Title: Susceptibility to Inattention: unpacking who is susceptible to inattention in energy based electronic billing

This is the accepted version of the following article:

Curley, C., Rustamov, G., Harrison, N. and Venable, M. (2020), Susceptibility to Inattention: Unpacking Who is Susceptible to Inattention in Energy-Based Electronic Billing. Rev Policy Res, 37: 744-764 https://doi.org/10.1111/ropr.12404

Abstract: In this paper we examine characteristics that may change the susceptibility to inattention in electronic billing (e-billing). Digitization of energy bills can increase the delivery of energy feedback and increase knowledge around conservation efforts, only when attention remains at similar levels to that of paper bills. We hypothesize that only subsets of the population are susceptible to inattention in e-billing. We do this by estimating energy consumption for e-bill and paper billers controlling for several characteristics of participants, homes, and weather in the City of Tallahassee, Florida. We use a difference-in-differences (DD) approach to estimate the effects of the e-bill participation, which is a common approach for observational and quasi-experimental settings. We find that budget constraints limit an individual's susceptibility to inattention in e-billing, with lower income groups decreasing energy consumption on average by 4.4% but has no effect on higher income groups. This suggests that inattention may not occur at the same levels or for the same reasons for all members of the public. This has implications regarding the practice of policy design and communication strategies for the public at large.

Introduction

Rational inattention has gained recent popularity in the economics literature, it informs how individuals make filtering decisions regarding what information to and not to give attention in their daily lives. If individuals are susceptible to inattention, it may have implications for decisions related to e-government, e-participation, and electronic information provision. As digitization of services and communication has become a common trend, scholars have begun to study implications from switching to electronic billing (e-billing). We have learned a fair number about digitizing bills as a cost reducing strategy by enabling streamlined information awareness in addition to offering accessible, maintained archives (Khan, Khan, & Aftab, 2015). For the individual, the desire to switch may be related to convenience (Checkfree, 2007) and perceived environmental benefits such as reduced water consumption, trash production, fuel use, and tree preservation associated with producing the message or bill in paper (Fiserv, 2016). Growing recognition of the widespread advantages e-billing offers has been cited as the driving force behind the increase in interest amongst customers who decide to make the switch (CheckFree, 2007; Fiserv, 2014; Schroeder, 2018). Once enrolled, the electronic billing medium offers companies the opportunity to tailor information to enrollees.

However, digitizing communication strategies may have negative consequences such as irrational consumer behavior (DellaVigna, 2009) and inattention (Reis, 2005). Though these negative consequences could be counterproductive to the goal of the communications, they have been overlooked and understudied with respect to digitizing information. Utility billing offers an excellent case study for seeking to understand these implications, particularly regarding inattention. Research on e-billing by utilities has focused on understanding how tailored messaging impacts energy conservation (Darby, 2006); it has found that the risks of inattention in e-billing include decreased price salience (Sexton, 2015; Finkelstein,2012), which can lead to unintended increases in consumption. Energy consumption behavior is particularly susceptible to inattention (Keefer & Rustamov, 2018) due to veiled prices, increased search costs, and limits to information access (Hansen & Haas, 2001), suggesting that individuals have overtaxed time and attention limits when making energy-related decisions (Falkinger, 2008).

Despite knowing that inattention is a possible consequence of e-bill enrollment, little work has been done to examine who is at risk of inattention. If inattention influences individuals in different ways, the question as to who is susceptible to inattention remains. This paper fills this lacuna by answering the question: “To what degree are individuals of varying demographics equally susceptible to inattention”. By analyzing this question, we bring to light potential equity implications of communication and service digitization. Should specific groups be more susceptible to inattention in certain settings, this can act as a barrier to resource access and information about behavioral changes that could benefit them, resulting in an inequitable distribution of benefits and burdens. In this paper, we utilize a database of household consumption and characteristics to better understand how individuals are influenced by the

digitization of information. Are certain population subgroups more or less susceptible to inattention by switching from paper to e-billing. We study a sample of residents in the city of Tallahassee, which is a mid-sized city with a municipally owned utility and a portfolio of demand side management programs. The e-billing program is advertised as an environmentally friendly mechanism. The next section develops a set of hypotheses regarding how e-billing and inattention may influence participants in the municipally owned utility's e-billing program. This is followed by an estimation of the Kilowatt Hour (kWh) changes in consumption from joining the e-billing programming.

Literature Review

As technological advancements have contributed to the growth of internet use, firms and customers have relinquished their dependency upon paper bills in favor of e-billing. Utility customers were found to devote less than two hours to reading their bills for the entirety of the year and invested on average five hours of their time to gain additional understanding of their energy bills (Leblanc, 2016). E-billing is a service provided by billers to combine multiple interfaces and aspects of billing systems into one stream-lined presentation. The capabilities of e-billing extend far beyond the ability to cut administrative costs (Briscoe, 1959) and process data more efficiently (Mesel, Wirtschafter, & Ramsey-Klee, 1976). E-billing creates opportunities to vary mode of payments (Fiserv, 2013), personalize the billing experience (Accenture, 2012), relay timely information to customers (Castro & De Bruhl, 2015), and increase information transmission (Moore & Litan, 2002). Firms can use e-billing to nudge customers towards a

specific choice allowing them to capitalize on individual preferences (Sunstein, 2015). These technological advancements are central to e-billing payment presentation and have resulted in a noticeable increase in participation (Au & Kauffman, 2001).

Individuals are abandoning traditional billing methods for a host of reasons, including increased reliance on online services (Fiserv, 2014), environmental concern (Clark, Kotchen, & Moore, 2003; Kim & Rohmer, 2012), removal of unnecessary mail (Kim & Rohmer, 2012), and automated bill payment (Sexton, 2015). Automatic Bill Payment (ABP) creates an opportunity to bypass the mental load of bill payment (DellaVigna, 2009) by alleviating the obligation to read the bill (Sexton, 2015). E-billing offers specialized self-services, cost-saving programs, and electronic notifications which can increase firm profitability (Casey, 2004). Customers exposed to additional, more immediate information from their bills may have a better understanding of their consumption metrics (Castro & De Bruhl, 2015), giving e-billing customers a distinctive advantage over those receiving paper bills.

Energy customers experience difficulty understanding their energy bill (Sernhed, Pyrko & Abaraavicius, 2003; Martins & Moura, 2016) and regularly underestimate the cost-savings associated with changes in energy appliances and behavior (Rodemeier, Löschel, & Kube, 2017), which makes the ability to provide additional information appealing. E-billing allows for changes to energy consumption through increased information diffusion (Gaballo, 2016), though the degree of change is based on the conditions of e-billing such as frequency, design, and framing (Allcott & Kessler, 2019).When customers are provided opportunities to interact with

their energy consumption data, this is thought to provoke more accurate perceptions of price regarding energy consumption (Kahn & Wolak, 2013).

