Going Private: A New Perspective on Climate Mitigation
Commons Center
1231 18th Avenue South
Vanderbilt University
11:30 am -12:15 pm, February 22, 2018

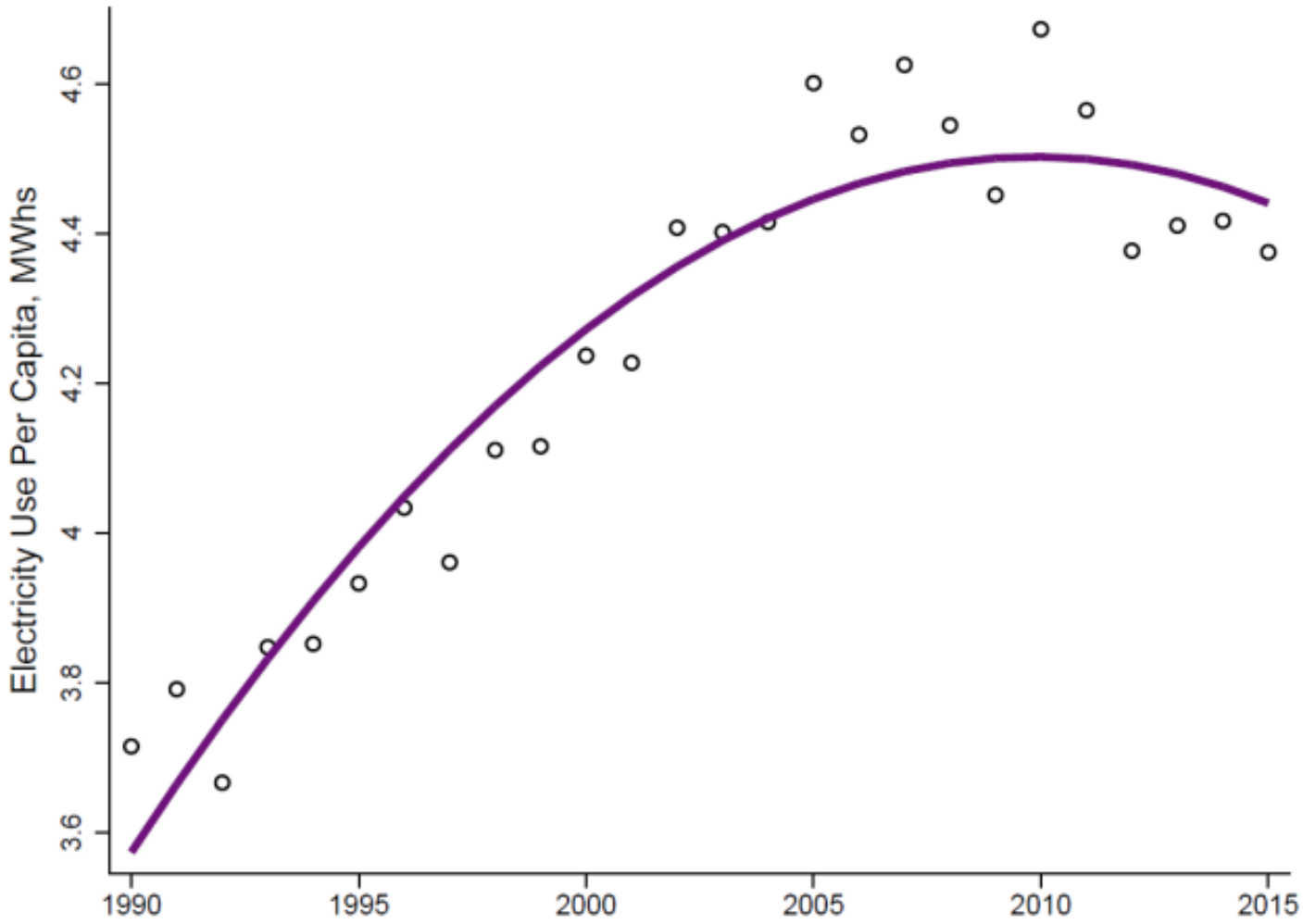
Who Did This?

"XXXX Announces Goal to Eliminate 20 Million Metric Tons of Greenhouse Gas Emissions"

- February 25, 2010
- Exceeded reductions target by end of 2015
- Joint announcement with EDF
- New billion ton initiative in 2017

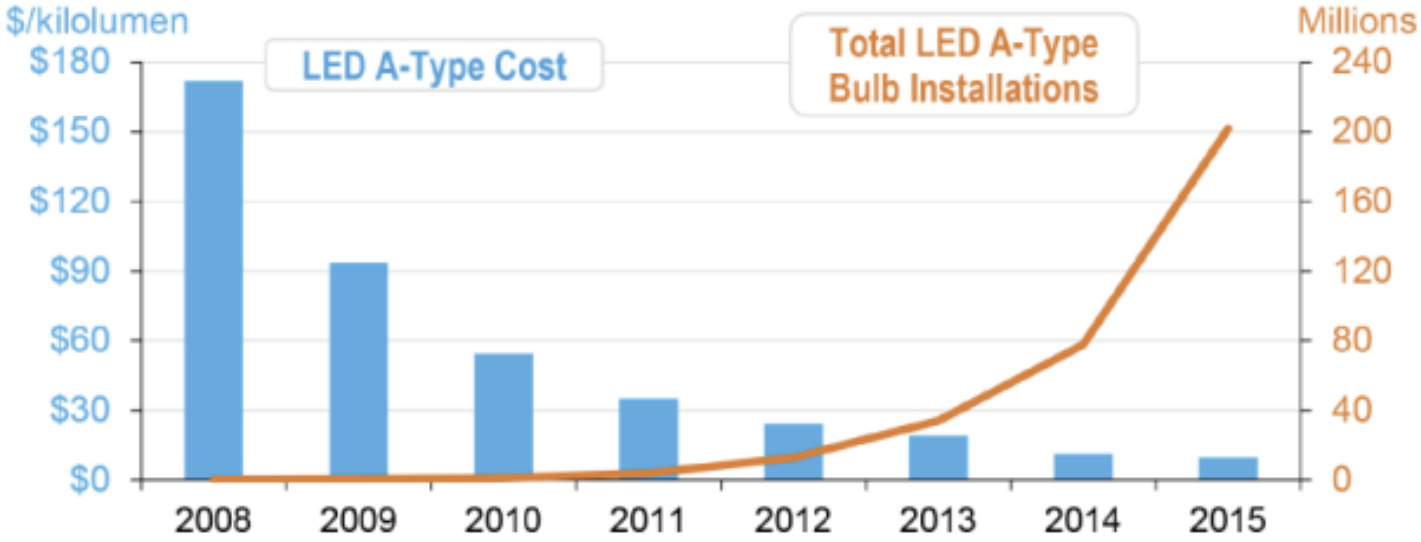
Who Did This?
U.S. Residential Electricity Consumption

Lucas Davis, **Evidence of a Decline in Electricity Use by U.S. Households**, Haas Energy Institute, (May 8, 2017)
at https://energyathaas.wordpress.com/2017/05/08/evidence-of-a-decline-in-electricity-use-by-u-s-households/,
based on *Davis, Lucas W. "Evidence of a Decline in Electricity Use by U.S. Households," Economics Bulletin, 2017, 37(2), 1098-1105*



Success? How much is attributable to behavior change?

Source: https://energyathaas.wordpress.com/2017/05/08/evidence-of-a-decline-in-electricity-use-by-u-s-households/



"Suppose that between LEDs and CFLs there are now one billion energy-efficient lightbulbs installed in U.S. homes. If operated 3 hours per day, this implies savings of 50 million megawatt hours per year, or 0.16 megawatt hours per capita, about the size of the decrease above."

Beyond Politics: Hard Questions and Important Opportunities for Social and Behavioral Scientists

Agenda

- Framing the Problem v. the Solution
- Overcoming Barriers/Identifying Opportunities
  - Conceptual Barriers
  - Corporate Motivations
  - Taking Households Seriously
  - Spillover Effects
  - Rethinking Climate Justice

Beyond Politics
The Private Governance Response to Climate Change

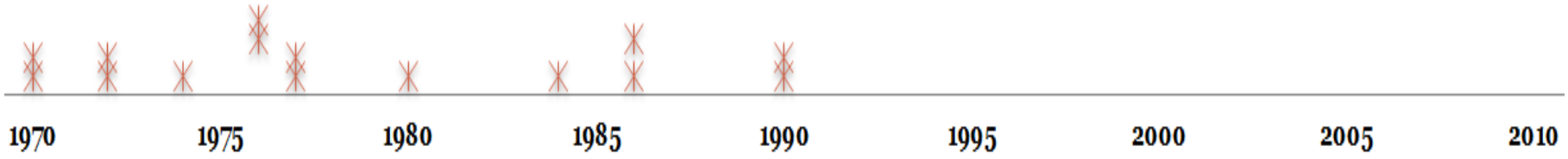
- **Framing**: Climate beliefs and mitigation policy support are driven not just by the framing of the *problem*, but the framing of the *solutio*n.
- **Governance**: Private climate initiatives can contribute a billion tons per year of additional carbon dioxide emissions reductions per year over the next decade. This is not a complete response, but it will buy time, reduce total mitigation costs and reduce the risk of exceeding important thresholds.

Framing Problems: The Actor
Federal Environmental Regulations

(photo courtesy of Michael Gerrard)

Major Pollution Control Statutes 1970-2015

(Vandenbergh 2013, 2014)



Included:

