Musings on the Current Practice of Benefit-Cost Analysis

Glenn Blomquist
University of Kentucky

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Benefit-Cost Analysis

- Organizational framework for identifying, quantifying, and comparing the costs and benefits (measured in money) of a proposed policy action
- Final decision is informed (though not necessarily determined) by a comparison of the total costs and benefits

Phaneuf *Benefit-Cost Analysis* in Haab & Whitehead (2014)

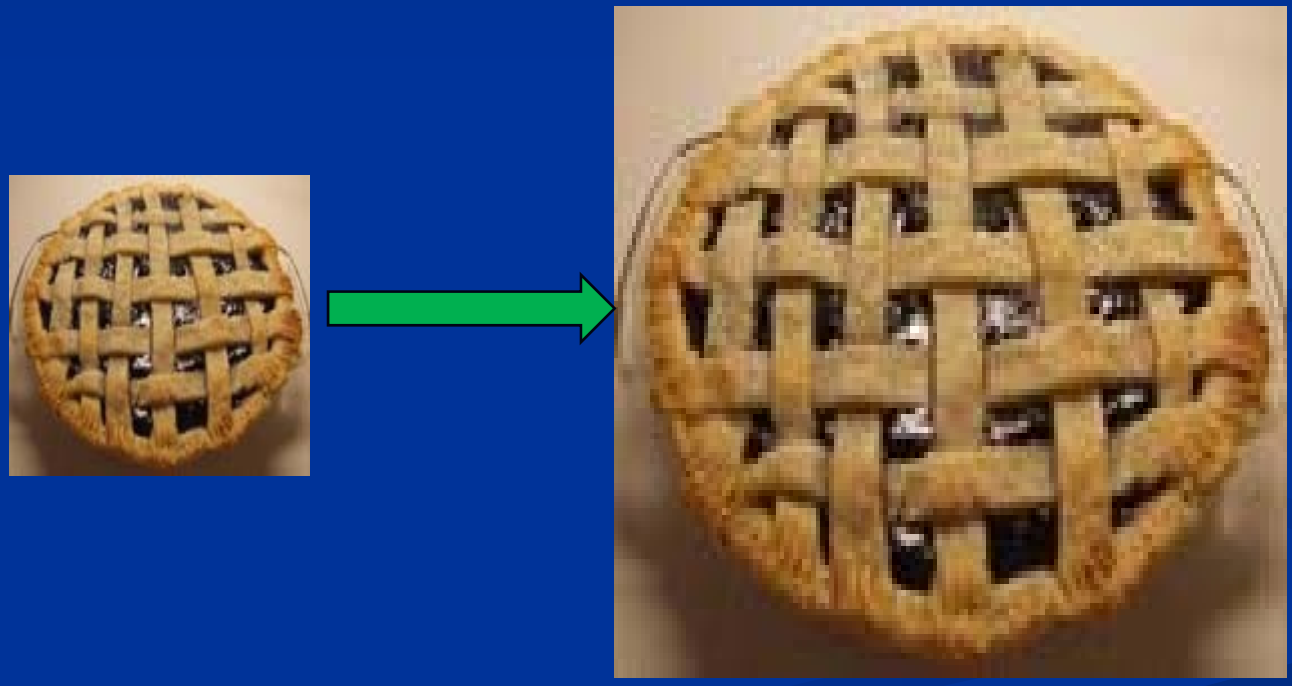
Benefit-Cost Analysis

Teleological, systematic, formal procedure for measurement of net economic benefit of any change in resource allocation using specific techniques derived from economic theory

Pluses: (1) Efficiency, (2) Transparency

Pareto Improvements & Potential Pareto Improvements

Making the pie bigger



Harberger's Three Postulates

Social Net Benefits =

Δ CS change in consumer surplus, WTP

+

Δ PS change in producer surplus, WTP

+

Δ GS change in gov't surplus, net revenue

(1+METB) times 1+ *marginal excess tax burden*

Musing 1: Many BCA analysts ignore excess burden

- Taxes are transfers, but METB applies to ΔGS

- $1 program cost actually costs more than $1
- DWL, Pie shrinks, Leaky bucket
- METB depends on the tax
- Best overall estimate: perhaps 0.20, even 0.75?

- Should be part of sensitivity analysis

Heckman includes METB - NBD

Table 1
Selected estimates of IRRs (%) and benefit-to-cost ratios.

