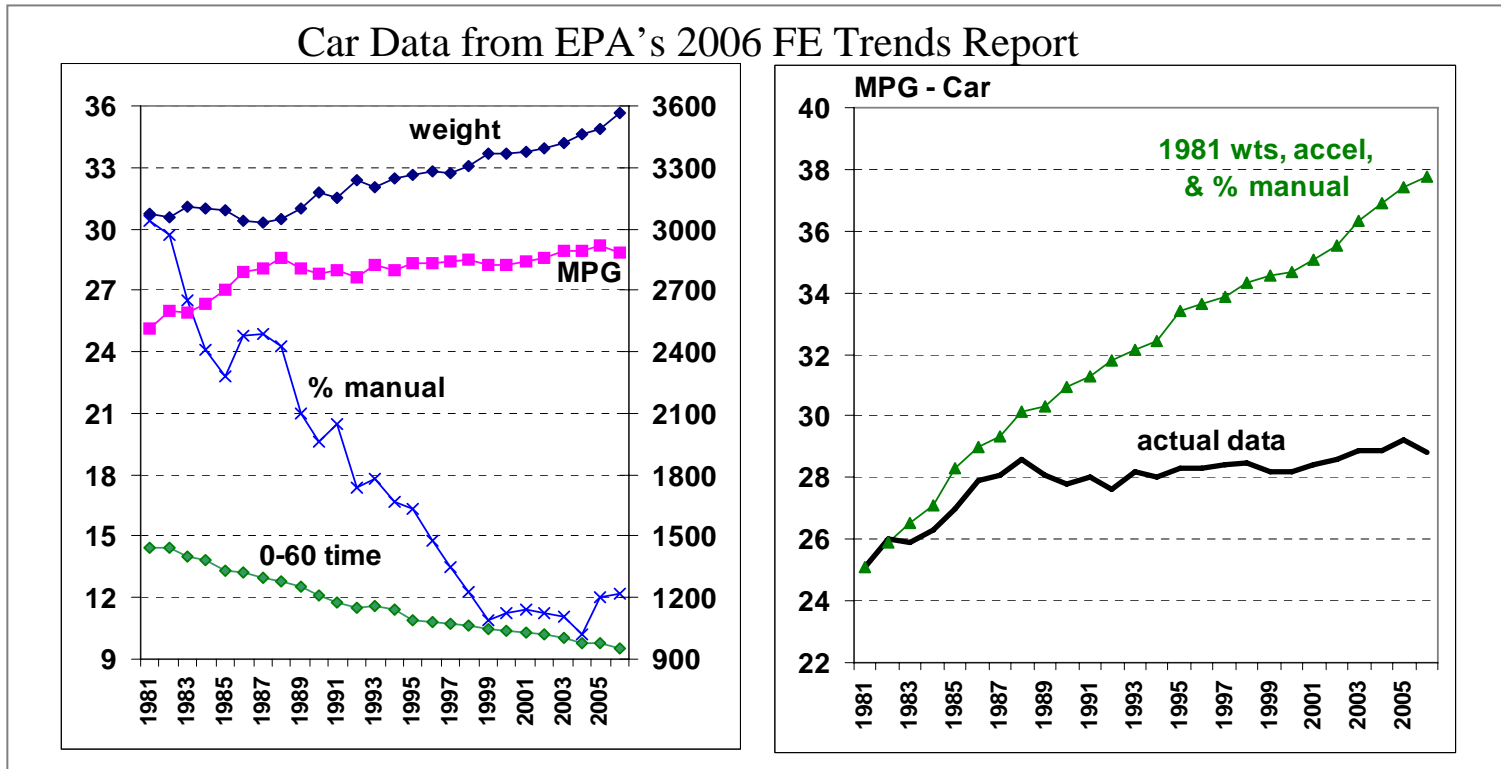
- ◆ Customer uncertainty and Loss Aversion
 - David Green – Asilomar, August 2007
- ◆ **Uncertainty** about several key elements of the net-present value calculation makes an expenditure on higher fuel economy **a risky bet**
 - What MPG will I get (your mileage may vary)?
 - How long will my car last?
 - How much driving will I do?
 - What will gasoline cost?
 - What will I give up or pay to get better MPG?

- ◆ Application of universal consumer loss aversion functions and uncertainty explains the fundamental behavior that causes the market to produce less fuel economy than is economically efficient
 - And likely explains market preference for attributes that may not be valued higher but are simply more certain – performance, luxury, etc.

