MERCATUS
RESEARCH

THE UNINTENDED CONSEQUENCES OF SAFETY REGULATION

Sherzod Abdukadirov

MERCATUS CENTER
George Mason University

Bridging the gap between academic ideas and real-world problems

ABOUT THE MERCATUS CENTER AT GEORGE MASON UNIVERSITY

The Mercatus Center at George Mason University is the world's premier university source for market-oriented ideas—bridging the gap between academic ideas and real-world problems.

A university-based research center, Mercatus advances knowledge about how markets work to improve people's lives by training graduate students, conducting research, and applying economics to offer solutions to society's most pressing problems.

Our mission is to generate knowledge and understanding of the institutions that affect the freedom to prosper and to find sustainable solutions that overcome the barriers preventing individuals from living free, prosperous, and peaceful lives.

Founded in 1980, the Mercatus Center is located on George Mason University's Arlington campus.

www.mercatus.org

Mercatus Center
George Mason University
3351 Fairfax Drive, 4th Floor
Arlington, VA 22201-4433
(703) 993-4930
mercatus.org

Release date: June 4, 2013

ABOUT THE AUTHOR

Sherzod Abdukadirov is a research fellow in the Regulatory Studies Program at the Mercatus Center at George Mason University. His research interests include the federal regulatory process, institutional reforms, and social complexity. His recent research has appeared in *Regulation*, *Constitutional Political Economy*, and the *Asian Journal of Political Science*.

ABSTRACT

This study examines how risk trade-offs undermine safety regulations. Safety regulations often come with unintended consequences in that regulations attempting to reduce risk in one area may increase risks elsewhere. The increases in countervailing risks may even exceed the reduction in targeted risks, leading to a policy that does more harm than good. The unintended consequences could be avoided or their impacts minimized through more careful analysis, including formal risk trade-off analysis, consumer testing, and retrospective analysis. Yet agencies face strong incentives against producing better analysis; increased awareness of risk trade-offs would force agencies to make unpalatable and politically sensitive choices, a prospect they would rather avoid. Further, a narrow focus on their mission often leads agencies to overlook the broader impacts of regulation. In addition, budget constraints induce agencies to prioritize new regulations over the review of existing ones. Thus, policymakers must mandate that agencies produce better analysis and subject their analyses to external oversight.

JEL code: K23

Keywords: unintended consequences, regulation, risk trade-offs, risk-risk, health-health, retrospective review, moral hazard, behavioral bias

I. INTRODUCTION

At the turn of the 21st century, biofuels appeared to be a solution to mounting concerns over greenhouse gas emissions, climate change, skyrocketing fuel prices, and dependence on foreign energy. When Congress passed the Energy Policy Act (EP Act) in 2005 with a renewable fuel standard (RFS) provision mandating that producers add ethanol to gasoline, it is unlikely that lawmakers thought the act would increase hunger and social unrest in the world's poorest countries. However, unintended consequences frequently accompany even the most well-intentioned policies.

Lawmakers specifically intended for the RFS provision to address both environmental and energy issues.[1] Ethanol is a cleaner fuel with lower carbon emissions than gasoline.[2] It is often added to gasoline as an oxygenate, allowing gasoline to burn more completely and thereby reducing carbon emissions. The EP Act simply ramped up the already increasing use of ethanol as a fuel additive with the hope of reducing greenhouse gas emissions. The law's proponents expected higher ethanol use to offset rising oil prices by filling at least some of the domestic demand for fuel.[3] Further, because most ethanol in the United States comes from domestically produced corn, policy advocates hoped the act would make the country less dependent on imported oil. As an added bonus, the policy would benefit US farmers. At the time, the policy seemed perfect.

As the Environmental Protection Agency (EPA) implemented the policy and further ramped it up in 2007,[4] scholars and environmentalists began to question its environmental and energy benefits.[5] Producing ethanol from corn or other crops consumes energy. For ethanol to be a viable fuel source, it should, on the balance,

---

1. Energy Policy Act of 2005, Pub. L. No. 109-58, 109 Stat. 594 (2005).

2. Brent D. Yacobucci, *Fuel Ethanol: Background and Public Policy Issues*, CRS Reports (Washington, DC: Congressional Research Service, March 3, 2006).

3. Ibid.

4. Energy Independence and Security Act of 2007, Pub. L. No. 110-40, 121 Stat. 1492 (2007).

5. David Pimentel and Tad W. Patzek, "Ethanol Production Using Corn, Switchgrass, and Wood; Biodiesel Production Using Soybean and Sunflower," *Natural Resources Research* 14, no. 1 (2005): 65–76; Timothy Searchinger et al., "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change," *Science* 319, no. 5867 (2008): 1238–40.

produce more energy than it consumes. Experts, however, disagree about whether this is the case.[6] Beyond ethanol's questionable viability as a fuel, the negative environmental impacts of corn production undermine ethanol's benefits. Corn farming leads to greater soil erosion than the farming of other crops. Higher pesticide and fertilizer use in corn farming compared to the farming of other crops increases water pollution. In addition, ethanol production leads to air pollution and greenhouse gas emissions, offsetting some of the environmental gains from its use as a fuel.[7]

Perhaps the most unexpected consequence of the policy has been its impact on worldwide food prices. The US fuels industry relied heavily on corn ethanol to comply with the RFS requirements. The resulting demand drastically increased the price for corn globally, not just domestically.[8] Since corn is a food staple across Latin America, higher corn prices effectively reduced purchasing power for lower-income households across the region. Also, as corn prices skyrocketed, farmers switched to corn production from production of other cereals, which reduced the latter's supply. At the same time, consumers substituted less expensive rice and wheat for corn. This substitution increased demand and prices for wheat and rice, staple foods across many regions in Africa and Asia. Overall, the RFS program led to higher prices for staple foods all over the world.[9] By some estimates, up to "70–75 percent [of the] increase in food prices was due to biofuels and the related consequences of low grain stocks, large land use shifts, speculative activity and export bans."[10] The spike in food prices, coupled with the global economic crisis, halted and even reversed the long-time trend in reducing malnutrition.[11] The number of undernourished in the developing world, which had been declining steadily since the 1970s, experienced a sharp increase between 2006 and 2009. In addition, the spike in food prices may have triggered political instability and food riots in lower-income countries, resulting in dozens of fatalities.[12]

---

6. Alexander E. Farrell et al., "Ethanol Can Contribute to Energy and Environmental Goals," *Science* 311, no. 5760 (2006): 506–8; Pimentel and Patzek, "Ethanol Production."