Return		To individual			To society[a]			To society[a]		
Murder cost[b]					High ($4.1M)			Low ($13K)		
		All[d]	Male	Female	All[d]	Male	Female	All[d]	Male	Female
Deadweight loss[c]										
IRR	0%	7.6	8.4	7.8	9.9	11.4	17.1	9.0	12.2	9.8
		(1.8)	(1.7)	(1.1)	(4.1)	(3.4)	(4.9)	(3.5)	(3.1)	(1.8)
	50%	6.2	6.8	6.8	9.2	10.7	14.9	8.1	11.1	8.1
		(1.2)	(1.1)	(1.0)	(2.9)	(3.2)	(4.8)	(2.6)	(3.1)	(1.7)
	100%	5.3	5.9	5.7	8.7	10.2	13.6	7.6	10.4	7.5
		(1.1)	(1.1)	(0.9)	(2.5)	(3.1)	(4.9)	(2.4)	(2.9)	(1.8)
Discount rate										
Benefit-cost ratios	0%	–	–	–	31.5	33.7	27.0	19.1	22.8	12.7
					(11.3)	(17.3)	(14.4)	(5.4)	(8.3)	(3.8)
	3%	–	–	–	12.2	12.1	11.6	7.1	8.6	4.5
					(5.3)	(8.0)	(7.1)	(2.3)	(3.7)	(1.4)
	5%	–	–	–	6.8	6.2	7.1	3.9	4.7	2.4
					(3.4)	(5.1)	(4.6)	(1.5)	(2.3)	(0.8)
	7%	–	–	–	3.9	3.2	4.6	2.2	2.7	1.4
					(2.3)	(3.4)	(3.1)	(0.9)	(1.5)	(0.5)

Heckman et al. “The Rate of Return to the HighScope Perry Preschool Program” *JPubE* (2010)

Carlsson & J-S includes METB - BD

Table 8

Present Value of Costs and Benefits in 1000 USD Per Car
Real Discount Rate 4% Per Year

	Battery car CO_2 from electricity production excluded	*Battery car CO_2 from electricity production included*	*Mild hybrid car*	*Advanced hybrid car*	*Fuel-cell car*
			Price calculation		
Incremental price	−6.40	−6.40	−2.20	−4.23	−6.57
Cost saving fuel	10.24	10.24	1.28	2.68	3.52
Required WTP for private profitability	−3.84	−3.84	0.92	1.54	3.05
			Social calculation		
Environ. benefit	2.95	2.73	0.53	1.02	1.56
Tax revenues	−6.41	−6.41	−0.79	−1.65	−2.98
Motivated electric-vehicle subsidy	−3.46	−3.68	−0.26	−0.63	−1.42

One purpose of this paper was to shed light on the question of whether governments should financially promote the introduction of EVs by, for example, subsidising them. The conclusion is negative for most types of passenger car, at least on a large scale. One reason is the often substantial loss in tax revenue that the government would face if a consumer switches to an EV.

Carlsson and Johansson-Stenman “Costs and Benefits of Electric Vehicles: A 2010 Perspective” *JTransEconPol* (2003)

Musing 2A: Many BCA analysts are unclear or confused about perspective

- BCA perspective, "standing" who counts
- Guardians: revenue expenditure analysis
  - Ignore time costs; waiting, environmental quality
  - CBO estimates of PPACA on federal budget (ignored state and personal budgets)
  - Benefits/costs to taxpayers
- Spenders: constituency support analysis
  - Federal or state spending in district is "benefit" even though it's a COST from a broader social perspective
- Should be part of sensitivity analysis, including all of society

Musing 2B: Regional politicians are usually clear about perspective

- Colorado water public works project
  - B: irrigation, electricity, recreation
  - C: construction, salinity

- Positive regional net benefits (+$767 m)
- *Negative* national net benefits (-$341 m)

Howe, Charles W. “Project Benefits and Costs from National and Regional Viewpoints: Methodological Issues and Case Study of the Colorado-Big Thompson Project” *Natural Resources Journal* (1986)

Social Cost of Carbon: An Exception

Costs		
Technology costs	132.137	
Congestion costs	30.040	
Accident costs	14.250	
Noise costs	0.568	
Total costs	176.995	
Benefits		
Lifetime fuel savings	416.456	
Consumer surplus from additional driving	9.105	
Refueling time value	15.292	
Petroleum market externalities	21.547	
Fatality costs	0.010	
CO_2	45.614	**3.2-10.7**
CO	0.000	
VOC	0.601	
NO_x	0.594	
Particulate matter	6.705	
So_x	5.401	
Total benefits	521.325	
Net total benefits	344.330	