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

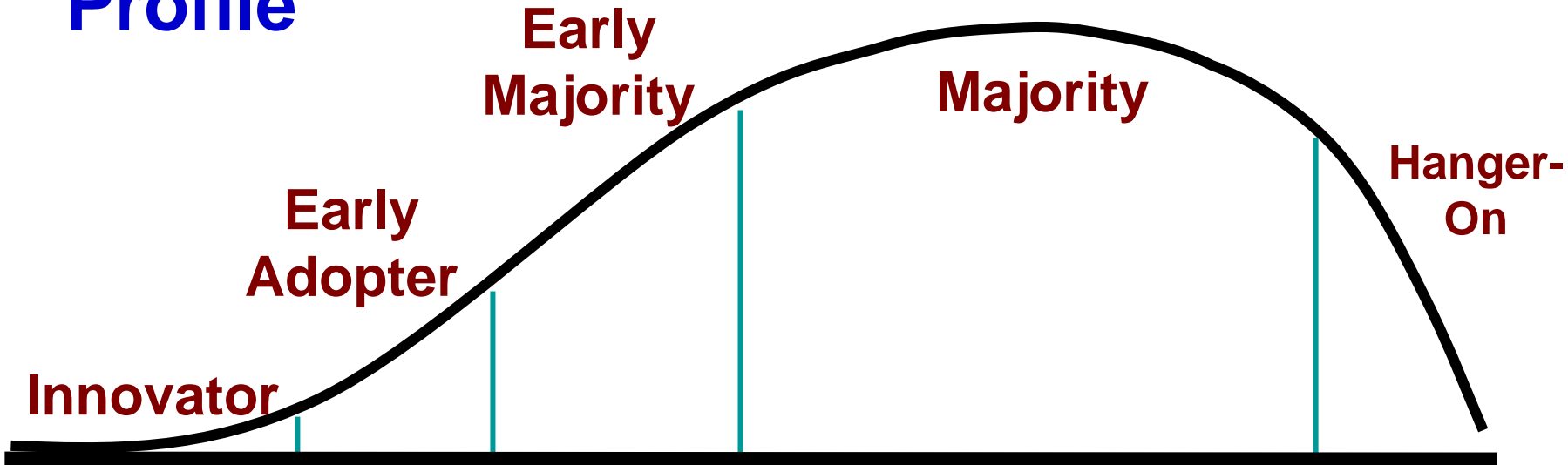


- ◆ Since 1987, technology advances have been used to improve attributes other than fuel economy



- Fuel efficiency has increased by about 1.3% 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

