FISCAL INCENTIVES for GHG Mitigation: Feebates

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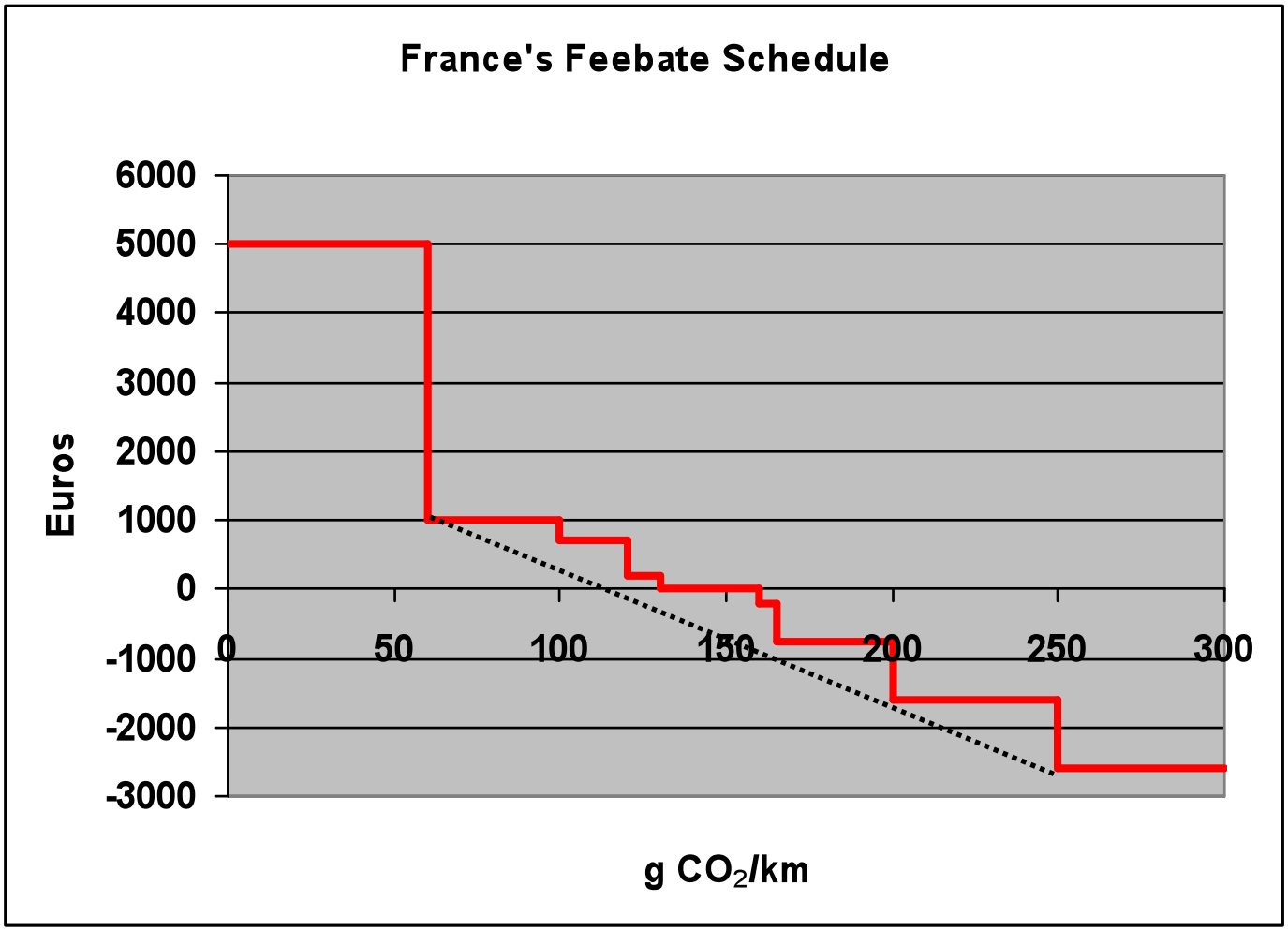
Feebates are a fiscal policy for encouraging car buyers to prefer more efficient, lower emission vehicles and manufacturers to design them.

- A fiscal policy combining graduated
  - **FEEs** on inefficient vehicles
  - Re**BATEs** on efficient vehicles.
- A "benchmark" defines who pays and who receives. (distribution)
- A "rate" determines the marginal costs and benefits. (efficient solution)
- Depending on the choice of benchmark, feebates can produce revenue, be revenue neutral or be a net subsidy to car purchases
- Also solve Uncertainty Loss Aversion Bias

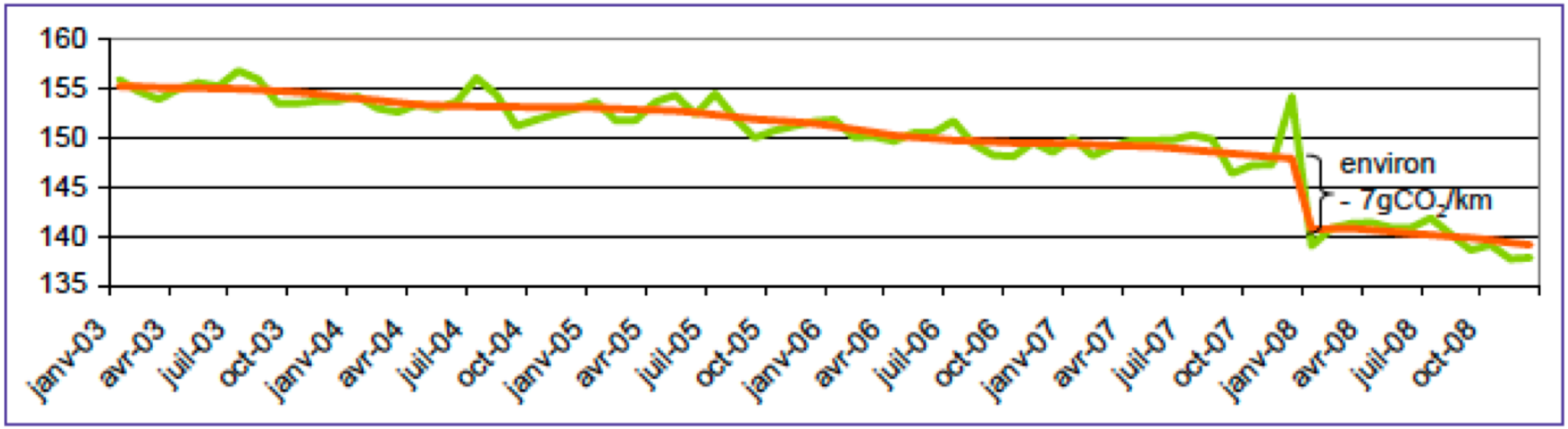
Today, 16 countries have some form of CO_2 or fuel consumption (l/100km) tax on light-duty vehicles.