Gayer & Viscusi "Overriding Consumer Preferences with Energy Regulations" *Journal of Regulatory Economics* (2013)

Musing 3: Creating more jobs is not easy

- US Interstate highway construction 1969-1993
- Non-metro counties; avoids endogeneity of building where there is growth

- Highway counties: +6-8% earnings over 24 years mostly service & retail industries
- Adjacent counties: negative 1-3%, retail fell 8-11%
- **Overall**, all counties, net effect ≈ **ZERO**

- Chandra & Thompson. "Does Public Infrastructure Affect Economic Activity? Evidence from the Rural Interstate Highway System" *Regional Science and Urban Economics* (2000)

Job Creation & Employment Efficiency

- Bartik. Upjohn (2011): 80% of employment increases in one state due to incentives are offset by employment decreases in other states
- Bartik, *ARRE* (2012): Involuntary unemployment when unemployment rate is *high*;

  Efficiency gain = Wage paid – reservation wage – costs to employers

  Lasting effects of *local* demand shocks
- *JBCA* (2015)

  Haveman & Weimer

  Belova, Gray, Linn, Morgenstern, and Pizer

Musing 4A: “Behavioral” BCA is real, challenging, and evolving

- 1st generation behavioral BCA is history, mostly
- Clear benefits to improving BCA and policy
- Hegel’s dialectic is relevant now in invoking behavioral failures

Madrian "Applying Insights from Behavioral Economics to Policy Design" *AnRevEcon* (2014)

Consumers' and producers' *cognitive limitations* and *psychological* biases cause market inefficiencies (failure to reach Pareto Optimality)

1. **Imperfect optimization** due to limited attention and competence – oversimplify, heuristics.
2. **Bounded self control** – intentions don't match behavior; procrastinate
3. **Context dependence** – status quo bias, framing matters, starting point matters

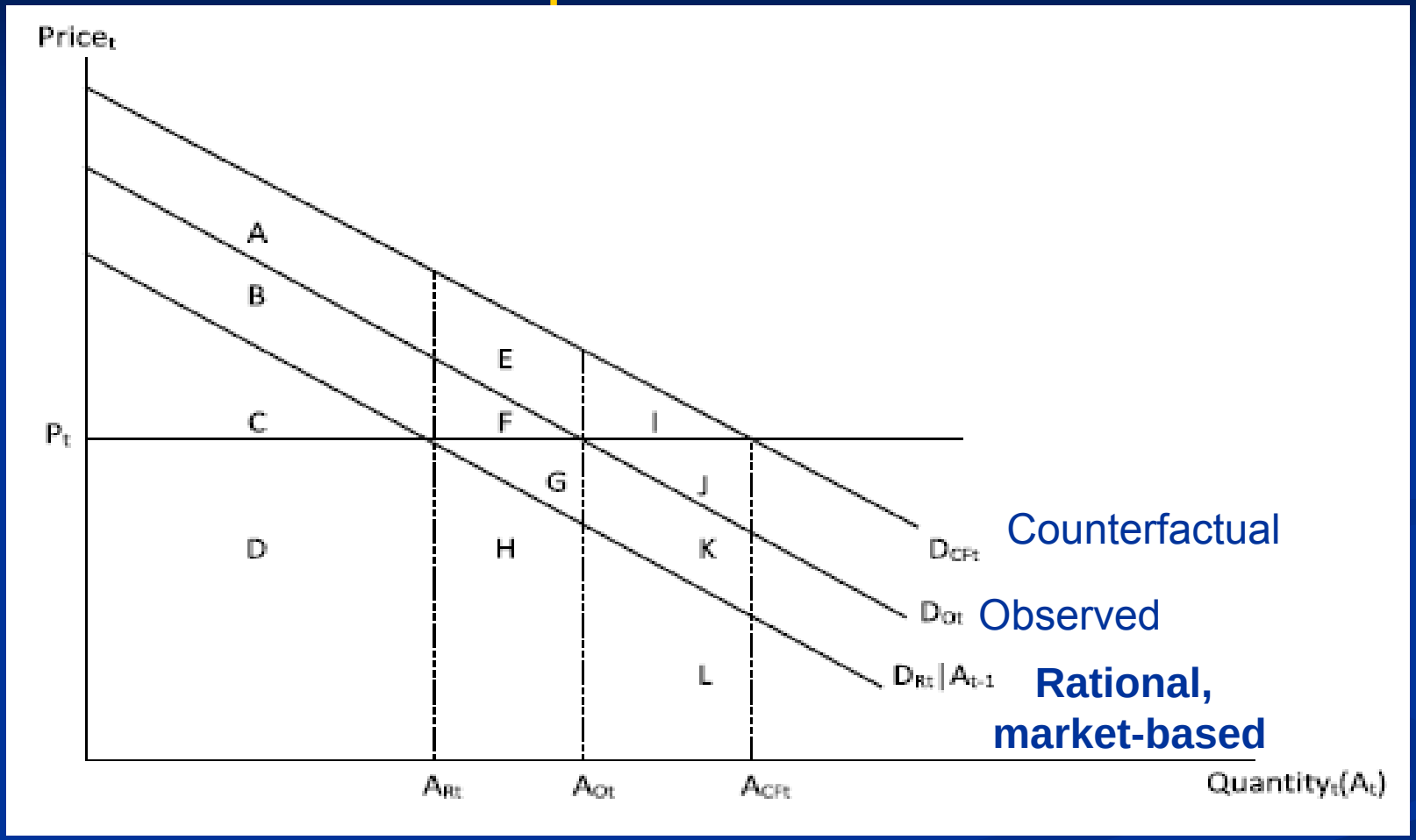
Behavioral Economics: Better BCA & Policy

