The Hidden Cost of Regulation: Emotional Responses to Command and Control

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In economic models of behavior consumers are assumed to value the goods and services they purchase based on stable preferences over externally identifiable attributes such as quality. These models predict that consumers will respond to changes in price in a way that is independent of the source of the price change. Yet research in the behavioral sciences indicates that consumers that are emotionally attached to a consumption good or other behavior might respond with resistance when policies threaten their consumption or behavior. Moreover, policies that in fact validate some emotional attachments can stir a stronger preference for the good or behavior. Reviewing both survey and experimental data from the literature, we demonstrate how such emotional responses can create hidden costs to policy implementation that could not be detected using standard welfare economic techniques. Building upon Rabin's work on fairness in games, we propose a partial equilibrium model of emotional response to policy whereby preferences are endogenous to policy choices. In accordance with evidence both from our own analysis and the field, we propose that confrontational policies (such as a sin tax) increase the marginal utility for a good, and that validating policies (such as a subsidy) also increases the marginal utility for a good. A social planner that ignores potential emotional responses to policy changes may unwittingly induce significant dead weight loss. Using our model, we propose a feasible method to determine if emotional deadweight costs exist, and to place a lower bound on the size of these costs.

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"…the Resolutions lately come by the East India Company, to send out their Teas to America Subject to the payment of Duties on its being landed here, is an open attempt to enforce the Ministerial Plan, and a violent attack upon the Liberties of America." -Samuel Adams

One of the primary appeals of economics is the relatively straightforward way in which the theory can be used not only to describe behavior, but also to prescribe policy (Atkinson 2011). So long as observed actions reflect individual choices that maximize wellbeing, those actions can then be used to determine how policy goals (such as reducing a negative externality) can be achieved in a way that has the smallest impacts on consumers and producers.[1] Generally speaking, a policy that maximizes welfare while achieving the policy objective is one that directly addresses the objective. In international trade theory, this is often referred to as the principle of targeting (Rodrik 1987). Thus, if we are aware that consumption of a good leads to a per unit externality, one policy that would meet the targeting criteria is to implement a tax or subsidy on that good so that consumers internalize the cost. In many cases, several different policies will yield very similar if not the same social welfare (e.g. a tax versus a cap on production), though the distribution of surplus will differ.

Two key assumptions are necessary to apply traditional welfare theory. First, preferences, usually represented by a utility function that embodies wellbeing as a function of consumption, must be directly linked to choice such that the individual is engaging in utility maximizing behavior. Secondly, the preference function must be stable and invariant to the policies that are implemented. Many of the recent results from behavioral economics undermine both of these key

[1] The preferred distribution of surplus, however, is generally considered beyond the scope of objective theory.

assumptions. Nearly all behavioral economic results have at their core that individuals appear to make systematic errors in judgment so that their wellbeing is not necessarily aligned with their actions even after learning may take place (e.g., DellaVigna and Malmendier 2006). Moreover, preferences appear to be context dependent (e.g., Kahneman, Knetsch and Thaler 1990) and thus may change under various policies. Several researchers have proposed ways to generalize welfare theory to account for context dependent preferences or choices that do not necessarily reveal preference (see Koszegi and Rabin 2007 or Bernheim and Rangel 2009). In general these theories are developed to account for decision mistakes: choices that the individual comes to regret because the actions do not represent their true preferences.[2] Building on further work by both Rabin (1993) and Kahneman, D., J.L. Knetsch and R.H. Thaler (1986a, 1986b) we propose to deal with a potentially more pernicious problem—that of emotional costs or benefits to policy approaches that may be partially unobservable in market behavior.

People can develop emotional attachments to goods or business relationships that are not often accounted for in economic application (Robison, Myers and Siles 2002). In this case, an individual can often face substantial individual cost in order to act on their emotions. These emotions can thus often be seen as changing preferences. In this paper we explore how regulation of such emotionally attached goods can lead to shifts in preferences and the implications for common application of welfare theory. We argue that the changes in preferences observed in market behavior cannot be interpreted in the lens of traditional welfare theory.

[2] In other cases, behavioral economists propose extensions to the neoclassical model to illustrate how seemingly irrational behavior can be considered rational. Key examples are time inconsistent preferences (see Frederick, Loewenstein, and O'Donoghue 2002), reference dependent preferences (see Koszegi and Rabin 2006), and fairness (Rabin 1993).

Interpreting these responses using such an approach leads to perverse results and may explain many of the recent policy clashes. Based on a few simple results from the literature and our own survey, we propose a theory of emotional response to policy. From this theory we derive a sort of emotional principle of targeting. This principle suggests that given a particular policy goal, policies that are more empathetic to consumer emotions will improve market welfare relative to those policies that are more combative or confrontational.

Emotional Attachments to Regulation and Policy

Economists have a rather short history of considering emotional attachments and their implications for transactions. One interesting example of such attachments is found by Siles et al. (2000) in examining farmland value. They and others have found that farmers will discount land sales by as much as 38% when sold to family members or close friends. On the other hand, buyers that are not part of the seller's social circle pay as much as a 40% premium on farmland (Siles et al., 2000; Perry and Robison, 2001; Robison, Myers, and Siles 2002). Theoretically the value of a parcel of farmland should be equal to the present value of the discounted stream of future profits from the land, which should be relatively independent of family relationships.

For many farmers, their land is not just a commodity, but a place with tender memories of learning to work with close friends and family. This land, though considered a commodity by many, may carry significant emotional value. Thus farmland is not purely a physical product asset, but a relational good that generates utility from the co-production and co-consumption with others (Uhlaner 1989; Becchetti Torvato, Bedoya 2011). When the land is for sale, a farmer with relational investments in the land will price the land more than the net present value of the future stream of benefits, unless the sale is to an individual with which the farmer has a positive social relationship. The value of the social capital in the sale to a friend or neighbor offsets the

farmer's above market valuation of the land. It is important to note that such emotional ties build an emotional connection between people (e.g., family members) *and* goods (e.g., land). This emotional attachment builds over long periods of time and can happen idiosyncratically. Thus hotdogs may hold a special value to an individual who can recall consuming them at ballparks with their grandfather long ago, while to others it may simply be a casing filled with processed meat.

Policies may often threaten to restrict the use of such emotional goods. In 2011, the Department of Labor planned to limit child labor on farms by providing a list of jobs children could not perform. This restriction would apply to all farms, including family farms.[3] After the announcement on August 25, 2011, farmers, youth and many that had previously engaged in farming were outraged. Farmers claimed the government was meddling too closely with parent-child relationships as parents used farm labor to teach values of hard work and responsibility. Children were also opposed as they voiced the benefits of working on farms (Richardson 2012). While the labor law would restrict labor pools for farmers and increase production costs, opponents focused solely on the impact on parenting. If the law were to pass, parents could no longer use traditional farming practices to teach their children certain values, and this would amplify the negative impact felt from increasing production costs. Given the heavy criticism of the proposed rule, the Department of Labor withdrew the proposed rule citing the need to preserve "the rural way of life, especially the role that parents and other family members play in passing those traditions down through the generations." (Leven 2012).

In the psychology literature, this sort of emotional response has been referred to as *reactance*. Reactance is a rebellious reaction to any sort of threat to restrict one's freedom

[3] Until this proposal, family farms were exempt from most child labor laws.

(Brehm 2009; Clee and Wicklund 1980). Reactance operates by making the restricted object more desirable (Brehm 2009). This reactance is an emotional response and can often times seem to run counter to rational behavior. An early example dealt with student responses to signs on bathroom stalls seeking to reduce the amount of graffiti (Pennebaker and Sanders 1976). When signs demanded that students stop writing on the walls, a greater amount of graffiti was observed, while signs that simply encouraged people not to write on the walls lead to a decrease in graffiti. Thus students' responses depended heavily on how confrontational or authoritarian the signage was. There is also evidence that children respond to food restrictions by eating a greater amount of the restricted food once in settings where it is available again (Fisher and Birch 1999; Faith et al. 2004). Reactance may explain some of the rapid decline in school lunch participation since the recent implementation of strict nutritional standards.

In addition to reactance, individuals also display positive emotional responses to the elimination of restrictions or enhancements to freedom (Worchel and Brehm 1971). Consider, for example, the case of Social Security. In a speech given during the National Conference on Economic Security in 1934, President Roosevelt argued (Social Security Administration 2014),

> "Old age is at once the most certain, and for many people the most tragic of all hazards. There is no tragedy in growing old, but there is tragedy in growing old without means of support…but I hope that in time we may be able to provide security for the aged – a sound and uniform system which will provide true security."

Roosevelt's impassioned plea was designed to create a positive emotional feeling for this policy. This emotional attachment continued to be leveraged by politicians generations later. President Clinton declared (Social Security Administration 2014):

> "For 60 years, Social Security has meant more than an ID number on a tax form; more than a monthly check in the mail. It reflects our deepest values – our respect for our parents and our belief that all Americans deserve to retire with dignity."

Such positive emotional ties are partly responsible for making social security the "third rail of politics" (Safire 2007).

Though emotions and feelings are important components of consumer behavior, it is difficult to quantify them or their impact on consumer goods. Moreover, there are lively debates over whether determining policy based upon the volatile emotions of a population is an effective strategy for improving societal welfare (Lusk 2014). Yet pinning down the mechanisms through which emotions are displayed potentially provides a more rigorous approach to defining consumer preferences and generating appropriate predications about the welfare implications of policies that might restrict consumption of emotional goods.

