ISSN 1936-5349 (print)
ISSN 1936-5357 (online)

HARVARD

JOHN M. OLIN CENTER FOR LAW, ECONOMICS, AND BUSINESS

REGULATING INTERNALITIES

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NBER Working Paper No. 21187

Discussion Paper No. 848

01/2016

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NBER Working Paper No. 21187
May 2015
JEL No. D03,D04,D10,D18,D61,D83,H21,K0,K20,L51,L94,Q48

ABSTRACT

This paper offers a framework for regulating internalities. Using a simple economic model, we provide four principles for designing and evaluating behaviorally-motivated policy. We then outline rules for determining which contexts reliably reflect true preferences and discuss empirical strategies for measuring internalities. As a case study, we focus on energy efficiency policy, including Corporate Average Fuel Economy (CAFE) standards and appliance and lighting energy efficiency standards.

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Introduction

It is well-established that governments can increase welfare by providing public goods and addressing market failures such as externalities, asymmetric information, and market power. In practice, governments also regulate to address "internalities" – that is, costs we impose on ourselves by taking actions that are not in our own best interest. Such "paternalistic" regulation brings up a series of important questions. In what settings should the government intervene at all? If intervening, what policy instrument should be used - a tax, a ban, a "nudge," or some other policy? How stringent should the policy be? And crucially, how can we do cost-benefit analysis using individuals' revealed preferences, instead of imposing the regulator's preferences on individuals?

This paper describes an approach to regulating internalities that aims to set and evaluate regulations on the basis of individuals' own preferences. The key is to focus regulation on situations when an individual's choices are inconsistent across contexts, but principled analysis can be used to determine which context more reliably reflects "true preferences." As examples, Kling *et al*. (2012) show that people are more likely to choose a lower-cost health insurance plan when given simplified comparison information; Carroll *et al.* (2009) show that more people enroll in 401k savings plans when making active choices instead of passive "opt-in" choices; and Hossein and Morgan (2006) show that consumers are less likely to buy a product when more of the cost is included in the base price instead of "shrouded" as part of shipping and handling charges. In all three examples, people's choices differ between two contexts (informed vs. uninformed, active vs. passive choice, clearly-presented vs. shrouded costs), and the first of the two contexts more plausibly reflects true preferences.

Using a simple economic model, we provide four principles for designing and evaluating behaviorally-motivated policy. We then provide rules for determining which contexts reliably reflect true preferences and discuss strategies for measuring internalities. Throughout the paper, we use energy efficiency policy as a case study. See Allcott and Sunstein (2015) for a longer version with additional considerations and more thorough citations to the related literature.

Background: The Behavioral Motivation for Energy Efficiency Policy

Energy efficiency policies such as Corporate Average Fuel Economy (CAFE) standards and appliance energy efficiency standards are important case studies of behaviorally-motivated policy because they often involve large costs and because federal agencies have pointed to what they see as substantial net benefits from internality reduction.

Consider the NHTSA (2012) RIA for the light duty CAFE standards for 2011-2025. Projected social benefits far outweigh projected social costs ($629 billion vs. $153 billion). The net externality reductions are valued at $61 billion, while the net *private* benefits (i.e. net social benefits excluding externalities) are $475 billion.[1] Of course, positive net private benefits could arise only in the presence of some non-externality distortion.[2] Drawing directly on behavioral research, the RIA points to "phenomena observed in the field of behavioral economics, including loss aversion, inadequate consumer attention to long-term savings, or a lack of salience of relevant benefits (such as fuel savings, or time savings associated with refueling) to consumers at the time they make purchasing decisions."

The 2009 technical support document for appliance and lighting energy efficiency standards promulgated under the Energy Independence and Security Act of 2007 (EISA) similarly finds large net private cost savings: $27 to $64 billion in net savings over 30 years (DOE 2009). As with CAFE standards, net private savings are much more important than externalities: net private savings outweigh the value of carbon externality reductions by 34 to 194 percent.

A Model of Optimal Policy under Inconsistent Choice

We present a simplified version of the "reduced form model of behavioral public finance" from Mullainathan, Schwartzstein, and Congdon (2012) and Allcott and Taubinsky (2015). Individuals decide whether or not to take an action, such as whether to open a retirement account, quit smoking, get preventive healthcare, or buy a higher fuel economy car. The action has equilibrium price p, and the perfectly-competitive supply curve is S(p).

Consumers incur true utility v when taking the action. In the standard economic model, consumers take the action if $v>p$. The "behavioral" model generalizes the standard model by allowing consumers to take the action if $d>p$, where $d=v-b$ is "decision utility" and b is some bias which could be zero, positive, or negative. In the language of Kahneman *et al*. (1997), v represents "experienced utility" and d represents "decision utility."

