Understanding Public Risk Perception: Responses to Changes in Perceived Risk

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OECD and IRGC Conference on Improving Risk Regulation
October 13, 2014

Preview

- What is perceived risk?
- Role and impact of crises
- Regulatory responses

- From a novel perspective
  - *Psychology* and *behavioral* decision theory/economics

- Weber, E.U. (in press). Understanding and responding to changes in perceived risk. In: E. Balleisen, L. Bennear, K. Krawiec, & J. Wiener (Eds.), Recalibrating Risk: Crises, Perceptions, and Regulatory Change.

Perceptions of risk and uncertainty

- In economics/finance, risk assessment is analytic
  - Metric that combines assessments of likelihood and severity of events
    - Variance of outcome distribution, value at risk, etc.

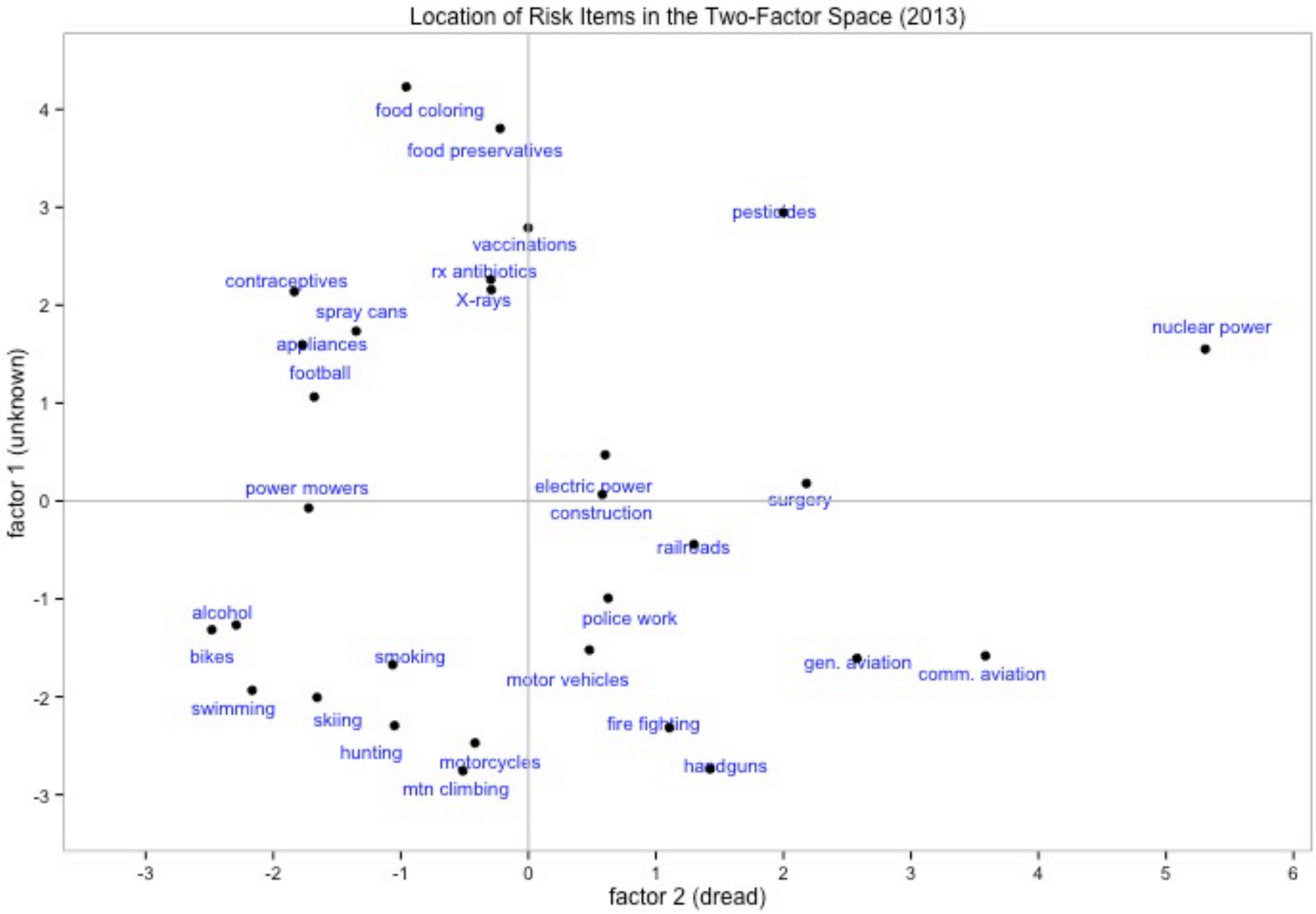
- In psychology, *risk perception* is an intuitive assessment of such events and their consequences
  - influenced by associative and affective/emotional processes
    - "Risk as feelings" (Loewenstein, Weber, Hsee, Welch, 2001)
    - Keynes (1936) "animal spirits"