Customer Profile

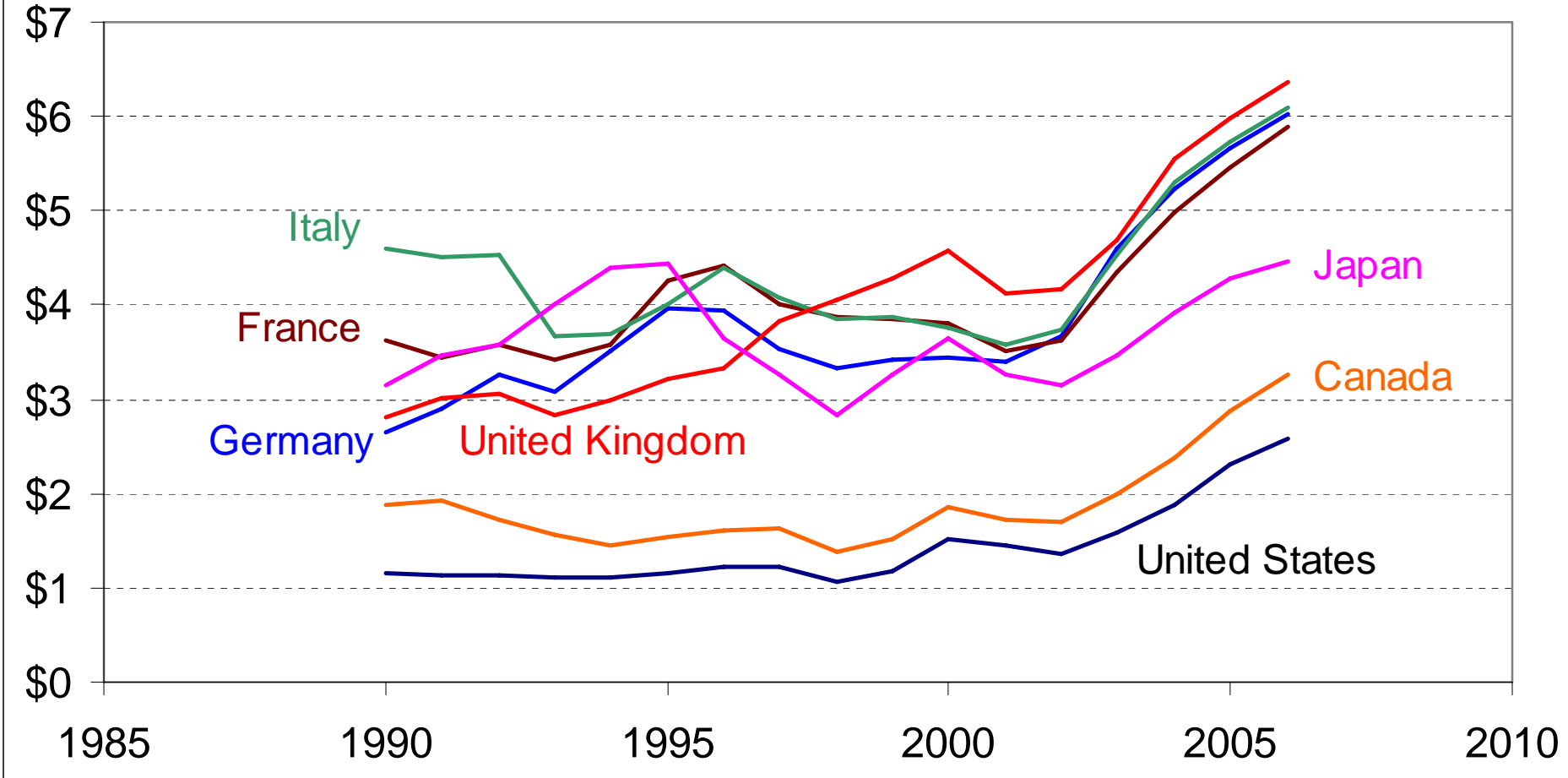


Insight-Prius-Civic

Increasingly risk averse –
applies to new technology,
not just fuel economy

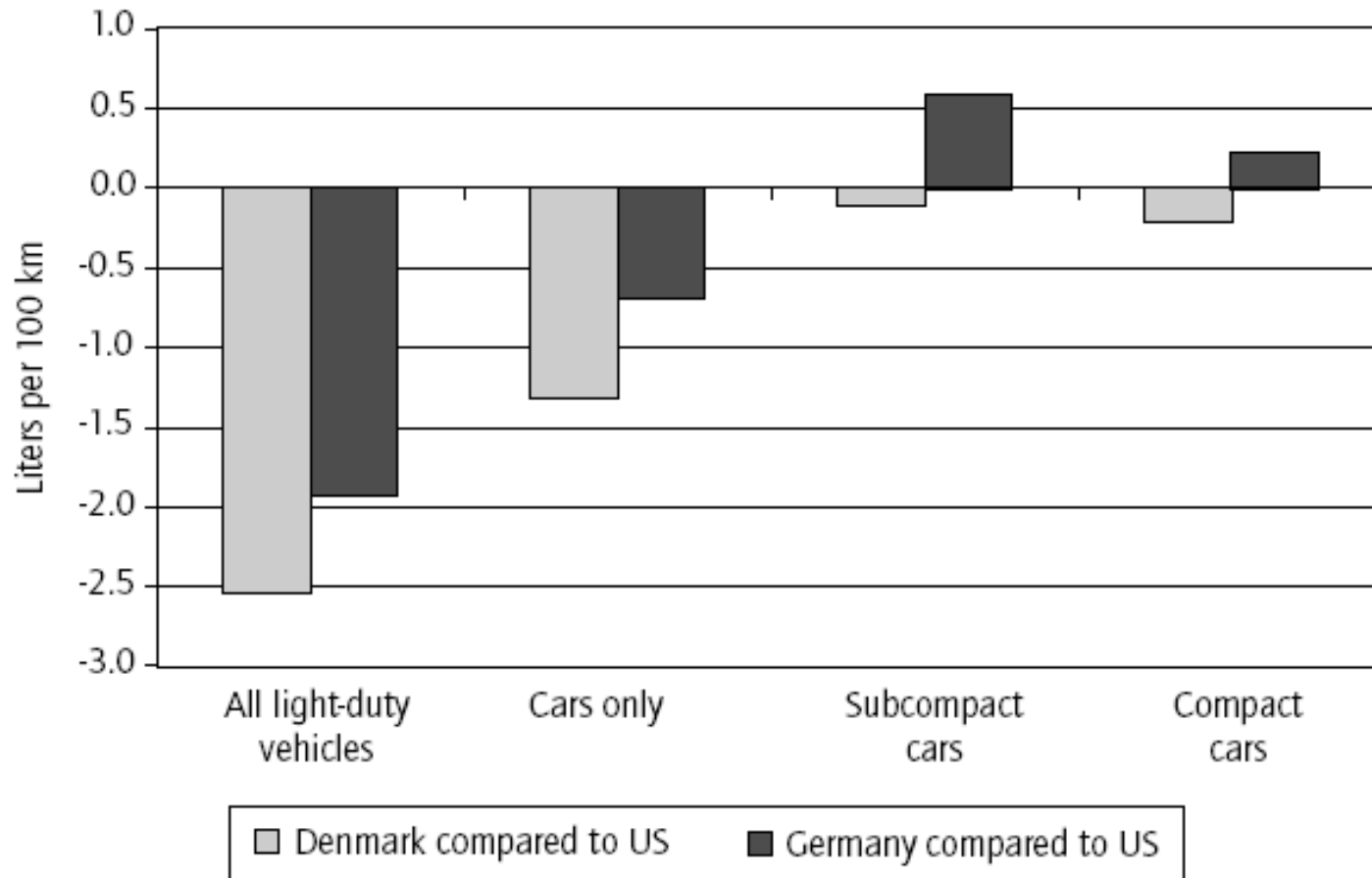
Gasoline Price Comparison