- Information and behavior – provide useful information in an understandable form to improve decisions of consumers and firms
- Incentives and behavior – understand how consumers and firms will respond to specific incentives (List and schools)

  Better models to avoid unintended consequences

  Don't just assume the information is useful and understandable or the incentives will motivate the desired change – focus groups, pilot studies

Musing 4B: Behavioral Economics can improve BCA



Jin, Kenkel, Liu & Wang "Retrospective & Prospective BCAs of US Anti-Smoking Policies" *JBCA* (2015)

Musing 4C: Behavioral Economics can produce incredible BCA

Costs	
Technology costs	132.137
Congestion costs	30.040
Accident costs	14.250
Noise costs	0.568
Total costs	176.995
Benefits	
Lifetime fuel savings	416.456
Consumer surplus from additional driving	9.105
Refueling time value	15.292
Petroleum market externalities	21.547
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CO_2	45.614
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Particulate matter	6.705
So_x	5.401
Total benefits	521.325
Net total benefits	344.330

0

104.869

-72.126

Gayer & Viscusi (2013)

DEPARTMENT OF ENERGY

10 CFR Part 431

[Docket Number EERE–2010–BT–STD–0003]

RIN 1904–AC19

Energy Conservation Program: Energy Conservation Standards for Commercial Refrigeration Equipment

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Final rule.

SUMMARY: The Energy Policy and Conservation Act of 1975 (EPCA), as amended, prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including commercial refrigeration equipment (CRE). EPCA also requires the U.S. Department of Energy (DOE) to determine whether more-stringent standards would be technologically feasible and economically justified, and would save a significant amount of energy. In this final rule, DOE is adopting more-stringent energy conservation standards for some classes of commercial refrigeration equipment. It has determined that the amended energy conservation standards for these products would result in significant conservation of energy, and are technologically feasible and economically justified.

DATES: The effective date of this rule is May 27, 2014. Compliance with the

TABLE I.3—SUMMARY OF NATIONAL ECONOMIC BENEFITS AND COSTS OF AMENDED COMMERCIAL REFRIGERATION EQUIPMENT ENERGY CONSERVATION STANDARDS*

Category	Present value Billion 2012$	Discount rate (percent)
Benefits		
Operating Cost Savings	7.70	7
	16.63	3
CO_2 Reduction Monetized Value ($11.8/t case)**	1.01	5
CO_2 Reduction Monetized Value ($39.7/t case)**	4.55	3
CO_2 Reduction Monetized Value ($61.2/t case)**	7.20	2.5
CO_2 Reduction Monetized Value ($117/t case)**	14.05	3
NO_X Reduction Monetized Value (at $2,591/ton)**	0.03	7
	0.10	3
Total Benefits†	12.28	7
	21.28	3
Costs		
Incremental Installed Costs	2.77	7
	4.89	3
Net Benefits		
Including CO_2 and NO_X † Reduction Monetized Value	9.51	7
	16.40	3

*This table presents the costs and benefits associated with commercial refrigeration equipment shipped in 2017–2046. These results include benefits to customers which accrue after 2046 from the equipment purchased in 2017–2046. The results account for the incremental variable and fixed costs incurred by manufacturers due to the amended standard, some of which may be incurred in preparation for this final rule.