A significant portion of the literature encourages utilities to use e-bills as feedback instruments for customers, offering additional information about their consumption than traditional bills (Sernhed, Pyrko & Abaraavicius, 2003). Some of this work develops best practices to increase enrollment in e-billing presentations (Samuelson, 2015) and identifying specific conditions that promote opt-in (Au & Kauffman, 2001). There is a considerable degree of consensus that the benefits of doing so are undeniable, and if harnessed correctly, could greatly increase profits and decrease customer attrition (Casey, 2004; Aspen Analytics, 2007). In fact, the literature and industry experts indicate that utilities should expect explosive growth in demand for e-billing (Fiserv, 2016; CheckFree, 2007; Netscape, 2017; Koch, 2019); increasing the importance of understanding the unknown behavioral choices of customers is this space (Savenije, 2014). Informative billing has been suggested as a successful tool to decrease energy consumption and increase awareness of conservation measures (Fischer, 2008). Further, energy feedback, possibly through informative billing, allows for consumers to have a wider knowledge of how they may control their energy consumption (Darby, 2006). Enrolling in e-billing as a utility customer can increase your access to more timely informative billing, therefore resulting in a decrease to energy consumption.

Inattention

Regardless of enrolling in e-billing, customers are often faced with road blocks to understanding their energy bills, including price shrouding (Gabaix & Laibson, 2006), bill shock (Grubb, 2014) left digit bias (Lacetera, Pope, & Sydnor, 2011), and inaccurate price perceptions (Grubb, 2014)[1]. These factors can lead to incorrect perceptions of energy prices which are most prevalent amongst inattentive customers who are less willing to receive personalized consumption information (Kazukauskas and Broberg 2016). Inattention refers to an individual's limited capacity to process information, perform computations, and allocate attention to tasks, resulting in attention as a scarce resource (Sims, 2003; Reis, 2005; Matějka & Mckay, 2015). Inattention is subsequently a result of bounded rationality, dictating how decision maker capacity is overloaded by information and observable choices (Sallee, 2014). Specifically, attention scarcity determines the degree of additional information and processing strategies pursued by the individual (Matějka & Mckay, 2015). This inattention allows individuals to acknowledge their preferences among alternatives and leave other alternatives underexplored (Masatlioglu et al., 2012).

Only a handful of individuals actively seek out additional information, confirming that inattention is rational and commonplace (Gerarden, Newell, & Stavins., 2017). Consumers choose to be rationally inattentive indicating a perceived trade-off between the costs of procuring

[1] Price shrouding, firms hiding true costs, creates an environment where customers are not able to make rational decisions, putting the salience of information and overall welfare at risk (Gabaix & Laibson, 2006). Bill shock occurs when the full costs of energy use are not recognized, often resulting in small unnoticed increases to energy consumption (Grubb, 2014). In situations where bill shock occurs, customers become more attentive of their consumption and energy costs, reacting rationally by decreasing their future energy usage (Filippini, Hirl, & Masiero, 2016). Left digit-bias, a possible antecedent to inattention, occurs when the cognitive processing of numbers is dependent upon their digit-placement and unit distance (Keefer & Rustamov, 2018). The ability to process costs is relatively simple for the left-most digit, followed by a sharp and continual decrease in salience as the digit-placement extends right (Lacetera et al., 2011).

and the expected benefits from additional information (Sallee, 2014). Inattention in the behavioral economic literature suggests that the resources necessary to calculate the payoff from attention to information (i.e time and money) are commonly perceived to be too costly, often exceeding what the typical consumer is able or willing to invest (Shafieepoorfard, Raginsky, & Meyn, 2013). Consumer inattention varies, falling somewhere between the two extremes--completely attentive and completely inattentive; these choices vary given the context of the situation, being partially dependent upon characteristics of the consumer or aspects within the choice itself (Palmer & Walls, 2015). It is possible that choosing to be rationally inattentive and making misinformed decisions are acceptable outcomes of their choices (Caplin & Dean, 2015). If left unchecked, inattention can become detrimental to making smart, economically beneficial decisions (Palmer & Walls, 2015) and disincentivizes the procurement of critical information regarding consumer decisions (Kazukauskas & Broberg, 2016).

Hansen and Haas (2001) suggest that attention decreases with provision of too much information in online settings, suggesting it may be inadvisable to supply consumers with anything more than the crucial aspects of their consumption metrics. Inattention occurs in instances in which individuals, having a cognitive capacity to consume and retain information, have a fairly inflexible budget of attention in which, if exceeded, salience of the information drastically decreases (Boik, Greenstein, & Prince, 2016). Thus, consumers may have the cognitive ability to understand their utility bill's contents but lack the capacity or willingness to allocate their attention to the matter (Basu, 2006). In fact, recent research suggests that an e-bill customer with higher exposure to more frequent energy related information actually increases water and electricity consumption than they would if they had less frequent interaction with their

bill (Wichman, 2017). E-billing's impact on energy consumption is reduced when inattention exists; therefore, participation in e-billing, when inattention is present, increases energy consumption

H1: E-billing participants, if susceptible to inattention, may increase in their energy consumption

Even though previous research suggests energy consumption decreases when enrolling in e-billing, we propose that e-billing has the potential to increase energy consumption when inattention is present. However, people vary in what they pay attention to and it is likely that inattention to e-billing varies as well. Individuals facing constraints on their income and time allocation (Boik et al., 2016) are more likely to filter information and make tough decisions regarding their limited attention. Individuals experiencing budget constraints focus their attention on matters that address meeting basic needs, such as electricity (Mani, Mullainathan, Shafir, & Zhao, 2013). This suggests that individuals facing economic hardship closely monitor their bills, regardless of the format. The budget constraint faced by these individuals keeps information around their bill more salient, which is important for consumers to understand their bill (LeBlanc, 2016). However, it is likely that this effect applies primarily to budget constrained homeowners, as individuals in assisted housing or renters may have their utilities included in rent and lack information related to their consumption (Dastrup, McDonnell, & Rerina, 2012). This suggests that customers who are budget constrained and receive more information via the electronic bill will have an increased ability to make actionable decisions regarding energy

consumption reduction. Therefore, budget constraints may maintain price salience and increase attention to information provided via e-billing.

H2: E-billing participants, if budget constrained individuals are likely less susceptible to inattention, thereby decreasing their energy consumption from participation in e-billing

Despite literature that suggests more information on energy consumption via e-billing will reduce consumption, we provide an argument that inattention may limit the viability of long-term consumption reduction. There is still much to learn about how the shift in billing type and method of communication in general can create unidentified consequences for specific groups. Customers making sub-optimal energy decisions due to inattention are not able to reap the full benefits intended by the enrollment in e-billing services. We provide a case study description and empirical investigation to inform our developed hypotheses regarding susceptibility to inattention and its impact on energy consumption.