In the last 30 years, social behavior has become a more common component of economic modeling. Early work in altruism laid foundations for the analysis of charitable behavior (Andreoni 1990). Rabin (1993) built upon this foundation when he introduced a theoretical framework for behavior motivated by fairness. He argues that individuals are motivated by the intents of others. More specifically, he proposes that one will sacrifice their own wellbeing for another if they believe that person is willing to do the same—and that one will sacrifice to inflict harm on another if they believe that person is willing to do the same. Rabin originally created this model to explain the classical result of the Ultimatum Game, in which participants who feel they have been short changed will refuse an ultimatum, leaving both players worse off.

A similar line of research was pursued by Kahneman, Knetsch and Thaler (1986a, 1986b), who find that individuals have strong opinions about when profit seeking behavior is fair and when it is out of bounds. For example, 82% of respondents to a survey considered it unfair to raise the price of a snow shovel in response to a major snow storm. Similarly, it was considered unfair (by 83%) to reduce an employee's wages simply because the market wage had declined. Reductions in wages were acceptable (by 63%) if the firm changed its production so that it now competed in a different market. Thus, not every change in wages is considered equally. The reason matters. Moreover, individuals were motivated to enforce these fairness rules on offending firms through their patronage (or lack thereof). This may explain the mass exodus of irate customers when Netflix suddenly changed their terms of service in 2011. Individuals may also hold governments to some standard of fair conduct based not just on the resulting commodity prices or allocation of wealth, but on the motives for their meddling.

Empirical Evidence for Emotional Attachments to Regulations

While a full *empirical* exploration of the welfare implications of these emotional responses is beyond the scope of this paper, it is important to determine whether such responses may be of a scope or size that would justify their exploration in future work. We present what might be termed rough evidence for the effect from two relevant policy debates. Our primary purpose is to motivate future study rather than to present air tight evidence of the emotional response.

Case 1: Fat Taxes and Thin Subsidies

Schulze et al. (2013) conducted an experiment that brought 173 adult (non-student) participants into a laboratory for lunch. Each was first given $20, and was presented with a menu of various items for lunch. They were told that they could retain any money not spent. After selecting their meal, they were shown revised menus and asked if they would like to revise their choices. Some

of the revised menus included health ratings of the food, others changed the prices of the foods, while a third set both changed the prices and offered health ratings. When prices were changed, they would reflect higher relative prices for the less healthy foods, and lower relative prices for the healthy foods. Sometimes these changes were presented as a tax (increase in prices on unhealthy foods) while sometimes they were framed as a subsidy (lower relative prices on healthy foods). By adjusting the original prices faced, the eventual prices faced both in the tax and subsidy conditions were identical. Enough variation in prices was observed in this experiment to generate simple linear demand curves using their summary statistics, presented in Figures 1 and 2.

The three demand curves depicted in Figure 1 show that the empirical preferences for healthy foods appear to depend on not just the price, but whether the price is framed as a subsidy on healthy foods, or relative to a tax on unhealthy foods. The base prices prior to the implementation of the subsidy occur near the intersection of the three curves. The curve labeled D_0 represents the change in demand when prices were changed without a tax or subsidy frame. The D_s curve represents demand when price changes are framed as a subsidy. Notice, that under the subsidy (as you move southeast from the region of intersection) the demand curve has a lower slope, meaning that individuals prefer the healthy goods more when lowering prices are represented as a subsidy on healthy foods than when simply represented as idiosyncratic price changes. When framed in reference to a tax on bad foods, D_T, individuals prefer the healthy items less and purchase less at each price.

Examining figure 2, we see that the demand for unhealthy foods responds in the opposite direction (now moving northwest from the intersection region). The demand for unhealthy foods under the tax frame becomes steeper indicating a strengthening of preference, while the demand

in reference to the subsidy on healthy foods is weaker. In both figures, the interactions between prices and frames are significant (Schulze et al. 2013). Though both groups faced the same prices, those who felt the price change was intended to reinforce their ability to choose changed their behavior much more than those who felt the policy was framed as restricting their choice. In both cases, the response appears to be loaded with a potentially emotional response to the policy.

Case 2: Environmental Regulation and Reactance

In response to concerns about global warming the US government has sought to curtail CO_2 emissions. In June 2014, the Environmental Protection Agency proposed to cut carbon pollution from power plants 30% before 2030. In his announcement, President Obama did not address the costs and benefits of this legislation. Instead, speaking at the Children's National Medical Center in Washington, DC he explained (White House 2014):

> "Often, these illnesses [asthma and other breathing problems] are aggravated by air pollution – pollution from the same sources that release carbon and contribute to climate change. And for the sake of all our kids, we've got to do more to reduce it."

His use of emotions to garner support for the proposal is a classic example of attempting to capture the intangible social capital existing between parents and children, and the duty to protect children in general.

In contrast, an article appearing in *US Financial Post* aimed to foster dissatisfaction with the proposal by pointing out potential job losses and other economic consequences. The article's author framed the President's energy policy as a war on the coal industry (Mason 2014). In

addition, the author pointed out that the President would allegedly impose the policy by executive order if necessary.

To gauge consumer sentiment about the proposed regulation and to identify reactance in responses to the two articles mentioned above, we administered a survey experiment on Amazon's Mechanical Turk. This survey was available from of June 9 to 23, 2014 resulting in 1131 survey responses. Survey respondents were randomly assigned to one of three groups: 1) read no article and complete the survey ($n = 356$); 2) read the press release containing President Obama's speech and complete the survey (referred to as the "positive" treatment, $n = 374$); or, 3) read the article in *US Financial Post* and complete the survey (referred to as the "negative" treatment, $n = 357$).In the survey, we asked the respondents basic measures of energy usage. To gauge reactance, we included a validated measure of reactance based on 10 questions (Hong and Page 1989; Hong and Faedda 1996; Dowd, Milne, and Wise 1999). In addition, we asked for demographic information. The survey is included in online Appendix A. Using nearest neighbor matching to control for political affiliation, age, gender, race, marital status, education and income, we find that the negative treatment has no significant impact on the reported weekly miles traveled (-5.07, p = 0.754) relative to the control. Alternatively, the positive treatment significantly reduces the reported miles traveled (-26.03, p = 0.02). Overall measures of reactance do not differ significantly by treatment. However, we do find some differences by treatment when we interact treatment with political affiliation.

Table 1 displays the interaction coefficients from simple regressions of reactance on dummy variables representing treatment, political affiliation and the interactions between treatment and political affiliation. The single significant interaction indicates that Republicans reduced their overall reactance (or emotional resistance) when exposed to President Obama's

impassioned plea. Other results are not significant, but of a reasonable sign and nearing significance. Republicans, independents, and libertarians all reported a higher reactance scale relative to democrats ($p = 0.001, p = 0.018, p = 0.001$, respectively) which suggest that republicans may already have a latent level of reactance which is captured through the main effect of the party affiliation. Interestingly this level of reactance is not heightened by the negative messaging. Rather, it appears to be mediated by the positively charged message. While these results are only suggestive at best, they are important for demonstrating that a positive emotional appeal can help to reduce the negative emotional response that is often associated with a sin tax of any nature. Moreover, it appears that the reduction in reactance also helped contribute to stated lower energy use.

A Theory of Emotional Response to Regulation

Consider a representative consumer of a good for which individuals may have some direct emotional attachment. Let us represent the amount of consumption of this good by $x_e \in \mathbb{R}_+$. The individual obtains some utility of consumption for the good based on the objective consumption properties of the good in conjunction with their consumption of all other goods which we will represent by $U: \mathbb{R}_+^{n+1} \to \mathbb{R}$, $U(\mathbf{x})$, with $\mathbf{x} = [x_1 \quad \cdots \quad x_n \quad x_e]$, where x_i, $i = 1, \dots, n$ represent the consumption levels of each other goods. We will assume this utility function conforms to the standard properties ($U(\cdot)$ is twice continuously differentiable, $U_i(\cdot) > 0$ for all i, and $U(\cdot)$ is concave in all arguments). Moreover, we assume that there are no Giffen goods. This utility function is analogous to the material outcome found in Rabin's (1993) work on fairness. We will refer to this as the consumption utility.

By accumulating an emotional attachment to the emotional good, x_e, the individual also obtains enjoyment, or dissatisfaction, from the relationship with the good as they consume it.

However, the amount of enjoyment can also be impacted by the regulatory context. For example, if the ability to consume x_e in the future is under some exogenous or external threat, the individual may suddenly value this emotional component more than they had previously, or may come to enjoy not just the consumption of the good but the satisfaction of rebelling against challenging a threatening policy. Moreover, if a policy appears to reinforce this emotional attachment (for example, providing a subsidy for child healthcare) one may now receive added enjoyment of the good due to this reinforcement. We represent this emotional component of preferences under a policy j as $h_j(x_e, t|\xi_x), h: \mathbb{R}_+ \times \mathbb{R} \to \mathbb{R}$, where t represents the *perceived*[4] change in consumer price under policy j, and ξ_x is a parameter of the function h_j that represents the valance of the emotional relationship with good x_e. We will represent the null policy as $j = 0$, which can serve as a reference point for the perceived price change. We will refer to this function as the emotional preference.

For convenience we assume that if the emotional connection to the good is positive, so that the good is associated with positive emotions, then $\xi_x = 1$. If the emotional connection is negative and associated with negative emotions, then $\xi_x = -1$. If there is no emotional connection, then $\xi_x = 0$. Moreover, we will assume that $h_j(\cdot,\cdot\,|\xi_x)$ takes on the same sign as ξ_x, and that $h_j(\cdot,\cdot\,|0) = 0$. Finally, we assume that $h_j(\cdot,\cdot\,|\xi_x)$ is twice continuously differentiable in x_e and,

[4] Note that the perceived change in price can be thought of as a perceived change in the nominal price, or the perceived change in the overall opportunity cost of the good. In the example of increased restrictions on child labor laws, one of the costs was an increase in the opportunity cost of teaching children hard work and responsibility as farmers would need to find new ways independent of farming.

