PENN PROGRAM ON REGULATION

Regulatory Equilibrium

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I once heard the story of a 19th Century rabbi who offered the following advice: In one pocket, one should keep a slip of paper that says "I am but dust and ashes," and in the other pocket keep a slip that says, "The world was created for me." The secret of living well, advised this rabbi, comes from knowing when to reach into which pocket.

In seeking an equilibrium between timidity and pride—an equilibrium that another religious scholar describes as humility[1]— I see in the rabbi's advice a useful analog to secular life, and even to the secular role of a regulator. The regulator should be humble about what regulatory actions can achieve, but not nihilistic to the point of neglecting to regulate when there is sufficient evidence. The regulator should appreciate its ability to affect great change, but should also recognize its role is not to regulate all, or even most, problems, even if the law allows it to do so. My recommendations below lean more towards the need for humility, discretion, and regulatory restraint, since I think the nature of, and selection into, the role of a regulator, in which the tendency is to see a societal problem and immediately conceive a regulatory response, presents a greater risk of regulatory action where it is not needed than of regulatory inaction where it is advisable.

I will focus on one particular balancing goal of an excellent regulator, which is the need to be guided by scientific evidence, while also recognizing the limits of science in the making of sound regulations. Scientific evidence can provide powerful reasons for forceful regulations ("the world was created for me"), but science can only answer so much and must therefore be employed critically and selectively ("I am but dust and ashes"). The science I refer to includes biological studies (such as epidemiological studies of health effects from pollution), economics studies (such as the valuation of the health benefits of reducing pollution), and psychological studies (such as the examinations of cognitive biases that can lead people to make purchasing decisions that harm themselves).

Regulation and the Evaluation of Evidence

The need for regulations to be guided by science should be self-evident, as knowing what and how much to regulate and how people and the economy will respond to regulations all require sound evidence. The limits of science might be less appreciated, and they take many forms. First, many regulatory decisions involve questions of values and ethics, which are not within the scope of scientific inquiry (Coglianese and Marchant, 2004). To take just one example, the question of what discount rate to use for climate change, in which the effects will be borne heavily hundreds of years from now, involves ethical considerations of inter-generational equity. A critical question for the regulator, and one that cannot be much helped

[1] Rabino Nilton Bonder: "Many people believe that humility is the opposite of pride, when, in fact, it is a point of equilibrium."

through empirical scientific studies, is how best to incorporate the preferences of future citizens in making regulatory decisions today.

Also, some important questions to consider in regulatory decision-making might not be amenable to credible empirical examination. For example, the usefulness of any environmental regulation rests squarely on the reliability of the estimates of the benefits and costs of reducing the targeted pollution. The biggest challenge arises in estimating the benefits of an environmental regulation—for example, the effect that a given reduction in a specific pollutant has on the health of affected individuals—because this requires an understanding of the causal relationship between that pollutant and an array of health outcomes.

The ideal, yet impossible, way to estimate a causal relationship would be to observe the same people in two different states of the world: one in which they are exposed to the pollutant and one in which they are not. (Even better would be to explore the same people in multiple states of the world, in which they are exposed to many different levels of the pollutant in each state.) By comparing the same people in different states of the world, it is guaranteed that all other factors (other than the pollutant) are held constant, and the different outcomes therefore reflect the causal impact of the pollutant. The impossibility of observing the same people in different states of the world is known as the fundamental problem of causal inference.

Given this problem, the most credible way to estimate the causal impacts of a pollutant or a regulation is by using a randomized control trial (RCT). An RCT randomly assigns subjects into a treatment group and a control group. In the pollution example, subjects would be randomly assigned to one group exposed to the pollutant (the treatment group) or another group not exposed to the pollutant (the control group). (Again, even better would be to have multiple treatment groups, each with different pollution exposures.) Because of the random assignment, with enough observations, the treatment and control groups should be statistically identical in all dimensions except pollution exposure. Therefore, any differences in outcomes can credibly be ascribed to exposure to the pollutant. In medicine, for instance, we establish a credible causal relationship between a treatment and a health outcome using an RCT. By randomly dividing people into two groups and comparing the health outcomes after one group has received the treatment, we can be relatively confident that any differences in health in the two groups are caused by the treatment.