7. Pimentel and Patzek, "Ethanol Production."

8. David J. Tenenbaum, "Food vs. Fuel: Diversion of Crops Could Cause More Hunger," *Environmental Health Perspectives* 116, no. 6 (2008): 254–57; Donald Mitchell, "A Note on Rising Food Prices" (Policy Research Working Paper, World Bank, Washington, DC, August 18, 2008), http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2008/07/28/000020439_20080728103002/Rendered/PDF/WP4682.pdf.

9. Gal Hochman, Deepak Rajagopal, and David Zilberman, "Are Biofuels the Culprit? OPEC, Food, and Fuel," *American Economic Review* 100, no. 2 (2010): 183–87.

10. Mitchell, "A Note on Rising Food Prices," 17.

11. Food and Agriculture Organization of the United Nations, *The State of Food Insecurity in the World* (Rome, Italy: Food and Agriculture Organization of the United Nations, 2010).

12. Rabah Arezki and Markus Bruckner, "Food Prices and Political Instability" (working paper, International Monetary Fund, Washington, DC, March 28, 2011), http://www.imf.org/external/pubs/ft/wp/2011/wp1162.pdf; Marco Lagi, Karla Z. Bertrand, and Yaneer Bar-Yam, "The Food Crises and Political Instability in North Africa and the Middle East" (working paper, New England Complex Systems Institute, Cambridge, MA, September 28, 2011), http://necsi.edu/research/social/food_crises.pdf.

As the ethanol mandate demonstrates, policies attempting to reduce risk in one area often increase risks elsewhere. In some cases, the increases in countervailing risks may even exceed the reduction in targeted risks, leading to a policy that does more harm than good.[13] However, while the negative regulatory consequences are usually unintended, they are by no means unforeseeable. Agencies could minimize or avoid them through more careful analysis of proposed regulations before they became law.

While many studies point to the potential negative outcomes of risk trade-offs,[14] no studies measure the extent to which regulators face such trade-offs. Yet, there are reasons to believe that risk trade-offs in safety regulation will only become more common.[15] Given the nation's progress in tackling the most prominent environmental and health risks, future risk-reduction efforts will face diminishing returns. As the target risks shrink, the importance of countervailing risks will only grow. Furthermore, as safety regulation addresses increasingly complex systems and technologies, the potential for risk trade-offs arising in regulation will increase as well.

Unintended consequences of safety regulation are not always negative. A regulation reducing a target risk may also reduce another risk, increasing the regulation's benefits.[16] In fact, agencies already account for ancillary benefits in their analyses to strengthen their case for regulation.[17] However, as I explain later in this paper, agencies have strong incentives to overlook countervailing risks. Thus, it is important to address agencies' regulatory incentives to examine potential risk trade-offs.

In this study, I examine how risk trade-offs undermine safety regulations. In section II, I provide a brief background on the most common types of risk trade-offs in regulatory policy and give specific examples for each trade-off type. In section III, I examine the reasons behind the agencies' failure to conduct better analysis. Finally, in section IV, I suggest potential policies to minimize or prevent an increase in countervailing risks.

---

13. John D. Graham and Jonathan Baert Wiener define countervailing risk as "the chance of an adverse outcome that results from an activity whose ostensible purpose is to reduce the target risk." John D. Graham and Jonathan Baert Wiener, "Confronting Risk Tradeoffs," in *Risk vs. Risk: Tradeoffs in Protecting Health and the Environment*, ed. John D. Graham and Jonathan Baert Wiener (Cambridge, MA: Harvard University Press, 1995), 23.

14. See, for example, John D. Graham and Jonathan Baert Wiener, eds., *Risk vs. Risk: Tradeoffs in Protecting Health and the Environment* (Cambridge, MA: Harvard University Press, 1995); W. Kip Viscusi, "Risk-Risk Analysis," *Journal of Risk and Uncertainty* 8, no. 1 (1994): 5–17; Randall Lutter, John F. Morrall, and W. Kip Viscusi, "The Cost-per-Life-Saved Cutoff for Safety-Enhancing Regulations," *Economic Inquiry* 37, no. 4 (1999): 599–608.

15. Graham and Wiener, "Confronting Risk Tradeoffs," 11–12.

16. Richard L. Revesz and Michael A. Livermore, *Retaking Rationality: How Cost-Benefit Analysis Can Better Protect the Environment and Our Health* (New York: Oxford University Press, 2008).

17. Christopher C. DeMuth and Douglas H. Ginsburg, "Rationalism in Regulation," *Michigan Law Review* 108, no. 6 (2010): 877–912.

II. TYPES OF RISK TRADE-OFFS

A policy to reduce risk in one area may increase countervailing risks. Patrick Hofstetter and his colleagues use the metaphor of ripples caused by a pebble thrown into a pond to explain countervailing risks.[18] Regulation's direct impact is throwing the pebble, while the ripples it causes in the water represent the indirect effects. Sometimes the ripples can have a stronger effect than the stone's original impact. It is important to know the magnitude of countervailing risks to ensure that a regulation does not inadvertently cause more harm than good.