(1) $$sign\left[\xi_x \frac{\partial^2 h_i(x_e,t|\xi_x)}{\partial x_e \partial t}\right] = sign[t].$$

Thus, if one has a positive emotional connection to the good, a policy that is intended to reduce consumption of the good relative to the null policy will increase the marginal emotional preference, while one that is intended to increase consumption relative to the null policy will also increase marginal emotional preference. On the other hand, if a good has a negative emotional connection, a policy that is intended to reduce consumption will reduce marginal emotional preference and one that increases consumption will also reduce marginal emotional preference.

This emotional preference function is very close in nature to the prospect theory value function (Kahneman and Tversky 1979), where the price under the null policy, p_0, induces the reference level of consumption. There are two key differences that are worth noting. First, we assume that $h_j(\cdot,\cdot\,|\xi_x)$ is continuously differentiable, and is thus smooth even at $t = 0$. Alternatively, the prospect theoretic value function is kinked at the reference point. Smoothness is useful in simplifying optimization, but also reflects the generic evidence that individuals tend to respond relatively mildly to policies that induce only a small change in consumption (e.g., small taxes on soda or cigarette consumption). Secondly, the emotional preference function is convex over increases in consumption and concave over losses in consumption. This is exactly opposite of the prospect theoretic value function. In the case of emotional responses to policy, our stylized evidence suggests that individuals will respond more heavily to a more restrictive policy (e.g., \$1 per pack tax on cigarettes, versus a \$0.10 per pack tax), clearly contradicting the standard prospect theory form. This is not surprising as the prospect theory valuation was generated through observations from simple and willful trades in goods. On the other hand, we are examining cases in which individuals are viewing the policy as a forced transaction of some sort. This emotional response to either confrontational or supportive policies would almost

certainly not mimic the individual's valuation of goods that could be willfully traded—which may more readily be compared to our utility of consumption. We must note that the properties we have assumed for the emotional preference may only hold locally (in a relevant neighborhood of $t = 0$), and must be constrained mathematically to avoid extreme behaviors (e.g., responding to a subsidy of a positive emotional good by abandoning all other consumption).

Not every policy will elicit the same emotional response even if they induce the same perceived change in price. For example, if market forces increase prices and reduce consumption, one may be emotionally neutral, where an equivalent tax or quota on consumption by policymakers that openly argue that excess consumption is immoral may induce a severe emotional response. Thus, it is not necessarily the case that $h_j(x_e, t|\xi_x) = h_k(x_e, t|\xi_x)$. We will refer to a policy j as being relatively more emotionally charged than policy k if $\left|\frac{\partial^2 h_j(x_e,t|\xi_x)}{\partial x_e \partial t}\right| > \left|\frac{\partial^2 h_k(x_e,t|\xi_x)}{\partial x_e \partial t}\right|$, meaning the slope of the emotional preference function is more responsive to price changes under an emotionally charged policy. A priori, we have no evidence nor reason to believe that a more emotionally charged policy might impact the rate at which emotional preference diminishes. Thus, for convenience, we assume that all higher order derivatives of the emotional preference functions are independent of policy. Thus the rate of diminishing marginal emotional preference is constant for a given price change across all possible policies, $\frac{\partial^2 h_j(x_e^*,t|\xi_x)}{\partial x_e^2} = \frac{\partial^2 h_k(x_e^*,t|\xi_x)}{\partial x_e^2}$ for all j, k. We will assume that $h_j(x_e, 0|\xi_x) = h_k(x_e, 0|\xi_x)$ for all i, j. In other words, when there is no perceived change in price, the emotional response to a policy is the same, regardless of the policy.

We will treat consumption utility and emotional preferences as additive. Thus, facing a price instrument of t on the emotional good, the individual solves

(2) $$\max_{\{\mathbf{x}\}} U(\mathbf{x}) + h_j(x_e, t|\xi_x)$$

subject to

(3) $$(\mathbf{p} + \mathbf{t}) \cdot \mathbf{x} \leq w$$

where $\mathbf{t} = [t \quad 0 \quad \cdots \quad 0]$. If an interior solution exists, this is solved where

(4) $$U_e + \frac{\partial h_i(x_e, t|\xi_x)}{\partial x_e} - \lambda(p_e + t) = 0$$

(5) $$U_i - \lambda p_i = 0$$

for $i \neq e$, $\lambda > 0$ and

(6) $$w - (\mathbf{p} + \mathbf{t}) \cdot \mathbf{x} = \mathbf{0}$$

The demand curve for good x_e can be derived by conducting the usual comparative statics on equations (4) through (6) resulting in

(7)

$$\frac{dx_e}{dt} = -\frac{\begin{vmatrix} 0 & -p_1 & \cdots & p_n & -x_e \\ -p_1 & U_{11} & \cdots & U_{1n} & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ -p_n & U_{1n} & \cdots & U_{nn} & 0 \\ -p_e & U_{e1} & \cdots & U_{en} & \frac{\partial^2 h(x_e, t|\xi_x)}{\partial x_e \partial t} - \lambda \end{vmatrix}}{|H|}$$

$$= -\frac{\frac{\partial^2 h(x_e, t|\xi_x)}{\partial x_e \partial t}|H_{ee}| - \lambda|H_{ee}| + (-1)^{n+1} x_e |H_{en}|}{\left(U_{ee} + \frac{\partial^2 h(x_e, t|\xi_x)}{\partial x_e^2}\right)|H_{ee}| + \sum_{i=1}^{n}(-1)^n U_{ei}|H_{ei}| - (-1)^{n+1} x_e \left|H_{e(n+2)}\right|}$$

$$< 0$$

where H is the bordered Hessian appearing in the total derivative of the first order conditions, and H_{ij} represents the matrix that is equal to the bordered Hessian with row i and column j deleted. The inequality follows from the restriction that there are no Giffen goods. If we compare the demand curve for two possible policies, then

$$(8)\ \Delta_{jk}(\mathbf{p},w) \equiv \frac{dx_e^j}{dt} - \frac{dx_e^k}{dt} = \frac{\left(\frac{\partial^2 h_k(x_e,t|\xi_x)}{\partial x_e \partial t} - \frac{\partial^2 h_j(x_e,t|\xi_x)}{\partial x_e \partial t}\right)|H_{ee}|}{\left(U_{ee} + \frac{\partial^2 h(x_e,t|\xi_x)}{\partial x_e^2}\right)|H_{ee}| + \sum_{i=1}^{n}(-1)^n U_{ei}|H_{ei}| - (-1)^{n+1}x_e|H_{e(n+2)}|}$$

Note that H_{ee} is the $(n-1)$th principle minor of bordered Hessian with a single constraint, and thus $sign(|H_{ee}|) = sign(\ (-1)^{n+1})$. Moreover, the denominator is the determinant of the nth principle minor and thus must have the opposite sign. Thus

$$(9) \qquad sign\left(\Delta_{jk}(\mathbf{p},w)\right) = sign\left(\frac{\partial^2 h_j(x_e,t|\xi_x)}{\partial x_e \partial t} - \frac{\partial^2 h_k(x_e,t|\xi_x)}{\partial x_e \partial t}\right)$$

Given our assumptions about emotional preference, there are nine possible regimes. Without loss of generality, let us assume that policy j is more emotionally charged than policy k, then the possible changes in the slope of the demand curve are depicted in Table 2.

A Graphic Example of Emotionally Charged Policies with a Positive Emotional Good

Measuring welfare requires accounting for changes in producer surplus, consumer surplus, government revenues and any externality within one of the markets (Just, Hueth and Schmitz 2005). In this case it will be easiest to calculate this in the market for the emotional good. Let us suppose there is some externality from consumption of the emotional good, with the external societal cost given by $E: \mathbb{R} \to \mathbb{R}$ and $E(x_e) \equiv E' x_e$, leading the policymaker to seek to modify consumption levels. Further, let us assume a supply function for the emotional good, $S_e: \mathbb{R} \to \mathbb{R}$,

$$(10) \qquad S_e(p_e) = x_e$$

Partial equilibrium requires that the demand curve in (8) and the supply curve in (10) both hold. Equilibrium is depicted in figure 3 for a positive emotional good with a negative externality. For the purposes of the figure suppose that the good generates a constant marginal negative externality and that the price change has been set to exactly offset this externality. With an emotionally neutral policy, changing the price by t will result in no change in the shape of the demand curve represented by the solid line labeled $D_e^0(p_e)$, leading to a reduction in

consumption from x_e^0 to x_e^t, with the consumer price increasing from p_e^0 to $p_e^t + t$, and producer price decreasing from p_e^0 to p_e^t. This results in total societal welfare that is equal to areas $C + D + E + F + S$, where tax revenue and externalities exactly offset. Alternatively, if an emotionally charged policy is employed, the demand curve becomes steeper, represented by the dashed portion of the line labeled as $D_e^1(p_e + t)$. This leads to consumption of the emotional good at the level $x_e^{t'} > x_e^t$. This invariably leads to an increase in producer surplus over the case of the emotionally neutral policy by area $P + Q + R$. Such an increase in producer surplus may lead producers to fan the flames of emotion when their goods are restricted—a strategy observed often in the recent past. The area representing the net zero change in welfare caused by the offsetting tax revenue and externality changes by a value equal to $E + F + G + K + O + N - P - Q$.