While RCTs offer the best means of credibly estimating a causal relationship, they are not foolproof. As James Manzi (2012) points out in his book *Uncontrolled*, the applicability of the scientific method (even of controlled experiments) is often limited when we are studying social phenomena. The researcher may confront what Manzi calls high "causal density," which means there are many causal chains and feedback loops at work in social processes, making it difficult, if not impossible, to make reliable inferences from a single study, even a single RCT. Manzi argues for using multiple, replicated experiments for social phenomena.

Another possible problem with RCTs exists if the researcher conducting the evaluation does not specify the outcome of interest before the experiment, since it is then possible that the regulator will only witness the subset of outcomes that responded to the treatment. For example, in 2000, the National Heart, Lung, and Blood Institute (NHLBI) in the United States started

requiring any studies that it funded to list all primary outcomes of interest before the evaluation was to take place. A recent study examined 55 clinical studies between 1970 and 2012 funded by the NHLBI and found that 57 percent of the ones published before 2000 showed a significant benefit in the primary outcome, but only 8 percent of the ones published after 2000 showed a significant benefit in the primary outcome (Kaplan and Irvin, 2015).

But a bigger impediment to RCTs, especially when examining environmental effects, is that they are seldom possible for ethical or practical reasons. The ethical objections apply to such things as randomized studies of the effects of pollution on health, although perhaps less so where the effect of the treatment is unknown. There are also many practical constraints to RCTs, including legal considerations that can prevent selectively applying regulations in the name of experimentation. The law frequently prohibits applying regulations on a small scale before applying them to the full population or applying regulations differently across regions.

The result is that many regulations are only evaluated before they are implemented and are never subsequently assessed by the regulators to see whether they are effective. The Obama administration, in its Executive Order 13563, has attempted to address this issue by requiring agencies to conduct retrospective reviews of regulations (Obama, 2011). Others, more skeptical of the inclination or ability of the agencies to impartially examine their own existing regulations, have suggested a more draconian legislative approach that sets a sunset window on regulations. No matter the likelihood of these approaches, an excellent regulator should embrace and attempt, where possible, to move toward Michael Greenstone's (2009) goal of "a culture of persistent regulatory experimentation and evaluation."

Given the challenges of conducing retrospective RCTs of regulations, most analyses of regulations tend to compare health outcomes of those exposed to the higher level of pollution to health outcomes of those exposed to the lower level of pollution. This approach faces the problem that there may be other important differences between the two groups of people. For example, pollution levels in central cities, where the local population tends to be lower income, tend to be higher than in outlying suburbs, where residents are wealthier. Thus a comparison of high-pollution groups to low-pollution groups, in this example, would tend to compare the health outcomes of low-income people to high-income people—people well known to have very different health outcomes. So it would be misleading to attribute the differences in health to the different pollution levels. Analysts can attempt to control for the differences in characteristics, but there is substantial evidence that attempting to control for confounding factors while using cross-sectional data is unlikely to provide reliable estimates.[2]

The implication is not that the regulator should abandon all hope of understanding the problem at hand and assume that no regulation is the right response to pollution ("I am but dust and ashes"). Rather, the challenges of empirical estimation highlight the need for some humility and for careful choice and scrutiny of the research design used to evaluate a causal link between treatment and outcome. RCTs still offer the best approach, when possible, especially where the number of observations are high, but even better would be multiple experiments with a variety of initial conditions. Even absent RCTs, there are alternative approaches such as "quasi-

[2] See, for example, Chay and Greenstone (2003).

experiments," where the researchers rely on circumstances outside their control to mimic random assignment to the treatment and control groups.[3] More generally, the degree of credibility of an empirical study will vary based on the exogeneity of the treatment being examined, and it is therefore to the credit of a researcher to carefully examine and explain how well the empirical strategy employed achieves this end.