Lester Lave first proposed a systematic approach to analyzing the countervailing risks inherent in social risk-reducing regulation by using risk-risk analysis.[19] He advocated that policy analysts enumerate and quantify a regulation's direct and indirect impacts as thoroughly as possible when evaluating regulatory alternatives. Graham and Wiener extended Lave's framework to propose a risk trade-off analysis.[20] They advocated for formal risk trade-off analysis to be included in the overall regulatory impact analysis that agencies currently perform for major regulations.

In order to systematically examine risk trade-offs, Hofstetter and his colleagues proposed to classify indirect risks by source as follows:[21]

1. direct risk trade-offs
2. indirect risk trade-offs
3. behavioral changes
4. economy-wide effects

Agencies have to perform rigorous analyses to shed light on countervailing risks. Different indirect risks require different types of analysis. A few examples illustrate these risks and the analyses required to address them.

Direct Risk Trade-Off

Perhaps the most straightforward risk trade-off cases involve agencies juggling various risks associated with alternative actions. For example, agencies faced a direct risk trade-off between fatalities resulting from an airborne terrorist attack and driving-related deaths and injuries after 9/11 when the Aviation and Transportation Security Act (ATSA) became law.[22] Among other measures, the ATSA established

18. Patrick Hofstetter et al., "Tools for Comparative Analysis of Alternatives: Competing or Complementary Perspectives?," *Risk Analysis* 22, no. 5 (2002): 833–51.

19. Lester B. Lave, *The Strategy of Social Regulation: Decision Frameworks for Policy* (Washington, DC: The Brookings Institution, 1981).

20. Graham and Wiener, *Risk vs. Risk*.

21. Hofstetter et al., "Tools for Comparative Analysis of Alternatives."

22. Garrick Blalock, Vrinda Kadiyali, and Daniel H. Simon, "The Impact of Post-9/11 Airport Security Measures on the Demand for Air Travel," *Journal of Law and Economics* 50, no. 4 (November 2007): 731–55.

the Transportation Security Administration (TSA) charged with enhancing airport security efforts. Most visibly, the act put the TSA in charge of airport security and baggage screening. The government made these laws to avert similar catastrophic attacks in the future and to reassure the public that flying is safe.

While the heightened airport security may have reduced the threat of terrorist attacks, it increased travelers' costs of flying through the hassles of passenger and baggage screening. In 2005 alone, the value of the time lost to screening added up to $2.76 billion.[23] More importantly, it led 6 percent of passengers to drive instead of fly, particularly on shorter routes. Flying, however, is comparatively safer than driving. Per mile traveled, driving carries a risk of fatality that is 8.9 times greater than flying.[24] Unsurprisingly, in the months immediately following the 9/11 attacks, driving-related fatalities spiked. In the fourth quarter of 2002, more than 100 driving-related fatalities could be linked to the increased hassle of flying.[25] By fixating on reducing the risks of future terrorist attacks, the TSA overlooked the increasing risks resulting from passengers switching their mode of transportation.

In some cases, regulation may reduce risk for one group while increasing it for another. The outcome of the National Highway Traffic Safety Administration's (NHTSA) rule requiring auto manufacturers to install air bags provides an example. Since the 1960s, consumer advocates have lobbied for higher auto-safety standards. Ralph Nader, a well-known consumer advocate, gained nationwide prominence after he published his 1965 book *Unsafe at Any Speed*, which claimed that driving was unsafe and criticized the auto industry's slow response to consumers' safety concerns.[26] Prompted by a shifting public opinion and increased consumer advocacy and political lobbying, Congress passed the National Traffic and Motor Vehicle Safety Act in 1966.[27] The act charged the Department of Transportation with developing and implementing auto safety standards in order to reduce driving-related fatalities and injuries.

One of the earliest steps to increase auto safety was the requirement that all cars be equipped with seat belts. However, historically low seat belt use rates (only 12.5 percent in 1984) prompted the NHTSA to require passive restraint systems, which included automatic seat belts and air bags, in its 1984 rule.[28] The NHTSA's analysis

---

23. Jerry Ellig, Amos Guiora, and Kyle McKenzie, "A Framework for Evaluating Counterterrorism Regulations," Mercatus Policy Series (Arlington, VA: Mercatus Center at George Mason University, September 2006).

24. Jamie L. Belcore and Jerry Ellig, "Homeland Security and Regulatory Analysis: Are We Safe Yet?," *Rutgers Law Journal* 40, no. 1 (2008): 1–96.

25. Garrick Blalock, Vrinda Kadiyali, and Daniel H. Simon, "Driving Fatalities after 9/11: A Hidden Cost of Terrorism," *Applied Economics* 41, no. 14 (2009): 1717–29.

26. Ralph Nader, *Unsafe at Any Speed* (New York: Grossman Publishers, 1965).

27. Carol Maclennan, "From Accident to Crash: The Auto Industry and the Politics of Injury," *Medical Anthropology Quarterly* 2, no. 3 (1988): 233–50.

28. Department of Transportation, National Highway Traffic Safety Administration, "Federal Motor Vehicle Safety Standards; Occupant Crash Protection," *Federal Register* 62, no. 3 (1997): 807–32.

accompanying the rule estimated that air bags provided little additional safety for passengers already using seat belts.[29] Thus, its rule targeted primarily the unbelted passengers. The rule gave automakers a choice between the passive restraint systems they could implement (automatic seat belts or air bags) to comply with the safety standards.

When the NHTSA promulgated the rule in 1984, it had no reliable real-world data on the true cost of air bags or their effectiveness rates.[30] Air bag technology has been available since the 1950s,[31] but few manufacturers installed air bags in cars until Congress mandated air bag installation in 1991.[32] The agency's estimates were therefore based on experimental crash tests and engineering judgment. The crash tests, conducted using an adult male–sized dummy, promised considerable auto safety improvements. What the agency did not anticipate based on the limited data available was that air bags would lead to the deaths of children.[33] Later studies estimated that while air bags reduced fatalities by 24 percent among adults, they increased fatalities by 34 percent among children under the age of 10.[34] The NHTSA's own estimates showed that by 1996, air bags had saved at least 1,664 lives.[35] At the same time, air bags had fatally injured at least 32 children, shifting traffic fatality risks from adults to children—hardly what the agency intended when it issued the rule. In 1997, the agency amended its rule to allow for less aggressive air bag deployment and other measures aimed at reducing air bag injuries.[36]

The air bag rule example highlights the importance of thorough analysis in safety regulation. While the agency eventually changed the rule to correct the negative outcomes, the damage it caused was irreversible. Had the agency been more through in its original analysis, children's deaths could have been avoided.