The remainder of the calculation of welfare is determined by the change in consumer surplus. However, this calculation of surplus depends heavily on assumptions about how emotions play into welfare. We will discuss three mutually exclusive assumptions regarding how emotions play into consumer preferences and the implications for social welfare maximization.

Assumption 1: Emotional Preference Has No Impact on Wellbeing.

Assumption 1 supposes that while emotional preference can lead you to change what you decide to purchase, this change does not represent actual preferences. In other words, the consumption utility represents actual preference and welfare, while the emotional preference represents deviations from utility optimization. This would be similar to other behavioral models that propose behavioral effects to be due to some extraneous deviation from optimization. In this case, consumer surplus remains the area under the original demand curve, now area $C + D - G$, and areas $A + B + G$ represent a misperceived benefit that was not realized. Thus under

assumption 1, consumer surplus is reduced by $E + F + G$ relative to the emotionally neutral policy. Thus the overall change in welfare for using an emotionally charged rather than an emotionally neutral policy is given by $P + Q + R - E - F - G$. In the particular example given in figure 3, this would lead to an overall welfare loss relative to the emotionally neutral policy.

***Assumption 2*: *Emotionally Resisting a Policy Reduces Wellbeing While Emotionally Supporting a Policy Increases Wellbeing*.** When an onerous policy induces an angry protesting response, the individual may be exerting effort to hold on to hostile feelings which reduce their wellbeing, offsetting some of the benefit they receive from consumption. The change in the area under the demand curve caused by emotional resistance offers a convenient measure of the emotional exertion required for the observed response. In this case, consumer surplus is decreased by $E + F + G + A + B$. The difference between the emotionally charged and the emotionally neutral policy would be than $P + Q + R - E - F - G - A - B$. This change, however, may not be fully representative of the total emotional cost. In other words, there may be some inframarginal change in wellbeing (or fixed emotional cost) to the policy that is not observed in behavioral change. Alternatively, subsidizing actions to which people feel positively attached could create an emotional benefit that is similarly unobservable.

Assumption 3: Emotional Preferences Contribute to Utility and Are Not Differentiated From Consumption Utility. The approach of assumption 3 is essentially the standard approach to welfare calculation.[5] If emotional preferences lead one to buy more, it is because they will enjoy

[5] This represents the standard practice which ignores the potential for emotion. A more correct approach built on welfare principles might treat emotions as a non-market good. However, such an approach would continue to assume that emotional response represents utility maximizing behavior—an assumption we feel is dubious.

purchasing more and thus the area under the new demand curve is part of consumer surplus. In this case, the shift out in the demand curve represents a benefit. Thus, consumer surplus relative to the emotionally neutral policy would be represented by $A + B - E - F$, and thus overall welfare changes by $P + Q + R + A + B - E - F$. In this case, the emotionally charged policy would be a benefit. Even though Assumption 3 follows the standard practice in calculating welfare, it still seems implausible. It supposes that we can create a benefit to the consumer simply by angering them into greater consumption. The resulting policy implications would be both morbidly humorous and grueling. In the following section, we derive the welfare implications using our model for the general case.

The Impact of Marginal Policy Changes

The social welfare function will depend on which assumption we employ regarding how emotions impact welfare. We will first derive the social welfare function and implications resulting from assumption 1. This yields the social welfare given by

$$\Psi^1(t,j) = CS_j(p_e + t) + PS(p_e) + E(x_e) + tx_e \tag{11}$$

$$= \int_{p_e+t}^{\infty} x_e^0(z)dz - \int_{x_e^{0-1}\left(x_e^j(p_e+t)\right)}^{p_e+t} \left[x_e^j - x_e^0(z)\right]dz + \int_0^{p_e} S_e(z)dz + E\left(x_e^j\right) + tx_e^j$$

where p_e solves $S_e(p_e) = x_e^j(p_e + t)$. Thus $dp_e/dt = \frac{1}{S_e' - x_e'}(dx_e^j/dt)$. The implications for welfare depend heavily on the size of the marginal externality relative to the impact of emotion on the slope of the demand function. In particular, we will refer to an externality as being a priority if

$$|E'| > \max\left\{\left|(1-p_e)p_e\left[\frac{1}{\eta_e^j} - \frac{1}{\eta_e^0}\right]\right|, \left|(1-p_e)p_e\left(\frac{1}{\eta_S} - \frac{1}{\eta_e^0}\right)\right|\right\}$$

where η_e^j is the elasticity of demand under policy j, and η_S is the elasticity of supply. If the change in the elasticity of demand is large enough, it will swamp the need to offset the externality altogether. Moreover, if the disparity between elasticity of demand and supply is large enough relative to the externality, the tax may result in an unstable equilibrium. The condition for a priority externality ensures that introducing a policy that alters the price will improve welfare on the margin (see Online Appendix B). In the analysis that follows we analyze the welfare impacts on the margin (evaluating from a starting point of no policy).

Proposition 1: Given a positively valenced emotional good and a constant negative (positive) marginal priority externality, a more emotionally charged policy will always result in lower (greater) welfare on the margin under assumption 1 than a less emotionally charged policy.

Proof: In order to examine the impact of a marginal tax, consider a first order Taylor series approximation of social welfare, approximating about the point $t = 0$. *This results in the approximation (see Appendix B)*

$$\Psi^1(t,j) \approx \Psi^1(0,j) + \Psi_t^1(0,j)t$$

$$= \Psi^1(0,j) + \left[x_e^0(1-p_e)\left[1 - \frac{\partial x_e^{0^{-1}}}{\partial x_e^0}\frac{\partial x_e^j}{\partial t}\right] + E'\frac{dx_e^j}{dt}\right]\left(\frac{S_e'}{S_e' - \frac{dx_e^j}{dt}}\right)t$$

From this we see that in order for the price policy to improve welfare over no policy,

$$sign\left(x_e^0(1-p_e)\left[1 - \frac{\partial x_e^{0^{-1}}}{\partial x_e^0}\frac{\partial x_e^j}{\partial t}\right] + E'\frac{dx_e^j}{dt}\right) = sign(t)$$

leading to the priority condition. Because the externality and the price change have opposite signs, this condition will be met if $|E'| > \left|(1-p_e)p_e\left[1/\eta_e^j - 1/\eta_e^0\right]\right|$. *We can calculate the approximate difference in the social welfare under an emotionally charged versus a less emotionally charged policy as (See Appendix B)*

$$\Psi^1(t,j) - \Psi^1(t,k) \approx \left\{ \frac{x_e^0(1-p_e)\left(1 - \frac{\partial x_e^{0\,-1}}{\partial x_e^0} S_e'\right) + E'S_e'}{\left(S_e' - \frac{dx_e^i}{dt}\right)\left(S_e' - \frac{dx_e^j}{dt}\right)} \right\} S_e' \Delta_{jk} t$$

The first term will take on the opposite sign of the price change if

$$|E'| > \left|(1-p_e)p_e\left(\frac{1}{\eta_S} - \frac{1}{\eta_d}\right)\right|$$

producing the result.

Proposition 1 demonstrates that if we consider the emotional response to be superfluous and unrepresentative of actual wellbeing obtained by consumption, then increasing the emotional charge of a policy reduces welfare when the policy is used to reduce the consumption of positively associated goods. Under these assumptions, policymakers should try to find policies that are less likely to feel threatening or confrontational. Alternatively emotionally charged policies may increase welfare when attempting to increase consumption of these goods. Proposition 2 shows that negatively valenced emotional goods will respond in the opposite way from positively valenced goods.

Proposition 2: Given a negatively valenced emotional good and a constant negative (positive) marginal priority externality, a more emotionally charged policy will always result in (greater) (lower) welfare on the margin under assumption 1 than a less emotionally charged policy.

Proof: Follows directly from the proof of proposition 1.

The results in Propositions 1 and 2 demonstrate that it is plausible that the degree to which a policy is confrontational or emotionally charged may be a matter of import to welfare calculations. However, assumption 1 considers emotions as valueless on their own. Though less orthodox considering the literature, assumption 2 may be more plausible in considering that individuals actually face a welfare reduction when they display emotional resistance, or an

emotional benefit when policies reinforce emotional attachments. Unfortunately, when we observe changes in the slope of the demand function, we can only observe the changes in marginal emotional preferences and not fixed emotional costs or benefits. Thus, we can only find a bound (upper or lower) on the emotional impacts on social welfare.

Proposition 3: Given a positively valenced emotional good and a constant negative (positive) marginal priority externality, a more emotionally charged policy will always result in lower (greater) welfare on the margin under assumption 2 than a less emotionally charged policy.

Proof: Note that the social welfare function is given by

$$\Psi^2(t,j) = CS_j(p_e+t) + PS(p_e) + E(x_e) + tx_e$$

$$= 2\int_{p_e+t}^{\infty} x_e^0(z)dz - \int_{p_e+t}^{\infty} x_e^j(z)dz - \int_{x_e^{0-1}\left(x_e^j(p_e+t)\right)}^{p_e+t}\left[x_e^j - x_e^0(z)\right]dz + \int_0^{p_e} S_e(z)dz + E\left(x_e^j\right)$$

$$+ tx_e^j = \Psi^1(t,j) + \int_{p_e+t}^{\infty} x_e^0(z)dz - \int_{p_e+t}^{\infty} x_e^j(z)dz$$

so that $\Psi_t^2(0,j) = \Psi_t^1(0,j) - x_e^0(p_e)\left(\frac{\partial p_e}{\partial t}+1\right) + x_e^1(p_e)\left(\frac{\partial p_e}{\partial t}+1\right) = \Psi_t^1(0,j)$. *The remainder of the proof is identical to that of Proposition 1.*

Note that welfare under assumption 2 will be larger in absolute value than that calculated under assumption 1; however, this difference is a second order effect.