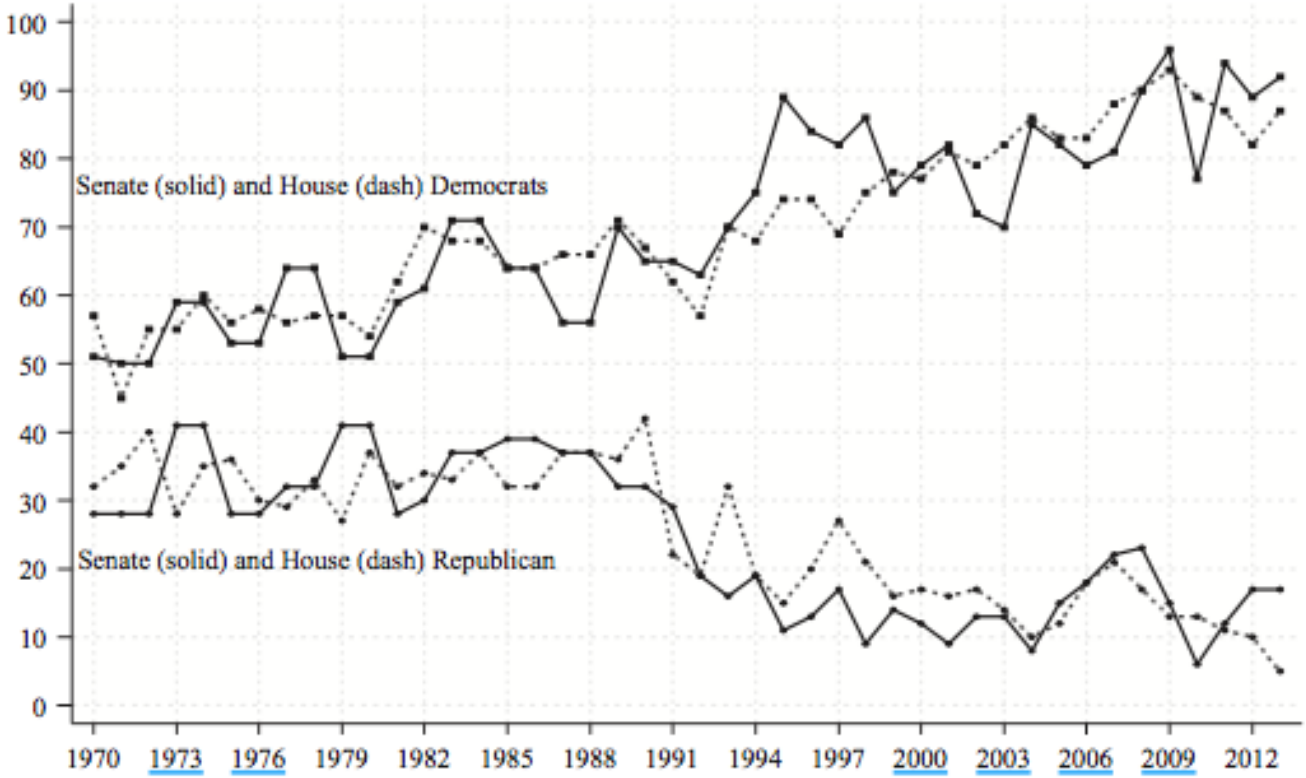
1970	Clean Air Act
	National Environmental Policy Act
1972	Federal Water Pollution Control Act
	Coastal Zone Management Act
1974	Safe Drinking Water Act
1976	Resource Conservation and Recovery Act
	Toxic Substances Control Act
1977	Surface Mining Control and Reclamation Act
	Clean Air Act Amendments
	Clean Water Act
1980	Comprehensive Environmental Response, Compensation and Liability Act
1984	Hazardous and Solid Waste Amendments (to RCRA)
1986	Emergency Planning and Community Right-to-Know Act
	SARA Amendments (to CERCLA)
1990	Oil Pollution Act
	Clean Air Act Amendments

Excluded:

1986	SDWA Amendments
1987	Water Quality Act
1988	FIFRA Amendments
1996	FQPA, SDWA Amendments
2002	CERCLA Amendments

Polarization: 1970-2013

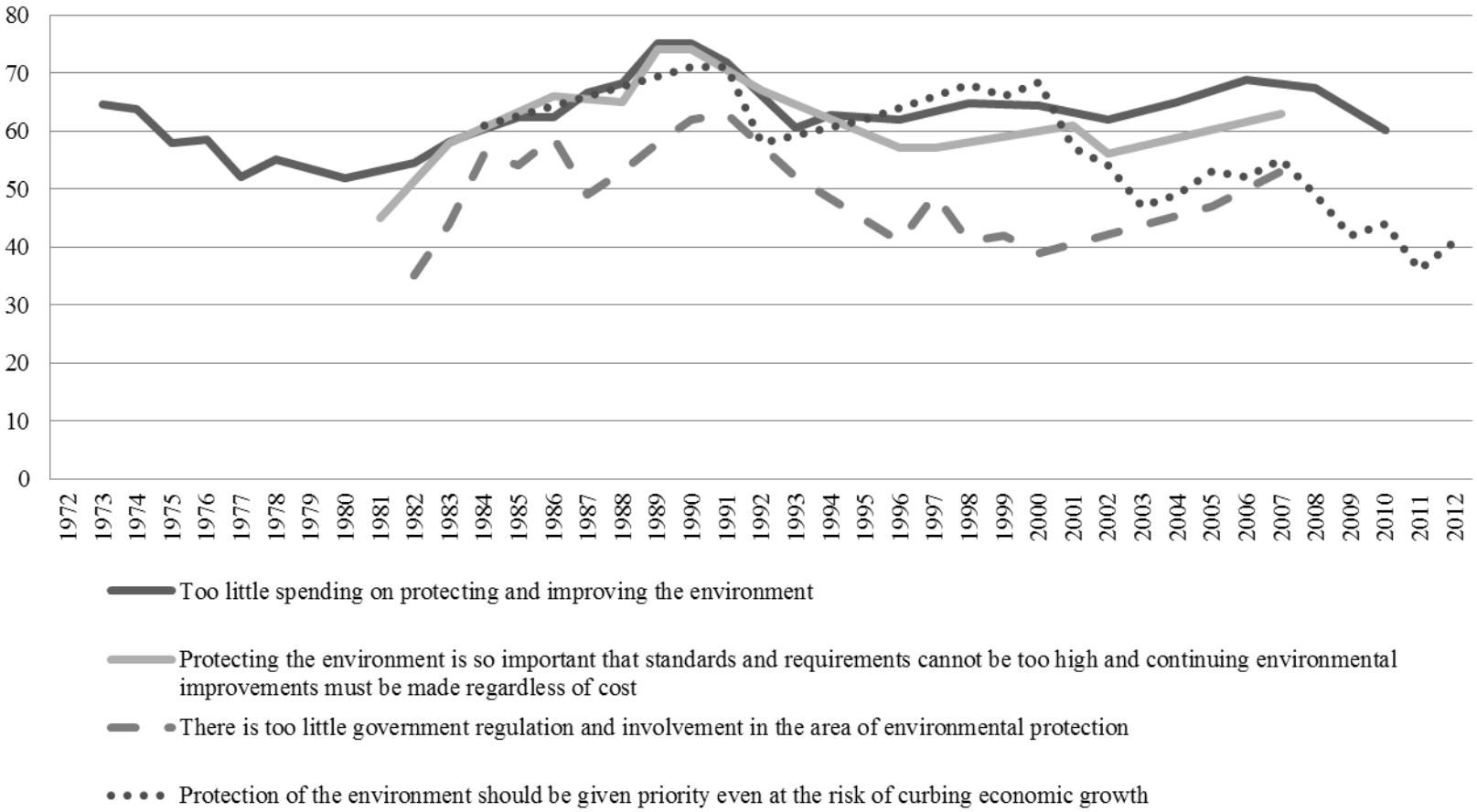
McCright et al., 2014



Note: Since 1970s, the LCV has tracked votes on bills relating to key environmental issues (ranging from air and water quality to wildlife and forest conservation to climate change) and has calculated an environmental voting score for each member of the House and the Senate. Briefly, a member's score, which can range from 0 to 100, is the number of pro-environment votes cast divided by the total number of votes on key environmental issues.

Fig. 1. Average league of conservation voters environmental voting score for democrats and republicans in congress, 1970–2013.

Trends in Public Support



Source: David P. Daniels et al, *Public Opinion on Environmental Policy in the United States in* THE OXFORD HANDBOOK OF U.S. ENVIRONMENTAL POLICY 21:1-39, 1 (Michael Kraft & Sheldon Kamieniecki, eds., 2012)(drawing on data from (1) General Social Survey studies 1973 to 2010; (2) CBS News/New York Times poll 1981 to 2007; and (3) Cambridge Reports/Research International, 1982 to 1994, Wirthlin Worldwide, 1996 to 2000, and Harris Interactive for 2005 and 2007).

New Framing
Private Environmental Governance
Conceptual Shift

(Vandenbergh, 2013)

- Actor: Government → Private Organization
- Action: Law, Policy, Program → Private Initiative
- Examples
  - MSC, FSC
  - Target & Walmart Toxics Standards
  - Environmental Supply Chain Requirements
  - Climate Change

Framing and Climate
The Effect of Worldview

- Confirmation bias
  - People seek out and remember information that fits with their existing beliefs
- Motivated reasoning
  - Reasoning that is motivated by desire to maintain existing beliefs, rather than desire for accuracy

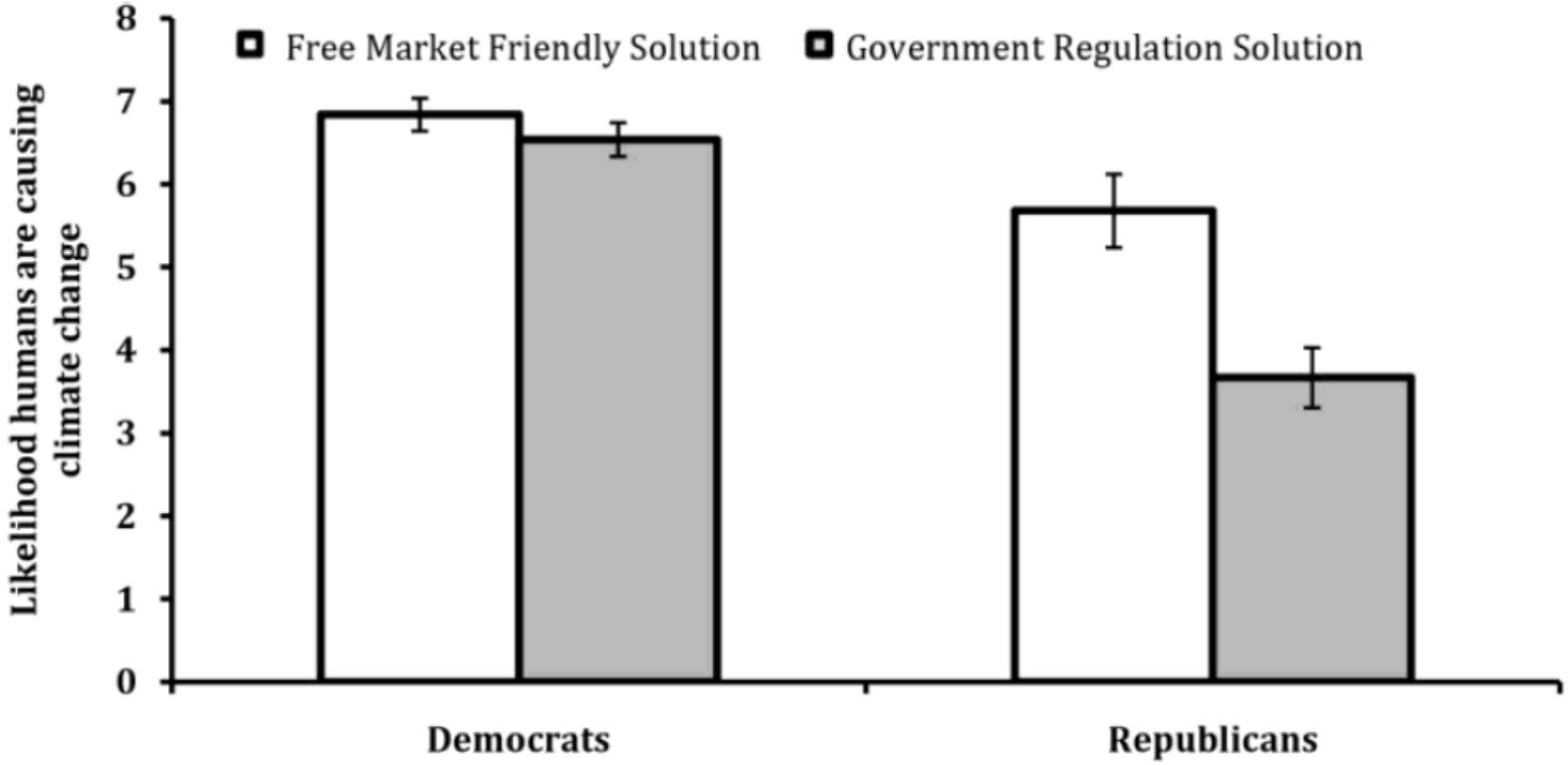
Big Government

http://www.gallup.com/poll/166535/record-high-say-big-government-greatest-threat.aspx