- New vehicle purchase or registration:
  - Austria, Canada, Finland, France, Ireland, Netherlands, Norway, Portugal, Spain, U.S.A.
- Annual or recurring registration fee:
  - Denmark, Germany, Ireland, Luxembourg, Portugal, Sweden, UK
- Source: N.A. Braathen, 2010. "Incentives for CO2 Emission Reductions in Current Motor Vehicle Taxes", ENV/EPOC/WPNEP/T(2009)2/FINAL, Environment Directorate, OECD, Paris.

France's Bonus/Malus is roughly equivalent to € 150 / tCO_2, a rate similar to the U.S. gas guzzler tax.



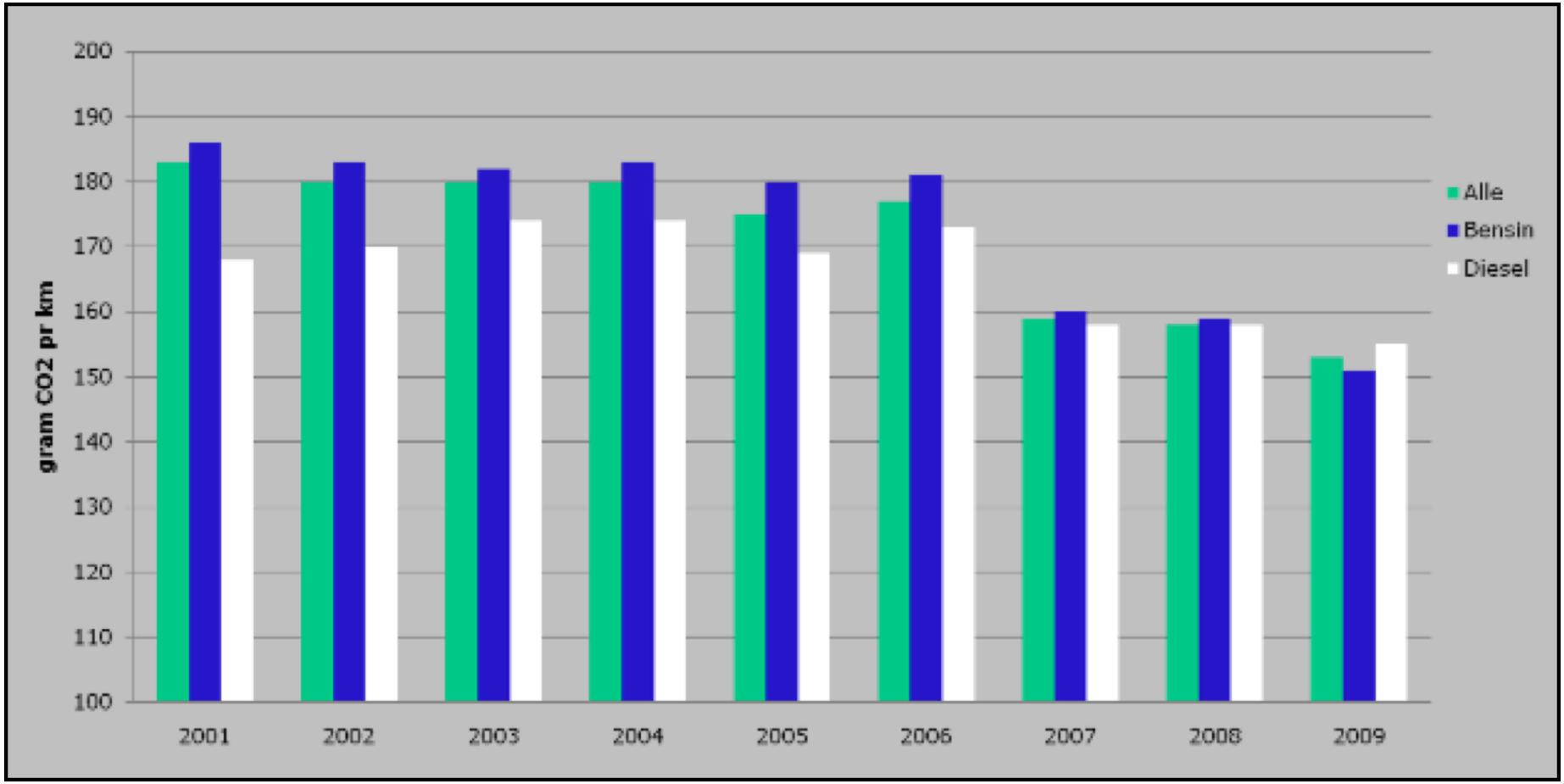
France's Bonus/Malus had an immediate effect, lowering the average emissions of cars sold by 7 g/mi., entirely due to car buyers choosing lower emission vehicles.