Case Study

To test our hypotheses, the City of Tallahassee is used as a case study. Tallahassee provides a good test case, being a mid-sized city with a highly educated, diverse population and a municipally owned utility that offers e-billing to its customers. City of Tallahassee Utilities (TU), provides electricity, water, and gas services to their customers. This case study focuses specifically on changes in electricity consumption. Tallahassee's utility being municipally owned means it is managed by the city, run by public employees, and owned by members of the utility. Rather than sharing profits with board members like investor-owned utilities, municipal utilities

are instead considered non-profit entities. Being a locally owned utility removes the pressure to maximize profits for investors and instead provide an affordable and quality service. This allows them to have more sovereignty in determining rates and regulations while being able to provide more optimal benefits to their customers. The utility offers a wide range of programs targeting sustainability and they position their e-billing program as an 'environmentally friendly' billing option. They have won numerous awards including one dedicated to being the number one municipal utility and other awards for their 'green programming'. Among their green programming are smart meters. Every customer has a smart meter that reads their energy usage in 30-minute intervals. TU started making the transition to smart meters in 2011. Table 1A in the appendix provides an overview of characteristics in the City of Tallahassee as compared to the United States. This allows for a brief glimpse into generalizability of our case.

The customer of Tallahassee Utilities that receives a paper bill receives the standard bill information, newsletter, and a return envelope for their payment. The paper bill displays information in an easily digestible format. The paper bill presents comparisons for consumption over time by utility type (energy, gas, and water service) and proportion of bill attributed to each service for which they are paying (energy, gas, water, wastewater, refuse, stormwater, and fire). However, the electronic bill (smartbill) allows you to click a button and make an immediate payment for the aggregated sum of these services without having to examine any additional bill information; the traditional bill with additional information is made available for download on the smartbill webpage. A notable difference between these two strategies is that the electronic biller only receives additional information and is only presented with their actual bill if they are interested in seeking it out, whereas the paper biller is confronted with their energy consumption

over time on the document they must use to pay their bill -- which provides them with at least some frame of reference for their electric use regardless of further investigation.

This creates the opportunity for a few information oriented mechanisms -- beyond inattention -- to come into play. Electronic billing, in the format utilized in this specific case, may fall prey to information costs. This is because an individual must be motivated to seek out this information by clicking through additional links, requiring more of their time, energy and attention (Blasch, Filippini, & Kumar, 2019), which may further exacerbate outcomes associated with inattention (Caplin & Dean, 2015). The paper bill consumers may be more susceptible to immediate information overload given the amount of information presented at once (Jackson & Farzaneh, 2012), depending on their information processing capacity (Eppler & Megnis, 2004), available time (Jackson & Farzaneh, 2012), and previous experience with and knowledge of the information (Cheng, Ouyang, & Liu, 2019). Information overload specific to the quality and quantity of information provided has been found to negatively impact pro-environmental intentions specific to electric vehicles (Cheng, Ouyang, & Liu, 2019). However, given that the consumers interact with the bill information regularly and the information presented is simply the amount of service used and associated cost, it would seem that the primary contributing factor to information overload is simply the quantity of information. More specifically, the inclusion of more information may be intentional to limit attention (Persson 2018), which means that the presentation of specific information may be intentional to draw attention to that content -- such as the inclusion of consumption history on the paper biller.

Data

Not until recently have studies empirically tested the connection between electronic service enrollment and increased consumption (Sexton, 2015). In contexts such as these, changes in monthly consumption (e.g. kWh) are analyzed to elicit how changes to certain aspects of e-billing may be expected to produce more predictable consumer behavior outcomes, namely changes in energy consumption behavior. This is often collected from residential energy utility bills that allow for monthly observations of energy consumption and conservation. Other sources of data typically rely upon self-reported survey responses including customers' satisfaction (Checkfree, 2007), enrollment motivations (Clark et al., 2003), and salience of bill contents (Martins & Moura, 2016). Previous research has attempted to account for individual characteristics as well as behavioral responses to e-bill enrollment by isolating factors such as age and length of enrollment while controlling for time effects through Vector-autoregression (Sexton, 2015). To reveal how e-billing enrollment alters energy use, consumption prior to intervention and consumption following sign up would indicate whether a causal relationship exists (Sexton, 2015). Other research has controlled for variables such as household size, length of relationship, income level, and educational attainment to reduce chances of error (Martins & Moura, 2016).

Our data shares similarities with previous studies by utilizing household level information in the City of Tallahassee. We focus on homeowners that are customers of Tallahassee Utilities. The data comes from the utility itself and is merged with the county level property appraisal database and 2010 Census data. Because the data from the utility is captured monthly from 2006-2011, we also gather airport weather sensor data to develop measures of

heating and cooling degree days during the month of energy consumption. We use e-billing enrollment in May of 2008 to cut our sample into participants and non-participant groups, which we describe as treatment and control in the modelling section below. This means that our sample either takes a value of 1 if they are in the treatment group as of May 2008, or they take a value of zero if they are not enrolled in e-billing as of May 2008. Our sample is established in a way to maintain treatment/control group status throughout the sample.

Weather Data Description

This data was developed by taking the weather sensor data for the City of Tallahassee (based on the Airport Sensor) and calculating a monthly count of heating and cooling degree days. These are calculated based on the industry standard using 65 degrees, with heating degree days being those when the temperature is below the standard and cooling days when the temperature is above.

Leon County Property Appraisal Data Description

The Leon County Property Appraiser makes data available via download on their website (Leon County Property Appraiser, 2019). This data is collected at the earliest time point in our sample. This data provides us information related to when the home was built, size, and market value of the home.

Census Data Description

The census block level data is pulled from the census website and matched to households based on their geographic location. This data includes home ownership rates, median income, median age, percent minority, and percent education (bachelors or higher).

Tallahassee Utilities Data Description

The data from Tallahassee Utilities is public record because of the municipal ownership status of the City of Tallahassee Utilities. This means that the address-based consumption data is available on their website. Working with Tallahassee Utilities enabled us to procure a more comprehensive and historical database that includes monthly energy, water, and gas consumption for all customers of the utility. Through a public records data request, we were granted access to records of when individuals opted into the e-billing program. Attached to this information was records of individuals who had called the utility to complain about a high bill.