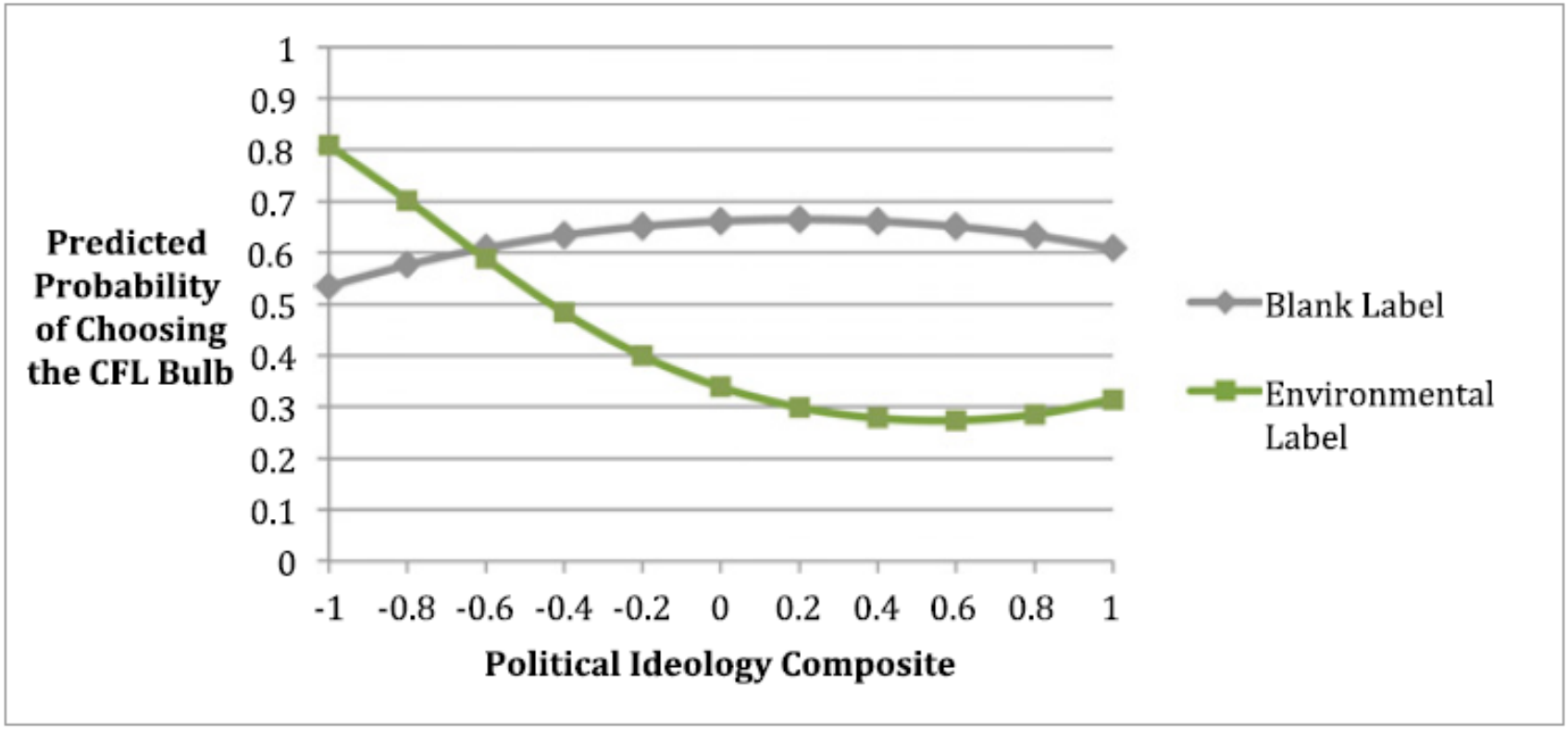
- "Record High in U.S. Say Big Government Greatest Threat" – Gallup (2013)
- 72% of U.S. respondents said that big government was a greater threat to the future of the country than big business or big labor
- Partisan divide: 92% of Republicans, 56% of Democrats

Solution Aversion

Campbell & Kay, 2014



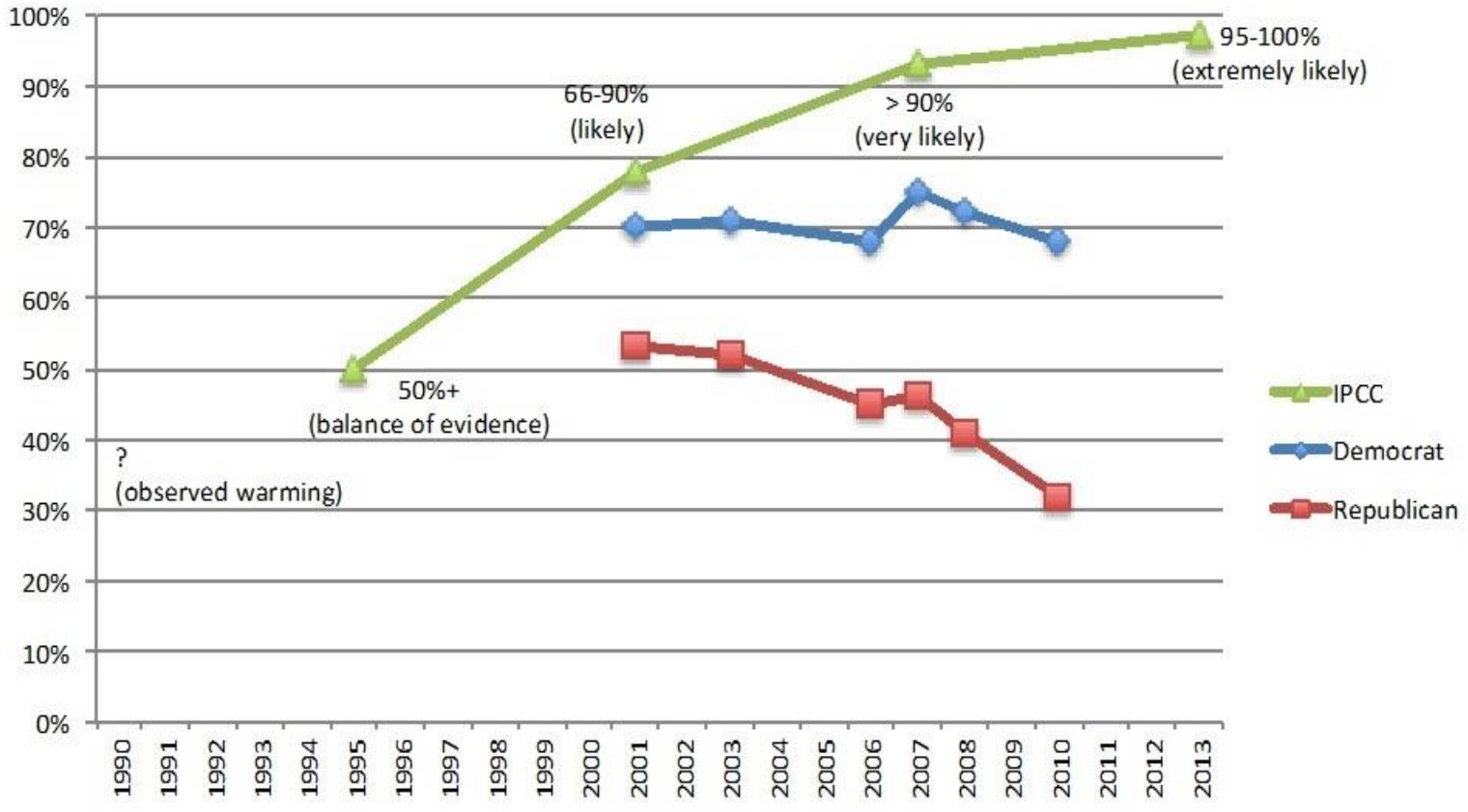
How Important is the Actor?
Effect of Ideology or Worldview
Individual Sustainability Behavior (CFLs)



Gromet et al. 2013

Climate Chante
Influences on Climate Beliefs: Worldview

(Vandenbergh, Raimi & Gilligan 2014)



IPCC: Likelihood that Observed Climate Change is Mostly Anthropogenic

Private Climate Governance

Vandenbergh & Gilligan (2015, 2017)

- Bypass Solution Aversion with Private Sector Responses
- Buy Time – ~ Gigaton of CO_2 Per Year
- Model: Self Interest and Other Motivations
- Corporations
  - Efficiency – Airlines, Potato Chips, and Idling
  - Reputation – Renewable Power in the Southeast
  - Corporate Pressure – Supply Chains, Investors, Lenders and Insurers
- Households

The Potential Contribution of Non-Federal Actors NGO Initiatives: States and Cities

Rocky Mountain Institute (2017)

- Non-Federal v. Non-State v. Private
- 20 States with GHG Targets (51% of population/36% of GHG emissions) (e.g., Climate Alliance, Under2 MOU, We Are Still In, Multi-state initiatives)
- Over 130 Cities have Committed to Set GHG Targets (e.g., C40, ICLEI USA, Global Covenant of Mayors, Under2 MOU, We Are Still In)

Conceptual Barriers
Existence of PEG Options

- What Can Government Do?
- International
- Policymaker
- Law, Regulation, Policy, Program
- Authority v. Governance

Conceptual Barriers
Evaluation of Options

- As Compared to What? (e.g., MSC)
- Analytical Rigor
  - Technical Potential (e.g., glass recycling)
  - Behavioral Plasticity (e.g., carpooling)
  - Policy Plasticity/Initiative Feasibility (e.g., carbon tax)

Opportunities with Private Initiatives
Climate Science
Prediction Market -- iPredict

Sea Level Contract	Type	Condition	Trading At ($)	Last Trade	Average Daily Vol.	Prediction
1	Binary	> 50 cm	1.00	12/15/2012	0.6	p (rise > 50cm) = 1
2	Binary	> 55 cm	0.85	1/7/2013	0.1	p (rise > 55cm) = .85
3	Index	% of 1 m	0.65	4/29/2013	0.2	Sea level will rise 65cm.

https://www.ipredict.co.nz/app.php?do=browse&cat=46 (May 23, 2013, 12:30 PM)

Do People Support Private Governance?