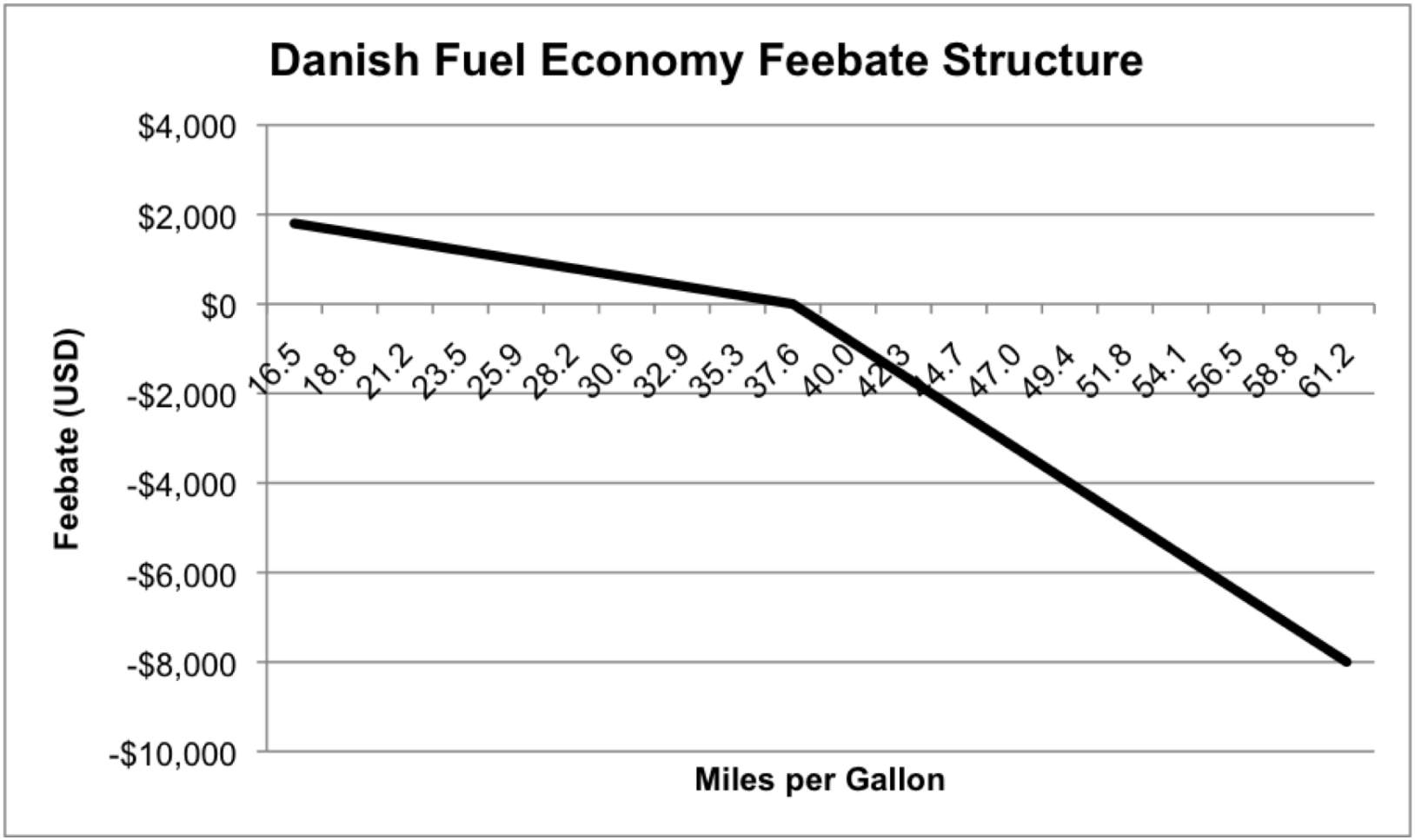
The immediate shift in sales was large and tended to favor French auto manufacturers.

Emissions of CO2 (g/lmkm)	Bonus (-) or Malus (+) per Vehicle (€)	New Registrations 2007	New Registrations 2008	Percent Change 2008/2007
=< 60	-5,000	0	0	0%
61 to 100	-1,000	352	1657	+371%
101 to 120	-700	412,598	721,235	+75%
121 to 130	-200	215,010	194,143	-10%
131 to 160	0	936,139	846,030	-10%
161 to 165	+200	66,415	41,161	-38%
166 to 200	+750	305,296	184,202	-40%
202 to 250	+1,600	95,416	46,614	-51%
>250	+2,600	33,317	15,241	-54%
TOTAL		2,064,543	2,050,283	-1%

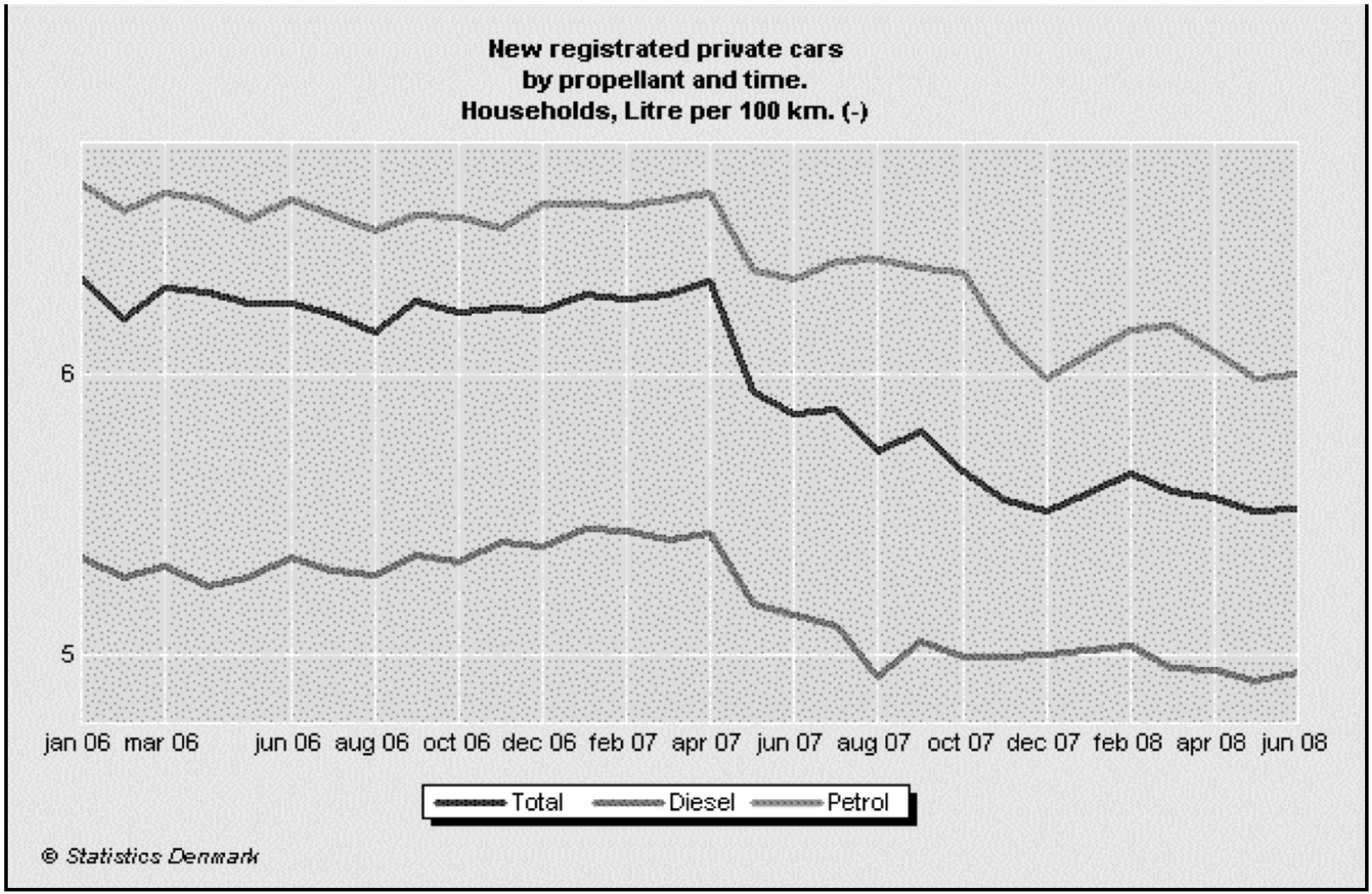
Norway's registration tax was based 50% on weight, 30% on engine displacement, 20% on power. In 2007 the displacement component was replaced by a CO_2 tax, with an immediate impact on emissions and fuel efficiency.