Proposition 4: Given a negatively valenced emotional good and a constant negative (positive) marginal priority externality, a more emotionally charged policy will always result in (greater) (lower) welfare on the margin under assumption 2 than a less emotionally charged policy.

Proof: Follows directly from the proof of proposition 1 and 3.

Finally, it is worthwhile considering assumption 3, which assumes that emotional preferences that affect consumption can be treated just as utility. On the face of it, this is a rather tempting option because it would leave our econometric and policy prescriptive procedures in

place. Moreover, it seems natural that if one is willing to pay the additional price that the individual must be obtaining a benefit that must more than offset the additional cost—whether that benefit be derived from consumption or some emotion. Propositions 5 and 6 demonstrate that such reasoning leads to counterintuitive and obviously silly results.

Proposition 5: Given a positively valenced emotional good and a constant negative (positive) marginal externality, a more emotionally charged policy will always result in greater (lower) welfare on the margin under assumption 3 than a less emotionally charged policy.

Proof: Social welfare is given by

$$\Psi^3(t,j) = CS_i(p_e + t) + PS(p_e) + E(x_e) + tx_e$$

$$= \int_{p_e+t}^{\infty} x_e^i(z)dz \; + \int_0^{p_e} S_e(z)dz + E\left(x_e^j\right) + tx_e^j$$

Considering a first order Taylor series approximation of social welfare, approximating about the point $t = 0$*. This results in the approximation (See Appendix A)*

$$\Psi^3(t,j) \approx \Psi^3(0,j) + \Psi_t^3(0,j)t$$

$$= \Psi^2(0,j) + E'\frac{dx_e^j}{dt}\left(\frac{\partial p_e^j}{\partial t} + 1\right)t$$

Thus, we can calculate the approximate difference in the social welfare under an emotionally charged versus a less emotionally charged policy as

$$\Psi^3(t,j) - \Psi^3(t,k) \approx \left\{\frac{dx_e^j}{dt}\left(\frac{\partial p_e^j}{\partial t} + 1\right) - \frac{dx_e^k}{dt}\left(\frac{\partial p_e^k}{\partial t} + 1\right)\right\}E't = \frac{{S_e'}^2\Delta_{jk}t}{\left(S_e' - \frac{dx_e^j}{dt}\right)\left(S_e' - \frac{dx_e^k}{dt}\right)}$$

which directly implies the result.

Proposition 6: Given a negatively valenced emotional good and a constant negative (positive) marginal priority externality, a more emotionally charged policy will always result in lower (greater) welfare on the margin under assumption 3 than a less emotionally charged policy.

Proof: Follows directly from the proof of proposition 1 and 3.

If we are to believe assumption 3, then propositions 5 and 6 tells us that when considering increasing the price of a positive emotional good, the policy maker should try to make the policy as emotionally charged, inflammatory and confrontational as possible. Doing so will necessarily increase the amount of the externality (the reduction of which was the original justification for the policy) but also ostensibly increase the wellbeing of the consumers by angering them to the extent that their benefit from this anger more than offsets the increase in the externality. This result is nonsensical. In fact, this is a solid argument for hidden costs and benefits that we cannot easily observe through standard welfare practice.

Implications for Economic Analysis

There are several important implications for economic analysis. First, it is important to recognize that emotional response may mean that traditional analysis is misleading. In fact, such analysis may lead to more and more confrontational policies rather than those that are calculated to accomplish their goals in a more empathetic way. Second, while it may not be possible to pin down the overall welfare impact due to emotion, we can find a lower bound for this result by observing the difference in demand responses to arbitrary price changes versus those that are motivated by a policy. This suggests a feasible method for measuring emotional impacts from policy through the estimation of interaction effects between policy related price changes and demand.

Conclusion

Over the course of the last several years we have seen numerous examples of policies instituted for the purpose of modifying the behavior of a small segment of consumers. Often times these policies have given rise to severe negative backlashes with either political consequences for those implementing, or longstanding resentment by the targets. Given the standard practice of welfare economics, such policies may seem to be an inevitable side effect of curbing externalities. However, our work suggests that there may be a larger set of policy options on the table. Indeed, by seeking policies that are empathetic to consumers, policymakers may be able to achieve more effective policies and reduce the degree of conflict and resentment that now appears to be endemic.

Much more work is needed to examine emotional responses and how they may be connected to policies and the implementation of policies. While the results from our analysis are relatively clear, they rest on several stylized assumptions that need further verification in both laboratory and field experiments. Nonetheless, no matter what the results of this future work may tell us, the current evidence (as well as honest introspection) tells us that emotional charging of policies can have substantive welfare implications. At times major historical events have hinged on miscalculating the emotional response to policies such as a tax—the American Revolution being the chief example. A greater understanding of the responses can help to ensure political stability, good governance and peaceful dialogue.

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Table 1: Interactions Between Political Affiliation and Responses to Energy Policy

	Reactance	
	Positive	Negative
Republican	-0.36**	-0.06
	(0.17)	(0.17)
Libertarian	-0.23	0.31
	(0.25)	(0.21)
Other	-0.24	0.37
	(0.27)	(0.26)

Results reported in this table were generated from two ordinary least squares regressions with reported miles driven and the reactance scale as dependent variables. Independent variables were the type of article read, and individuals reported political affiliation, and the interaction between these variables. Standard errors are reported in parentheses. ** $p<0.05$.

Table 2. The Impact of Policy Regimes and Emotional Attachment on the Slope of the Demand

Nature of Emotional Attachment	Reduced Price $t < 0$	No Price Change $t = 0$	Increased Price $t > 0$
Negative Valence $\xi_x = -1$	+	0	-
Neutral Valence $\xi_x = 0$	0	0	0
Positive Valence $\xi_x = 1$	-	0	+

Each cell contains the sign of $\Delta_{jk}(\mathbf{p}, w)$ assuming policy j is more emotionally charged than policy k.