Maki, Wallston & Vandenbergh, in progress

- Randomly assigned 1,128 US adults to read a message about
  - (1) private governance approaches to climate change,
  - (2) public governance non-tax approaches to climate regulations,
  - or (3) or a nationwide carbon tax

Can Private Governance Bypass Solution Aversion?

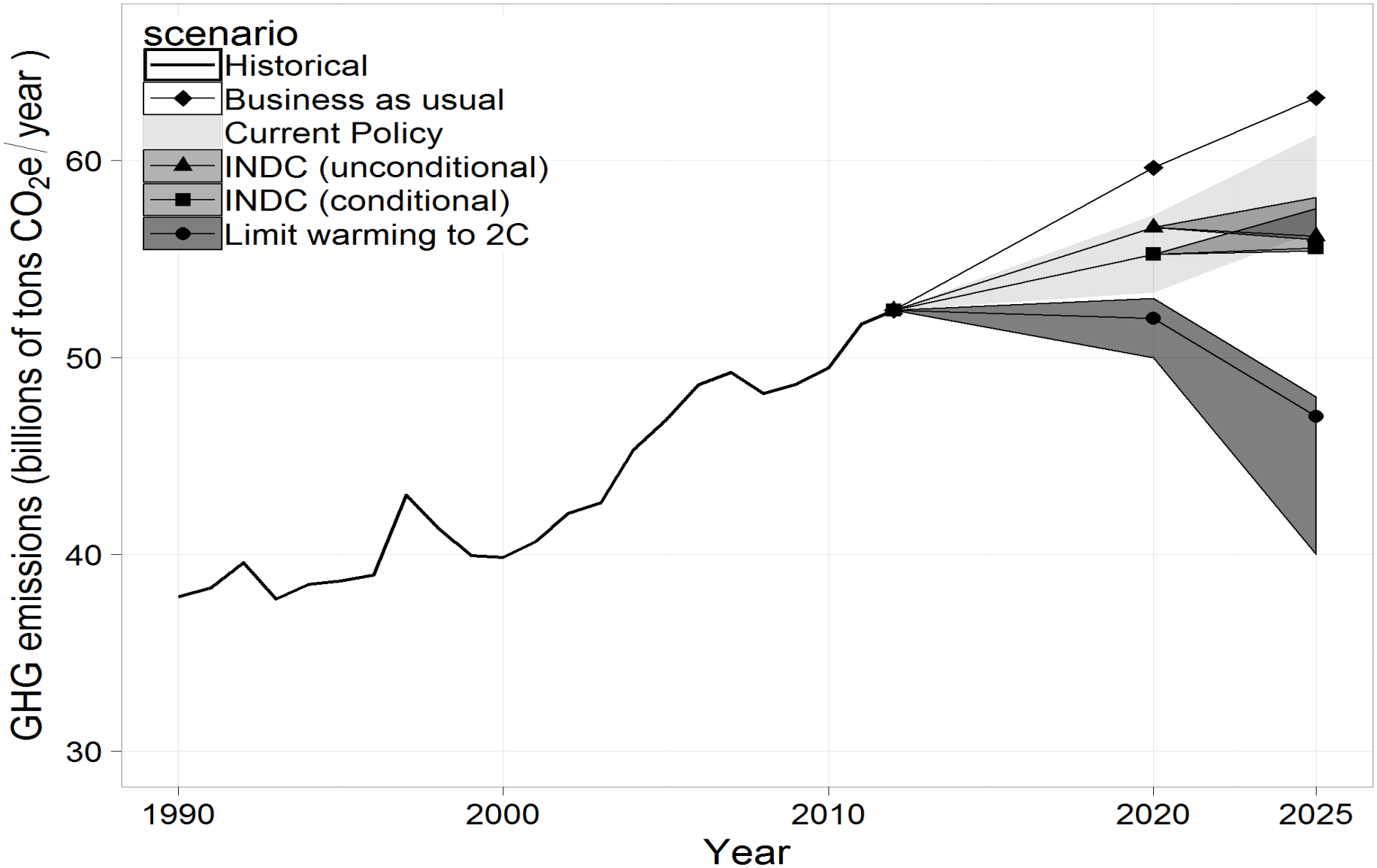
Maki, Wallston & Vandenbergh, in progress

- People who read about private governance approaches to climate change, compared to the other topics, were more supportive of private governance approaches, and believed them to be more effective and feasible (*p*s < .01)

- Particularly true for political conservatives and moderates, as reading about private governance made conservatives more likely to state that carbon emissions should be reduced, and private governance approaches were the ideal way to reduce such emissions ($p < .05$)

Can Private Governance Buy Time?
The Paris Gap

(VANDENBERGH & GILLIGAN, 2017)(fig. 2.4)



Barrier/Opportunity
Corporate Motivations
Examples of Corporate Actions

(Sources: David Gardiner & Associates, 2017; Rocky Mountain Institute, 2017; Power Forward 3.0)

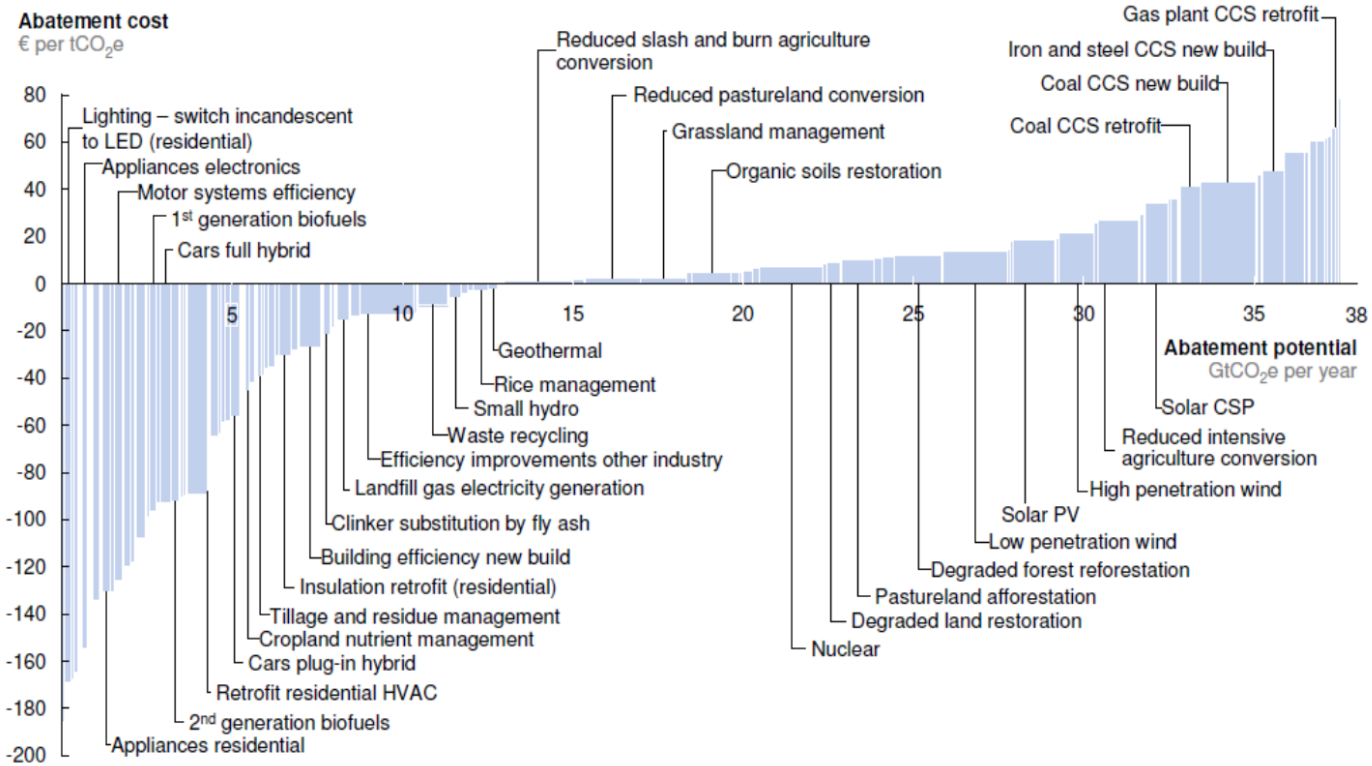
- *Targets* -- Nearly half of the companies in the Fortune 500 and 63 percent of the Fortune 100 have set targets to reduce GHG emissions, improve energy efficiency, and increase renewable energy.
- *Internal Carbon Taxes* – Over 400 companies have an internal price on carbon.
- *RE100* -- 111 companies have committed to 100% renewable power (e.g., GM, Mars, Unilever, VF Corporation, Nike, and Apple).
- *Corporate Renewable Energy Buyers' Principles* -- 65 companies have signed on (over 48 million MWh of annual demand by 2020).
- *Corporate-NGO Initiatives* -- Over 2,700 companies are involved in at least one of nine climate platforms.

Barrier/Opportunity Corporate Private Initiatives Corporate Drivers

- Reduce Government Regulation
- Shape Government Regulation
- Raise Rivals' Costs

- Accelerate Efficiency
- Assure Supply
- Brand Reputation
- Retail Customers
- Corporate Customers
- Investors
- Lenders
- Employee Morale
- Manager Norms

Barrier/Opportunity
Can't We All Just Get Along?
The Efficiency Gap – McKinsey Curve



Enkvist, Dinkel, & Lin, *Global Greenhouse Gas Abatement Cost Curve 2.1* (McKinsey, 2010)

- No transparency on data or methods

Barrier/Opportnity
Can't We All Just Get Along?
Efficiency Gap – Implicit Discount Rates

Source: Stern (2007)

Table 1. Implicit discount rates calculated from data on purchases of household appliances.