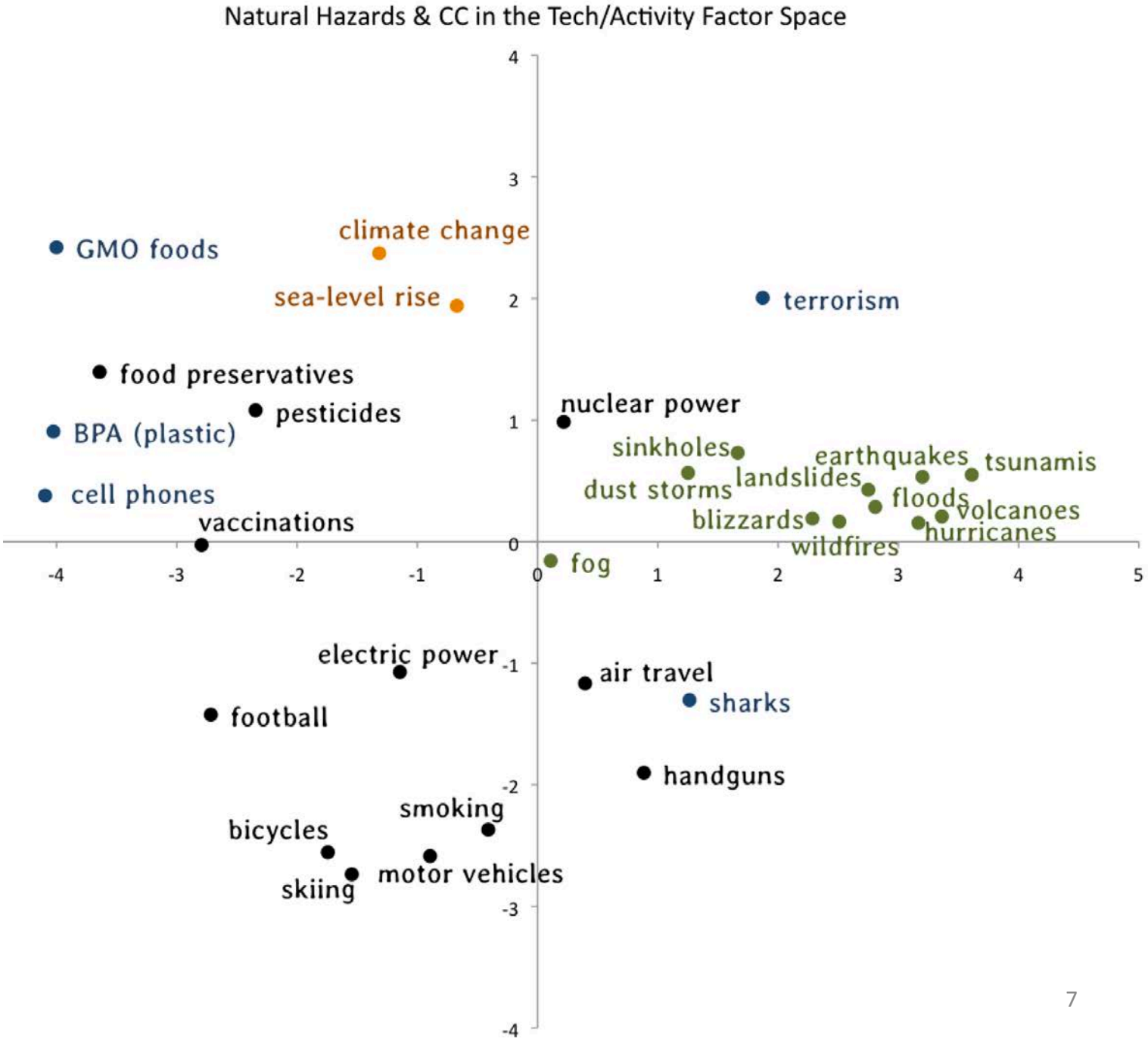
Thinking: Fast and Slow

- Kahneman (2003 and 2011) distinguishes two modes of thinking
  - ***System 1***, associative and affective processes that give rise to intuitive perceptions of risk; operate automatically and quickly, with little effort or sense of voluntary control, available to everyone from an early age
  - ***System 2***, analytic processes that give rise to analytic assessments of risk; work by algorithms and rules such as probability calculus, Bayesian updating, and formal logic; must be taught explicitly, requires conscious effort and control, and operates more slowly
  - System 1 orients and motivates adaptive behavior, especially under conditions of threat and uncertainty (Finucane et al. 2000; Loewenstein et al. 2001; Peters et al. 2006)