The bias parameter b could reflect different specific inconsistencies in different contexts. Under present bias, individuals might decide today to quit smoking tomorrow, but when tomorrow arrives they might not quit smoking. Under inattention, individuals might buy an energy efficient lightbulb if energy costs and prices are presented together, but they might ignore energy costs and buy the cheaper energy inefficient bulb if energy costs are not salient.

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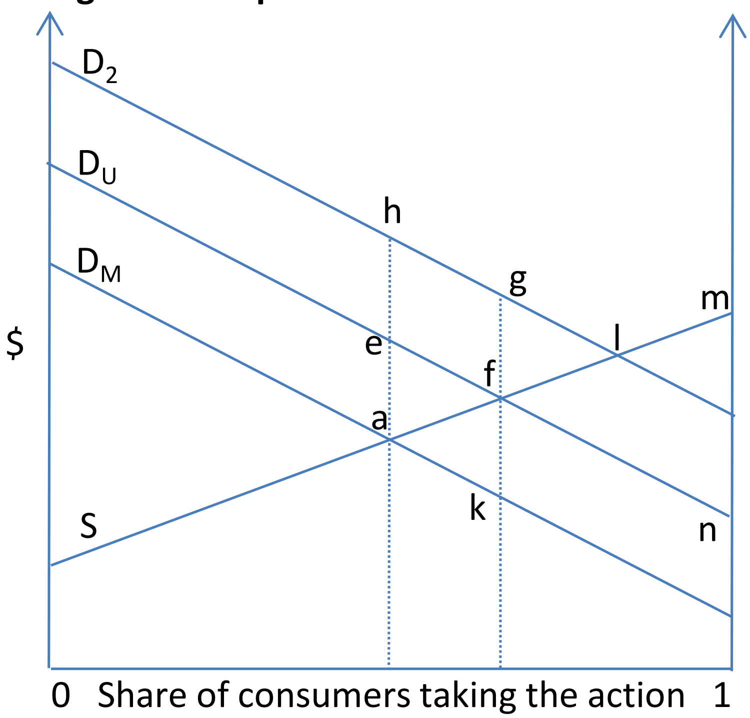
[1] These figures are from Table 13, for NHTSA's "preferred alternative," assuming a three percent discount rate and using the 2010 baseline fleet.

[2] It is sometimes argued that the fact that *gross* private benefits (without netting out increases in vehicle costs) are much larger than externality benefits is evidence that the CAFE RIA assumes internalities. This is not correct. Even assuming zero internalities, any CAFE cost-benefit analysis will find that private benefits are a large share of gross benefits, because the policy primarily saves gasoline, and private costs are a large share of gasoline's assessed social costs. What is true is that some non-externality market failure is required for *net* private benefits to be positive.

Figure 1 illustrates the model. $D_M(p)$ is market demand – it reflects the heterogeneity in decision utility d across consumers. Imagine that all consumers have homogenous bias $b_1>0$ against the action, so the demand curve if consumers were unbiased would be $D_U(p)$, and it is $D_U(p)$ that reflects experienced utility. Bias b_1 is quantified in dollars as the vertical difference between D_M and D_U. The market equilibrium is at point a, whereas in the efficient equilibrium, all consumers to the left of points f and k would take the action.

Figure 1: Graphical Model of Internalities



While consumer bias is not a traditional market failure, the source of inefficiency is clear: consumers between points a and k on the market demand curve don't take the action even though their true utility exceeds the cost. There is thus a distortion with welfare loss equal to triangle aef. The role of government in this model is also clear: if the policymaker subsidizes the action by amount $s^*=b_1$, the equilibrium moves from point a to point k, and the social optimum is achieved. This government intervention has eliminated the distortion, increasing welfare by amount aef. Notice here the direct analogy between internalities and externalities: if we reinterpret b_1 as an externality, this model simply restates the standard Pigouvian model of externality taxation. It is thus useful to think of internalities as "externalities that individuals impose on themselves."

Principles of Behaviorally-Informed Regulation

Here we discuss four principles that follow from our simple model and use them to comment on major energy efficiency policies.

Principle 1: Taxes and subsidies are more allocatively efficient than mandates or bans

In our model, imagine that the policymaker has two instruments available: a subsidy of amount s and a mandate that all consumers take the action. Per above, the optimal subsidy generates welfare gain aef. Similarly, the mandate also increases welfare for consumers between a and k on the market demand curve. However, for consumers to the right of k (those with true utility $v<p$), the mandate decreases

welfare by forcing them to take an action that they value at less than cost. Thus, the net welfare effects of a ban are aef minus fmn. Except for the special case where *all* consumers have v>p and an infinite subsidy is thus optimal, a mandate is thus strictly worse than the optimal subsidy. In this drawing, a mandate is also worse than no policy at all, because aef is smaller than fmn.