Gasoline Prices in Nominal Dollars



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

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



Even 3 years into the European CO2 requirements (1998) and despite 3 x higher fuel prices in Europe, US efficiency still matched that of Europe.

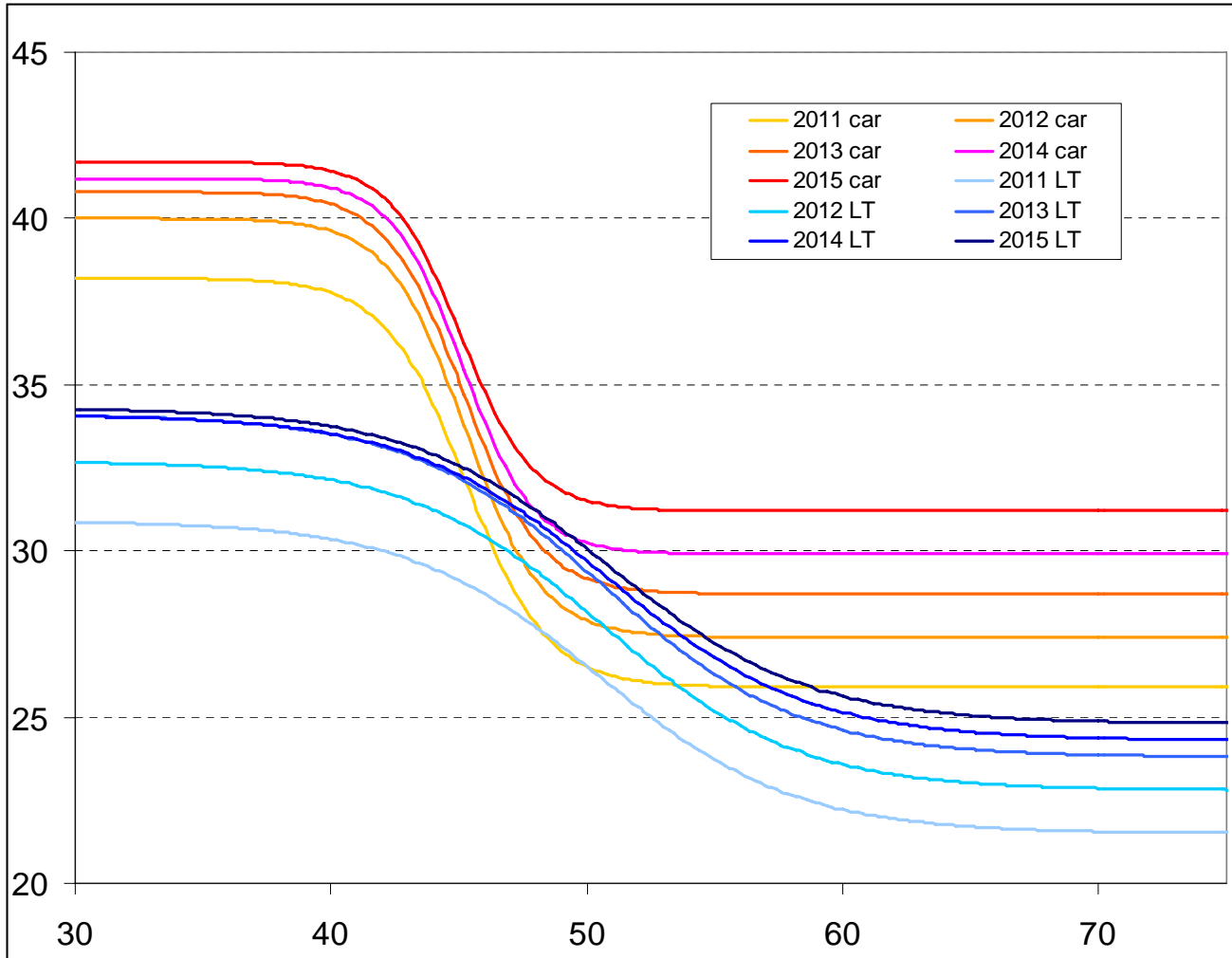
- ◆ CAFE and Feebates fill the same gap between societal and consumer value of fuel savings