[Insert Table 1: Treatment and Control Group Comparisons of Summary Statistics Here]

Table 1 above provides summary statistics by e-bill status across the different variables (t-test at period 0). The pre-treatment dependent variable, monthly kWh (electricity consumption), usage is not statistically significantly different between the two groups. However, participants enroll in the e-billing database at different points in time. To address this issue and create a quasi-experimental design, we opt for a matching strategy to pair 768 e-bill participants and 768 non-participants[2]. This selection was done randomly, not based on specific

[2] E-bill participation dates are different for each customer. Therefore, cutoff time differs among the e-bill participants. The challenge occurs during the selection of time cutoffs for non-participants. One way to

characteristics. Despite the random pairing, there are some t-test differences on observed characteristics, as evidenced in table 1 above; however, the absolute differences are not large enough to be a concern for our analysis.

Empirical Method:

We utilize the random pairing process to create a sample for our quasi-experimental design to help develop treatment and control groups based on participation in the e-billing program. The goal of the analysis is to estimate the causal effects of participating in e-bill on electricity consumption. Our dependent variable is monthly electricity consumption, we utilize two specifications of the dependent variable: monthly energy consumption in kWh and logarithmic transformation of the monthly kWh. We employ a difference-in-differences (DD) method, which is a commonly used quasi-experimental method[3]. This method allows for estimation of the causal effects, particularly for the analysis of non-random participation. The DD estimation allows us to estimate the average monthly effect of the treatment, i.e., e-bill enrollment.

The standard DD regression model is now as follows:

$$Y_{it} = \alpha + \beta(TS_i) + \sigma(TP_t) + \delta(TS_i * TP_t) + \gamma X_{it} + \epsilon_{it}$$

address this issue was to form matched pairs between participant and non-participant groups, and then to apply matched e-bill date to the matched control. This process was done at random, not based on any observable characteristic. Since there is not any information about why customers participate at a particular time, it is appropriate to exercise the random pair matching.

[3] The analysis is a standard DD method. Initial e-bill group size was fewer than the potential comparison group due to this pairing process. We excluded unpaired samples from the analysis. We thank Clyde Schechter for providing feedback on this part in the STATA forum (www.statalist.com).

where TS indicates treatment status, TP indicates the treatment period, and interaction term, δ, is the DD estimator of the treatment effect, or the impact of the e-bill on electricity consumption. $\delta$is an interaction between two binary variables which is e-bill participation status and treatment period. The dependent variable is monthly electricity consumption and X is a vector of other control variables. Our variable of interest in this model, is the δ, which estimates the impact of enrolling in the e-bill program on monthly consumption.

The Hausman test is used to determine model specification, it supports the use of a fixed effects model over the alternative random effects specifications. Therefore, we employ a DD fixed effects model which can also mitigate any potential omitted variable bias problems. Given that the quasi-experimental design, with non-random selection, may fall prey to selection bias, we utilize a screening procedure to assess the extent of the selection problem. In this process we utilize a probit model with participation in e-billing as a dependent variable to determine the extent of these problems. The results of this analysis are presented in Table 2A within the Appendix. We find that no observed characteristics predict e-bill participation[4]. As a second step to determine the potential effect of selection bias, we evaluate the baseline balance or the differences between the two groups prior to e-bill enrollment, across covariates and dependent variables. The treatment and control groups are observationally similar at baseline, granting us

[4] As shown in the table (Appendix), none of the right-hand side variables are predicting e-bill participation. We also investigate marginal effects from the probit model. The probability of e-bill = 1 is .0082 (or 0.82%) given that all predictors are set to their mean values. The probit model suggestion is a valid argument since e-bill participation is not randomly assigned, i.e., some customers would have been more likely than others to participate in the program. However, this does not prevent us from applying difference-in-difference approaches here. The data contains the outcomes for the customers before the treatment and we observe untreated (non-participant) customers as well, who are experiencing the same trends over time, then we can still estimate the effect of the treatment (Pischke 2005).

higher confidence that the two groups preserve exchangeability. Our last step to reduce baseline heterogeneity, is to employ matching as a statistical method. Matching does not always produce matched groups that are more similar than without matching, which we encountered in our sample. Appendix Figure 1A provides the pre and post matching distribution between control and treatment groups. Based on these results, we do not need to utilize a propensity score matching strategy to offset potential selection bias issues in our analysis.

Another potential issue with DD models is serial correlation (Bertrand, Duflo, and Mullainathan 2004). One potential solution to this issue, as identified by Bertrand, Duflo, and Mullainathan (2004) is to utilize cluster-robust standard errors. Therefore, our analysis is conducted utilizing standard errors clustered at the customer level. This helps to account for within-household serial correlation and produce consistent standard errors in the presence of such cases. The following section discusses the results of the analysis.

Results

We begin by presenting the DD fixed effects estimates where the comparison group are customers not participating in e-billing, these can be found in table 2. Given that we are utilizing fixed-effects, time invariant variables (i.e., house size, e-bill status, etc.) within each customer are omitted because we cannot estimate their effects. Since they are collinear with the fixed effect, they cannot be estimated in the fixed effects model. This analysis is meant to capture the effect of the pre-existing research that suggests participation in e-billing will decrease energy consumption. Table 2 presents the average treatment (e-bill) effects, where the outcomes are presented both in terms of monthly electricity consumption (kWh) and natural log of electricity

consumption (ln(kWh)). The log-linear model is included for two reasons, first it presents the results in terms of percentage change and provides an additional robustness check on our key conclusions. The coefficient of the interaction term, δ, is the DD estimator of the treatment (e-bill) effect, meaning that when the utility customer becomes an e-biller they experience the change presented in δ as a result of enrolling.

Table 2 presents four columns, Columns 1 and 3 utilize monthly household-level electricity consumption (kWh) as a dependent variable, while Columns 2 and 4 presents the dependent variables as log of household-level monthly electricity consumption (log(kWh)). Columns 1 and 2 present DD regression with no additional independent variables beyond the e-bill period and the interaction term. These regression models are more parsimonious than those presented in Columns 3 and 4. The analyses presented in Columns 3 and 4 present DD regression results with other independent variables. Overall, our estimation shows that e-bill participation leads to reduction in electricity consumption a little more than 3%, or over 30 kWh on average, per month relative to non-enrollees (see bracketed row).

[Insert Table 2: The table provides DD fixed effects results based on both kWh and log(kWh). Main treatment effect is bracketed Here]

We then investigate the differences in responses to e-bill participation among different income brackets to explore hypothesis 2. We expected that individuals who were budget constrained would be less susceptible to inattention, thereby decreasing their energy consumption from participation in e-billing. This will help to understand the generalizability of

the results from the analysis in table 2 above. In our dataset median income is around $50,000. Therefore, the rationale is to use this as a benchmark to segregate the sample. In table 2 we present results for different income categories i.e., households located in census tracts with income above the $50,000 cutoff and households below the $50,000. Table 3 presents differential performances of low- and high-income e-bill participants. On average, low-income households who receive an e-bill reduce electricity consumption. Columns 1 and 2 present results for low-income households, where treatment effect is about 36 kWh or 4.4%. For high-income households, columns 3 and 4, we do not have the evidence of treatment effect. High income households consume higher electricity than low-income households (about 1400 kWh vs. 1100 kWh) and differences are statistically significant.