In an earlier paper, I suggested that the regulatory impact analyses (RIAs) conducted by regulators should include basic information in order to assess the quality of the empirical studies used in the benefit-cost analyses contained in the report (Gayer, 2011). Such basic information could include an overview of the research design employed (RCT, quasi-experiment, panel data, repeat cross-sectional data, time-series data, cross-sectional data, theory, anecdote). It could also note whether the empirical studies report the averages of available variables for the treatment and control groups, and whether the available variables have statistically significant differences between treatment and control groups. For example, any RIA claiming health benefits of regulating emissions should include a comparison of the statistical distributions of the treatment and control groups for each health study used, noting how many characteristics were available to compare and the proportion of them that were statistically balanced between the treatment and control groups. If the observable characteristics of the treatment group are statistically similar to the observable characteristics of the control group, then we can have greater confidence that those characteristics that cannot be observed are also similar across the two groups, implying that any difference in outcomes is due to the treatment, not confounding factors.

Unfortunately, many published studies lack a transparent presentation of the research design and of diagnostic tests that can help assess the reliability of the results. This lack of information makes the credibility of the findings more dubious and they should be treated accordingly in regulatory analyses. A step in the right direction would be for regulators to require that any raw data, cleaned-up data, and statistical programs used in an analysis be made available and replicable in order for the results to be relied upon in a regulatory impact analysis. Indeed, in the United States the Office of Management and Budget or the regulatory agencies themselves can easily make this information available online, affording anyone the ability to assess the empirical estimation and to replicate the findings. This movement towards greater transparency is occurring in the academic literature, such as exemplified by the *American Economic Review's* data availability policy that requires data for studies published in the journal to be "clearly and precisely documented" and "readily available to any researcher for purposes of replication."

The idea of using a checklist to track the characteristics of empirical analysis, and then providing greater data transparency to allow replication, should help regulators pay closer attention to the quality of the empirical studies underlying the benefit-cost analyses they use to justify regulations. But I confess to skepticism that even the best regulators will fully adopt such an approach. Regulators are people, not angels, so even the best of them are subject to biases, and limited information can lead them to incorrectly evaluate the evidence concerning a regulatory concern. This problem is especially acute because, in the case of the U.S., the agencies are charged with conducting the benefit-cost analyses for the regulations they are

[3] See, for example, Greenstone and Gayer (2009) for a discussion and examples of the role of quasi-experiments in environmental economics.

considering. We all suffer from confirmation bias, so one would expect that those most deeply involved in the implementation of a regulation are likely to focus on evidence of the benefits of their preferred regulatory approach more than the evidence of the costs of this approach, irrespective of the quality of the research designs. All organizations resist evaluation, and government organizations—which are not subject to market discipline to test their effectiveness—are in particular need of outside evaluation. The role of the Office of Information and Regulatory Affairs (OIRA) in the United States is in part to serve as a check on regulatory agencies' benefit-cost analyses, and indeed my idea of a "quality checklist" is meant to beef up this role. But OIRA has limited resources and is not itself an independent third party, since it is, like the regulatory agencies, part of the executive branch.

The desire for third-party validation of regulatory analyses has led to proposals in the United States to add the benefit-cost standard to the Administrative Procedure Act's criteria for judicial review. In effect, the benefit-cost standard, which has applied to major rules by executive order since 1981, would be made a statutory standard subject to judicial review. Chris DeMuth (2015) describes many benefits of this approach, primarily as a way of addressing what he sees as an unhealthy expansion of regulatory discretion and power due to Congress's delegation of responsibilities to the executive branch. The appeal to me is that it would provide greater third-party assessment of benefit-cost analyses (in this case, by the judiciary), which would increase the premium on credible and convincing empirical evidence on the benefits and costs of regulations in order to better justify either regulatory action and inaction. No matter the prospects of legislative changes to the Administrative Procedure Act, there does seem to be a trend of the judiciary paying more attention to the benefit-cost analyses used to justify regulations, such as the recent Supreme Court ruling against the Environmental Protection Agency's (EPA) regulation of mercury and other hazardous air pollutants, in which the Court found that the EPA unreasonably failed to "consider cost when making its decision" (*Michigan v. EPA*, 2015).