Appliance	1972	1978	1980
Gas central space heater	39	51	56
Oil central space heater	52	78	127
Room air conditioner	20	22	19
Central air conditioner	19	25	18
Electric water heater	587	825	816
Gas water heater	91	146	166
Refrigerator	105	96	78
Freezer	379	307	270

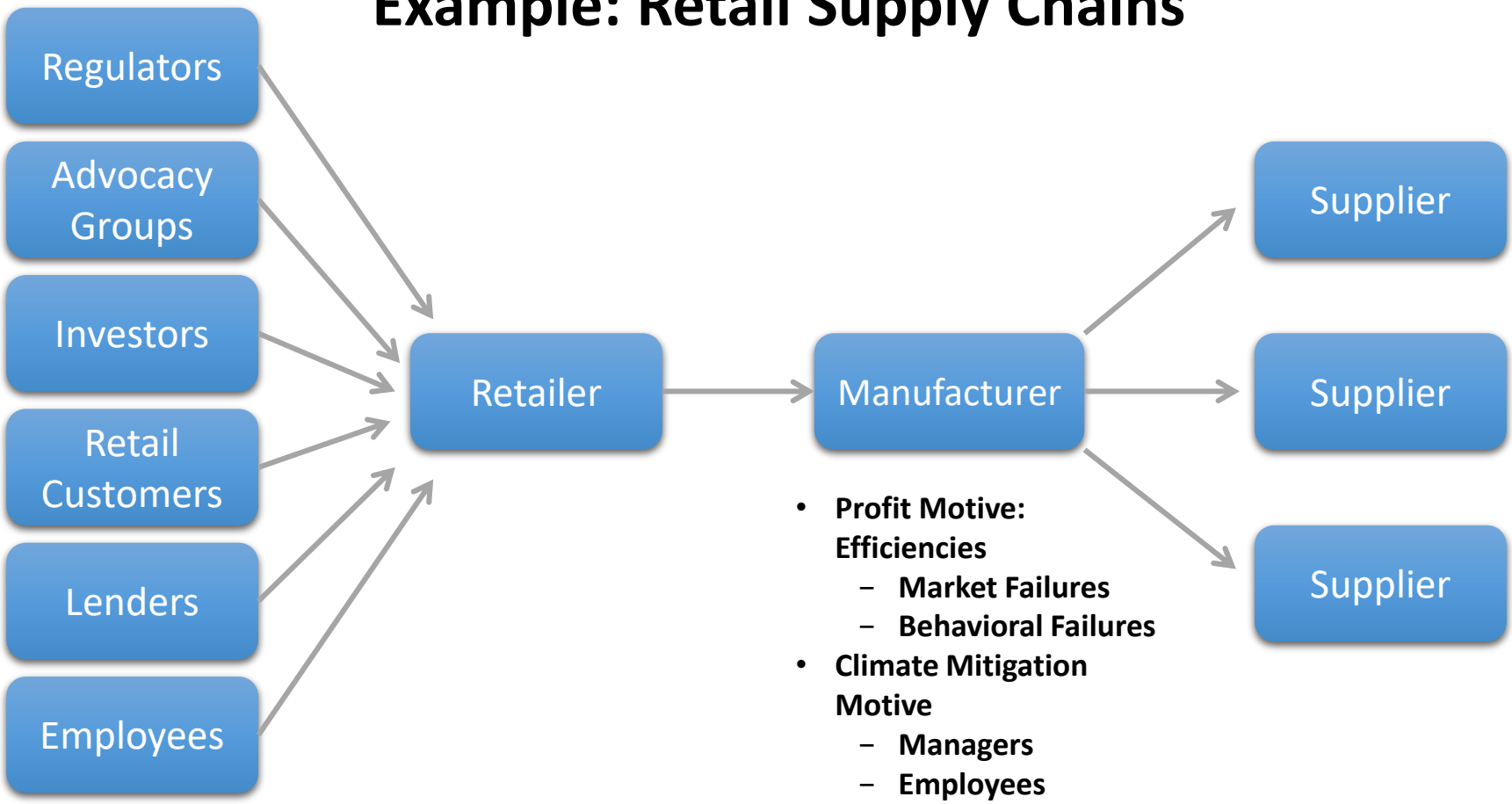
Source: Ruderman, H., Levine, M. D., and McMahon, J. E., "The Behavior of the Market for Energy Efficiency in Residential Appliances Including Heating and Cooling Equipment," *The Energy Journal*, 7 (1986) in press.

Barrier/Opportunity
Efficiency Gap
Virgin Atlantic Pilot Feedback

Gosnell et al. at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2798244

- 40,000 flights made by 335 captains in 2014
- Provided pilots with feedback on selected fuel use reduction goals
- Saved ~500,000 kg of fuel, worth ~3.3 million pounds, prevented the emission of ~1.5 million kg of CO2, at negative cost $250 per ton of CO2
- The intervention was so cost effective, the researchers said that it "outperforms every other reported carbon abatement technology of which we are aware"

Barrier/Opportunity
Motivations for Private Environmental Governance
Example: Retail Supply Chains



Example
Private Supply Chain Pressure
Cross-Border Effects

"The world's largest and richest computer company said it would build, or work with its partners to build, more than 2 gigawatts of solar power plants meant to provide electricity to the company's suppliers. Observers said the move is likely to force Apple's rivals to ratchet up the mild pressure they've put on their contractors so far to reduce their carbon emissions to combat climate change…."

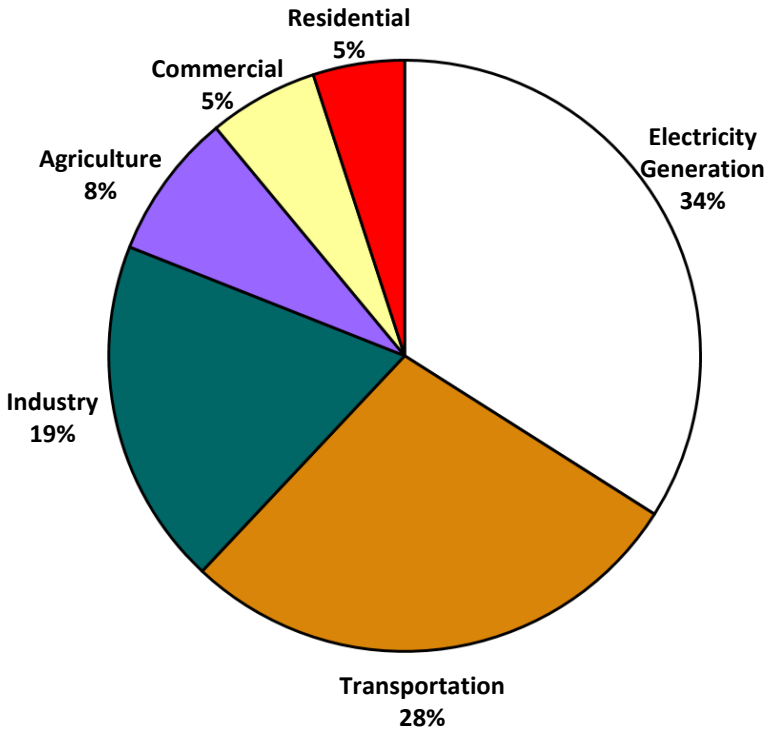
David Ferris, *Apple's solar commitment in China could roil tech industry*, Energy Wire (Oct. 23, 2015)

Taking Households Seriously
Household Private Initiatives
(~500 million tons CO_2)

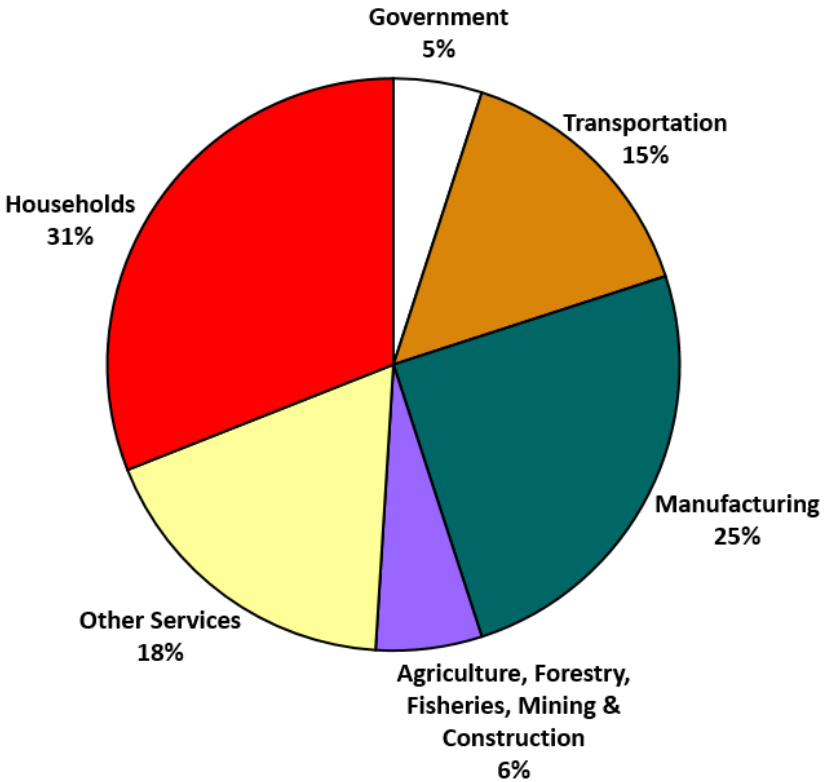
- Taking Individual Behavior Seriously
- Behavioral Wedge
- Myth Busting
- Home Energy Disclosure
- Immediate Feedback
- Employee Programs

Barrier/Opportunity
Taking Households Seriously
Sources of US CO_2 Emissions

The Standard View



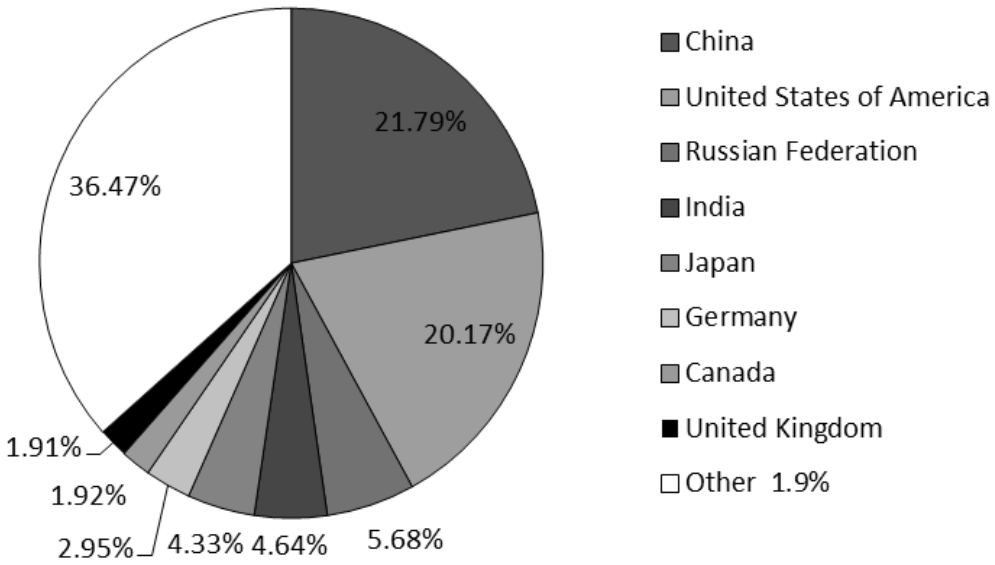
The Behavioral Wedge View



Sources: Vandenbergh & Steinemann 2007, Vandenbergh et al. 2011, based on House Committee on Energy and Commerce (2008), http://bit.ly/6Xgyon ; U.S. COMMERCE DEPARTMENT, U.S. CARBON DIOXIDE EMISSIONS AND INTENSITIES OVER TIME: A DETAILED ACCOUNTING OF INDUSTRIES, GOVERNMENT AND HOUSEHOLDS 7, Fig. 3 (2010)

Aggregate Impact of Households
The One Percent Problem
National CO_2 Flows

Stack & Vandenbergh (2011)(data from CAIT 2010)