[Insert Table 3: The table provides DD fixed effects results based on both kWh and log(kWh) for different income levels. Here]

As demonstrated by our analysis in table 2, we see that the average impact is, in fact, a decrease in energy consumption. However, upon further investigation it appears that homes located in these higher income areas are unaffected by the change in billing design. However, homes located in lower-income areas do appear to decrease their energy consumption. This suggests that e-billing design may increase customer attention to their bills, for those experiencing budget constraints. It is also likely that shifting to an e-billing platform does not change the information available to higher income groups, likely because they are not changing the attention paid to their bill regardless of the format.

[Insert Table 4: Comparison of Means between Income Groups Here]

Table 4 offers insight into the two income groups. It is clear and expected that these groups vary quite substantially in terms of their consumption and home value. Despite minimum differences in our participant and nonparticipant groups, we see substantial differences between these groups that we would expect when cutting the sample based on income levels. Even though the homes located in lower income areas tend to be smaller in size and older, with lower energy consumption, these customers still appear to save energy by enrolling in the e-bill program. Despite having the potential to be highly inattentive due to other demands on their time -- the e-bill program appears to provide actionable information that is more salient, increasing attention, and changing behavior. However, for higher income households, enrolling in the e-bill program does not appear to serve the same purpose. In fact, e-billing may serve to minimize the attention requirements for bill paying -- by increasing convenience and availability of information. This suggests that in order to drive savings behavior for higher income customers, e-bill content may require the inclusion of different information that addresses these customers' heuristics, biases, and nudges them towards savings. This may have implications for e-bill program designers to make information more targeted.

Our analysis faces two important limitations - 1) sample size, and 2) limited household information. In future iterations of this exploration, there should be attempts made to increase sample size to improve power and increase potential analysis strategies. Despite the limited sample size, this analysis demonstrates that inattention susceptibility is important and should

receive additional attention. To address limitation two, there is some ability to glean individual level characteristics from voter registration data. However, registered voters likely have different degrees of susceptibility to inattention than non-registered voters.

Discussion

From the analysis presented here we can extrapolate a few important points: 1) enrolling in e-billing does not inadvertently increase energy consumption; 2) enrolling in e-billing does result in a decrease in energy consumption for individuals with potential budget constraints; 3) individuals are not equally susceptible to inattention. These three points have implications for policy design and future research.

In this particular case, the e-bill program is designed as opt-in, which means there is potential selection bias in these results, our analysis has controlled for these results as best as possible, however, different program designs might allow us to examine the robustness of these findings in situations that are not opt-in. Although our results show evidence of savings among some segments of the customers, it would be helpful to develop a true treatment and control group that were not dictated by self-selection, to ascertain whether this is true for all customers. Our analysis would suggest that opt-out enrollment would not have adverse consequences on inattention and consumption patterns. Given that our analysis revealed no adverse consequences from e-bill enrollment for high income groups, it likely means this group is susceptible to inattention regardless of billing format. However, the positive benefits from e-bill enrollment from lower income groups might mean that the additional information in the online environment

helps e-billers to decrease their energy costs. This means that e-billing and increased information awareness may help to decrease the energy consumption of lower income homes by 36 kWh, or a roughly 4.4 % reduction after enrolling in the e-bill program. This consumption reduction translates to a bill decrease of $3.70 on average per month after enrollment in the e-bill. This impact is perhaps quite small for the individual but can make an impact for individuals who are already energy burdened. In addition, if there was a successful shift to an opt-out policy design, it might result in larger aggregate impacts for the utility's benefit, decreased greenhouse gas emissions, and increase societal welfare.

In addition, research should explore design features of e-billing to assess whether susceptibility to inattention increases further from enrollment decisions for all groups. If this were the case, it would raise design questions as to how to re-ignite the salience of digital communication. Perhaps certain characteristics of individuals help to retain the salience of e-billing, while other characteristics mute the long-term salience of e-billing information. The suggestion proposed here that susceptibility to inattention is not equal for all individuals presents some important consequences for other forms of information policy design and policy tool selection. Here the outcomes suggested that this policy design might in fact be equitable, however others may reinforce or propagate inequities.

We suggest that in addition to budget constraints, other characteristics may impact information salience, Leblanc (2016), for example, found age and environmental concern to be precursors to bill salience. We propose exploring age as a determining factor of inattention in e-billing, particularly due to the acceptance of technology and motivations behind e-bill

enrollment. Research has indicated receiving a statement in the mail is still the preference for a significant portion of customers who are not ready nor willing to part ways with their paper bills (U.S. Postal Service Office of Inspector General, 2015; Susswein, 2019; Howard, 2019). Traditional billing methods are not as attractive to Gen Y (Fiserv, 2014); this group favors technological services, engaging less with paper bills (Fiserv, 2013). In addition to such preferences, the marketing of e-bills as addressing environmental concerns may act as an increased incentive for Gen Y utilization (Kim & Rohmer, 2012; Rouse, S. M., & Ross, A. D. 2018, pg. 151).

Environmental policy is often considered an important societal and political focus for millennial voters, with more than 70% of individuals 30 years of age and younger reporting that climate change is happening now and mainly caused by human activities (Hamilton, 2018). In fact, environmental concern serves as a catalyst for Gen Y customers to change the way they receive their bills (Fiserv, 2013), choosing the most environmentally friendly option. Furthermore, it appears that those who make up Gen Y believe that by altering their everyday choices to be more environmentally conscious (e.g. consuming less paper or enrolling in electronic services), they can reduce their environmental impact (Glass Packaging Institute, 2014). This may suggest that age plays an important factor in not only the decision to participate in e-billing, but also the attention paid to outcomes from it.

In addition, research suggests that party affiliation may play an important role in how individuals make energy consumption decisions (Costa & Kahn, 2013) and filter the information that they receive regarding climate change (Dunlap & McCright, 2008). In other words,

individuals who identify as a Democrat may be more likely to pay attention to certain policy frames that position activities as sustainable or climate friendly (Nisbet, 2009). When activities, such as e-billing, are framed as 'going green' or 'paperless' it may be that Democrats will pay more attention to the materials inside of it (Theodori & Luloff, 2002). However, Republicans may respond more to framing around "convenience" and "cost savings" that can result from information on energy consumption (Gromet, Kunreuther, & Larrick, 2013; Wolsko, Ariceaga, & Seiden, 2016). This might suggest that party affiliation can act as a factor that increases or decreases susceptibility to inattention in utility-based e-billing. Beyond age and political affiliation, other factors such as occupation, education, energy IQ, and attitudes toward the environment might influence individual susceptibility to inattention and should be further explored.