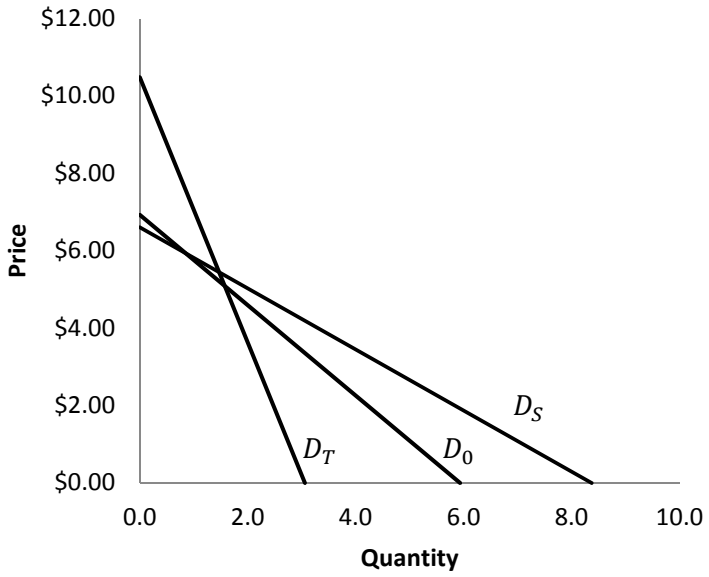

Figure 1. Demand for Healthy Food

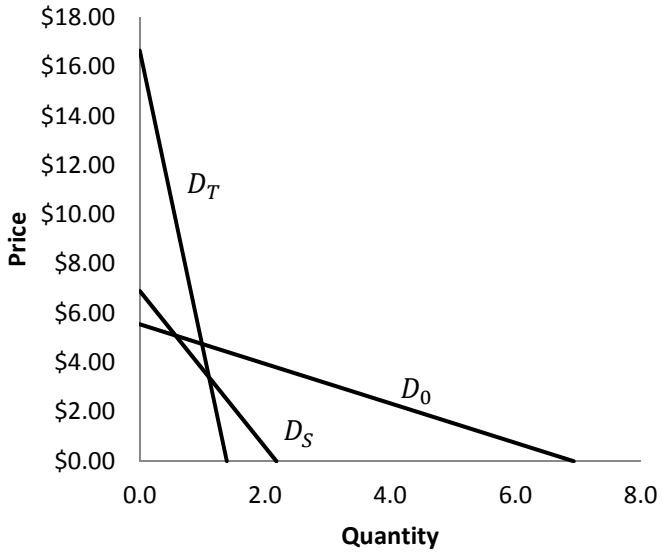

Figure 2. Demand for Unhealthy Food

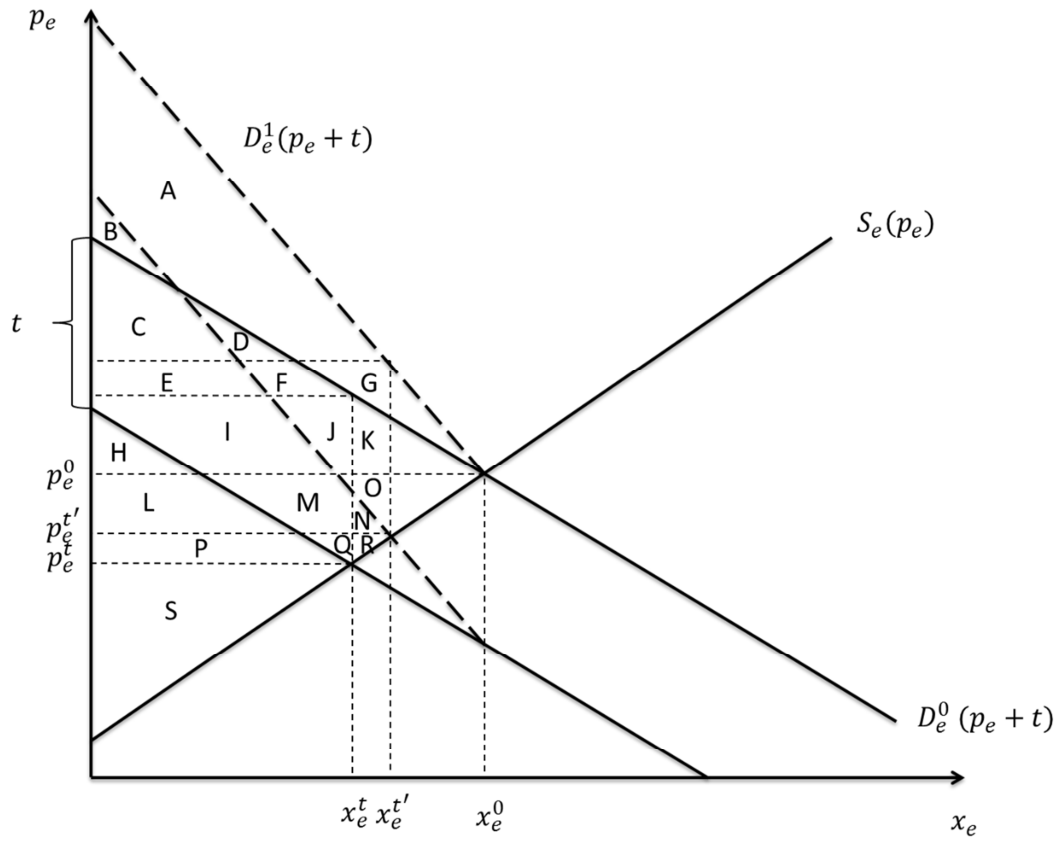

Figure 3. Welfare under Partial Equilibrium with an Emotionally Charged Policy

Appendix A: Energy Survey Instrument

Thank you for taking this survey. Before you proceed, please read the consent form below. If you wish to proceed with the study, click the "Yes" button at the bottom of the page.
Informed Consent:
You are being asked to take part in a research study about energy consumption and policy.
Purpose: The purpose of this study is to understand consumer energy use and perceptions of energy policy.
Participation: Participation in this study will involve completing the survey that follows, which should take no more than 15 minutes to complete.
Risks/Benefits: There are no known risks associated with participating in this study other than those experienced in everyday life.
Compensation: You will receive $0.30 in compensation upon completion of this study.
Confidentiality: All survey responses will remain anonymous and confidential. Only researchers involved with the study will have access to the information you provide. Any public report we make related to this study will not include any information that would make it possible to identify you.
Voluntary Participation: Participation in this study is completely voluntary, so you may decline to participate or decide to end your participation at any time for any reason.
Questions: If you have any questions, please ask the researchers conducting this study: Andrew Hanks and David Just. If you have questions later, you may contact Andrew Hanks at ah748@cornell.edu or David Just at drj3@cornell.edu. If you do not have any questions and agree to participate, please give your oral consent. If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) at 607-255-5138 or access their website at http://www.irb.cornell.edu. You may also report your concerns or complaints anonymously through Ethicspoint (www.hotline.cornell.edu) or by calling toll free at 1-866-293-3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured. You will be given a copy of this form to keep for your records.
Statement of Consent: By clicking on the button below, you acknowledge that you have read the above information and agree take part in the study. This consent form will be kept by the researcher for at least five years beyond the end of the study. If you would like to know about the results from the study, please leave us your email.

I acknowledge that I have read the above information and agree take part in the study.

❍ Yes (1)

If you would like to learn more about the study once it is complete, please leave your email below. If you do not wish to receive information about the study, please leave the space blank.

Treatment 1: No Article

Instructions: Thank you for taking time to complete this survey. Please respond to the following questions. If you prefer not to answer a specific question, please proceed to the next question.

Treatment 2: Positive Article

Instructions: Thank you for taking time to complete this survey. Please read the announcement below from President Obama and then respond to the following questions. If you prefer not to answer a specific question, please proceed to the next question.

Weekly Address: Reducing Carbon Pollution in Our Power Plants
Remarks of President Barack Obama
Children's National Medical Center in Washington, D.C.
May 31, 2014

Hi, everybody. I'm here at Children's National Medical Center in Washington, D.C., visiting with some kids being treated here all the time for asthma and other breathing problems. Often, these illnesses are aggravated by air pollution – pollution from the same sources that release carbon and contribute to climate change. And for the sake of all our kids, we've got to do more to reduce it.

Earlier this month, hundreds of scientists declared that climate change is no longer a distant threat – it "has moved firmly into the present." Its costs can be measured in lost lives and livelihoods, lost homes and businesses; and higher prices for food, insurance, and rebuilding.

That's why, last year, I put forward America's first climate action plan. This plan cuts carbon pollution by building a clean energy economy – using more clean energy, less dirty energy, and wasting less energy throughout our economy.

One of the best things we can do for our economy, our health, and our environment is to lead the world in producing cleaner, safer energy – and we're already generating more clean energy than ever before. Thanks in part to the investments we made in the Recovery Act, the electricity America generates from wind has tripled. And from the sun, it's increased more than tenfold. In fact, every four minutes, another American home or business goes solar – and every panel is pounded into place by a worker whose job cannot be shipped overseas.

We're wasting less energy, too. We've doubled how far our cars and trucks will go on a gallon of gas by the middle of the next decade, saving you money at the pump – and we're helping families and businesses save billions with more efficient homes, buildings, and appliances.

This strategy has created jobs, grown our economy, and helped make America more energy independent than we've been in decades – all while holding our carbon emissions to levels not seen in about 20 years. It's a good start. But for the sake of our children, we have to do more.

This week, we will. Today, about 40% of America's carbon pollution comes from power plants. But right now, there are no national limits to the amount of carbon pollution that existing plants can pump into the air we breathe. None. We limit the amount of toxic chemicals like mercury, sulfur, and arsenic that

power plants put in our air and water. But they can dump unlimited amounts of carbon pollution into the air. It's not smart, it's not safe, and it doesn't make sense.

That's why, a year ago, I directed the Environmental Protection Agency to build on the efforts of many states, cities, and companies, and come up with commonsense guidelines for reducing dangerous carbon pollution from our power plants. This week, we're unveiling these proposed guidelines, which will cut down on the carbon pollution, smog, and soot that threaten the health of the most vulnerable Americans, including children and the elderly. In just the first year that these standards go into effect, up to 100,000 asthma attacks and 2,100 heart attacks will be avoided – and those numbers will go up from there.

These standards were created in an open and transparent way, with input from the business community. States and local governments weighed in, too. In fact, nearly a dozen states are already implementing their own market-based programs to reduce carbon pollution. And over 1,000 mayors have signed agreements to cut their cities' carbon pollution.

So the idea of setting higher standards to cut pollution at our power plants is not new. It's just time for Washington to catch up with the rest of the country.

Now, special interests and their allies in Congress will claim that these guidelines will kill jobs and crush the economy. Let's face it, that's what they always say.

But every time America has set clear rules and better standards for our air, our water, and our children's health – the warnings of the cynics have been wrong. They warned that doing something about the smog choking our cities, and acid rain poisoning our lakes, would kill business. It didn't. Our air got cleaner, acid rain was cut dramatically, and our economy kept growing.

These excuses for inaction somehow suggest a lack of faith in American businesses and American ingenuity. The truth is, when we ask our workers and businesses to innovate, they do. When we raise the bar, they meet it. When we restricted cancer-causing chemicals in plastics and leaded fuel in our cars, American chemists came up with better substitutes. When we phased out the gases that depleted the ozone layer, American workers built better refrigerators and air conditioners. The fuel standards we put in place a few years ago didn't cripple automakers; the American auto industry retooled, and today, they're selling the best cars in the world, with more hybrids, plug-in, and fuel-efficient models to choose from than ever before.

In America, we don't have to choose between the health of our economy and the health of our children. The old rules may say we can't protect our environment and promote economic growth at the same time, but in America, we've always used new technology to break the old rules.

As President, and as a parent, I refuse to condemn our children to a planet that's beyond fixing. The shift to a cleaner energy economy won't happen overnight, and it will require tough choices along the way. But a low-carbon, clean energy economy can be an engine of growth for decades to come. America will build that engine. America will build the future. A future that's cleaner, more prosperous, and full of good jobs – a future where we can look our kids in the eye and tell them we did our part to leave them a safer, more stable world. Thanks, and have a great weekend.

Treatment 3: Negative Article

Instructions: Thank you for taking time to complete this survey. Please read the article below from Politics and then respond to the following questions. If you prefer not to answer a specific question, please proceed to the next question.

Unemployment and Economic Losses Ahead as Obama Ramps Up War on Coal Reporter:
Viki Mason May 6, 2014 in *US Financial Post*

Monday, White House advisor John Podesta told lawmakers that there was "zero" chance of slowing down President Obama's war on the coal industry in spite of the job losses and economic consequences the administration's proposed new, stringent regulations will engender.