It is possible to improve the transparency of the regulatory review process irrespective of any changing role of the judiciary in reviewing benefit-cost analyses. One of the goals of Executive Order 12866, which required U.S. regulatory agencies to assess the benefits and costs of regulatory options, was to make the regulatory review process more "open to the public" (Clinton, 1993). For economically significant rules, agencies are required to develop regulatory impact analyses (RIAs) "to provide to the public and to OMB a careful and transparent analysis" that includes "an assessment and (to the extent feasible) a quantification and monetization of benefits and costs anticipated to result from the proposed action and from alternative regulatory actions" (U.S. Office of Management and Budget).

Unfortunately, over time the regulatory review process has come to serve more as a public relations tool, in which it is used for supporting decisions that have already been made, rather than a tool for informing and contributing to the decision-making process. OIRA's ability to counter this is limited, since it frequently receives RIAs for proposed or final rules from the agencies with little time to require substantial changes, due to delays by the agencies coupled with deadlines imposed by statutes or court orders. Indeed, in some cases, agencies submit draft RIAs for OIRA's review after submitting their draft rule language. This has led to proposals to institute a formal early review process that would allow at least six months of review in advance

of proposed and final regulations (Harrington, Heinzerling, and Morgenstern, 2009). Given the limited resources available to OIRA to conduct a more thorough and informative early review process, the early review process could only apply to a subset of regulations, for example, those expected to have annual benefits or costs in excess of $1 billion (Fraas, 2009).

Regulating Behavioral Failures

As has long been advocated by economists, and institutionalized in U.S. government guidelines such as the Office of Management and Budget's Circular A-4, regulations should be motivated by the need to address a significant market failure (e.g., externalities, market power, and inadequate or asymmetric information). Economists have long argued that regulators should rely, when possible, on market-based principles in designing regulations to address these market failures. For example, in the case of a pollution externality, a tax on production equal to the marginal external costs could lead producers to internalize the third-party costs stemming from production, which would result in an efficient outcome.

The modern regulator, however, must consider the emergence of the behavioral economics literature, which has focused on identifying cognitive limitations and psychological biases that lead people to make choices that cause self-harm, thus suggesting another type of market failure that justifies government intervention. These behavioral failures involve departures from the individual rationality assumptions incorporated in economists' models of consumer choice.[4]

Much of the evidence of behavioral failures is derived from laboratory experiments, stated preference studies, hypothetical classroom exercises, or narrowly defined decision contexts, so as with the empirical studies discussed above, if not more so, there is a need for regulators to assess the quality and the applicability of any behavioral study before using it as a justification to regulate. In another paper, Kip Viscusi and I refer to the practice of applying results from a behavioral study in one context to a broader application of policy as "behavioral transfer" to recognize its similarity to the long-acknowledged challenge of "benefits transfer," in which the benefit estimation in one sub-population is applied to another sub-population being evaluated for a regulation (Viscusi and Gayer, 2015a). We conclude that a higher level of scrutiny is required for behavioral transfers than for traditional benefits transfer, and that the results of behavioral studies are most relevant for indicating the presence of a potential behavioral failure rather than for credibly estimating the empirical magnitude of the failure.

While the behavioral economics literature does provide evidence that would point to another role for regulation, a prudent regulator should possess the self-awareness to recognize the two main reasons why regulatory responses motivated by behavioral economics findings might be suboptimal.[5] The first is that as a behavioral agent herself, the regulator is not immune from the psychological biases that affect ordinary people. The second is that a substantial public

[4] Congdon, Kling, and Mullainathan (2011) offer a thorough summary and categorization of the deviations from standard economic assumptions found in the behavioral economics literature.
[5] For other reasons against regulating based on behavioral failures, see, for example, Sugden (2008) and Llusk (2014).

choice literature suggests that a regulator is subject to political incentives that could lead to sub-optimal policies, and even at times to the misuse of behavioral economics studies to enhance regulatory control or favor the influence of special interests rather than promote social welfare (Viscusi and Gayer, 2015b).