Conclusion

This research builds on previous work that has explored the implications of e-billing participation (Sexton, 2015) and the growing discussion regarding the prevalence of inattention in the energy market (Keefer & Rustamov, 2018). We contribute to discussions surrounding consumption behaviors in the residential energy market by investigating how inattention tied to e-billing participation alters the consumption behavior of residential energy users. To our knowledge we are the first to expand that discussion to include equity considerations, arguing that inattention in e-billing may in fact be selective. Specifically, we ask how inattention impacts energy consumption in the residential energy market differently based upon the specific

customer characteristics. Our findings show that customer's vary in their reactions to enrolling into e-billing; individuals in lower income areas tended to decrease their energy consumption after switching to e-billing programs, while individuals in higher income areas appeared to be unaffected by the switch to e-billing.

This reflects larger underlying inequities at play in energy consumption. The first of these is that low income areas are required to use more of their scarce information resources (i.e., time and attention) to save $3.70 per month. The second of these is that lower income communities tend to be disproportionately impacted by the environmental effects of climate change, which are in part caused by utility born emissions. The lower income communities appear to be utilizing their scarce resources to contribute to the reduction of emissions, while higher income areas can 'afford' to be inattentive to their own carbon contributions. While the direct effect of e-bill enrollment has positive consequences for reducing the energy burden for lower-income homes, these findings also speak to the difficulty in achieving energy justice. Ultimately, these findings hold insights for utilities and policy makers when assessing their ability to effectively communicate information to the public and considering the resulting distribution of outcomes that result from the communication.

When considering the implications of changing from paper to electronic forms of communication, the role of inattention is important. The implications of subgroup susceptibility to inattention should raise new questions regarding equitable decisions made by governments and organizations as they push toward purely electronic forms of communication. Individuals will prioritize information and their attention according to what is deemed most relevant and

salient to them. This research should raise caution that certain information sharing strategies are unlikely to have equal impact for all. This may increase the need to have more targeted marketing and communication, specifically for increasing attention in relevant and meaningful ways in bill design. The impact of transitioning from traditional communication strategies to online formats, particularly as they relate to equity, are not well known (D'Agostino, Schwester, Carrizales, & Melitski, 2011). This paper has shed light on the potential variation in susceptibility to inattention, which may have consequences beyond e-billing.

References

Accenture. (2012). Actionable Insights for the New Energy Consumer Accenture end-consumer observatory. Retrieved from: http://www.smartgrids-cre.fr/media/documents/Accenture-Actionable-Insights-New-Energy-Consumer.pdf.

Allcott, H., & Kessler, J. B. (2019). The welfare effects of nudges: A case study of energy use social comparisons. *American Economic Journal: Applied Economics*, 11(1), 236-276. https://www.doi.org/10.1257/app.20170328.

Aspen Analytics. (2007). The e-bill Effect: The Impact on Customer Attrition from Banks that Offer E-bill. Retrieved from: http://graphics8.nytimes.com/packages/pdf/business/AspenWhitepaper.pdf.

Au, Y. A. & Kauffman , R. J. (2001). Should We Wait? Network Externalities, Compatibility, and Electronic Billing Adoption. *Journal of Management Information Systems*,18(2), 47-63. https://doi.org/10.1080/07421222.2001.11045678.

Ayres, I., Raseman, S., & Shih, A. (2013). Evidence from two large field experiments that peer comparison feedback can reduce residential energy usage. *The Journal of Law, Economics, and Organization*, *29*(5), 992-1022. https://doi.org/10.1093/jleo/ews020.

Basu, K. (2006). Consumer Cognition and Pricing in the Nines in Oligopolistic Markets. *Journal of Economics & Management Strategy*, 15(1), 125–141. https://doi.org/10.1111/j.1530-9134.2006.00094.x.

Beard, T., Gropper, D. & Raymond, J. (1998). Bill Averaging Programs and Consumer Behavior: Theory and Evidence. *Journal of Regulatory Economics, Springer*, 13(1), 19-35. https://doi.org/10.1023/A:1007934515138.

Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates?. The Quarterly journal of economics, 119(1), 249-275. https://doi.org/10.1162/003355304772839588.

Bird, L., Swezey, B., & Aabakken, J. (2004). Utility green pricing programs: design, implementation, and consumer response (No. NREL/TP-620-35618). National Renewable Energy Lab., Golden, CO.(US). https://doi.org/10.2172/15006910.

Blasch, J., Filippini, M., & Kumar, N. (2019). Boundedly rational consumers, energy and investment literacy, and the display of information on household appliances. Resource and Energy Economics, 56, 39-58. https://doi.org/10.1016/j.reseneeco.2017.06.001.

Boik, A., Greenstein, S. & Prince, J. (2016).The Empirical Economics of Online Attention. NBER Working Paper, 22427. https://doi.org/10.3386/w22427.

Briscoe, C. B. (1959). Electronic Billing in St. Louis. *Journal-American Water Works Association*, 51(9), 1127-1131. https://doi.org/10.1002/j.1551-8833.1959.tb21215.x.

Caplin, A. & Dean, M. (2015). Revealed Preference, Rational Inattention, and Costly Information Acquisition. *American Economic Review*,105(7), 2183–2203. https://doi.org/10.1257/aer.20140117.

Casey, T. (2004). Automation, Self-Service, and Analytics Improve the Customer Relationship. *American Water Works Association*, 96(8) , 34-36. https://doi.org/10.1002/j.1551-8833.2004.tb10665.x.

Castro, D. & De Bruhl, B. (2015). How to Promote Smarter Water Use by Giving Consumers Access to Their Consumption Data. *Center For Data Innovation*. http://dx.doi.org/10.2139/ssrn.2689584.

CheckFree. (2007). Understanding and Driving Consumer Adoption of E-Bills: Enabling Biller Organizations to Push for Paperless. Retrieved from: Billing. http://www.checkfreecorp.com/assets/files/Driving_eBill_Adoption.pdf.

Cheng, P., Ouyang, Z., & Liu, Y. (2019). The effect of information overload on the intention of consumers to adopt electric vehicles. Transportation, 1-20. https://link.springer.com/article/10.1007/s11116-019-10001-1.

Clark, C. F., Kotchen, M.J., & Moore, M.R. (2003). Internal and external influences on pro-environmental behavior: Participation in a green electricity program. *Journal of Environmental Psychology,* 23(3), 237–246. https://doi.org/10.1016/S0272-4944(02)00105-6.

CNN. (2019a, October 18). Florida Results: Presidential Results. Retrieved from: https://www.cnn.com/election/2016/results/states/florida.

CNN. (2019b, October 18). Presidential Results. Retrieved from: https://www.cnn.com/election/2016/results/president.