Psychological risk dimensions

- Influence people's intuitive perceptions of risk
  - Fischhoff, Slovic, Lichtenstein (1978), Slovic (1987)
  - Replication by Fox-Glassman & Weber (2014)
  - ***Dread risk***
    - captures emotional reactions to hazards like nuclear reactor accidents, or nerve gas accidents; perceived lack of control over exposure and because consequences may be catastrophic
  - ***Unknown risk***
    - degree to which a risk (e.g., DNA technology) is seen as new, with a perceived lack of control due to unforeseeable consequences
  - Both can be expected to increase after a major accident or crisis


Location of Risk Items in the Two-Factor Space (2013)
food coloring
food preservatives
pesticides
vaccinations
rx antibiotics
contraceptives
X-rays
spray cans
nuclear power
appliances
football
power mowers
electric power
surgery
construction
railroads
alcohol
police work
bikes
smoking
gen. aviation
comm. aviation
motor vehicles
swimming
skiing
fire fighting
hunting
motorcycles
handguns
mtn climbing
factor 1 (unknown)
factor 2 (dread)
4
3
2
1
0
-1
-2
-3
-3
-2
-1
0
1
2
3
4
5
6


Natural Hazards & CC in the Tech/Activity Factor Space
GMO foods
climate change
sea-level rise
terrorism
food preservatives
pesticides
nuclear power
BPA (plastic)
sinkholes
earthquakes
tsunamis
landslides
dust storms
floods
cell phones
volcanoes
blizzards
hurricanes
vaccinations
wildfires
fog
electric power
air travel
sharks
football
handguns
smoking
bicycles
motor vehicles
skiing
4
3
2
1
0
-1
-2
-3
-4
-4
-3
-2
-1
0
1
2
3
4
5

Need for Control

- Basic human need (Maslow, 1954)
  - Inability to control environment leads to depression and learned helplessness (Seligman, 1975)
- Positive personal exposure and resulting familiarity
  - increase perceived control and lower perceived risk, even when objective probabilities remain unchanged
- Negative experience (crises)
  - Signal lack of control, trigger fearful retreat to the safe and known
  - Implications
    - Prior analytic assessments of risk were wrong (model misspecification)
    - Regime change

Attention to Events

- *Small probability but previously experienced events*
  - Overweighted, when described (**Prospect Theory;** Kahneman & Tversky, 1979)
  - Weight depends on recency of experience in decisions from experience; underweighted on average, but strong overreaction when they occur → Availability heuristic
  - Captured by **reinforcement learning** models with strong recency weight (Weber, Shafir, Blais, 2004)

- *Common events*
  - Underweighted when described

- *Rare and not previous experienced events*
  - Underweighted both in decisions from description and from experience

Limited emotional capacity

- **Finite pool of worry**
  - Increases in concern about one risk are accompanied by decreases in another (Weber, 2006)
  - Nuclear power worries crowding out tsunami and GHG concerns
  - Ebola worries crowding out malaria or influenza concerns
- **Single action bias**
  - Tendency to engage in a single risk reduction or risk management behavior when action is triggered by concern (rather than analysis)
    - Farmers concerned about climate change engage in either production, pricing, or policy path to protection, but not all three (Weber, 1999)
    - Consumer showing psychological rebound effects after one pro-environmental behavior when done out of fear or guilt (Truelove et al., 2014)

All Perception is Relative

- Thurber “compared to what?”
- Neural adaptation
  - Weber’s (1834) law
    - Change or risk perceived relative to baseline