A preference for price instruments instead of mandates or bans has direct implications for energy efficiency policy. Federal minimum standards ban energy inefficient appliance models. A different approach that taxed energy inefficient appliances at the level of the average marginal distortion (including internalities, uninternalized externalities, and any other market failures) would be more allocatively efficient. Intuitively, this is because there are some people who use air conditioners infrequently or face low electricity prices and thus would optimally own an energy inefficient air conditioner that is currently prohibited. Allcott and Taubinsky (2015) quantify this point in the lightbulb market. For the consumers in their randomized experiments, a moderate tax on energy inefficient lightbulbs might increase welfare by reducing internalities, but some consumers still strongly prefer traditional incandescent lightbulbs even when given clear information about their energy costs, and banning them from buying incandescents reduces welfare.

Principle 2: Target the distortion

With heterogeneous bias, the optimal subsidy level is the average marginal bias – i.e. the average bias of consumers that are on the margin at the subsidized price. This is analogous to Diamond's (1973) result that the optimal externality tax equals the average marginal externality. Under heterogeneity, the uniform subsidy no longer delivers the best possible outcome, because even the "optimal" uniform subsidy is a compromise that is too weak for relatively biased agents and too strong for unbiased agents. This motivates nudges as a policy instrument. If the bias derives from imperfect information or inattention, providing salient information can help misinformed and inattentive consumers without affecting the already informed and attentive types. If the bias derives from present bias, offering commitment contracts can similarly help biased consumers make the privately-optimal decision without distorting choices by time consistent types. In this model, the benefit of nudges is thus not the (important) philosophical idea that they interfere less with choice. Instead, this model highlights that nudges can be preferred from an efficiency perspective to the extent that they target unbiased consumers.

Allcott, Knittel, and Taubinsky (2015) argue that many energy efficiency subsidies could be poorly targeted because well-informed "environmentalist" types are more likely to be aware of subsidy availability and also more likely to be marginal when subsidizing niche goods such as hybrid cars and energy efficient lightbulbs. On the other hand, direct mail programs such as home energy reports are often selectively targeted to heavier users who might be unaware of their heavy usage and who might benefit more from information.

While nudges are by definition better targeted than uniform subsidies and standards, using nudges alone is not optimal unless the nudge removes *all* systematic bias. For example, while energy use information labels such as appliance “yellow tags” and fuel economy labels are the natural first step to addressing imperfect information and inattention, many consumers do not see and internalize this information: 40 percent of Americans report that they “did not think about fuel costs at all” during their most recent auto purchase (Allcott 2011). Thus, the fact that information is available does not mean that the policymaker should not consider CAFE standards or other policies to address imperfect information or other distortions.

Principle 3: Minimize losses from regulators’ imperfect information

Environmental economists often argue for flexible policies such as carbon prices instead of command-and-control regulations because regulators typically lack the information to impose economically efficient firm-specific mandates. A similar logic applies to behaviorally-motivated regulation: we should prefer policies that exploit what regulators know and minimize the losses from what they do not know.

The engineering approach to determining the optimal CAFE standard is highly informationally demanding: the 2012-2016 light-duty standards required 2142 pages of regulatory impact statements, technical support documents, and responses to comments, much of which was devoted to modeling automakers’ technology adoption decisions. Even from the most competent and well-motivated officials, there is inevitably a risk of error here, although we do not see a better way to evaluate the regulation in its current form.

Principle 4: Adopt the policy that maximizes net benefits

In our model, any subsidy that is not correctly calibrated to equal the average marginal bias reduces welfare relative to the optimally-calibrated subsidy. Analogously, there is a range of possible levels of stringency for energy efficiency requirements, and regulators should adopt the level with the highest net benefits (including internalities). This principle emphasizes the importance of measuring internalities, which is the issue we take up below.

Measuring the Average Marginal Bias

Principled refinements of the welfare-relevant domain

Welfare analysis in the standard model assumes that the market demand curve (D_M in our model) reflects individuals’ true utility (v). The behavioral model relaxes this assumption. The challenge is to determine in a principled way which choices reflect true preferences and which reflect mistakes. Drawing on the recent economics literature, we propose four principles for applied work:

1. *Use well-informed choices.*
2. *Use considered choices.* Here, "considered" means choices where the individual evaluates all relevant facets of a product or activity.
3. *Use active choices.* Such choices reflect the agent's own values and tastes, whereas passive choices (such as failing to opt in or opt out of a default setting) may not.
4. *If individuals are present-biased, use long-run instead of present-biased (impulsive) choices.*

In the language of Bernheim and Rangel (2009), choices that satisfy these four criteria would constitute the "welfare-relevant domain," while choices that fail any of these criteria can plausibly be defined as "suspect" on welfare grounds. If suspect choices differ from the choices in the welfare-relevant domain, they would not be used for welfare analysis. In this sense, paternalistic regulation can be limited to situations in which individuals' choices are demonstrably inconsistent, and when it can be argued in a principled way that choices in one setting do not promote people's welfare or reflect true preferences.