Costa, D. L., & Kahn, M. E. (2013). Do liberal home owners consume less electricity? A test of the voluntary restraint hypothesis. *Economics Letters*, 119(2), 210-212. https://doi.org/10.1016/j.econlet.2013.02.020

Costanzo, M., Archer, D., Aronson, E., & Pettigrew, T. (1986). Energy conservation behavior: The difficult path from information to action. *American Psychologist*, 41(5), 521. https://psycnet.apa.org/record/1986-26040-001.

Darby, S. (2006). The effectiveness of feedback on energy consumption. *A Review for DEFRA of the Literature on Metering, Billing and direct Displays*, *486*(2006), 26. https://www.eci.ox.ac.uk/research/energy/downloads/smart-metering-report.pdf.

D'Agostino, M., Schwester, R., Carrizales, T., & Melitski, J. (2011). A Study Of E-Government And E-Governance: An Empirical Examination Of Municipal Websites. Public Administration Quarterly, 35(1), 3-25. Retrieved from www.jstor.org/stable/41804540

Dastrup, S., McDonnell, S., & Reina, V. (2012). Household energy bills and subsidized housing. *Cityscape*, 127-147. www.jstor.org/stable/41553084.

DellaVigna, S. (2009). Psychology and Economics: Evidence from the Field. *Journal of Economic Literature*, 47(2), 315–372. https://doi.org/10.1257/jel.47.2.315.

Dunlap, R. E., & McCright, A. M. (2008). A widening gap: Republican and Democratic views on climate change. *Environment: Science and Policy for Sustainable Development*, 50(5), 26-35. https://doi.org/10.3200/ENVT.50.5.26-35.

Eppler, M. J., & Mengis, J. (2008). The concept of information overload-a review of literature from organization science, accounting, marketing, mis, and related disciplines (2004). In Kommunikationsmanagement im Wandel (pp. 271-305). Gabler. https://link.springer.com/chapter/10.1007/978-3-8349-9772-2_15.

Falk, S., Römmele, A., & Silverman, M. (2017). The promise of digital government. In Digital Government (pp. 3-23). Springer, Cham. http://dx.doi.org/10.1007/978-3-319-38795-6_10.

Falkinger, J. (2008). Limited Attention as a Scarce Resource in Information-Rich Economies. *The Economic Journal*, 118(532), 1596-1620. https://doi.org/10.1111/j.1468-0297.2008.02182.x.

Filippini, M., Hirl, B., & Masiero, G. (2016). Rational habits in residential electricity demand. *CER-ETH Center of Economic Research* at ETH Zurich, Working Paper, (16/228). http://dx.doi.org/10.2139/ssrn.2713792.

Finkelstein, A. (2012). E-ZTAX: Tax Salience and Tax Rates. *Quarterly Journal of Economics,* 124(3), 969-1010. https://doi.org/10.1162/qjec.2009.124.3.969.

Fischer, C. (2008). Feedback on household electricity consumption: a tool for saving energy?. *Energy efficiency*, 1(1), 79-104. https://doi.org/10.1007/s12053-008-9009-7.

Fiserv. (2013). State of E-Bill Adoption. Fiserv. Available at: https://docplayer.net/11454851-White-paper-state-of-e-bill-adoption.html (accessed December 2018).

Fiserv. (2014). Sixth Annual Billing Household Survey:
The Gen Y Effect and Explosive Growth of the Mobile Channel Fuel Need for Billers to Support More Payment Channels Than Ever Before. Retrieved from: https://www.fiserv.com/resources/state-e-bill-adoption-white-paper.aspx.

Fiserv. (2016). Paper Statements Vs. Electronic Bills. Retrieved November 12, 2019, from http://www.e-billplace.com/cda/e-billplace/tools/papervselectronic.html.

Fiserv. (2016). Mobile Billing and Payment: Consumer Preferences and Billers' Strategic Response. Available at: file:///home/chronos/u-7e72b66a877d2b0261411baa801f2ea8b1b193db/MyFiles/Downloads/Fourth_Annual_Biller_Mobile_Bill_Pay_Benchmark_Study.pdf.

Gabaix, X. & Laibson, D. (2006). Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets. *The Quarterly Journal of Economics*, 505-540. http://pages.stern.nyu.edu/~xgabaix/papers/shrouded.pdf.

Gaballo, G. (2016). Rational Inattention to News: The Perils of Forward Guidance. *American Economic Journal: Macroeconomic*, 8(1), 42–97. https://doi.org/10.1257/mac.20130337.

Gerarden, T. D., Newell, R. G., & Stavins, R. N. (2017). Assessing the energy-efficiency gap. *Journal of Economic Literature*, 55(4), 1486-1525. https://doi.org/10.1257/jel.20161360.

Glass Packaging Institute. (2014). The Millennials: A Generation Invested in Health and the Environment,
Retrieved from: http://www.gpi.org/sites/default/files/GPI-TheMillennials-11%206%2014-FINAL.pdf

Gromet, D. M., Kunreuther, H., & Larrick, R. P. (2013). Political ideology affects energy-efficiency attitudes and choices. *Proceedings of the National Academy of Sciences*, 110(23), 9314-9319. https://doi.org/10.1073/pnas.1218453110.

Grubb, M. D. (2014). Consumer Inattention and Bill-Shock Regulation. *Review of Economic Studies*, 1–39. https://doi.org/10.1093/restud/rdu024.

Hamilton, Lawrence. (2018). Data Snapshot: Millennials and Climate Change. The Carsey School of Public Policy at the Scholars' Repository. 337. https://scholars.unh.edu/carsey/337

Hansen, M. T. & Haas, M. R. (2001). Competing for Attention in Knowledge Markets: Electronic Document Dissemination in a Management Consulting Company. *Administrative Science Quarterly*, 46(1), 1-28. https://doi.org/10.2307/2667123.

Howard, A. (2019). Consumer Action survey: Given the choice, consumers prefer a paper trail. Retrieved from https://www.consumer-action.org/news/articles/paper-or-digital-winter-2018-2019.

Jackson, T. W., & Farzaneh, P. (2012). Theory-based model of factors affecting information overload. International Journal of Information Management, 32(6), 523-532. https://doi.org/10.1016/j.ijinfomgt.2012.04.006.

Kahn, M. E. & Wolak, F. A. (2013). Using Information to Improve the Effectiveness of Nonlinear Pricing: Evidence from a Field Experiment. Working paper, Stanford University. http://web.stanford.edu/group/fwolak/cgi-bin/sites/default/files/files/kahn_wolak_July_2_2013.pdf.

Kazukauskas, A. & Broberg, T. (2016). Perceptions and inattention in private electricity consumption. CERE Working Paper, 2016:2. http://dx.doi.org/10.2139/ssrn.2743227.