Direct and Indirect Influences on Transportation Sector GHG Emissions

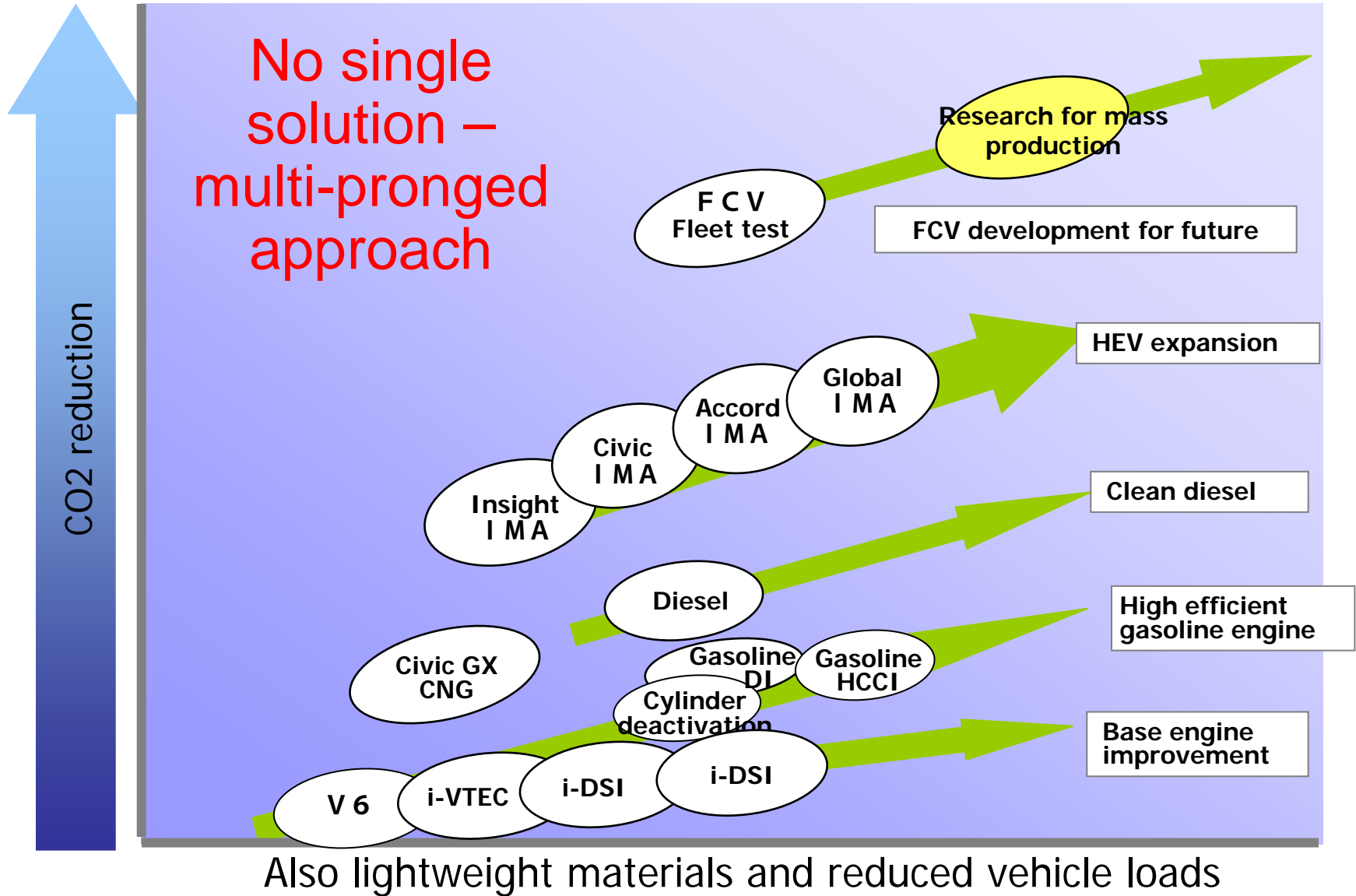
Factor/Entity		Vehicle Miles Traveled	Vehicle Efficiency			Carbon content
Strategy	Primarily affects		Leap-Forward Technology	Technology spread	Smaller vehicles	Alternative fuels
Fuel price (taxes)	Consumers	+			+	+ (if fuel price difference)
Land Use & Infrastructure	Consumers	+				
Technology mandates/ incentives	Manuf.		+			+ (w/ enough dollars)
CAFE or Feebates	Manuf.			++	(possible but small impact)	+