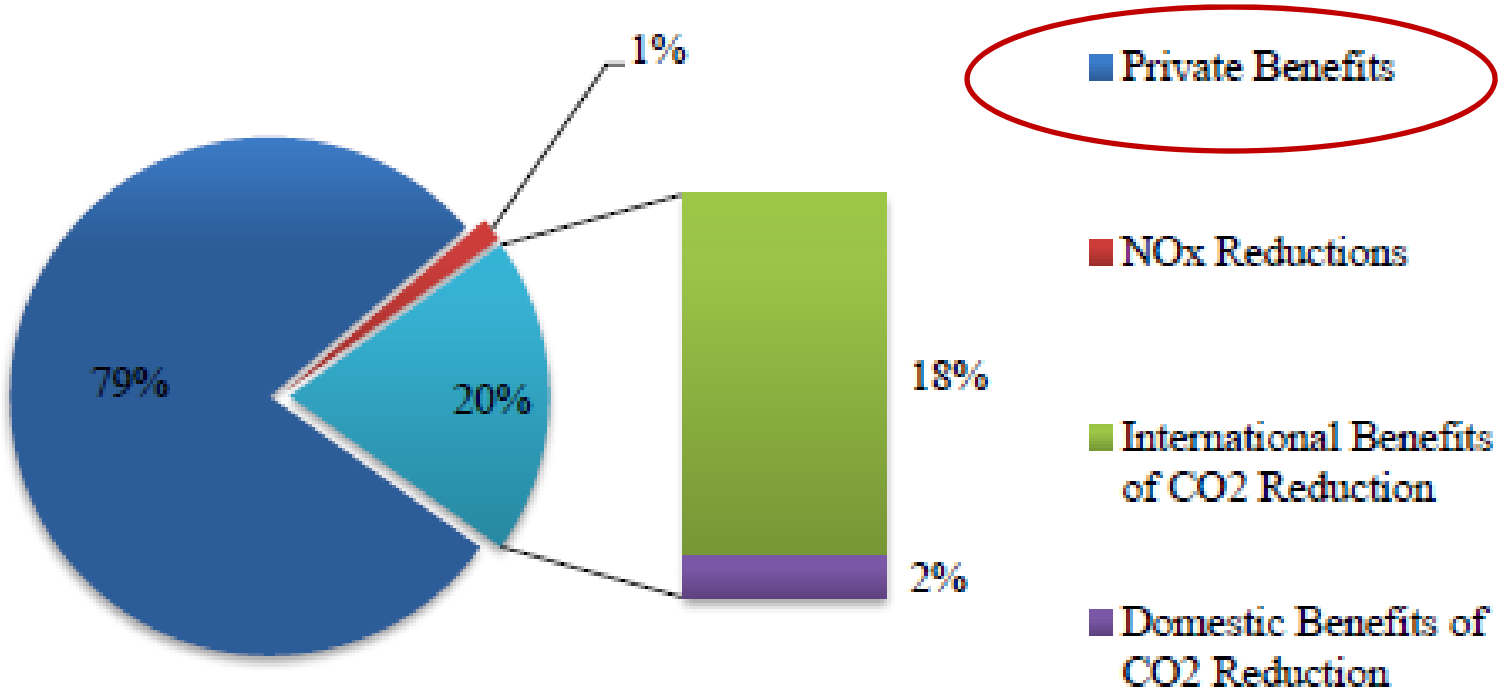
**The CO_2 values represent global monetized values of the SCC, in 2012$, in 2015 under several scenarios of the updated SCC values. The first three cases use the averages of SCC distributions calculated using 5%, 3%, and 2.5% discount rates, respectively. The fourth case represents the 95th percentile of the SCC distribution calculated using a 3% discount rate. The SCC time series used by DOE incorporates an escalation factor. The value for NO_X is the average of the low and high values used in DOE's analysis.

†Total Benefits for both the 3% and 7% cases are derived using the series corresponding to average SCC with 3-percent discount rate.