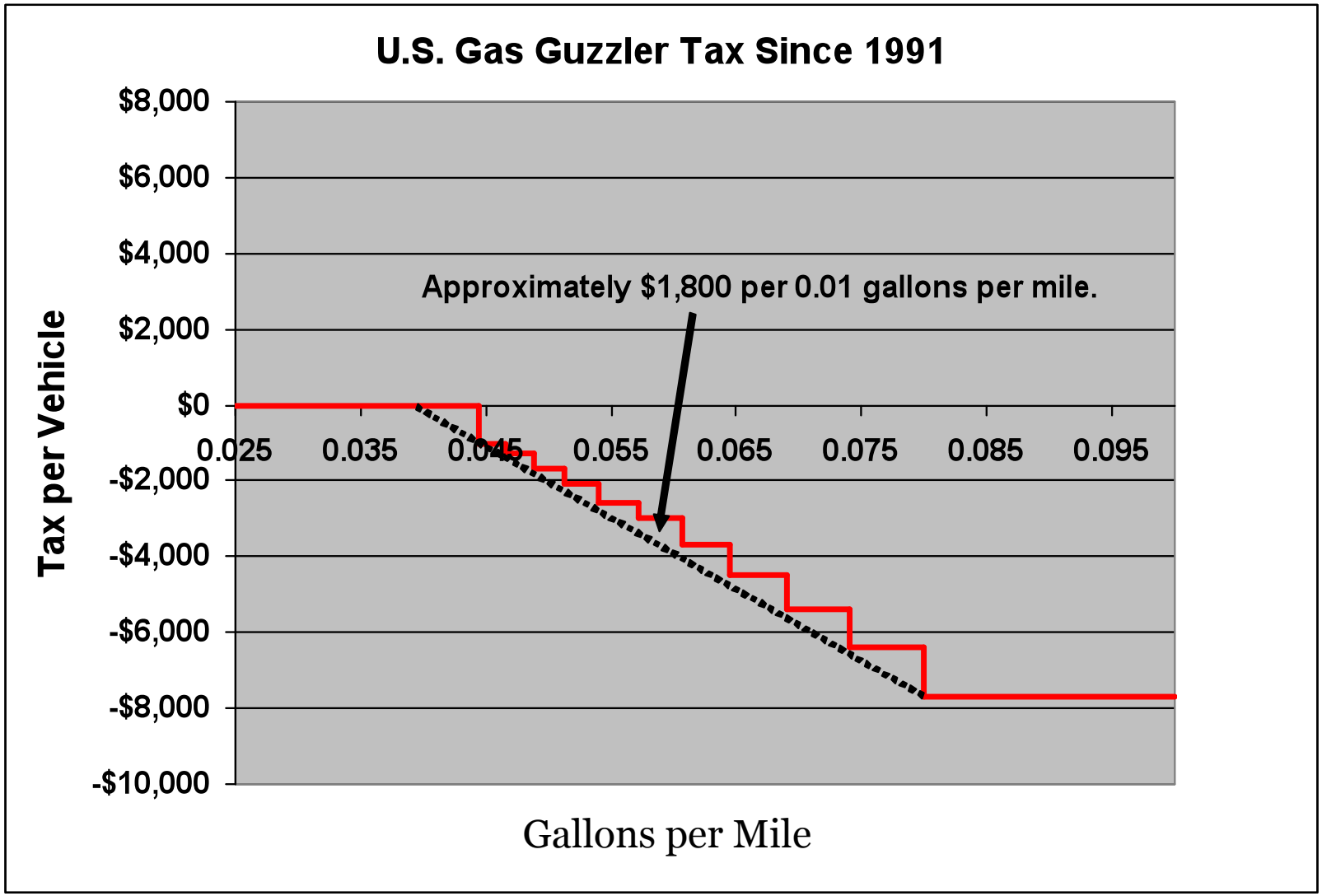
Denmark's system is based on km/l and is equivalent to $320 US per MPG. There are different rates for fees and rebates.