- ◆ **New CAFE is a game changer**
- ◆ Honda supports new CAFE, but it is very challenging
 - 35 mpg by 2020 overall
 - Annual improvement over twice historical rate
 - All must go to fuel economy, not other attributes
- ◆ **“Maximum feasible” standards through 2030**
- ◆ Don't know how NHTSA will allocate CAFE burden
 - Among cars versus LDT
 - Slope of the attribute-adjustment curve for cars and LDTs

- ◆ Each manufacturer has its own standard
- ◆ Regulates efficiency (technology), not fuel economy



If high fuel prices shift market to smaller vehicles, the smaller footprint automatically raises standards – no change in stringency



- ◆ New Technologies = Huge Risk
- ◆ Ironically, there are too many technology options
 - Multitude of technology options, each with unknown future costs and technology synergies
- ◆ Market is very competitive – customers discount FE
- ◆ Manufacturer at a competitive disadvantage if the selected technology ultimately proves to be more expensive

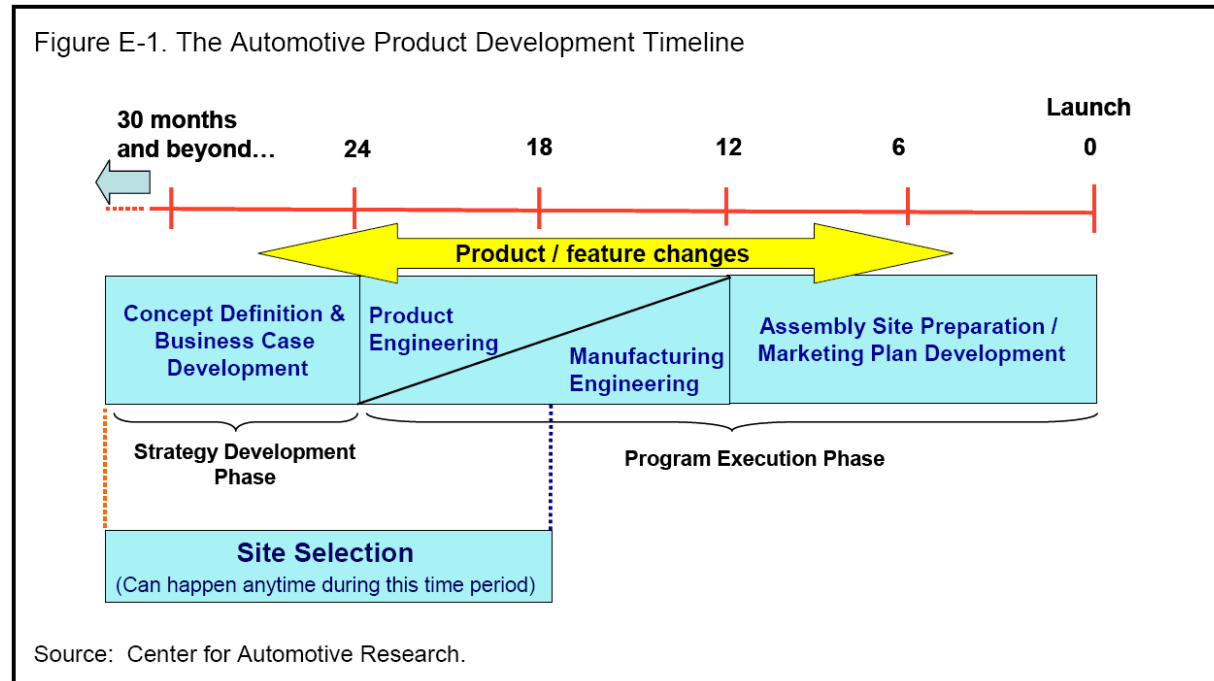
- ◆ Even worse – widespread adoption of a technology that does not meet customer expectations for performance and reliability
 - Hurts manufacturers' reputation
 - Sets back acceptance of new technology for everyone (e.g. early 1980s diesel)

◆ The Real Barrier – Lead Time

- Rigorous product development process – 2-3 years after feasibility demonstrated
- Prove in production on a limited number of vehicles for first 2-3 years
- Assess impact of higher volume and further development on costs before committing to a single technology
- Spread across fleet – 5-year minimum product cycles

- ◆ Longer lead time is needed for new technologies
- ◆ Costs increase dramatically if normal development cycles are not followed
 - Greatly increases development costs, tooling costs, and risks of mistakes

**HOW
AUTOMAKERS
PLAN THEIR
PRODUCTS**
Center for
Automotive
Research,
July 2007



“Automobiles require long lead times for design, development and production planning (including tooling and supplier contracting). The process of developing a new program, whether for a new or redesigned vehicle or a powertrain, typically spans two and one-half years from concept to launch, as illustrated in Figure E-1.”

“because vehicle programs carry over a high level of components and engineering from other programs, product changes are almost always evolutionary. Moreover, intrinsic time lags—the two- to three-year lead time for product development, the even longer planning cycle for all of a company’s products, as well as the evolutionary nature of product change—represent constraints that must be respected.

Any potential policy requirements must acknowledge these realities. Indeed, it is difficult for automakers to do too much too fast. They are constrained by money, human resource issues and tooling costs, to name but a few.”

2002 NAS Study - EFFECTIVENESS AND IMPACT OF CAFE STANDARDS

Finding 15. Technology changes require very long lead times to be introduced into the manufacturers' product lines. Any policy that is implemented too aggressively (that is, in too short a period of time) has the potential to adversely affect manufacturers, their suppliers, their employees, and consumers. Little can be done to improve the fuel economy of the new vehicle fleet for several years because production plans already are in place. The widespread penetration of even existing technologies will likely require 4 to 8 years. For emerging technologies that require additional research and development, this time lag can be considerably longer.

- ◆ Not the same as criteria pollutant control
 - Emission requirements were met with catalysts and improved air/fuel control, not complete vehicle redesign
- ◆ Vehicles are designed, manufactured, marketed, and distributed nationally
- ◆ Separate state requirements would divide resources and increase costs and leadtime concerns, with little benefit
- ◆ **Limited engineering resources**

- ◆ Real cost of driving is still low
- ◆ Fuel prices have little impact on technology
 - Customers greatly discount fuel savings due to uncertainty
 - To minimize leadtime constraints, government should set ***long-term performance*** requirements and incentives
- ◆ New CAFE standards regulate efficiency (technology), not fleet-wide mpg
- ◆ CAFE law requires “maximum feasible”, not 35 mpg in 2020
- ◆ Finite engineering resources the primary constraint on increasing efficiency
 - State requirements divert resources and slow innovation

HONDA

The Power of Dreams