Provisions of the President's Clean Air Act will impose strict regulations designed to cut carbon dioxide emissions for all new coal and gas-fired power plants and will likely speed the retirement of older coal-fired plants unless cost prohibitive carbon capture and storage technology is retro-fitted to the plant.

Podesta, Chief of Staff to former President Bill Clinton, and enthusiastic proponent of using executive orders to accomplish goals when congress is slow to act, was brought on-board the White House staff late last year. His appearance, some speculate, was ordained in order to shore up the President's efforts to bypass congressional interference in Obama's 2014 "Year of Action."

Congressional members from both sides of the aisle have urged the Obama administration to scale back its climate agenda because of the impacts expected in coal producing states like West Virginia and Kentucky, where jobs related to that industry fuel the economy. Nevertheless, Podesta told reporters that the president includes his contentious Clean Air Act's provisions among the measures he intends to enact with or without the help of Congress and by executive order if necessary.

On Tuesday, in what may be a welcome attempt to distract the public from ugly unemployment numbers and the Benghazi document shell-game which have dominated the news cycle of late, the President plans to launch his assault on the Coal Industry by meeting with meteorologists to discuss the importance of global warming. This move comes as scientists log the year 2012 as the hottest year on record in the United States. (Interestingly, 2011 was cooler than average.)

Meanwhile, using the Climate Change report to be released today, the Obama administration will argue that global warming is adversely impacting American lives every day. Study co-author Donald Wuebbles, who is a climate scientist at the University of Illinois, told the Associated Press on Monday, "We're already seeing extreme weather and it's happening now," Wuebbles said, "We're seeing more heat waves, particularly in the West and in the South." Nevertheless, Republicans are not convinced the benefits of the President's agenda outweigh the costs. Of this report, upon which the President floats his climate change agenda, Senator James Inhoffe, and Oklahoma Republican, said, "This report is part of the game the president is playing to distract Americans from his unchecked regulatory agenda that is costing our nation middle-class jobs, new economic opportunities and our ability to be energy independent."

Bipartisan legislation on the climate is already making its way through Congress. An energy efficiency bill sponsored by Sens. Rob Portman, R-Ohio, and Jeanne Shaheen, D-N.H., reinforces overall support for clean energy, however, some Republicans are lobbying to add an amendment to the bill that would approve the Keystone XL Pipeline, a mega-job creator that has been on perpetual hold while the Obama administration ponders the possible impacts. "We hope that it passes," Podesta said of the legislation.

“But if it passes with unacceptable riders, then it will be headed to the watery depths, I guess,” advisor Podesta threatened.

Questions

On average, how many miles do you drive each week? Please enter only whole numbers.

Do you have plans to change this in the future?

- ❍ Yes (1)
- ❍ No (2)

If you do you have plans to change the amount you drive, which of the following best describes your plans?

- ❍ Drive less (1)
- ❍ Drive more (2)
- ❍ Don't know (3)

At what temperature do you set your thermostat in the winter? Please enter your response in degrees Fahrenheit.

At what temperature do you set the thermostat in the summer? Please enter your response in degrees Fahrenheit.

Do you ever use air conditioning to cool your home?

- ❍ Yes (1)
- ❍ No (2)

How would you respond if an executive order was issued that required carbon emissions to be reduced by 30% by 2030.

- ❍ I would try to cut back on my energy use (1)
- ❍ I would increase my energy use (2)
- ❍ I would not change my energy use (3)
- ❍ I don't know (4)

What percentage of the respondents to this survey do you think will answer in the same way you did?

_____ Percent (1)

Using the ranking from strongly disagree to strongly agree, please respond to the following question.

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
Global warming is a serious concern. (1)	❍	❍	❍	❍	❍

What percentage of the respondents to this survey do you think will answer in the same way you did?

_____ Percent

Using the ranking from strongly disagree to strongly agree, please respond to the following question.

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
Global warming is man made (1)	❍	❍	❍	❍	❍

What percentage of the respondents to this survey do you think will answer in the same way you did?

_____ Percent

Using the ranking from strongly disagree to strongly agree, please respond to the following questions.	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
Regulations trigger a sense of resistance in me (1)	❍	❍	❍	❍	❍
I find contradicting others stimulating (2)	❍	❍	❍	❍	❍
When something is prohibited, I usually think “that’s exactly what I am going to do.” (3)	❍	❍	❍	❍	❍
I resist the attempts of others to influence me. (4)	❍	❍	❍	❍	❍
It makes me angry when another person is held up as a model for me to follow. (5)	❍	❍	❍	❍	❍
When someone forces me to do something, I feel like doing the opposite (6)	❍	❍	❍	❍	❍
It disappoints me to see others submitting to society’s standards and rules. (7)	❍	❍	❍	❍	❍
I am content only when I am acting of my own free will. (8)	❍	❍	❍	❍	❍
I consider advice from others to be an intrusion. (9)	❍	❍	❍	❍	❍
Advice and	❍	❍	❍	❍	❍

recommendations induce me to do just the opposite. (10)					

Please tell us your age.

Please select your gender

- ❍ Male (1)
- ❍ Female (2)

What is your race?

- ❍ African American (1)
- ❍ Asian (2)
- ❍ Caucasian (3)
- ❍ Hispanic (4)
- ❍ Native American (5)
- ❍ Pacific Islander (6)
- ❍ Other (7)

What is your marital status?

- ❍ Married (1)
- ❍ Single (2)
- ❍ Live with significant other (3)
- ❍ Widowed (4)
- ❍ Divorced (5)

How many people live with you at least three days a week?

- ❍ 0 (1)
- ❍ 1 (2)
- ❍ 2 (3)
- ❍ 3 (4)
- ❍ 4 (5)
- ❍ 5 (6)
- ❍ 6 (7)
- ❍ 7 (8)
- ❍ 8 (9)
- ❍ More than 8 (10)

Please select your current level of education.

- ❍ Did not complete high school (1)
- ❍ High school diploma (2)
- ❍ Some college (3)
- ❍ Associate's degree (4)
- ❍ Bachelor's degree (5)
- ❍ Some graduate education (6)
- ❍ Master's degree (7)
- ❍ Doctoral degree (8)

What is your current employment status?

- ❍ Employed full time (1)
- ❍ Employed part time (2)
- ❍ Student (3)
- ❍ Unemployed (4)
- ❍ Retired (5)
- ❍ Stay at home parent (6)

Please select the correct range for your current household income.

- ❍ < $20,000 (1)
- ❍ $20,000 to $30,000 (2)
- ❍ $30,001 to $40,000 (3)
- ❍ $40,001 to $50,000 (4)
- ❍ $50,001 to $60,000 (5)
- ❍ $60,001 to $70,000 (6)
- ❍ $70,001 to $80,000 (7)
- ❍ $80,001 to $90,000 (8)
- ❍ $90,001 to $100,000 (9)
- ❍ > $100,000 (10)
- ❍ I prefer not to answer (11)

Please tell us your political preference

- ❍ Democrat (1)
- ❍ Republican (2)
- ❍ Independent (3)
- ❍ Libertarian (4)
- ❍ Other (5)

Have you heard of the President's planned executive order curbing carbon emissions?

- ❍ Yes (1)
- ❍ No (2)

Thank you for completing this survey. The survey code is EPA2014.

Appendix B: Comparing Welfare of More and Less Emotionally Charged Policies

We consider a fixed price change t and a constant marginal externality.

Under assumption 1: Social welfare is given by

$$\Psi^1(t,i) = CS_i(p_e+t) + PS(p_e) + E(x_e) + tx_e$$

$$= \int_{p_e+t}^{\infty} x_e^0(z)dz - \int_{x_e^{0-1}\left(x_e^i(p_e+t)\right)}^{p_e+t} \left[x_e^i - x_e^0(z)\right]dz + \int_0^{p_e} S_e(z)dz + E\left(x_e^i\right) + tx_e^i$$

Let us consider a first order Taylor series approximation of social welfare, approximating about the point $t = 0$. This results in the approximation

(A1) $$\Psi^1(t,i) \approx \Psi^1(0,i) + \Psi_t^1(0,i)t$$

$$= \Psi^1(0,i) + \left[-x_e^0\left(\frac{\partial p_e^i}{\partial t}+1\right) - \int_{x_e^{0-1}(x_e^i)}^{p_e+t} \frac{dx_e^i}{dt}\left(\frac{\partial p_e^i}{\partial t}+1\right)dz \right.$$

$$- x_e^i\left[p_e + t - x_e^{0-1}(x_e^i)\frac{\partial x_e^{0-1}}{\partial x_e^0}\frac{\partial x_e^i}{\partial t}\right]\left(\frac{\partial p_e^i}{\partial t}+1\right) + x_e^0\left(\frac{\partial p_e^i}{\partial t}+1\right)$$

$$- x_e^0\left(x_e^{0-1}(x_e^i)\right)\frac{\partial x_e^{0-1}}{\partial x_e^0}\frac{\partial x_e^i}{\partial t}\left(\frac{\partial p_e^i}{\partial t}+1\right) + S_e(p_e)\frac{\partial p_e^i}{\partial t} + E'\frac{dx_e^i}{dt}\left(\frac{\partial p_e^i}{\partial t}+1\right)$$

$$\left. + t\frac{dx_e^i}{dt}\left(\frac{\partial p_e^i}{\partial t}+1\right) + x_e^i\right]_{t=0} \times t$$

$$= \Psi^1(0,i) + \left[x_e^0(1-p_e)\left[1 - \frac{\partial x_e^{0-1}}{\partial x_e^0}\frac{\partial x_e^i}{\partial t}\right] + E'\frac{dx_e^i}{dt}\right]\left(\frac{S_e'}{S_e' - \frac{dx_e^i}{dt}}\right)t$$