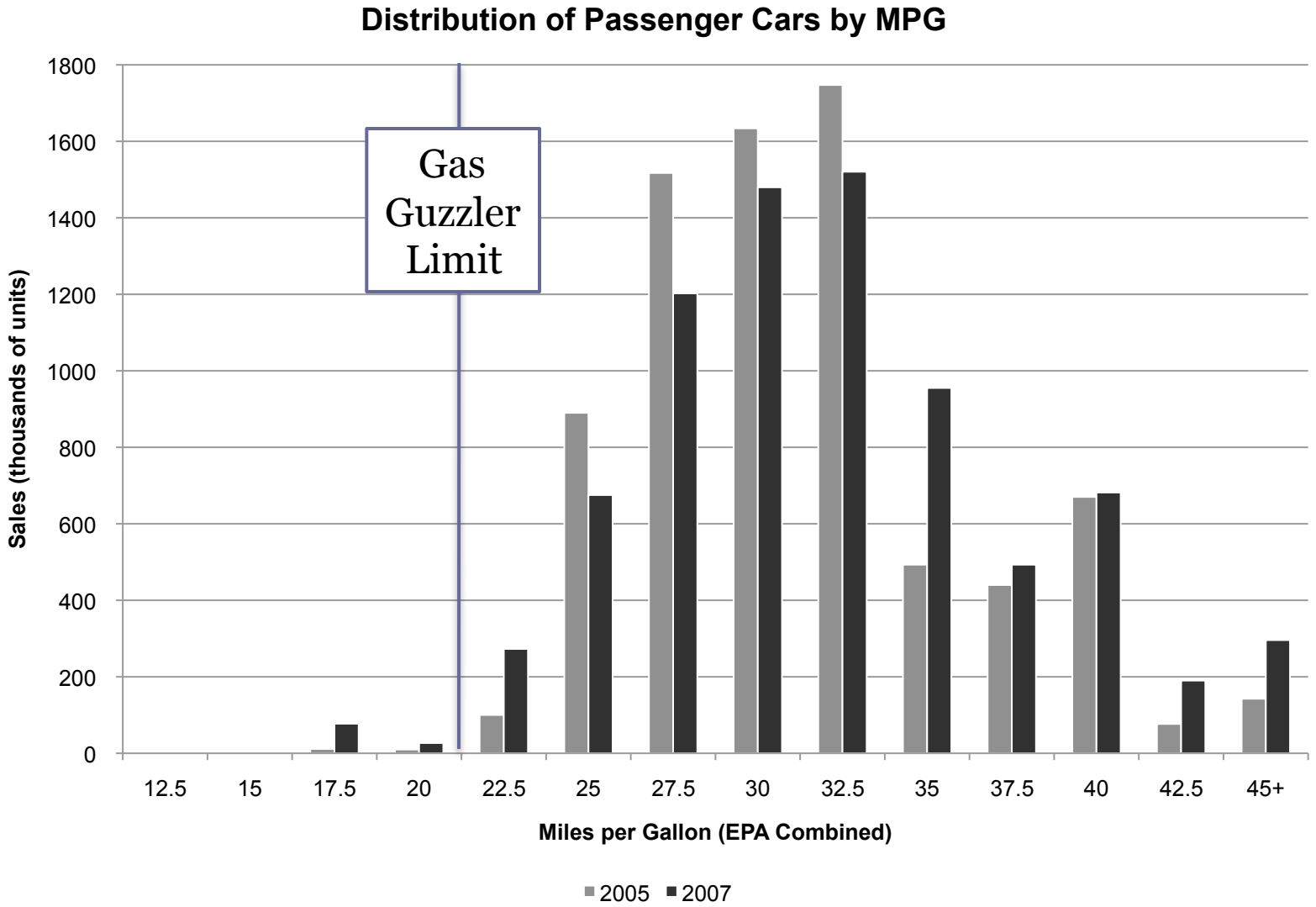
Denmark's experience was similar to that of the other states, an immediate improvement in l/100km.



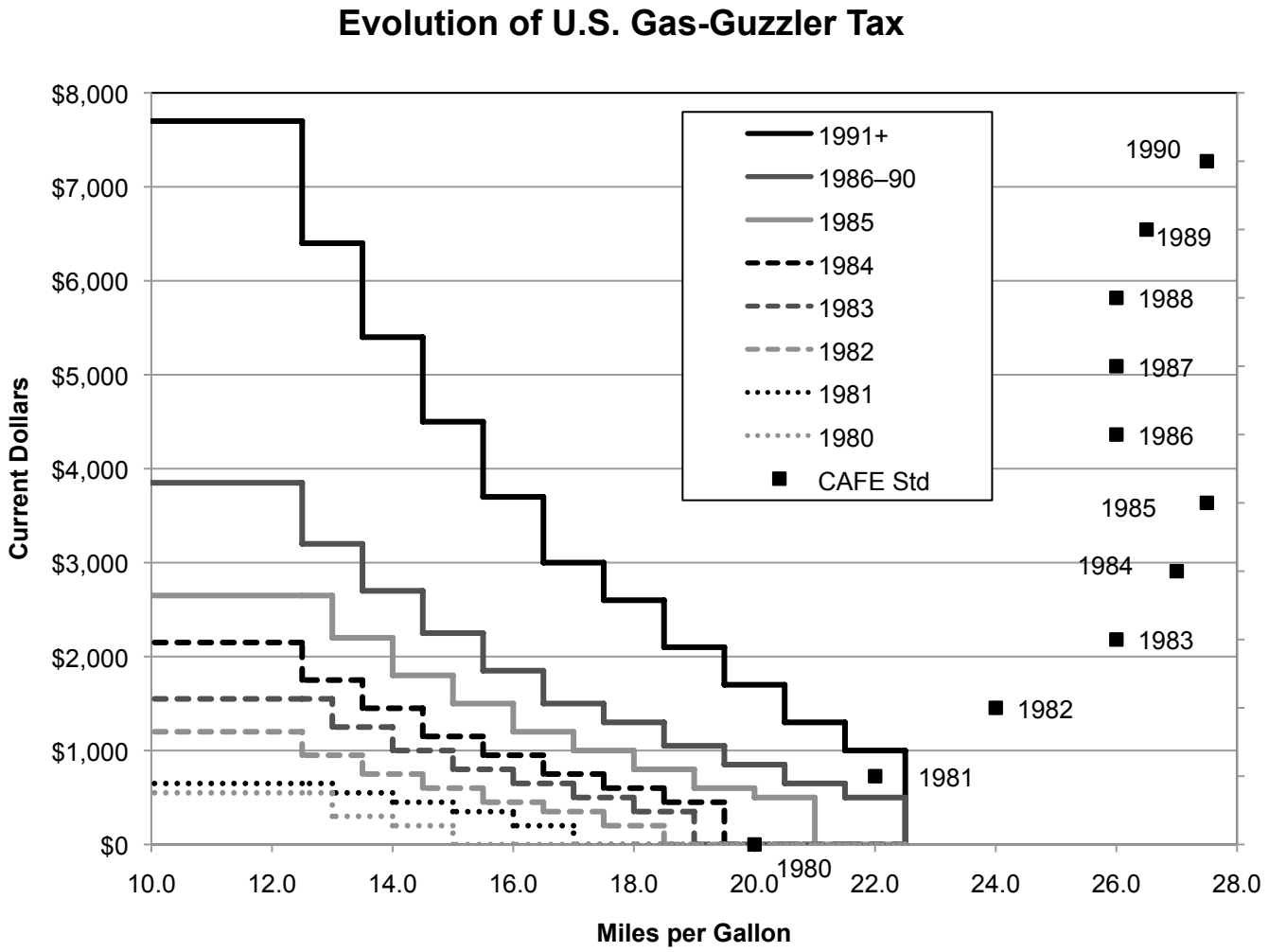
The U.S. Gas Guzzler Tax (for passenger cars only, not light trucks and still on the books) is half a feebate system. $1,800/0.01gal/mi = approx. $20/g/mi



The US gas-guzzler tax has also been effective. No mass market vehicles have ever paid it.