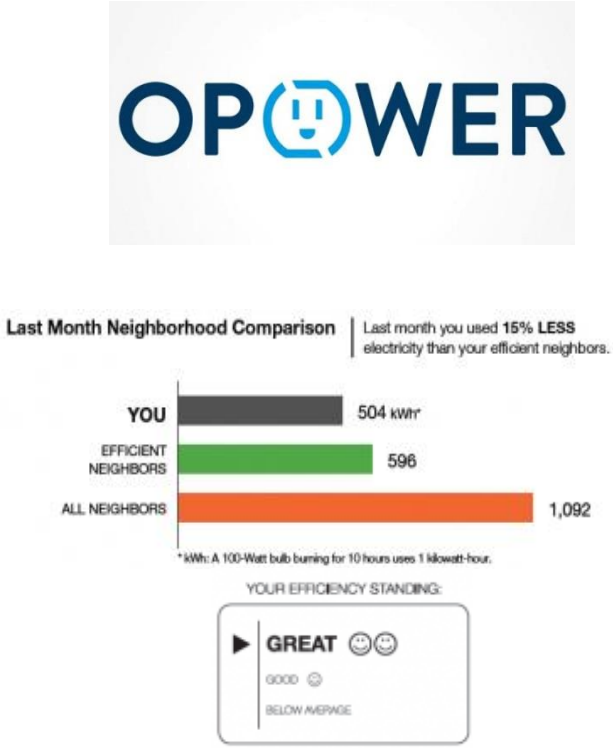


The Behavioral Wedge

Dietz, Gardner, Gilligan, Stern & Vandenbergh (2009)

Action Type	Technical Potential (Million metric tons of CO2)	Behavioral Plasticity (% Behavior Change)	RAER (Million metric tons of CO2)	RAER (%I/H)
Weatherization	92	90%	78	3.39%
HVAC Equipment	45	80%	39	1.72%
Low-flow showerheads	5	80%	4	0.18%
Efficient water heater	25	80%	20	0.86%
Appliances	54	80%	43	1.87%
LRR tires	27	80%	24	1.05%
Fuel-efficient vehicle	206	50%	115	5.02%
Change HVAC air filters	32	30%	14	0.59%
Tune up AC	11	30%	5	0.22%
Routine Auto Maintenance	32	30%	15	0.66%
Laundry temperature	2	35%	1	0.04%
Water heater temperature	11	35%	4	0.17%
Standby electricity	34	35%	12	0.52%
Thermostat setbacks	37	35%	16	0.71%
Line drying	22	35%	8	0.35%
Driving behavior	88	25%	28	1.23%
Carpooling & Trip-chaining	132	15%	23	1.02%
Totals	855		449	20%

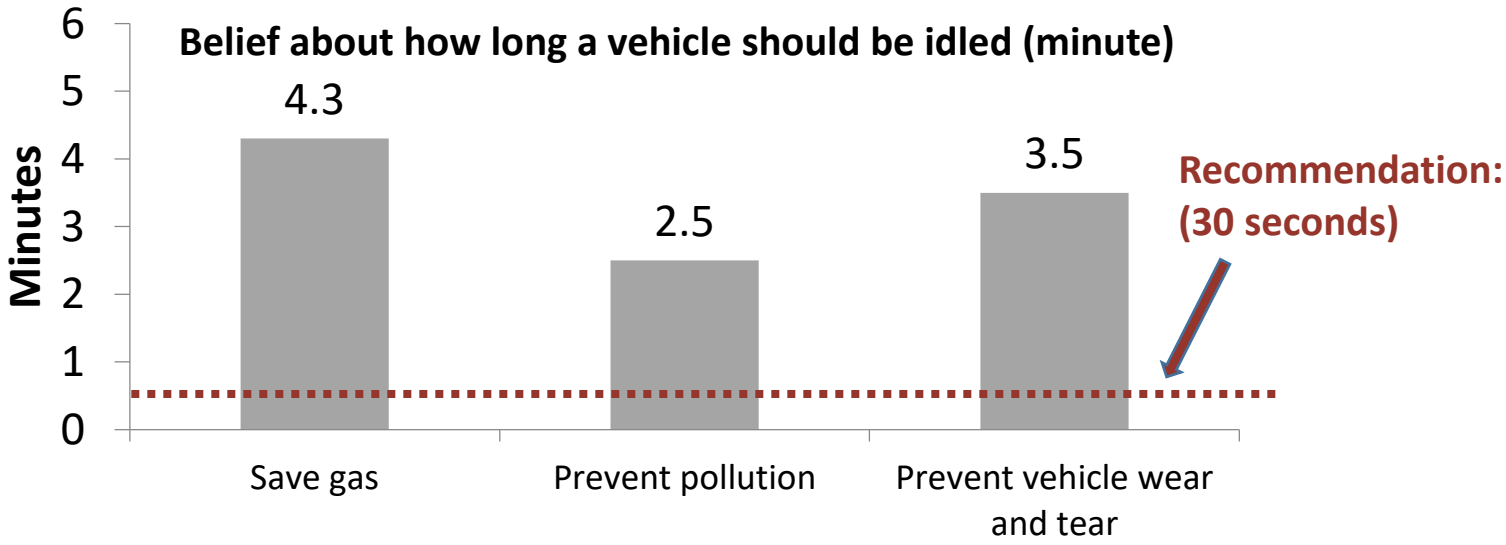
Social Norms and Home Energy Use
Monthly v. Immediate Feedback



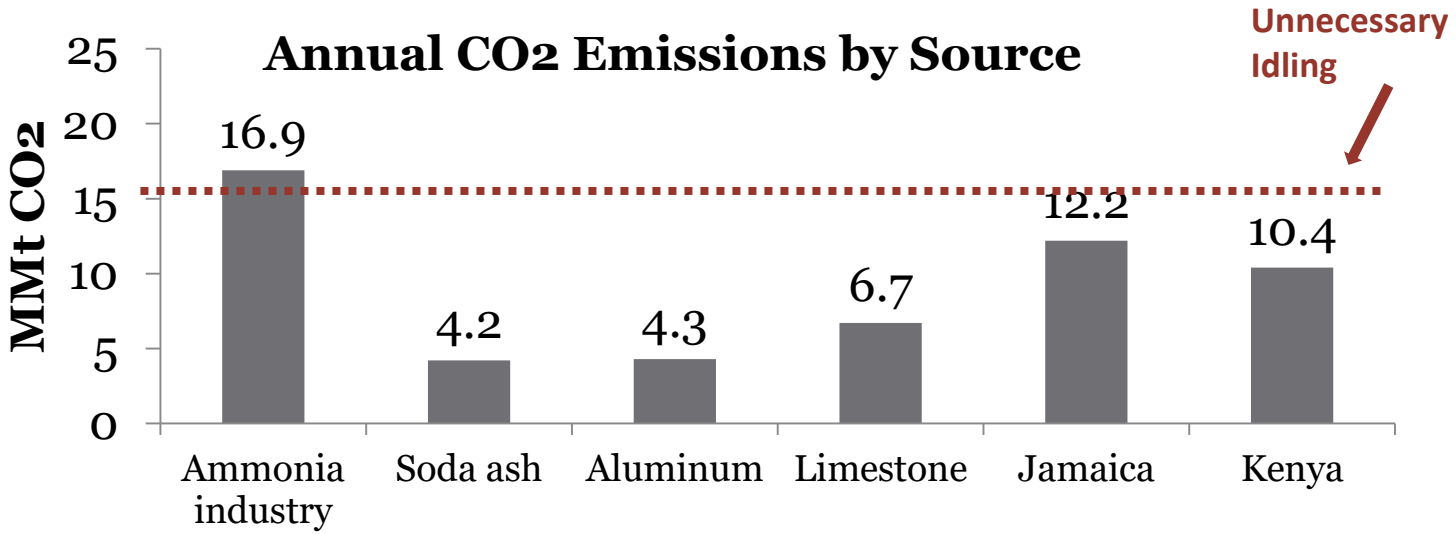
- Avoid the magnetic middle:
  - Solution: Smiley Faces
  - Reminder of injunctive norm

Household Opportunity
Myth Busting
Idling/Handwashing/Dryers/Printing

- Over 80% of Americans hold outdated beliefs about how long it is beneficial to idle a vehicle



Household Opportunity Myth Busting



The Problem of Scale

House Energy and Commerce Committee Perspective (2007)

The residential sector is composed of a “very large number of sources that are each responsible for very low emissions,” so inclusion of the residential sector in the climate mitigation effort would be an “administrative burden.”

Source: Dingell, John D. and Boucher, Rick (2007). *Climate Change Legislation Design White Paper: Scope of a Cap-and-Trade Program*, U.S. House of Representatives Committee on Energy and Commerce. Available at http://www.usclimatepartnership.org/documents/ClimateChangeLegislationDesignWhitePaper_10.07.pdf.

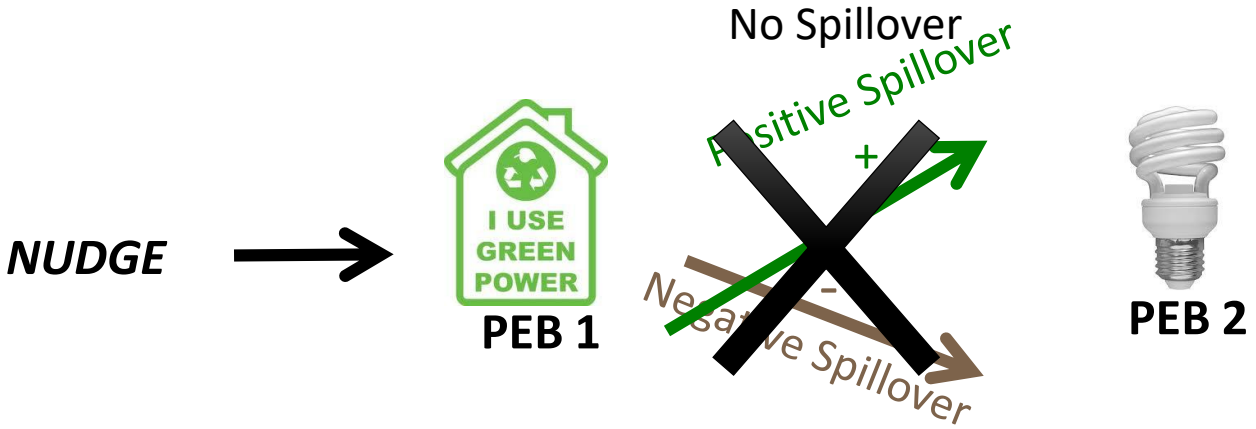
Barrier/Opportunity
The Problem of Scale
Types of Employee Energy Benefits

Maki, McKinney, Cohen, Vandenbergh & Gilligan, under review

Subsidies	Incentives	Transportation Support	Information	Other
Offer discounts for solar panels	Provide rewards for carpooling	Reserve preferential parking for carpools	Provide informational pamphlets, newsletters, or internal websites	Support working from home
Offer discounts for hybrid cars	Offer discounts, rewards, or free passes for taking the bus	Organize carpooling to work programs	Offer classes/courses	Host local farmer's markets
Offer discounts for home energy audits or retrofits	Provide rewards for people who walk or bike to work	Reserve preferential parking for hybrids	Provide carbon footprint calculators	Organize environmental volunteering opportunities
	Use competitions, quizzes, or games to incentivize home behavior change	Host electric car charging station	Offer access to energy use feedback software	Encourage donations/dollar-for-dollar matching
	Offer discounts for other "green" products (e.g., recycled goods, organic food)	Provide free bike storage		
	Provide free energy efficient lightbulbs	Organize guaranteed rides home for people who miss the bus		
		Organize shuttle service to work/ between work sites		

Spillover
The Question

Does the adoption of a pro-environmental behavior (PEB) in response to an intervention affect the likelihood of adopting subsequent PEB's?