---

29. Department of Transportation, *National Highway Traffic Safety Administration, Final Regulatory Impact Analysis, Amendment to Federal Motor Vehicle Safety Standard* 208, Passenger Car Front Seat Occupant Protection (Washington, DC: Department of Transportation, National Highway Traffic Safety Administration, 1984), http://www-nrd.nhtsa.dot.gov/pubs/806572.pdf.

30. Kimberly M. Thompson, Maria Segui-Gomez, and John D. Graham, "Validating Benefit and Cost Estimates: The Case of Airbag Regulation," *Risk Analysis* 22, no. 4 (2002): 803–11.

31. Keith Miller, "Deflating the Airbag Pre-emption Controversy," *Emory Law Journal* 37, no. 4 (1988): 897–948.

32. Department of Transportation, National Highway Traffic Safety Administration, "Federal Motor Vehicle Safety Standards; Occupant Crash Protection."

33. Thompson, Segui-Gomez, and Graham, "Validating Benefit and Cost Estimates."

34. Elisa R. Braver et al., "Reductions in Deaths in Frontal Crashes among Right Front Passengers in Vehicles Equipped with Passenger Air Bags," *Journal of the American Medical Association* 278, no. 17 (1997): 1437–39.

35. Department of Transportation, National Highway Traffic Safety Administration, "Federal Motor Vehicle Safety Standards; Occupant Crash Protection."

36. Ibid.

Indirect Risk Trade-Offs

The term "indirect risk trade-offs" refers to the link between regulation-induced expenditures and increased mortality risks. The logic of indirect risk trade-offs is based on the well-established link between income and mortality.[37] Scholars have found that differences in income (as well as closely related factors such as education, access to health care, occupation, personal habits, and nutrition) account for differences in mortality in the national population. Similarly, unemployment is associated with significant risks, including increases in heart attacks, alcoholism, crime, suicides, and child abuse.[38] Extending these findings, Aaron Wildavsky noted that as regulation-induced expenditures reduce national income, some of which would have been spent on reducing risk and improving health, they increase the population's health risks.[39] Thus, regulation's negative impacts of lower private spending on health and safety offset the positive safety impacts.

Ralph Keeney formalized Wildavsky's hypothesis by estimating the increased mortality from higher regulation expenditures.[40] He found that if individuals paid for regulations in proportion to their income, safety regulations that cost more than $17 million to $21 million per life saved actually led to more deaths through increased poverty.[41] Later studies estimating the threshold at which safety regulations led to more deaths through increased poverty generally confirmed Keeney's findings. The threshold estimates ranged between $6.5 million and $15 million per life saved in one study, to $20 million per life saved in another study.[42] The high costs of safety regulation may have even stronger negative impacts on low-income families, since low-income families stand to gain the most from having more income to spend on private safety measures such as better health insurance or a safer car.[43]

---

37. Evelyn M. Kitagawa and Philip M. Hauser, *Differential Mortality in the United States: A Study in Socio-economic Epidemiology* (Cambridge, MA: Harvard University Press, 1973); Ralph R. Frerichs et al., *Cardiovascular Diseases in Los Angeles, 1979–1981* (Los Angeles: American Heart Association, Greater Los Angeles Affiliate, 1984); Michael Drummond et al., "Health Economics: An Introduction for Clinicians," *Annals of Internal Medicine* 107, no. 1 (1987): 88–92.

38. Ralph L. Keeney, "Mortality Risks Induced by Economic Expenditures," *Risk Analysis* 10, no. 1 (1990): 147–59.

39. Aaron B. Wildavsky, "Richer Is Safer," *Financial Analysts Journal* 37, no. 2 (1981): 19–22; Aaron B. Wildavsky, *Searching for Safety* (New Brunswick, NJ: Transaction Publishers, 1988).

40. Keeney, "Mortality Risks Induced by Economic Expenditures"; Ralph L. Keeney, "Mortality Risks Induced by the Costs of Regulations," *Journal of Risk and Uncertainty* 8, no. 1 (1994): 95–110.

41. Values are reported in 2012 dollars.

42. John D. Graham, Bei-Hung Chang, and John S. Evans, "Poorer Is Riskier," *Risk Analysis* 12, no. 3 (1992): 333–37; Kenneth S. Chapman and Govind Hariharan, "Controlling for Causality in the Link from Income to Mortality," *Journal of Risk and Uncertainty* 8, no. 1 (1994): 85–93; Randall Lutter and John F. Morrall, "Health-Health Analysis: A New Way to Evaluate Health and Safety Regulation," *Journal of Risk and Uncertainty* 8, no. 1 (1994): 43–66.

43. Diana Thomas, "Regressive Effects of Regulation" (Working Paper, Mercatus Center at George Mason University, Arlington, VA, November 2012).

Behavioral Changes

Attempts to reduce risk through regulation often impact consumer behavior by changing individuals' incentives. For example, by making an activity safer, regulations may induce some individuals to behave more recklessly. In a seminal article examining the impacts of auto-safety regulation, Sam Peltzman demonstrated that drivers compensate for increased safety by riskier driving.[44] This behavior became known as the Peltzman effect.