The gas guzzler function was adjusted several times. Would be necessary with feebates to achieve revenue neutrality.



The University of California's analysis of feebates for the California Air Resources Board showed impacts similar to those seen in the EU.

- Immediate ***additional*** emissions reduction of approximately 10 g/mi (5%) for a California-only feebate, 30 g/mi (15%) for nationwide standard.
- Assuming car buyers tend to undervalue fuel economy, costs per barrel of oil or per ton CO_2 are negative ***even in the presence of strict fuel economy standards***.
- Feebates can significantly increase the market success of advanced technology (hybrid) vehicles over and above the effect of fuel economy standards once the technology becomes cost effective.

WHY FEEBATES?

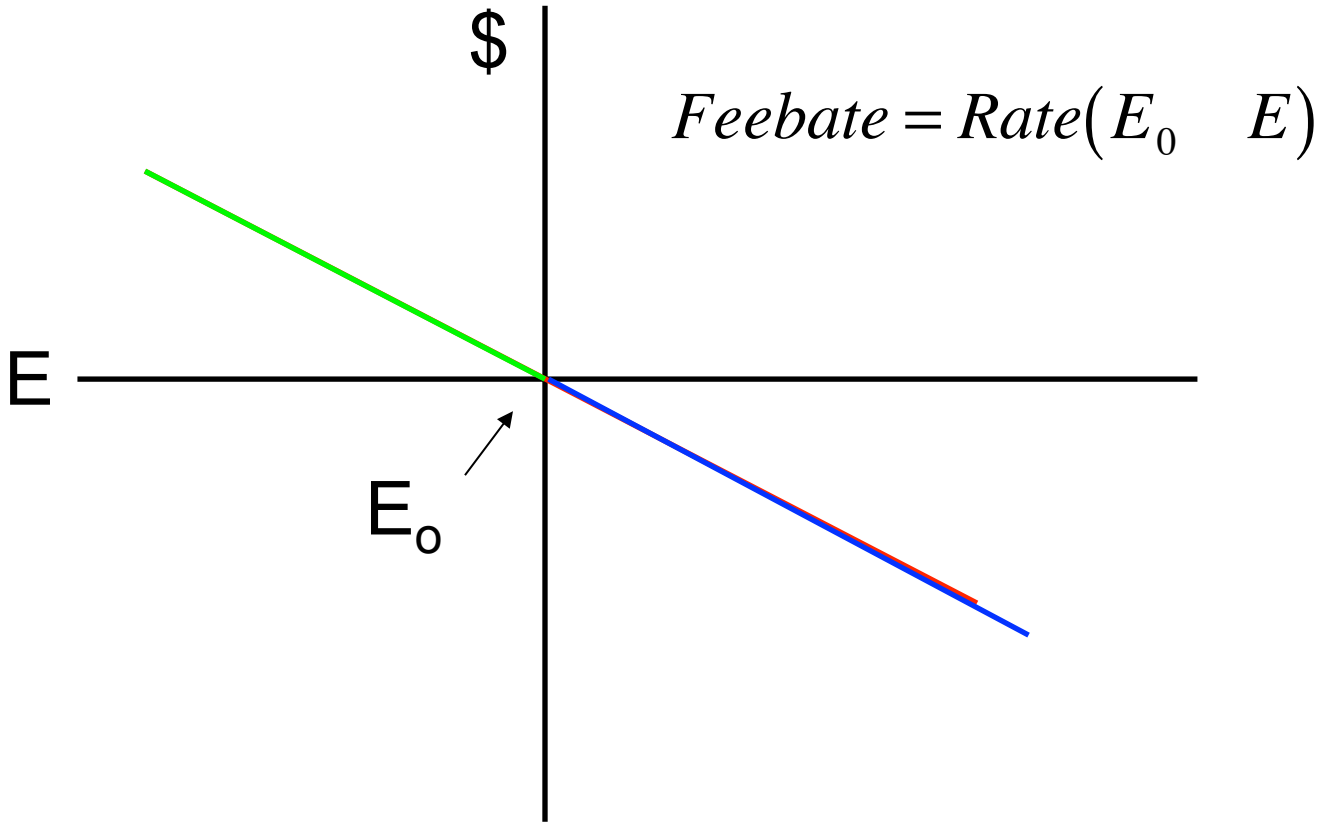
- Influence consumer choices by means of a monetary incentive.
  - Correct uncertainty loss aversion bias.
  - Induce changes in sales distribution.
  - Little or no effect on miles driven, however.
- Create continuing incentive for manufacturers to improve technology.
  - Provide a continuing incentive for technology innovation and implementation.
  - Shift trade-off between performance and energy efficiency.
  - Regulatory standards could be continuously raised, however.

Muchas Gracias.

Simplest feebate is linear in energy use or CO_2 emissions per mile.

Benchmark is E_0. Rate is slope of the line.

System is *revenue neutral* if benchmark is carefully chosen.