Spillover
Competing Theories
& Conflicting Evidence

Positive Spillover

Virtuous Escalator
(e.g., Thøgersen 1999; Willis & Schor 2010)

Foot in the Door Effect
(e.g., Friedmen & Fraser, 1966)

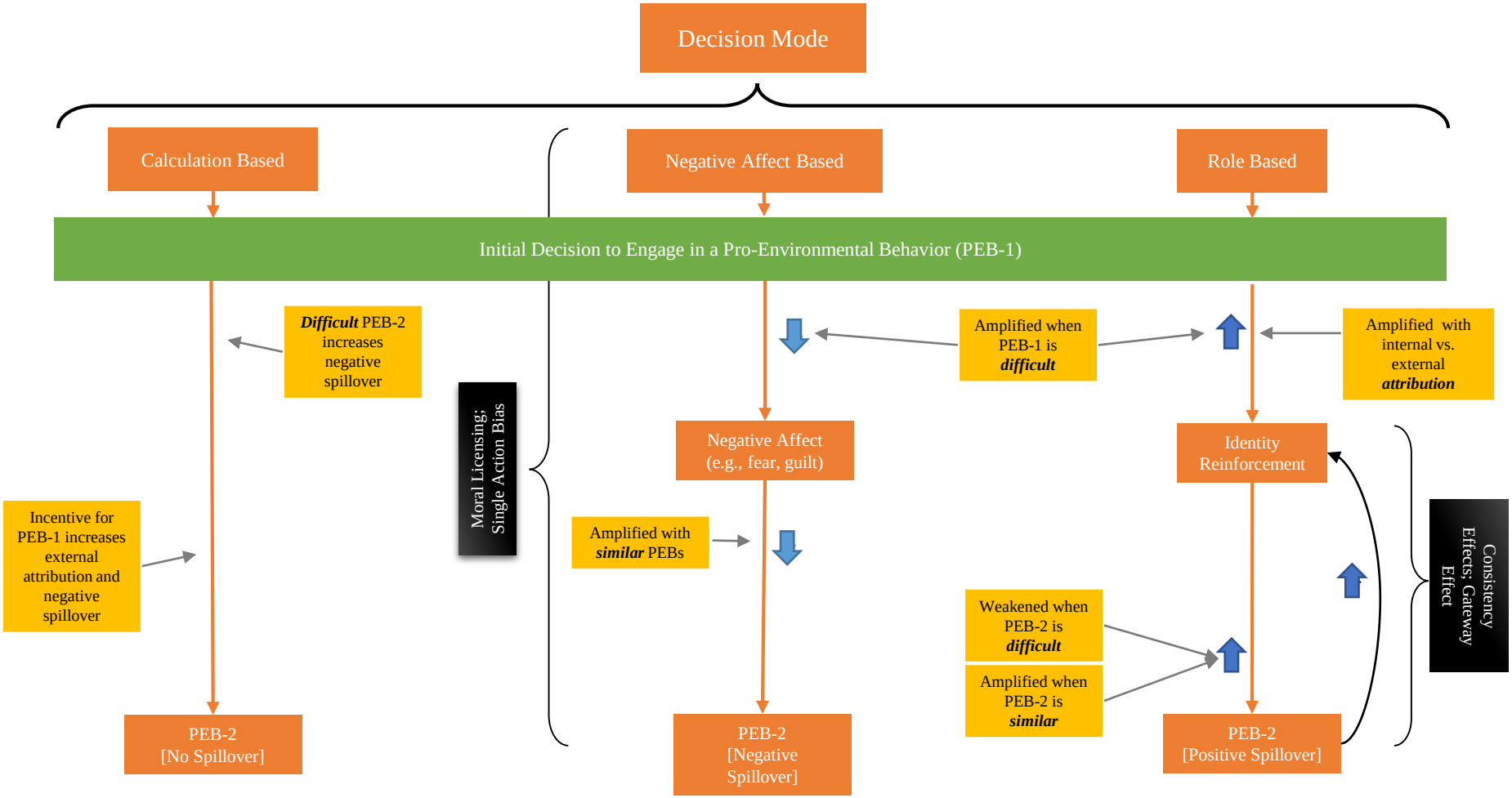
Self-Perception theory
(e.g., Bem, 1972)

Negative Spillover

Single Action Bias
(e.g., Weber, 1997; Hansen et al., 2004b)

Rebound/Takeback Effects
(e.g., Hirst et al., 1985; Binswanger, 2001; Ehrhardt-Martinez & Laitner, 2010)

Moral Licensing
(e.g. Jacobsen et al., 2012)



Truelove, Carrico, Weber, Raimi & Vandenberh (2014). Positive and negative spillover of pro-environmental behavior: An integrative review and theoretical framework. *GEC.*

Spillover
Preliminary Conclusions

- Identity (political and environmental) seems to be an important element of spillover
- Ease of the initial behavior seems to matter
- Future questions:
  - The role of ease/difficulty
  - Behavioral similarity
  - Internal vs external attribution
- Meta-analysis of the spillover literature

Climate Change Justice

- What is Justice?
- Intra-Generational Justice
- Inter-Generational Justice
- Framing

Intra-Generational Justice
Ability to Pay for Mitigation/Near-Term Climate Effects

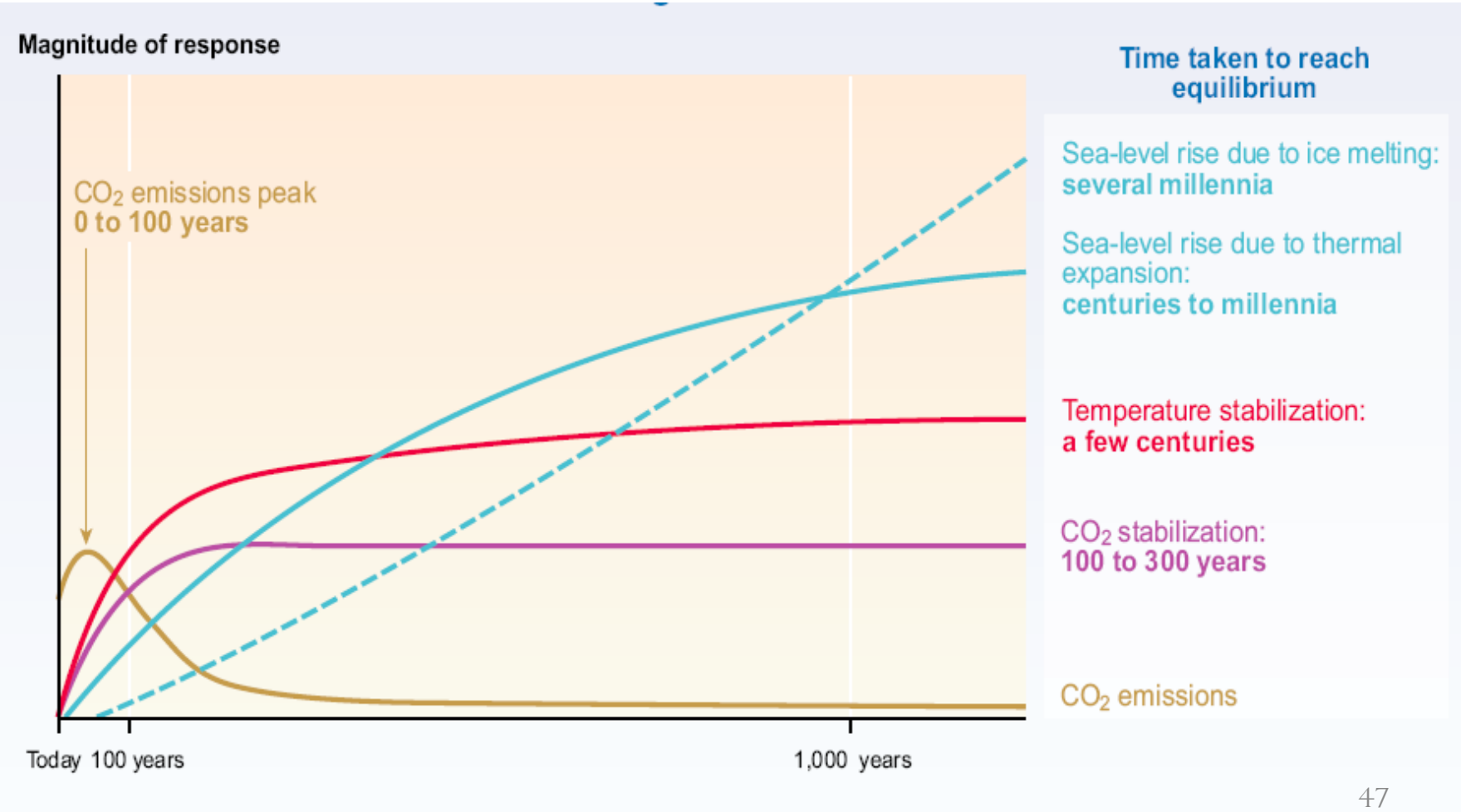
People living on less than $2.00 a day

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
People living on less than 2005 PPP $2.00 a day (millions)									
East Asia & Pacific	1,278	1,280	1,238	1,274	1,262	1,108	1,105	954	729
China	972	963	907	961	926	792	770	655	474
Europe & Central Asia	35	28	25	32	49	56	68	57	42
Latin America & Caribbean	90	110	103	96	96	107	111	114	94
Middle East & North Africa	46	44	47	44	48	52	52	51	51
South Asia	799	836	881	926	950	1,009	1,031	1,084	1,092
India	609	636	669	702	735	757	783	813	828
Sub-Saharan Africa	294	328	351	393	423	471	509	536	556
Total	2,542	2,625	2,646	2,765	2,828	2,803	2,875	2,795	2,564
Share of people living on less than 2005 PPP $2.00 a day (%)									
East Asia & Pacific	92.6	88.5	81.6	79.8	75.8	64.1	61.8	51.9	38.7
China	97.8	92.9	83.7	84.6	78.6	65.1	61.4	51.2	36.3
Europe & Central Asia	8.3	6.5	5.6	6.9	10.3	11.9	14.3	12.0	8.9
Latin America & Caribbean	24.6	28.1	24.9	21.9	20.7	22.0	21.8	21.6	17.1
Middle East & North Africa	26.7	23.1	22.7	19.7	19.8	20.2	19.0	17.6	16.9
South Asia	86.5	84.8	83.9	82.7	79.7	79.9	77.2	77.1	73.9
India	86.6	84.8	83.8	82.6	81.7	79.8	78.4	77.5	75.6
Sub-Saharan Africa	73.8	75.5	74.0	76.1	75.9	77.9	77.6	75.6	72.9
Total	69.4	67.7	64.3	63.4	61.6	58.3	57.1	53.3	47.0

WORLD BANK, POVERTY DATA: A SUPPLEMENT TO WORLD DEVELOPMENT INDICATORS 2008, at 11 tbl.3. (2008), *available at* http://siteresources.worldbank.org/DATASTATISTICS/Resources/WDI08supplement1216.pdf.