One example of the Peltzman effect is the impact of compulsory auto insurance laws on traffic fatalities. The purpose of auto insurance is to guarantee compensation to accident victims.[45] Without auto insurance, traffic accident victims would have to demand compensation for health and property damages through the courts. If the liable party were unable to pay, the victims would remain without due compensation. Auto insurance reduces the risk that individuals causing car accidents will lack funds to compensate accident victims for the necessary medical care and property damages.

As car ownership increased throughout the 20th century, so did the problems related to compensation for traffic accidents, leading to calls for compulsory auto insurance. Massachusetts became the first state to require drivers to purchase liability insurance for their vehicles in 1927.[46] New York and North Carolina followed suit, passing similar laws in the mid-50s. In the 1960s and 1970s, increased public awareness of traffic fatalities helped spread compulsory auto insurance to most states. The number of states requiring auto insurance increased to 22 by 1975 and to 45 by 1997.[47]

The compulsory auto insurance laws achieved their intended results: they reduced the number of uninsured motorists.[48] They also, however, created an incentive for greater risk-taking by insured motorists, which increased fatal traffic accidents. The effect of insurance on drivers is substantial: by some estimates, for each percentage point decrease in the number of uninsured motorists, traffic fatalities increased by 2 percent.[49] Regulations requiring auto insurance reduced drivers' risk of financial hardship and uncompensated injuries and property damages, and the lower financial risk reduced drivers' incentives to exercise caution while driving. Thus, risk-reducing regulation inadvertently induced drivers to take more risk.

---

44. Sam Peltzman, "The Effects of Automobile Safety Regulation," *Journal of Political Economy* 83, no. 4 (1975): 677–726.

45. Robert E. Keeton and Jeffrey O'Connell, "Basic Protection—A New Plan of Automobile Insurance," *Journal of Risk and Insurance* 32, no. 4 (December 1965): 539.

46. Alma Cohen and Rajeev Dehejia, "The Effect of Automobile Insurance and Accident Liability Laws on Traffic Fatalities," *Journal of Law and Economics* 47, no. 2 (2004): 357.

47. Ibid.

48. Ibid.

49. In the study, the authors compared states that required auto insurance with the states that didn't. The authors controlled for the number of registered cars and socio-economic factors. Ibid., 388.

Consumers' unexpected reactions to safety regulation are another source of offsetting risks. For instance, the 2001 Food and Drug Administration (FDA) advisory on the health risk posed by mercury in commercial fish may have caused more harm than good. Since the early 1990s, consumer advocates have warned that mercury in fish poses risks to small children.[50] High doses of mercury can harm an unborn baby's or small child's nervous system.[51] In response to increasing public concern, the FDA advised that pregnant women, nursing mothers, and young children reduce their consumption of certain types of fish and shellfish that contain high levels of mercury.[52]

The consumer response to the FDA's well-intentioned advisory led to adverse effects on public health. The agency expected at-risk consumers to switch from species with high mercury levels to ones with safe mercury levels. Instead, many at-risk consumers reduced their consumption of all fish.[53] But fish is a primary source of omega-3 fatty acids, which are important to healthy development in infants and young children. By consuming less fish, pregnant and nursing mothers have actually increased the health risks to their children. Thus, whatever risks decreased when mothers and children abstained from consuming high-mercury fish were more than offset by the reduced consumption of omega-3 fatty acids and other substances in fish that are vital to healthy development in young children.[54] Despite the FDA's intentions, consumers failed to differentiate between species with high and low mercury levels and substitute accordingly, leading to an outcome that left consumers with higher risk than the original circumstances.

Economy-Wide Effects

While agencies may intend for their policies to have narrow impacts, regulations may have economy-wide consequences beyond the regulators' target. Higher compliance costs and changes in consumer behavior may affect prices and production in distant sectors. Given the narrow focus of agencies' regulatory analysis, economy-wide impacts often catch regulators off guard.

Rising world food prices resulting from the US renewable fuel policies described in the introduction demonstrate this point. When the EPA established the RFS

---

50. "F.D.A. Warns Women Not to Eat Some Fish," *New York Times*, January 14, 2001.

51. P. Grandjean, "Mercury Risks: Controversy or Just Uncertainty?," *Public Health Reports* 114, no. 6 (1999): 512–15.

52. Food and Drug Administration, "An Important Message for Pregnant Women and Women of Childbearing Age Who May Become Pregnant about the Risks of Mercury in Fish," *Food and Drug Administration, Consumer Advisory*, March 2001, http://www.fda.gov/OHRMS/DOCKETS/ac/02/briefing/3872_Advisory%201.pdf.

53. Jay P. Shimshack and Michael B. Ward, "Mercury Advisories and Household Health Trade-Offs," *Journal of Health Economics* 29, no. 5 (2010): 674–85.

54. Ibid.

program under the EP Act of 2005, it had environmental concerns in mind. The agency hoped the RFS program would reduce greenhouse gas emissions, lessen the country's dependency on fossil fuels, and help expand the domestic renewable fuels sector. In its analysis, however, the EPA failed to foresee the impact the program would have beyond its targets. What the EPA intended as a domestic environmental policy turned out to have a major impact on national security and health far beyond US borders.

III. SOURCES OF UNINTENDED RISK TRADE-OFF CONSEQUENCES

Much has been written about unintended consequences, their origins, and ways to avoid them. In his classic essay "What Is Seen and What Is Not Seen," the eminent French political economist Frédéric Bastiat attributed unintended consequences to poor analysis. He claimed that "there is only one difference between a bad economist and a good one: the bad economist confines himself to the visible effect; the good economist takes into account both the effect that can be seen and those effects that must be foreseen."[55] Thus, when economists confine themselves to analyzing only the immediate effects of a given policy, they are bound to miss its larger impacts.

Another seminal work on the subject by distinguished American sociologist Robert Merton claims that ignorance and error are the main culprits.[56] Policy analysts, according to Merton, sometimes lack the necessary expertise or fail to collect all the relevant information when constructing a policy. In some cases, the necessary information may be unavailable or too costly to collect. Alternatively, analysts may base their judgment on flawed assumptions or methodology. Similar to Bastiat's bad economists, they miss the potential undesirable effects of their proposed policies.