There are many public choice reasons why private decisions, even those subject to behavioral failures, might lead to better outcomes if left unregulated rather than regulated. The most obvious argument is that behavioral evidence of irrational and self-harming behavior in market transactions would suggest that bad decision-making also presents itself in political decisions, such as in voting practices. To the extent that policies are decided by the median voter, and the voting of the median voter is subject to behavioral failure, then this would suggest a tendency for policy to be sub-optimal (although it's ambiguous whether it's better or worse than no policy). Public choice theory also suggests that private decision-makers have stronger incentives to acquire information—expending both time and money—to overcome behavioral biases, since the personal costs to the person who makes a bad decision are arguably higher than the personal costs to the regulator of a rule that leads to a bad outcome.

Again, humility, not dismissiveness, is in order for a regulator faced with evidence of behavioral failures. One way to approach the challenge is to consider Daniel Kahneman's (2011) description of two modes of thinking: System 1 thinking "operates automatically and quickly, with little or no effort and no sense of voluntary control," while System 2 thinking "allocates attention to the effortful mental activities that demand it, including complex computations." The biases that lead to suboptimal private actions typically stem from the "freewheeling impulses" of System 1 thinking. The impulse to regulate when there is evidence of a behavioral failure is motivated by the belief that government experts are, by nature, training, and employment, better disposed towards System 2 thinking and can therefore design policies that overcome the problems caused by System 1 thinking. The countervailing risk is that the behavioral failures of the regulators (such as stemming from narrowness of expertise or overconfidence caused by the illusion of explanatory depth), as well as public choice pressures, could lead to a sub-optimal regulatory response. The challenge then is to assess whether private decision-makers acting in the marketplace are more or less prone to harmful biases than are the regulators. This approach parallels the traditional public finance calculus of weighing the inefficiencies caused by market failures against the inefficiencies caused by government failures in attempting to address market failures through regulations (Winston, 2006).

In another paper, Kip Viscusi and I take a "behavioral public choice" approach and find many instances in which cognitive and psychological biases, combined with public choice pressures, lead to policies that institutionalize irrational behavior rather than overcome them (Viscusi and Gayer, 2015b). For example, a well-documented bias is that people tend to over-estimate low mortality risk and under-estimate high mortality risk (Lichtenstein et al., 1978). That is, threats to health—such as the risks of stroke, cancer, and heart disease—tend to be underestimated, while less consequential threats—such as the risks of botulism, lightning strikes, and natural disasters—tend to be overestimated. Experts in regulatory agencies could be better suited to making more accurate risk assessments if they have professional involvement in particular risks that the general public does not have. Government agencies have the expertise and staff to stay informed about the evolving scientific evidence related to risk, thus relying on

Kahneman's System 2 thinking when evaluating these risks. Unfortunately, in the analysis Viscusi and I conducted, we found many regulatory policies (such as EPA's approach to remediating hazardous waste sites), in which the regulatory response demonstrated the same kind of biased risk perception that plagues individual risk judgments.

The point, again, is not that an excellent regulator should be dismissive of findings of behavioral failures. Doing so would mean foregoing regulatory opportunities to address real harms. Rather, the point is that there is a need for weighing the risk of leaving a behavioral failure unregulated against the risk of a policy response that institutionalizes the bias.

This cautionary approach would adopt the default position of respecting consumer sovereignty under the presumption that fully informed people are better able to make decisions that bear on their own well-being than are regulators. However, the insights of behavioral economics suggest that market failures indeed can arise when people make self-harming decisions, and Viscusi and I advocate estimating the benefits of correcting these actions relative to the outcome that would present if people were fully informed and fully rational actors. To take a simplistic example, regulators should prioritize remediating the high-risk hazardous waste site over the low-risk hazardous waste site, even if psychological factors lead residents to view the latter as higher risk than the former. It is important that such an approach be grounded in systematic, well-documented, and context-specific findings of behavioral findings, and that the policy outcome to address self-harm be achieved through less intrusive and lower cost regulations when possible.