Note that in order for the price policy to improve welfare over no policy,

$$sign\left(x_e^0(1-p_e)\left[1 - \frac{\partial x_e^{0-1}}{\partial x_e^0}\frac{\partial x_e^i}{\partial t}\right] + E'\frac{dx_e^i}{dt}\right) = sign(t)$$

Because the externality and the price change have opposite signs, this condition will be met if

$$\left| x_e^0(1-p_e)\left[\frac{1}{\frac{dx_e^i}{dt}} - \frac{1}{\frac{dx_e^0}{dt}}\right]\right| < |E'|$$

Thus, we can calculate the approximate difference in the social welfare under an emotionally charged versus a less emotionally charged policy as

$$\Psi^1(t,i) - \Psi^1(t,j)$$

$$\approx \left\{ \left[x_e^0(1-p_e)\left[1 - \frac{\partial x_e^{0\,-1}}{\partial x_e^0}\frac{\partial x_e^i}{\partial t}\right] + E'\frac{dx_e^i}{dt}\right]\left(\frac{\partial p_e^i}{\partial t}+1\right)\right.$$

$$\left. - \left[x_e^0(1-p_e)\left[1 - \frac{\partial x_e^{0\,-1}}{\partial x_e^0}\frac{\partial x_e^j}{\partial t}\right] + E'\frac{dx_e^j}{dt}\right]\left(\frac{\partial p_e^j}{\partial t}+1\right)\right\} t$$

$$= \left\{ x_e^0(1-p_e)\left(\frac{\partial p_e^i}{\partial t} - \frac{\partial p_e^j}{\partial t} - \frac{\partial x_e^{0\,-1}}{\partial x_e^0}\left(\frac{\partial x_e^i}{\partial t}\left(\frac{\partial p_e^i}{\partial t}+1\right) - \frac{\partial x_e^j}{\partial t}\left(\frac{\partial p_e^j}{\partial t}+1\right)\right)\right)\right.$$

$$\left. + E'\left(\frac{\partial x_e^i}{\partial t}\left(\frac{\partial p_e^i}{\partial t}+1\right) - \frac{\partial x_e^j}{\partial t}\left(\frac{\partial p_e^j}{\partial t}+1\right)\right)\right\} t$$

$$= \left\{ \frac{x_e^0(1-p_e)\left(1 - \frac{\partial x_e^{0\,-1}}{\partial x_e^0}S_e'\right) + E'S_e'}{\left(S_e' - \frac{dx_e^i}{dt}\right)\left(S_e' - \frac{dx_e^j}{dt}\right)} \right\} S_e'\Delta_{ij}t$$

This will depend on the relative sizes of $(1-p_e)p_e\left(\frac{1}{\eta_S} - \frac{1}{\eta_d}\right)$ and E'.

Under assumption 2: Social welfare is given by

$$\Psi^1(t,i) = CS_i(p_e+t) + PS(p_e) + E(x_e) + tx_e$$

$$= 2\int_{p_e+t}^{\infty} x_e^0(z)dz - \int_{p_e+t}^{\infty} x_e^i(z)dz - \int_{x_e^{0\,-1}\left(x_e^i(p_e+t)\right)}^{p_e+t}\left[x_e^i - x_e^0(z)\right]dz + \int_0^{p_e} S_e(z)dz + E\left(x_e^i\right)$$

$$+ tx_e^i$$

Let us consider a first order Taylor series approximation of social welfare, approximating about the point $t = 0$. This results in the approximation

(A2) $$\Psi^2(t,i) \approx \Psi^2(0,i) + \Psi_t^2(0,i)t$$

$$= \Psi^2(0,i) + \left[-2x_e^0 \left(\frac{\partial p_e^i}{\partial t} + 1 \right) + x_e^i \left(\frac{\partial p_e^i}{\partial t} + 1 \right) - \int_{x_e^{0^{-1}}(x_e^i)}^{p_e+t} \frac{dx_e^i}{dt} \left(\frac{\partial p_e^i}{\partial t} + 1 \right) dz \right.$$

$$- x_e^i \left[p_e + t - x_e^{0^{-1}}(x_e^i) \frac{\partial x_e^{0^{-1}}}{\partial x_e^0} \frac{\partial x_e^i}{\partial t} \right] \left(\frac{\partial p_e^i}{\partial t} + 1 \right) + x_e^0 \left(\frac{\partial p_e^i}{\partial t} + 1 \right)$$

$$- x_e^0 \left(x_e^{0^{-1}}(x_e^i) \right) \frac{\partial x_e^{0^{-1}}}{\partial x_e^0} \frac{\partial x_e^i}{\partial t} \left(\frac{\partial p_e^i}{\partial t} + 1 \right) + S_e(p_e) \frac{\partial p_e^i}{\partial t} + E' \frac{dx_e^i}{dt} \left(\frac{\partial p_e^i}{\partial t} + 1 \right)$$

$$\left. + t \frac{dx_e^i}{dt} \left(\frac{\partial p_e^i}{\partial t} + 1 \right) + x_e^i \right]_{t=0} \times t$$

$$= \Psi^2(0,i) + \left[x_e^0(1 - p_e) \left[1 - \frac{\partial x_e^{0^{-1}}}{\partial x_e^0} \frac{\partial x_e^i}{\partial t} \right] + E' \frac{dx_e^i}{dt} \right] \left(\frac{\partial p_e^i}{\partial t} + 1 \right) t$$

Thus, we can calculate the approximate difference in the social welfare under an emotionally charged versus a less emotionally charged policy as

$$\Psi^2(t,i) - \Psi^2(t,j)$$

$$\approx \left\{ \left[x_e^0(1 - p_e) \left[1 - \frac{\partial x_e^{0^{-1}}}{\partial x_e^0} \frac{\partial x_e^i}{\partial t} \right] + E' \frac{dx_e^i}{dt} \right] \left(\frac{\partial p_e^i}{\partial t} + 1 \right) \right.$$

$$\left. - \left[x_e^0(1 - p_e) \left[1 - \frac{\partial x_e^{0^{-1}}}{\partial x_e^0} \frac{\partial x_e^j}{\partial t} \right] + E' \frac{dx_e^j}{dt} \right] \left(\frac{\partial p_e^j}{\partial t} + 1 \right) \right\} t$$

$$= \left\{ x_e^0(1 - p_e) \left(\frac{\partial p_e^i}{\partial t} - \frac{\partial p_e^j}{\partial t} - \frac{\partial x_e^{0^{-1}}}{\partial x_e^0} \left(\frac{\partial x_e^i}{\partial t} \left(\frac{\partial p_e^i}{\partial t} + 1 \right) - \frac{\partial x_e^j}{\partial t} \left(\frac{\partial p_e^j}{\partial t} + 1 \right) \right) \right) \right.$$

$$\left. + E' \left(\frac{\partial x_e^i}{\partial t} \left(\frac{\partial p_e^i}{\partial t} + 1 \right) - \frac{\partial x_e^j}{\partial t} \left(\frac{\partial p_e^j}{\partial t} + 1 \right) \right) \right\} t$$

$$= \left\{ \frac{x_e^0(1-p_e)\left(1-\frac{\partial x_e^{0^{-1}}}{\partial x_e^0}S_e'\right)+E'S_e'}{\left(S_e'-\frac{dx_e^i}{dt}\right)\left(S_e'-\frac{dx_e^j}{dt}\right)} \right\} S_e'\Delta_{ij}t$$

This will depend on the relative size of $(1-p_e)p_e\left(\frac{1}{\eta_S}-\frac{1}{\eta_d}\right)$ and $-E'$.

Under assumption 3: Social welfare is given by

$$\Psi^3(t,i) = CS_i(p_e+t) + PS(p_e) + E(x_e) + tx_e$$

$$= \int_{p_e+t}^{\infty} x_e^i(z)dz \; + \int_0^{p_e} S_e(z)dz + E\left(x_e^i\right) + tx_e^i$$

Let us consider a first order Taylor series approximation of social welfare, approximating about the point $t = 0$. This results in the approximation

(A2) $$\Psi^3(t,i) \approx \Psi^3(0,i) + \Psi_t^3(0,i)t$$

$$= \Psi^2(0,i) + \left[-x_e^i\left(\frac{\partial p_e^i}{\partial t}+1\right) + S_e(p_e)\frac{\partial p_e^i}{\partial t} + E'\frac{dx_e^i}{dt}\left(\frac{\partial p_e^i}{\partial t}+1\right) + t\frac{dx_e^i}{dt}\left(\frac{\partial p_e^i}{\partial t}+1\right) + x_e^i\right]_{t=0}$$

$$\times t$$

$$= \Psi^2(0,i) + E'\frac{dx_e^i}{dt}\left(\frac{\partial p_e^i}{\partial t}+1\right)t$$

Thus, we can calculate the approximate difference in the social welfare under an emotionally charged versus a less emotionally charged policy as

$$\Psi^3(t,i) - \Psi^3(t,j) \approx \left\{\frac{dx_e^i}{dt}\left(\frac{\partial p_e^i}{\partial t}+1\right) - \frac{dx_e^j}{dt}\left(\frac{\partial p_e^j}{\partial t}+1\right)\right\}E't = \frac{{S_e'}^2\Delta_{ij}t}{\left(S_e'-\frac{dx_e^i}{dt}\right)\left(S_e'-\frac{dx_e^j}{dt}\right)}$$