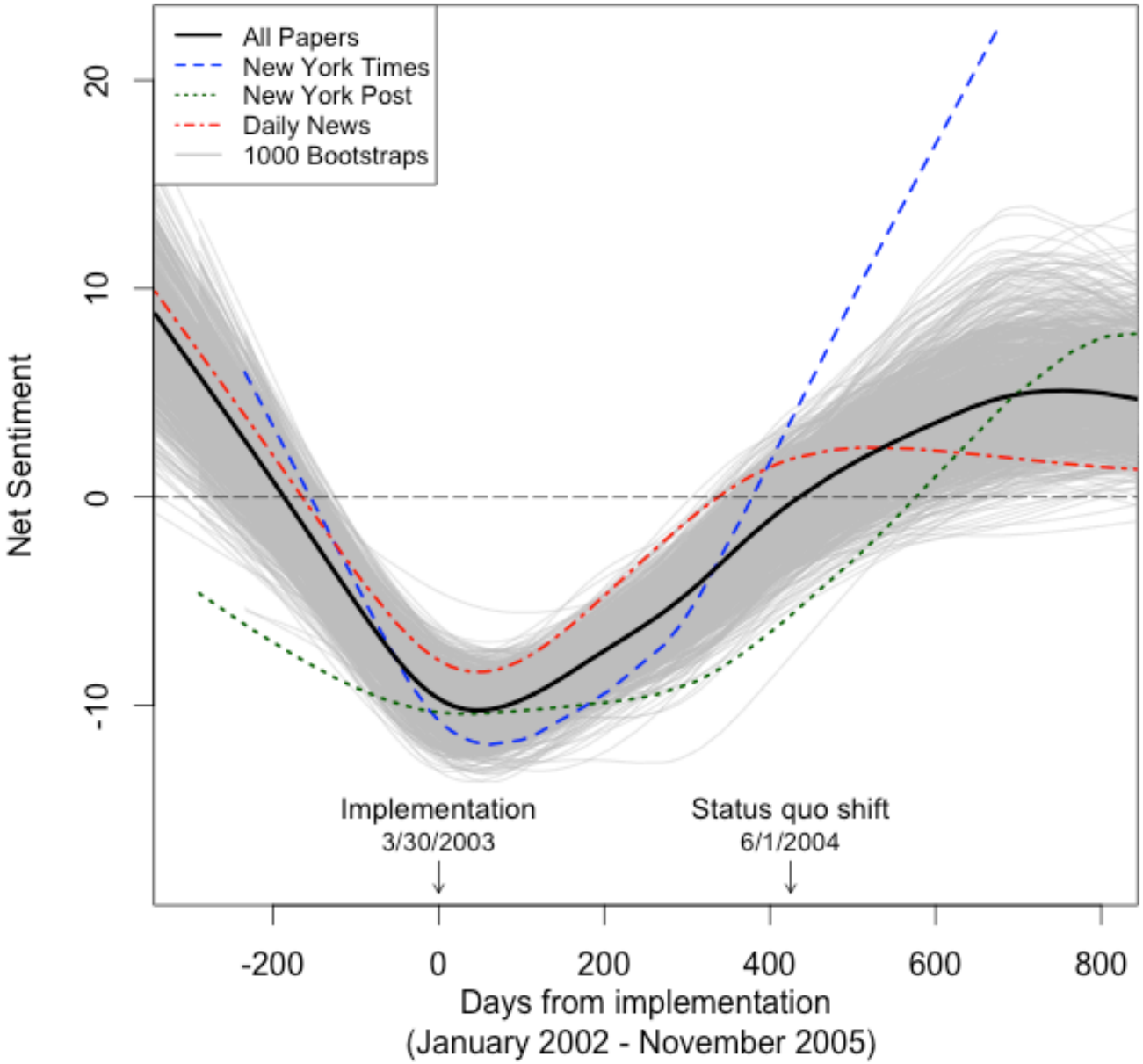
- Behavioral models of decisions under risk and uncertainty predict *status-quo bias*
  - Samuelson & Zeckhauser (1988)
  - Prospect theory (Kahneman & Tversky)
  - Query theory (Johnson et al., 2007; Weber et al., 2007)