A regulator should also attempt to guard against the temptation to misuse behavioral insights to achieve goals other than addressing self-harming behavior. For example, the behavioral literature on tax salience suggests that tricking people into thinking a tax does not exist could increase tax revenues by more than it harms the taxpayers who are making poor consumption choices based on lack of knowledge about the tax.[6] Although net benefits are increased, a policy of disguising taxes (or regulations) would be inconsistent with the approach of basing policies on fully informed, fully rational decision-making.[7] Similarly, in another paper, Viscusi and I find evidence that agencies relied on weak claims of behavioral biases to justify a host of inefficient energy efficiency mandates (Gayer and Viscusi, 2012). The behavioral economics literature provides fascinating insights into the systematic deviations from rational behavior, which can then be integrated into economics in a way that can provide better predictive capabilities and ultimately better opportunities for improving social welfare. But the existence of these behavioral insights does not mean a regulator should be dismissive of the merits of individual choice when making policy prescriptions stemming from behavioral findings.

[6] The model in Chetty et al. (2009) demonstrates how net benefits can increase as a tax becomes less salient.

[7] Finkelstein (2009) provides evidence that as tax salience goes down (in the case of a switch from a toll booth to an E-Z pass), tax rates go up.

Conclusion

The existence of an "excellent regulator" does not mean there will necessarily be excellence in regulation. Regulation does not, nor should not, stem from individual decision-makers or institutions, no matter what qualities they might exhibit when exercising full discretion and using their authority to improve social welfare. As with the exercise of other governmental power, an excellent overall regulatory system should be subject to of the full checks and balances of the larger governmental system within which it is situated, with the legislature maintaining ultimate authority for the regulatory powers it delegates to the regulator, and with courts helping to ensure that regulations are based on valid legal authority and do not violate protected legal rights. Such a regulatory system works well only insofar as it is robust to the existence of a decidedly non-excellent regulator.

Despite my reservations about focusing too much on the characteristics of the regulator and not the full regulatory apparatus, I have attempted to recommend an approach any regulator should take in evaluating the evidence brought to bear in the regulatory decision-making process, and along the way I have recommended some key design elements in the regulatory process itself, such as the implementation of quality checklists and required disclosure of research methods. My recommendations would promote greater discernment in evaluating the quality of the scientific evidence used in the regulatory review process, and more transparency and decentralized information-sharing of the data and methods underlying this evidence. My approach also calls for a regulator to take seriously the insights of behavioral economics, insofar as these findings are systematic, well-documented, and specific to the context under consideration for regulation, but also to be on guard against using behavioral findings as open-ended justifications for regulatory action.

The 19th Century rabbi's paper-in-each-pocket metaphor captures well what an excellent regulator must do. Keeping it always in mind should encourage regulators to find an equilibrium in which they are motivated to act on sound evidence, but still strive to mitigate the risk of confirmation bias and regulatory overreach.

Notes

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About the Author

Ted Gayer is the vice president and director of the Economic Studies program and the Joseph A. Pechman Senior Fellow at the Brookings Institution. He conducts research on a variety of economic issues, focusing particularly on public finance, environmental and energy economics, housing, and regulatory policy. Prior to joining the Brookings Institution in September 2009, he was associate professor of public policy at Georgetown University. From 2007 to 2008, he was deputy assistant secretary for Economic Policy at the Department of the Treasury. While at Treasury, he worked primarily on housing and credit market policies, as well as on energy and environmental issues, health care, Social Security and Medicare. From 2003 to 2004, he was a senior economist at the President's Council of Economic Advisers, where he worked on environmental and energy policies. From 2006 to 2007, he was a visiting fellow at the Public Policy Institute of California, and from 2004 to 2006 he was a visiting scholar at the American Enterprise Institute.