A feebate can be viewed as a tax on future oil use or GHG emissions paid at time of purchase.

$$PV = \int_{t=0}^{L} C(E_0 \quad E) K_o e^{\ t} e^{\ rt} dt$$

- Assuming:
  - 14,000 km/year when new = K_o
  - Decreasing at 4%/year = δ
  - Discount rate of 7%/year = r
  - Expected life of 14 years = L
  - Cost to society of oil use and GHG emissions = C

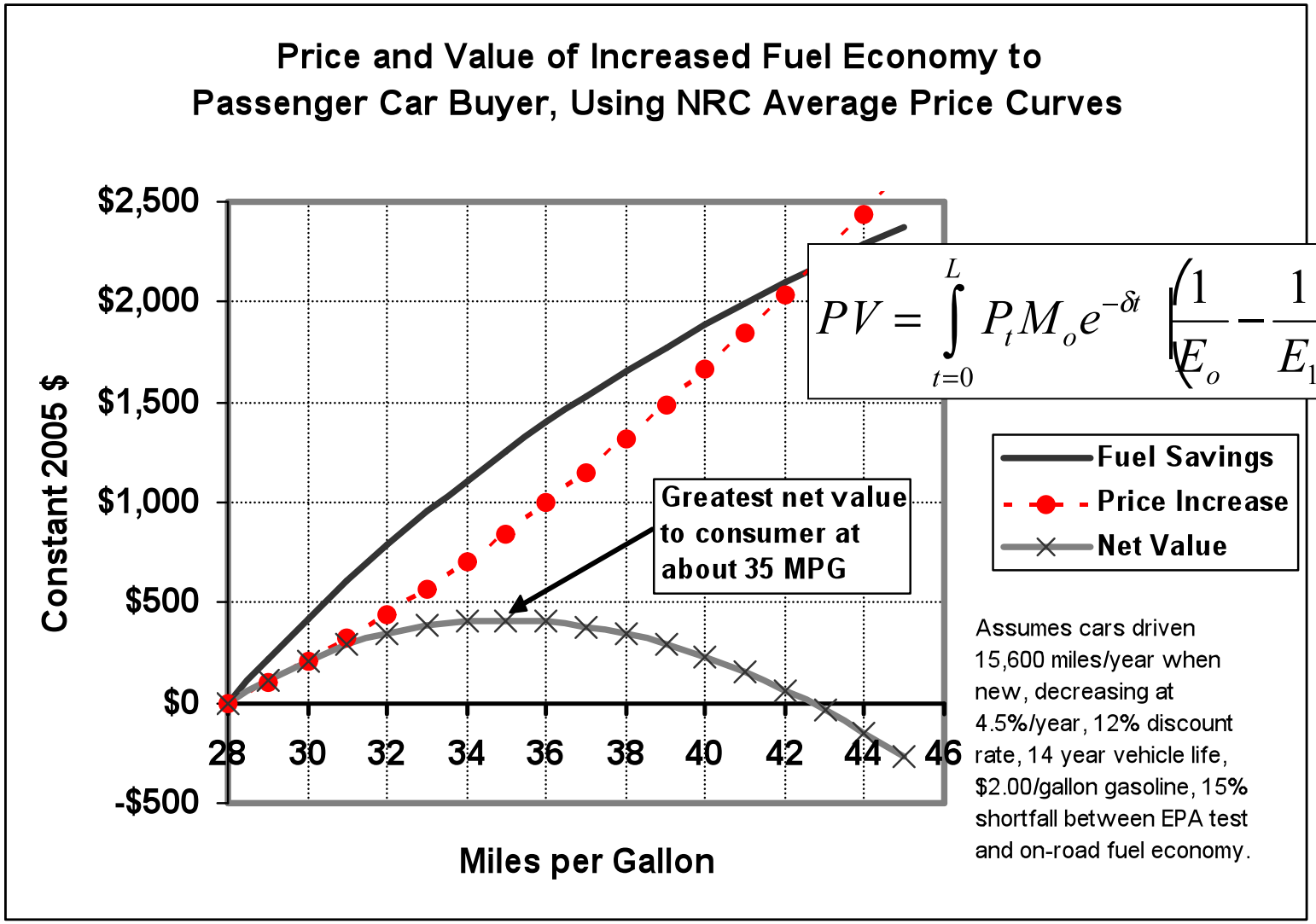
$$PV = C \quad (E_0 \quad E) \quad 100{,}000$$

$$PV = \frac{\$100}{tCO_2} \quad \frac{1g}{km} \quad 100{,}000km \qquad R = \frac{\$10}{g/km}$$

Why these tools?

Energy efficiency paradox: NAS (2002) fuel economy cost estimates: 25% increase in MPG would be optimal.

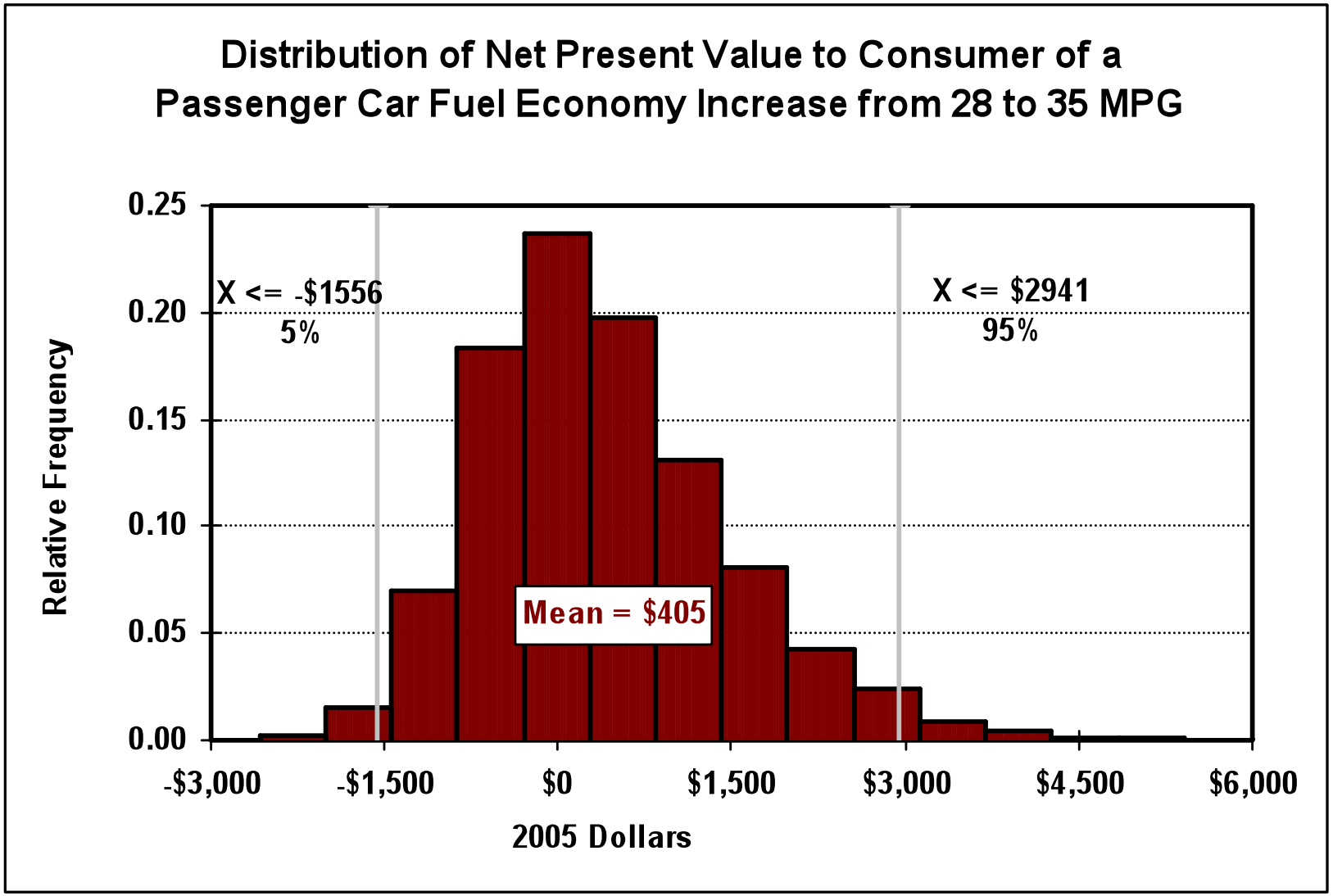
Manufacturers decide for consumers.