In the risk trade-off examples described above, regulators failed to examine the regulations' impacts beyond their direct, visible effects. While regulators did not intend some of the regulatory consequences in these cases, a careful analysis might have alerted regulators to potential problems with the promulgated regulations. Given their substantial resources, federal agencies are fully capable of producing high-quality analysis. Then why do agencies fail to account for countervailing risks?

One possible source of unintended consequences is the differing ability of various groups to advance their interests.[57] Risk trade-offs often involve transferring risks from one group to another. Direct risks may fall on concentrated interests, while countervailing risks may affect a group that has fewer resources or is less organized.

---

55. Frédéric Bastiat, *Selected Essays in Political Economy* (Irvington-on-Hudson, NY: Foundation for Economic Education, 1968), 6.

56. Robert K. Merton, "The Unanticipated Consequences of Purposive Social Action," *American Sociological Review* 1, no. 6 (1936): 894–904.

57. Graham and Wiener, *Risk vs. Risk*.

When regulations transfer risk from powerful concentrated interests to the broader public or a vulnerable group, agencies may overlook or dismiss countervailing risks.

The unintended consequences of the RFS program are a good example. The voices of environmentalists and the US agricultural industry were prominent in pursuing the policy. Both groups supported the push for wider renewable fuels use. For the environmental activists, the policy addressed increasing concerns over greenhouse gas emissions. The agricultural industry enjoyed the windfall profits stemming from a higher demand for corn and other crops. The one group excluded from the rulemaking process was consumers, especially the world's poorest consumers. Had they been given a voice, they might have raised concerns over rising food prices disrupting their livelihoods. They might have pointed out that the harm to the poor resulting from the RFS program might exceed the program's environmental benefits. Yet, given their minimal resources, the world's poor have a limited ability to influence US politics. While the rulemaking process provides the public with a chance to comment, typically only the organized interests have the knowledge and resources to influence regulatory policy. The poorest consumers simply cannot afford to stay abreast of, let alone shape, policy.

A related source of unintended consequences is agencies' tunnel vision. Supreme Court Justice Stephen Breyer calls tunnel vision a "classic administrative disease," which leads agencies to carry a "single-minded pursuit of a single goal too far."[58] In their exclusive focus on the target risk, agencies often overlook the regulation's impacts in other areas. As discussed earlier, the TSA narrowly focused on passenger security in the nation's airports and airplanes. While its actions may have reduced the threat of airborne terrorist attacks, they also led to increases in traffic fatalities as many passengers decided to drive instead of fly.

A variant of tunnel vision is what Justice Breyer calls "the last 10 percent"—a situation where most risk can be eliminated at a reasonable cost but eliminating the last bit requires a prohibitively high expense in return for very little improvement.[59] This situation occurred when the EPA banned asbestos-containing materials. Asbestos is a hazardous material that can lead to lung cancer or mesothelioma. The regulation aimed at reducing consumers' exposure to asbestos in order to reduce its harmful health effects. However, the potential exposure levels from asbestos materials were very low, while the cost of banning these materials was prohibitively high. The proposed regulation would have achieved its goals at a cost as high as $70 million per life saved, the point at which the negative indirect health effects of regulation may outweigh its benefits. While reducing asbestos exposure in general is beneficial, pushing for the last 10 percent may in fact be counterproductive.[60]

---

58. Stephen Breyer, *Breaking the Vicious Circle: Toward Effective Risk Regulation* (Cambridge, MA: Harvard University Press, 1995), 11.

59. Ibid.

60. Corrosion Proof Fittings v. EPA 947 F.2d 1201 (5th Cir. 1991).

Unintended consequences may result from limited knowledge when Congress requires agencies to regulate even if they have little reliable evidence that could be used in a systematic regulatory analysis. In these cases, they may have to rely on less dependable sources that have not been peer-reviewed or independently verified.[61] Alternatively, they may have to rely on expert judgment and limited experiments. For example, the NHTSA promulgated the rule requiring auto manufacturers to install air bags in 1984 even though it had no reliable real-world data on air bags' effectiveness rates.[62] Later studies estimated that while air bags reduced adult fatalities, they increased fatalities of children under the age of 10.[63]

Unintended consequences may also result from complex behavioral responses. Most regulations assume an informed, rational response from consumers, but recent studies indicate that individuals do not always act rationally.[64] In some cases, their actions may be systemically biased, which means that individuals deviate from rational decisions in consistent and predictable manners. In particular, cognitive biases may lead them to take mental shortcuts in order to simplify complex decisions. They may base their decisions on partial information rather than the full range of information available to them. When the FDA issued a warning regarding high mercury content in some fish, the rational response that regulators expected was for at-risk consumers to switch to fish with low mercury content. Instead, consumers took a mental shortcut and stopped eating fish altogether.

Distorting impacts of cognitive biases are not limited to populations targeted by regulation. Regulators suffer from the same biases.[65] They often resort to heuristics to simplify the complex issues they have to address. Mental shortcuts may lead regulators to overlook countervailing risks arising from regulation. For example, Viscusi and Hamilton demonstrate that the EPA's decisions in managing the Superfund, a program to clean up hazardous waste sites, were subject to cognitive biases.[66] Thus, EPA regulators established more stringent cleanup targets for highly publicized chemicals. The decision reflects the regulators' availability effect bias in which individuals emphasize risks they can easily think of. Consequently, chemicals that

---

61. Wendy E. Wagner, "The 'Bad Science' Fiction: Reclaiming the Debate over the Role of Science in Public Health and Environmental Regulation," *Law and Contemporary Problems* 66, no. 4 (October 1, 2003): 63–133.