Perceptions and Preferences Adapt

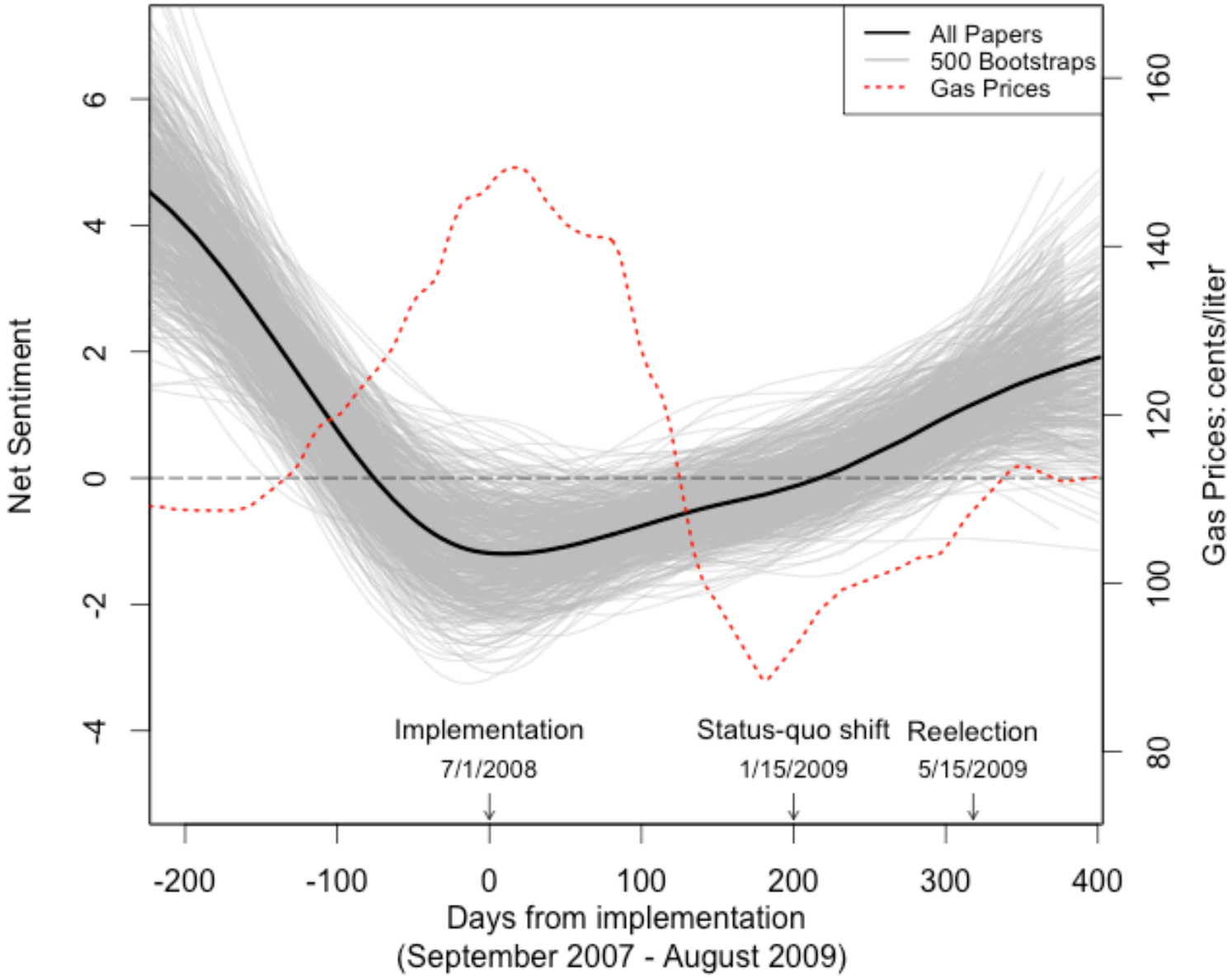
- People underestimate their adaptation to changes in status quo
  - winning lottery or becoming paralyzed

- Argument against policy making by public opinion poll
  - Media Analysis of two bold policies
    - Treuer, Weber, Appelt, Goll, Crookes (2014)
  - 2002 New York City smoking ban
    - Banned smoking in all public buildings in NYC, including bars
  - 2008 British Columbia carbon tax
    - Revenue neutral tax on greenhouse gas emissions

Newspaper coverage of the NYC smoking ban



Newspaper coverage of the BC carbon tax



Beyond Rational Actor/Social Planner

- Need to separate the descriptive from the normative
  - But look for omissions in rational model objective function
    - Equity and other motivations beyond rational self-interest
- Benefits to consider homo sapiens perception and response to risk (and time delay) in evaluation and implementation of policy options
  - Provides additional and less costly motivators (e.g., social approval)
  - Allows for design of more effective economic and legal interventions
  - Choice architecture tools

Conclusions

- Very partial introduction to behavioral decision theory as applied to response to risk
  - Complement not substitute to rational analysis
  - More complete view of human motivation and information processing as additional constraint but also asset
    - Explains “paradoxes”
    - Provides additional policy tools
- Most effective when considered ex-ante, rather than as ex-post band-aid
  - Social science crowd sourcing rather than competition
  - Systematic use of choice architecture in policy design and implementation rather than “nudge” fixes of policy failures

Expert vs. Public Disagreements

- Often explained by differences in how public vs. experts learn about the risk
  - Flood risks, airplane crash risk (flight insurance)
    - Experts by description (actuarial rates), public from experience
  - Vaccination side effect risks
    - Public by description (website, pamphlet), pediatricians from experience

- Done for first time in current IPCC report (FAR)
  - Ch. 2 on Risk Management in WG3 Report argues that
    - Rational model assumptions about human information processing and motivation/goals are incomplete at best
    - Functional input/output models sufficient to predict behavior; causal psychological process models required for effective interventions to change behavior