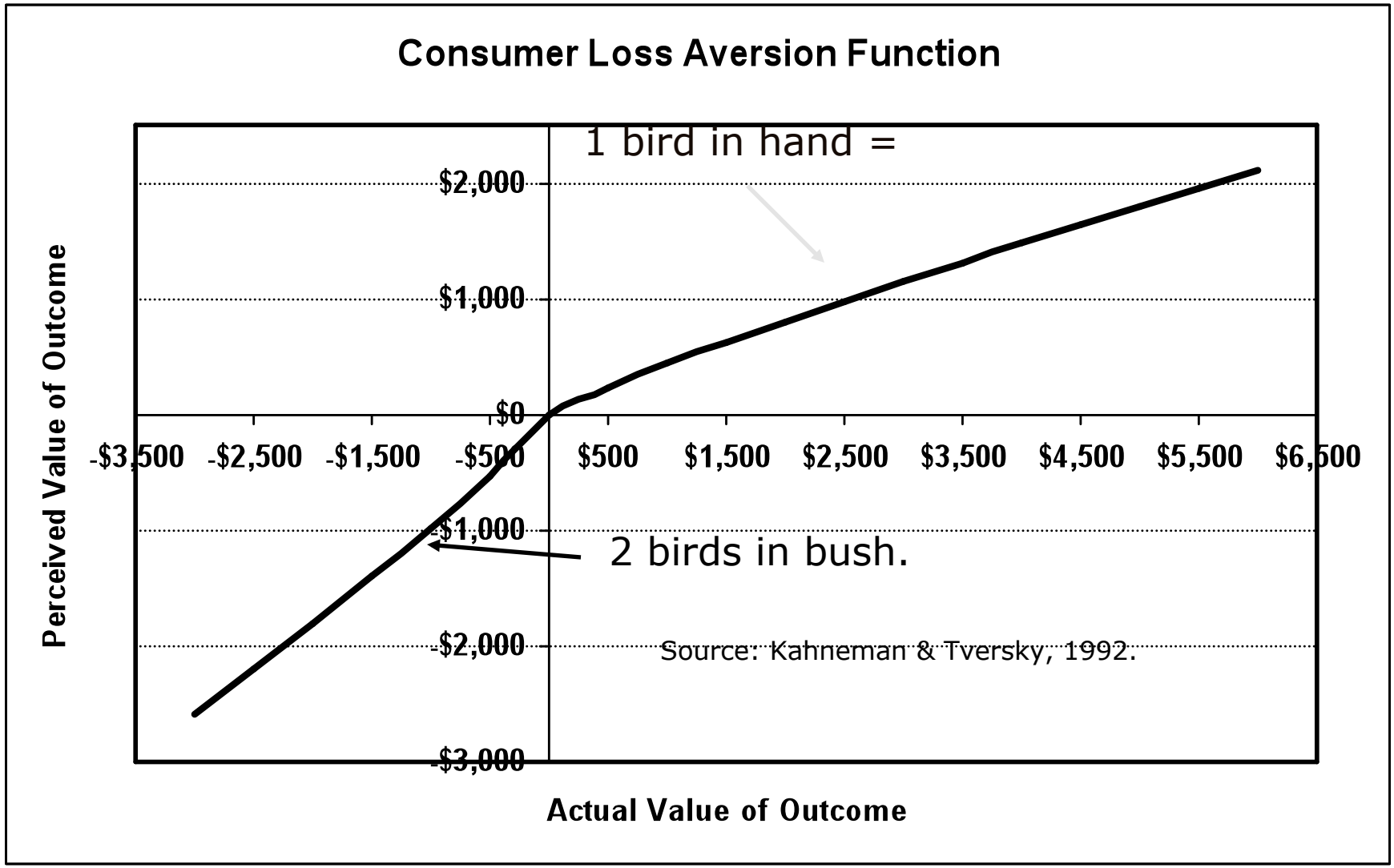
In reality, UNCERTAINTY **makes higher energy efficiency a RISKY BET.**

- Yes, there's a fuel economy label, but what will *I* get?
- What will gasoline cost (over the next 10-15 years)?
- How much driving will I do?
- How long will my car last?
- (How long will *I* last?)
- What will I have to give up to get better fuel economy?

A simulation including uncertainties indicates that the fuel efficiency bet has an *expected present value* of $405. (Other assumptions same as rational model above.)



Nobel prize-winning economic research has shown that consumers are loss-averse: perceived value of (loss of $X > gain of $X).



Applying typical consumer loss-aversion changes the perceived value of the fuel economy bet to -$32. Consumers would decline the 25% MPG increase.