62. Thompson, Segui-Gomez, and Graham, "Validating Benefit and Cost Estimates."

63. Braver et al., "Reductions in Deaths in Frontal Crashes."

64. See Richard H. Thaler, *Nudge: Improving Decisions about Health, Wealth, and Happiness* (New Haven, CT: Yale University Press, 2008); Dan Ariely, *Predictably Irrational: The Hidden Forces That Shape Our Decisions* (New York: Harper, 2009).

65. Frank H. Buckley, *Fair Governance: Paternalism and Perfectionism* (New York: Oxford University Press, 2009); Edward L. Glaeser, "Paternalism and Psychology," *University of Chicago Law Review* 73, no. 1 (2006): 133–56.

66. W. Kip Viscusi and James T. Hamilton, "Are Risk Regulators Rational? Evidence from Hazardous Waste Cleanup Decisions," *American Economic Review* 89, no. 4 (1999): 1010–27, doi:10.2307/117171.

the media frequently mentioned received greater scrutiny and were assigned more stringent targets than the less publicized but equally risky chemicals.

IV. AVOIDING UNINTENDED CONSEQUENCES

As discussed in the previous section, better analysis could help agencies avoid or minimize countervailing risks when relatively good data are available. When good data are not available, agencies could invest in acquiring better information. If they have to regulate when good information is not available, agencies could collect better data after the fact and revisit regulations to minimize potential countervailing risks. Unfortunately, agencies typically have little incentive to invest in more thorough analysis. Thus, potential solutions to risk trade-offs have to address agencies' institutional incentives. I discuss a few proposals below.

To counter agencies' narrow focus on target risks, Graham and Wiener proposed to formally include risk trade-off analysis in the agencies' regulatory impact analysis requirements.[67] In 2003, the Office of Management and Budget (OMB) issued *Circular A-4*, guiding agencies to consider countervailing risks in their cost and benefit estimates.[68] Yet despite OMB's guidance, few agencies conduct a thorough risk trade-off analysis.[69] Additional analysis would require agencies to devote more time and resources to each regulation, which budget-conscious agencies are hesitant to allocate. It would also force agencies to face hard trade-offs, particularly in cases that transfer risk from one group to another. Understandably, agencies prefer to avoid making potentially controversial policy choices.

Agencies' failure to consider countervailing risks stems in parts from the failure of external oversight. The Office of Information and Regulatory Affairs (OIRA) within OMB reviews agency regulatory analysis for all major regulations.[70] OIRA is responsible for ensuring that agencies conduct a thorough regulatory analysis, including risk trade-off analysis. However, it may be politically difficult for OIRA, an executive-branch agency, to publicly criticize other executive agencies' analysis—especially on regulations that reflect the administration's policy priorities.[71]

---

67. Wiener and Graham, "Resolving Risk Tradeoffs," in *Risk vs. Risk*, ed. Graham and Wiener, 243–44.

68. Note that OMB guidance limits itself to direct risk trade-offs and does not require agencies to consider indirect risk trade-offs, e.g. health-health analysis. See Office of Management and Budget, *Circular A-4: Regulatory Analysis* (Washington, DC: Office of Management and Budget, 2003), http://www.whitehouse.gov/sites/default/files/omb/assets/regulatory_matters_pdf/a-4.pdf.

69. While exact statistics are not available, even a cursory search for terms like "risk trade-off" and "countervailing risk" in the *Federal Register*, which publishes federal regulations, yields few results. See https://www.federalregister.gov.

70. Office of Management and Budget, *Circular A-4*.

71. Government Accountability Office, *Regulatory Accounting: Analysis of OMB's Reports on the Costs and Benefits of Federal Regulation* (Washington, DC: Government Printing Office, April 20, 1999), http://www.gao.gov/archive/1999/gg99059.pdf; Stuart Shapiro, "Politics and Regulatory Policy Analysis," *Regulation* 29, no. 2 (2006): 40–45.

Thus, it may be necessary to place regulatory analysis oversight outside the executive branch to ensure effective enforcement of analytical requirements.

When the information relevant to regulation is incomplete or highly uncertain, agencies have to invest in acquiring better data. Thus, agencies could test individual responses to regulatory incentives to account for systemic biases and complex behaviors. For example, agencies have to consider possible consumer responses when regulating consumer products. In particular, when it comes to consumer advisories or disclosure requirements for consumer products (e.g., nutrition labels), agencies cannot simply assume that providing more information will lead to better results. In some cases, consumers may find the disclosed information confusing or misguiding. FTC researchers James Lacko and Janis Pappalardo suggest that agencies proceed with such regulations only after careful consumer testing.[72] For example, when the Department of Housing and Urban Development (HUD) developed a rule to simplify the process of obtaining a mortgage,[73] it conducted extensive consumer testing of mortgage disclosure forms before adopting its current form. The improved form ensured that consumers could easily understand the key terms and total mortgage costs. Yet, without a mandate, agencies may choose not to undertake consumer testing.

Better upfront analysis may not always be possible. To minimize potential countervailing risks, agencies could revisit their regulatory decisions with a thorough retrospective analysis. Retrospective analysis allows agencies to check whether a regulation achieved its intended goals and whether it may have inadvertently led to some unwanted outcomes. In addition, it gives Congress a chance to revisit the authorizing statutes and modify them if necessary. Over the years, Congress has asked agencies to conduct retrospective analyses for some major regulations, most notably the regulations implementing the Clean Air Act. In addition, Congress mandated retrospective review for major regulations under the Regulatory Flexibility Act and the Unfunded Mandates Reform Act.

To date, agencies' record on retrospective analysis is mixed. A recent Government Accountability Office (GAO) study examined retrospective review practices in nine federal agencies between 2001 and 2006.[74] Together, these agencies accounted for almost 60 percent of all final federal regulations within the study period. The GAO study found that agencies conducted more than 1,300 retrospective reviews, but

---

72. James Lacko and Janis K. Pappalardo, *The Effect of Mortgage Broker Compensation Disclosures on Consumers and Competition: A Controlled Experiment* (Washington, DC: Bureau of Economics, Federal Trade Commission, 2004).