These refinements mean that there are cases when this framework does *not* justify paternalistic regulation. For example, the framework does not support paternalism in cases when people make considered and active choices after gathering all relevant information, but their interpretation of the evidence differs from the regulator.

Measuring bias

We follow Mullainathan, Schwartzstein, and Congdon (2012) and others in defining three empirical approaches to measuring bias:

1. *Comparing demand responses.* Consumers should be equally responsive to variations in purchase prices and to variations in other product costs. For example, quantity demanded should decrease by the same amount if a good's purchase price increases by $1 or if other costs such as shipping and handling, sales taxes, or present discounted energy costs increase by $1.
2. *Measuring effects of nudges*. If a nudge is something that only removes bias, then the change in demand caused by a nudge is a measure of bias. Allcott and Taubinsky (2015), Chetty, Looney, and Kroft (2009), and others use this approach, providing information to a randomly-selected treatment group to measure the bias caused by imperfect information or inattention. The challenge is finding an intervention that only removes bias but has no other effects. For example, one might be worried that an "information" intervention does not just remove bias, but also subtly persuades consumers to take a different action.
3. *Comparing elicited beliefs to factual data.*

One potential alternative to using revealed preference is to use engineering or accounting models to measure true utility. At least in the context of energy efficiency, however, some engineering models do not accurately predict true utility in some contexts. Fowlie, Greenstone, and Wolfram (2014), Joskow and Marron (1992), and others have shown that engineering models overstate actual energy savings in particular settings. Anderson and Newell (2004) and others argue that costs not included in engineering models reduce takeup of energy efficiency relative to models' predictions.

Applying Recent Estimates of Internalities to Future CAFE Regulatory Impact Analyses

The recent papers by Allcott and Wozny (2014), Busse, Knittel, and Zettelmeyer (2013), and Sallee, West, and Fan (2015) use the "comparing demand responses" approach to measure whether consumers fully value gasoline costs relative to vehicle purchase prices. The exact empirical strategies differ, but the basic approach is to compare how the relative prices of low- vs. high-fuel economy used vehicles change as gas prices change. Intuitively, as gas prices increase, the price of a Prius should increase relative to the price of a Hummer, because the higher fuel economy rating of the Prius is more valuable. An exact relationship between gas prices and used vehicle prices can be predicted under assumptions about future gas price expectations, vehicle lifetimes and miles traveled, and other factors. If vehicle prices move as predicted with gas prices, we have reason to think that consumers are not biased in their evaluations of the benefits of fuel economy.

The main estimates in Allcott and Wozny (2014) suggest that consumers value 76 percent of discounted future gas prices, i.e. a moderate bias relative to full (100 percent) valuation. Busse, Knittel, and Zettelmeyer (2013) and Sallee, West, and Fan (2015) find results more consistent with full valuation, i.e. zero average bias. All three papers agree that used vehicle prices are highly responsive to gasoline prices and that the average bias is at most moderate. This finding is important given the simulation model of Fischer, Harrington, and Parry (2006), which argues that "the efficiency rationale for raising fuel economy standards appears to be weak unless carbon and oil dependency externalities are far greater than mainstream economic estimates, or consumers perceive only about a third of the fuel savings benefits from improved fuel economy." Other simulation models find similar qualitative results.

The empirical literature is continuing to develop. However, there is a discrepancy between the engineering model results, which suggest very large internalities, and these foregoing empirical estimates, which do not. The engineering model may overstate net benefits, or the empirical estimates may not correctly measure internalities, or there may be some additional market failure other than internalities that the empirical estimates do not capture, perhaps related to vehicle supply or innovation spillovers. Future CAFE RIAs might productively engage with the developing literature and with this possibility.

Conclusion

A large body of existing research suggests that imperfect information and internalities are real and significant in some markets, so it is appropriate to consider them in regulatory impact analyses. In these cases, our simple model (and many more formal models in the literature) show how policy intervention can increase welfare, whether by restricting choices, changing prices, or by "nudging" individuals toward privately-optimal decisions. In this paper, we review an approach to paternalistic regulation that relies on consumers' own preferences as revealed through well-informed, considered, active, and pre-planned choices.

This approach suggests potential policy improvements in energy efficiency and other domains: taxing instead of banning choices that generate internalities, targeting policies directly toward market distortions, using regulations that rely on less regulator knowledge, and correctly calibrating the stringency of a tax, subsidy, or standard. Recent evidence raises issues about the magnitudes of internalities in the context of fuel economy. Given the many billions of dollars of social welfare at stake, it is clear that further research is needed to understand these issues.

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