Commercial Consumer v. Expert

The cumulative net present value (NPV) of total consumer costs and savings of today's standards for commercial refrigeration equipment ranges from $4.93 billion (at a 7-percent discount rate) to $11.74 billion (at a 3-percent discount rate).[7] This NPV expresses the estimated total value of future operating cost savings minus the estimated increased product costs for products purchased in 2016–2047.

Figure 1: Composition of Annualized Benefits for DOE's Proposed Commercial Refrigeration Rule



Source: Department of Energy's Technical Support Document for the Proposed Rule, *Energy Conservation Program: Energy Conservation Standards for Commercial Refrigeration Equipment*. Page 1-3.

Public Interest Comment[1] on

The Department of Energy's Proposed Rule

Energy Conservation Program: Energy Conservation Standards for Commercial Refrigeration Equipment

Docket ID No. EERE-2010-BT-STD-0003

RIN: 1904-AC19

November 12, 2013

Sofie E. Miller, Policy Analyst[2]

The George Washington University Regulatory Studies Center

Additionally, DOE does not explain why sophisticated, profit-motivated purchasers of commercial refrigeration would suffer from either informational deficits or cognitive biases that would cause them to purchase products with high lifetime costs without demanding higher-price, higher-efficiency products. This asymmetric information, if it exists, could be remedied by improved labeling or other types of consumer education campaigns rather than banning products

Musing 4D: The dialectic applies to behavioral BCA

- Test: Comparing demand responses;
- if vehicle prices move as predicted with gas prices, consumers are not biased in evaluations of fuel economy

- Finding: Vehicle prices are highly responsive to gas prices and any bias is moderate at most

- Evidence: Discrepancy between engineering models (large internalities) & actual behavior (little or zero internalities)

Allcott & Sunstein “Regulating Internalities” NBER (2015)

Still Musing 4D: The dialectic applies to behavioral BCA

- Focus groups on information by EPA

Wolverton, Klemick, and Kopits "The Energy Efficiency Paradox: Evidence from Three Industries" (2016) SBCA meetings in Washington, DC

- Observations of fuel saving devices on trucks

Lutter, Fraas, Porter, and Wallace "Regulating Use of Energy-Saving Technologies: The Case of Aerodynamic Devices on Heavy Duty Trucks" (2016) SBCA meetings in Washington, DC

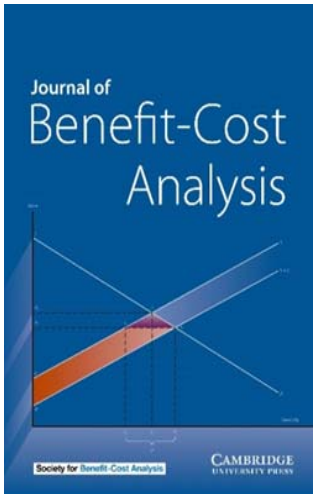
- **Standard & behavioral models in BCA sensitivity analysis; epistemic uncertainty**

Journal of Benefit-Cost Analysis

JBCA 7,1 (forthcoming Spring 2016) A Special Issue

Introduction to the Special Issue on [Ir]rationality, Happiness, and Benefit-Cost Analysis
Lisa A. Robinson, Guest Editor

The Good, the Bad, and the Ugly: A Unified Approach to Behavioral Welfare Economics (open access)
B. Douglas Bernheim



Cost-Benefit Analysis, Who's Your Daddy? (on FirstView)
Cass R. Sunstein

Do We Need a New Behavioral Baseline For BCA?
Jason F. Shogren and Linda H. Thunström

Rational Benefit Assessment for an Irrational World
Ted Gayer and W. Kip Viscusi

Bad Air Days: The Effects of Air Quality on Different Measures of Subjective Wellbeing
Paul Dolan and Kate Laffan

Unequal Life Chances and Choices: How Subjective Well-Being Metrics Can Inform Benefit-Cost Analysis (on FirstView)
Carol Graham

Behavioral Economics, Happiness Surveys, and Public Policy
Matthew Adler

Musing 5: It's only analysis and advice

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

Docket No. NHTSA-2010-0162

RIN 2127-AK43

Federal Motor Vehicle Safety Standards; Rear Visibility

Table 1: Estimated Costs and Benefits Under 59% and 73% Market Adoption Scenarios

	73% Adoption	59% Adoption
Annual Benefits (2010 $)	$265 M to $396 M	$398 M to $595 M
Annual Costs (2010 $)	$546 M to $620 M	$827 M to $924 M

Congress instructed DOT to promulgate this rule despite estimates of costs > benefits