Inter-Generational Justice

Allow CO_2 to grow to 450-1000 ppm and then stabilize.
How does climate respond?



Climate Change Justice

500 Generations Affected

1 Emoji=7 Billion People

Private Supply Chain Pressure
Cross-Border Effects and Global Justice

"The world's largest and richest computer company said it would build, or work with its partners to build, more than 2 gigawatts of solar power plants meant to provide electricity to the company's suppliers. Observers said the move is likely to force Apple's rivals to ratchet up the mild pressure they've put on their contractors so far to reduce their carbon emissions to combat climate change…."

David Ferris, *Apple's solar commitment in China could roil tech industry*, Energy Wire (Oct. 23, 2015)

Disciplinary and Worldview Barriers/Opportunities
The Individual Responsibility Gap

(Vandenbergh & Steinemann 2007)

- Conservatives
  - Personal Responsibility
  - Climate Change
- Liberals
  - Climate Change
  - Personal Responsibility

Household-Corporate Private Initiatives
Employee Energy Benefits

Maki, McKinney, Vandenbergh, Cohen & Gilligan (under review)

- Scalable
- Employee Behavior at Work
- Employee Behavior at Home
- Examples – Kimberly Clark, Sony Pictures, 3M
- Behavioral Incentives

Barrier/Opportunity
Private Climate Governance
Other Actors and Actions

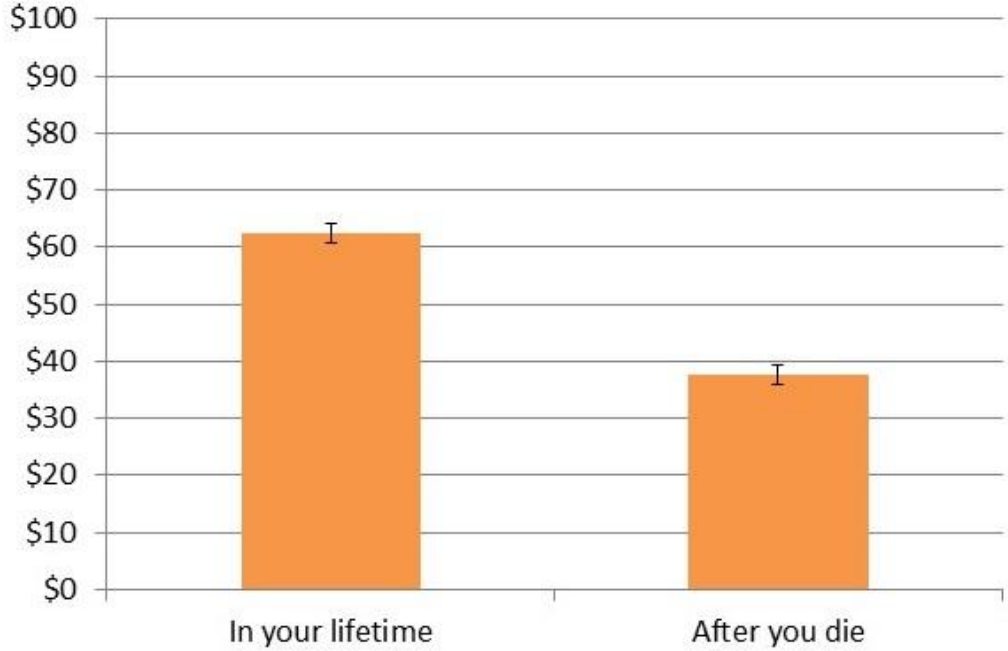
Vandenbergh & Gilligan (forthcoming 2017)

- Actors
  - Religious Organizations
  - Colleges & Universities
  - Small Businesses
  - Civic & Cultural Institutions
  - Hospitals
- Actions
  - Prediction Market
  - Legacy Registry

Barriers/Opportunity
Overcoming the Socio-Temporal Trap
Legacy

(Vandenbergh & Toner 2015)

How would you allocate $100 to buy a good reputation?



People allocate more toward a good reputation in their lifetime than for a good posthumous reputation:
$F(1, 203) = 53.659, p < .001$

But willing to put 38% of their resources toward their posthumous reputation.

Barriers/Opportunities
Reliability
Role of Meta-Analysis

Table 1
Descriptive statistics.

Study characteristic	Field observations	Mean	Std. Dev	Min	Max	Percent of Observations (%)	Percent of Papers (%)	Weighted average treatment effect (%)
Dependent variable								
Effect size (Percent)	156	−7.441	10.02	−55.00	18.80			−7.4%
Independent variables								
Individual usage feedback	156	0.7564	0.43	0	1	75.6	76.9	−8.5
Energy saving tips	156	0.7243	0.45	0	1	72.4	63.1	−9.6
Real time feedback	156	0.1217	0.33	0	1	12.2	22.0	−11.0
Audits and consulting	156	0.0833	0.28	0	1	8.3	6.2	−13.5
Monetary savings Info	156	0.3012	0.46	0	1	30.1	26.2	−7.7
Monetary incentives	156	0.2179	0.22	0	1	21.8	27.7	−5.7
Social comparisons	156	0.2371	0.42	0	1	23.7	20.0	−11.5

Delmas et al., 2013

Private Climate Governance Policy Gap

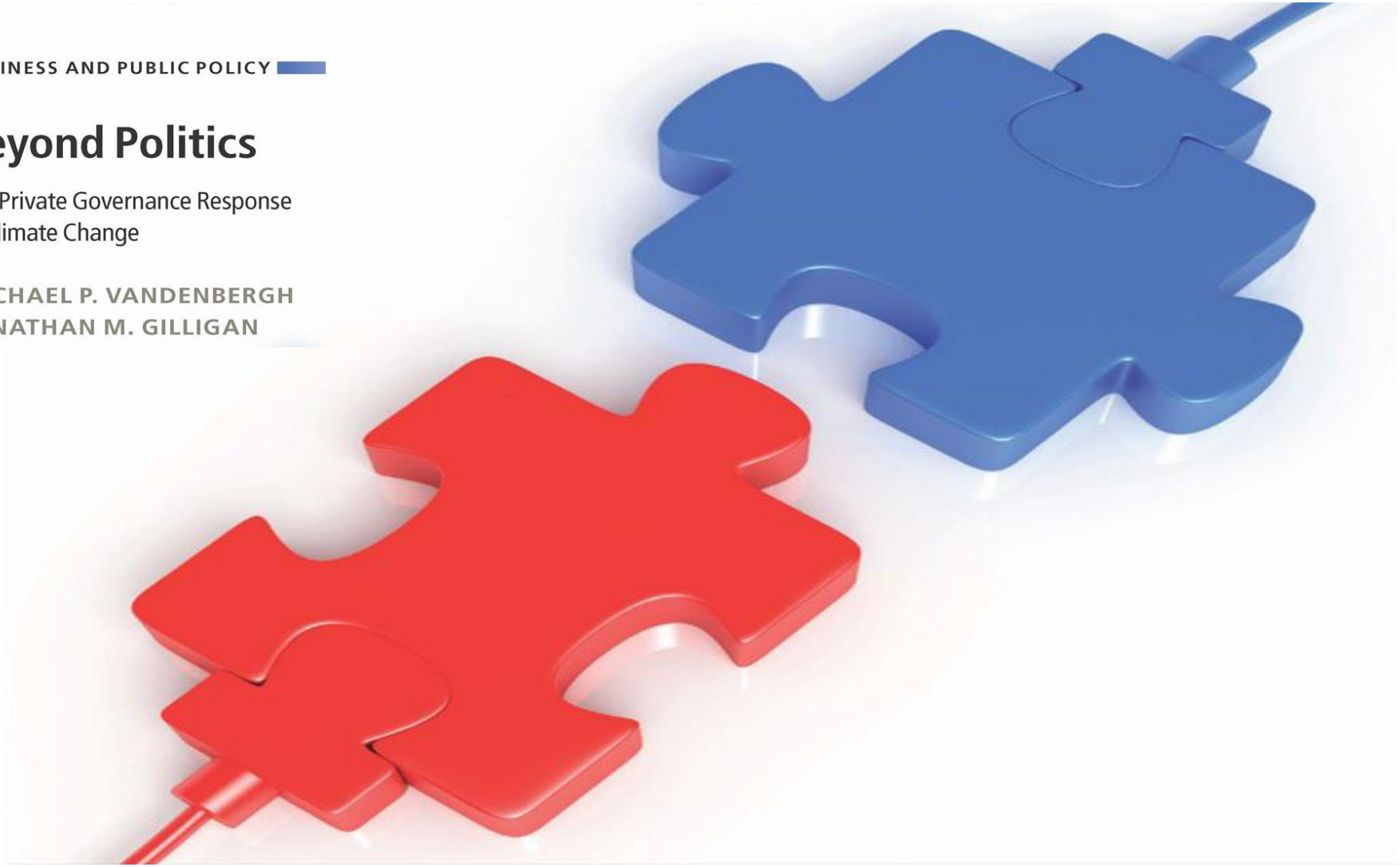
- Multi-Stakeholder Initiative
- Identify Overall Opportunity
- Prioritize Most Promising Immediate Opportunities
- Identify Private Actors to Address Them
- Identify Sources of Financial Support
- Identify Basic and Applied Areas Where Research is Needed
- Assess and Report on Outcomes

BUSINESS AND PUBLIC POLICY

Beyond Politics

The Private Governance Response to Climate Change

MICHAEL P. VANDENBERGH
JONATHAN M. GILLIGAN



Private Climate Governance Project

- MICHAEL P. VANDENBERGH & JONATHAN M. GILLIGAN, BEYOND POLITICS: THE PRIVATE GOVERNANCE RESPONSE TO CLIMATE CHANGE (Cambridge University Press) available at https://www.amazon.com/Beyond-Politics-Governance-Response-Business/dp/1316632482/

- Michael P. Vandenbergh & Jonathan M. Gilligan, *Beyond Gridlock*, 40 COLUM. ENVTL. L.J. 217 (2015) available at http://ssrn.com/abstract=2533643

- Climate Change Research Network Website at http://law.vanderbilt.edu/academics/academic-programs/environmental-law/climate-change-network/

- Behavioral Wedge Website at https://my.vanderbilt.edu/behavioralwedge/

- Beyond Politics Website at www.beyondpoliticsbook.com

- Buying Time TEDx Talk at http://youtu.be/2bXNcEQ6QX0

Thank You