73. Department of Housing and Urban Development, "Rule to Simplify and Improve the Process of Obtaining Mortgages and Reduce Consumer Settlement Costs," 73 Fed. Reg. 222 (November 17, 2008): 68204–88.

74. Government Accountability Office, *Reexamining Regulations: Opportunities Exist to Improve Effectiveness and Transparency of Retrospective Reviews* (Washington, DC: Government Printing Office, July 16, 2007), http://www.gao.gov/assets/270/263827.pdf.

review quality varied substantially. Many reviews limited themselves to soliciting public comments and failed to examine the continuing need for regulation or the need for substantive changes to the regulation. Overall, the GAO concluded that retrospective review practices lacked a systematic standard-based approach and thorough documentation. In related studies, the GAO found that vague statutory mandates for retrospective review left compliance at agencies' discretion with little external oversight.[75]

There is a difference between retrospective review and analysis.[76] Retrospective review focuses on the administrative process of evaluating the appropriateness of existing regulations. In contrast, retrospective analysis measures the actual impacts of a regulation to evaluate its costs and benefits. Retrospective review may or may not include analysis. As the GAO report demonstrates, few agencies chose to produce full retrospective analyses in the review process.

Examining agencies' regulatory incentives is instrumental to understanding agencies' reluctance to complete retrospective analyses of existing regulations. As with other types of analysis, agencies have little incentive to review existing regulations. While Congress holds agencies accountable for implementing regulations resulting from new statutes, it rarely follows through with oversight of the agencies' performance for existing regulations.[77]

A comprehensive retrospective analysis can be costly.[78] A proper evaluation of an existing regulation would require as much time and as many resources as a new regulatory analysis. Operating under constrained budgets, agencies generally prioritize producing new regulations over reviewing existing ones, especially given their accountability incentives.[79] In addition, a comprehensive retrospective analysis would measure agency performance and possibly reveal shortcomings in implementation or ex ante regulatory analysis that agencies are reluctant to make public. Consequently, agencies have strong incentives to produce analysis that supports

---

75. Government Accountability Office, *Regulatory Flexibility Act: Congress Should Revisit and Clarify Elements of the Act to Improve Its Effectiveness* (Washington, DC: Government Printing Office, July 20, 2006), http://www.gao.gov/new.items/d06998t.pdf; Government Accountability Office, F*ederal Mandates: Few Rules Trigger Unfunded Mandates Reform Act* (Washington, DC: Government Printing Office, February 15, 2011), http://www.gao.gov/new.items/d11385t.pdf.

76. Randall Lutter, "The Role of Retrospective Analysis and Review in Regulatory Policy" (Working Paper, Mercatus Center at George Mason University, Arlington, VA, April 2012).

77. A partial exception to this rule was Section 812 of the Clean Air Act Amendment of 1990, which required the EPA to analyze the act's effectiveness. The fact that Congress had to insist on retrospective analysis in this statute indicates that agencies do not routinely measure their performance.

78. Government Accountability Office, *Environmental Protection: Assessing the Impacts of EPA's Regulations through Retrospective Studies* (Washington, DC: Government Printing Office, September 14, 1999), http://www.gao.gov/assets/230/227989.pdf.

79. Robert W. Hahn and Paul C. Tetlock, "Has Economic Analysis Improved Regulatory Decisions?," *Journal of Economic Perspectives* 22, no. 1 (2007): 67–84; Government Accountability Office, *Environmental Protection*.

their original decisions or to produce perfunctory reviews that do not truly measure performance. Given that retrospective reviews face little oversight, few agencies opt for analysis critical of their performance.

Agencies' poor track record with retrospective reviews highlights the challenges in getting agencies to account for potential risk trade-offs in their analyses. The GAO report suggested several improvements to retrospective analysis; these suggestions could be applied to the other proposed types of analysis as well. First, the analytical requirements have to be clear. Otherwise, compliance will be left to the agencies' discretion. Second, the analysis should be subject to external oversight. Such oversight would limit agency discretion and make it harder for agencies to get away with a perfunctory analysis.

V. CONCLUSION

Unintended consequences can undermine even the most well-intentioned polices. Regulations aimed at reducing risk in one area often increase countervailing risks elsewhere. Thus, regulators often face risk trade-offs when deciding between regulatory alternatives. Some risk trade-offs are straightforward, as in the cases when each alternative carries some risk. Regulators must choose the option that reduces the overall risk by taking countervailing risks into account. In other cases, countervailing risks are indirect. Regulatory costs reduce national incomes, leaving consumers with less to spend on private risk-reducing actions like purchasing insurance or a safer car. Regulations with a high cost per life saved may reduce incomes enough to induce a fatality. In addition, regulations may increase risk by changing consumers' preferences. Alternatively, risk-reducing regulations may affect prices in far-off sectors of the economy, increasing risk in areas that are not directly related to the targeted sector.

The consequences of regulations discussed in this paper were unintended but not unforeseeable. A formal risk trade-off analysis would allow agencies to evaluate the potential countervailing risks resulting from regulations. Similarly, consumer testing may help agencies avoid unexpected consumer responses. Finally, a thorough retrospective analysis would give agencies a chance to evaluate and modify regulations if necessary.

Agencies often fail to account for countervailing risks. A thorough analysis is costly, and budget-conscious agencies may hesitate to devote additional time and resources to each regulation. In addition, they may want to avoid making potentially controversial choices. In addition, the population facing the increased countervailing risks may not be represented in the regulatory process, biasing policymakers' decisions toward organized special interests.

To minimize or avoid unintended consequences, agencies must formally consider countervailing risks. Given agencies' incentives against considering risk trade-offs, additional analysis may have to be part of the regulatory impact analysis requirements. In addition, strong oversight is necessary to ensure agencies' compliance.