Keefer, Q. & Rustamov, G. (2018). Limited Attention In Energy Markets: A Regression Discontinuity Approach. *Empirical Economics*, 1-25. https://doi.org/10.1007/s00181-017-1314-6.

Khan, S., Khan, S., & Aftab, M. (2015). Digitization and its impact on economy. *Int. J. Digital Libr. Serv*, 5(2). https://pdfs.semanticscholar.org/5195/0dbb469ff8ac65c20a0929a63e76ed619317.pdf.

Kim, J. & Rohmer, S.(2012). Electronic Billing vs. Paper Billing: Dematerialization, Energy Consumption and Environmental Impacts. *Electronics Goes Green* 2012, 1-4. https://ieeexplore.ieee.org/abstract/document/6360455.

Koch, B. (2019). E-Invoicing / E-Billing: International Market Overview & Forecast. Retrieved from https://www.billentis.com/einvoicing_ebilling_market_overview_2019.pdf.

Lacetera, N., Pope, D. G., & Sydnor, J. R. (2011). Heuristic Thinking and Limited Attention in the Car Market. *American Economic Review*, 102(5), 2206–2236. https://ideas.repec.org/p/red/sed011/105.html.

Leblanc, B. (2016). Do Customers Understand Their Power Bill? Do They Care? What Utilities Need to Know. Available at : https://www.esource.com/email/ENEWS/2016/Billing (Accessed January 2017).

Loeff, B. (2007). The Right Stuff: When and How To Make Bill Inserts Effective. Available at: https://www.elp.com/articles/2007/09/the-right-stuff-when-and-how-to-make-bill-inserts-effective.html (accessed 1 August 2019).

Leon County Property Appraiser. (2019). Property Data, Retrieved from: https://www.leonpa.org/_dnn/Downloads

Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2013). Poverty impedes cognitive function. *science*, 341(6149), 976-980. https://doi.org/10.1126/science.1238041.

Martins, R., & Moura, P. (2016). Water bills: are they clear to residential users? *Portuguese Association for Regional Development*, 2012. https://www.redalyc.org/pdf/5143/514351889001.pdf.

Masatlioglu,Y., Nakajima, D., & Ozbay, E. Y. (2012). Revealed Attention. *American Economic Review*, 102(5), 2183-2205. https://doi.org/10.1257/aer.102.5.2183.

Matějka, F., & McKay, A. (2015). Rational inattention to discrete choices: A new foundation for the multinomial logit model. *American Economic Review*, 105(1), 272-98. https://doi.org/10.1257/aer.20130047.

Mesel, E., Wirtschafter, D. D., & Ramsey-Klee, D. M. (1976). Economic analysis of an automated billing system for physicians' services. *Medical care*, 1037-1051. www.jstor.org/stable/3763253.

Moore, C. & Litan, A. (2002). The State of E-Billing in the Utilities Industry. Retrieved from: https://www.bus.umich.edu/kresgepublic/journals/gartner/research/110100/110188/110188.html.

Netscape Communications.Electronic Bill Presentment and Payment (2017). Retrieved from: https://svpg.com/wp-content/uploads/2017/07/Example-Assessment.pdf

Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment: Science and policy for sustainable development,* 51(2), 12-23. https://doi.org/10.3200/ENVT.51.2.12-23

Palmer, K. & Walls, M. (2015). Limited Attention and the Residential Energy Efficiency Gap. *American Economic Review: Papers & Proceedings*, 105(5): 192–195. https://doi.org/10.1257/aer.p20151009.

Persson, P. (2018). Attention manipulation and information overload. Behavioural Public Policy, 2(1), 78-106. https://doi.org/10.1017/bpp.2017.10.

Pischke, J. S. (2005). Empirical methods in applied economics: Lecture notes. Downloaded July, 24, 2015. http://econ.lse.ac.uk/staff/spischke/ec524/evaluation3.pdf.

Reis, R. (2005). Inattentive Consumers (No. 5053). *CEPR Discussion Papers.* https://ssrn.com/abstract=774347

Rodemeier, M., Löschel, A., & Kube, R. (2017). Casting light on energy efficiency: evidence on consumer inattention and imperfect information. *Applied Economics Letters*, 24(21), 1575-1587. https://doi.org/10.1080/13504851.2017.1332742.

Rouse, S. M., & Ross, A. D. (2018). *The Politics of Millennials: Political Beliefs and Policy Preferences of America's Most Diverse Generation.* University of Michigan Press.

Sallee, J. (2014). Rational Inattention and Energy Efficiency. *Journal of Law and Economics*, 57 (3), 781-820. https://doi.org/10.1086/676964.

Samuelson, K. (2015, September 23). Insight I Wish I'd Had When I Worked on E-Billing Adoption. Retrieved from: https://www.esource.com/es-blog-9-23-15-paperless/insight-i-wish-id-had-when-i-worked-e-billing-adoption.

Savenije, D. (2014). Do utilities know what their customers really want? Retrieved from: https://www.utilitydive.com/news/do-utilities-know-what-their-customers-really-want/262952/.

Schroeder, M. (2018, December 12). 2018 Trends in Billing and Payments: Enhancing the Customer Experience. Retrieved from https://www.fiserv.com/en/about-fiserv/the-point/2018-trends-in-billing-and-payments-enhancing-the-customer-experience.html.

Sernhed, K., Pyrko, J., & Abaravicius, J. (2003). Bill me this way!–customer preferences regarding electricity bills in Sweden. *Proceedings of the 2003 summer study of the European Council for an energy efficient economy*, 1147-1150.

Sexton, S. (2015). Automatic bill payment and salience effects: evidence from electricity consumption. *The Review of Economics and Statistics*, 97(2), 229–241. https://doi.org/10.1162/REST_a_00465.

Shafieepoorfard, E., Raginsky, M., & Meyn, S. P. (2013, June). Rational inattention in controlled Markov processes. In *2013 American Control Conference* (pp. 6790-6797). IEEE. https://doi.org/10.1109/ACC.2013.6580906.

Sims, C. A. (2003). Implications of rational inattention. *Journal of monetary Economics*, 50(3), 665-690. https://doi.org/10.1016/S0304-3932(03)00029-1.

Stanton, T., & Kline, K. (2016). Energy and Water Utility Billing Rules, Standards, and Practices: A Survey of the State of the Art and Ideas about Future Directions. *National Regulatory Research Institute.*

Sunstein, C. (2015).Nudging and Choice Architecture: Ethical Considerations. *Yale Journal on Regulation*. https://ssrn.com/abstract=2551264.

Susswein, R. (2019). Preserving paper choice: Not everyone is ready (or wants) to transition to electronic delivery. Retrieved from https://www.consumer-action.org/news/articles/paper-or-digital-winter-2018-2019

Tergesen, A. (2008). Insurance Goes Green. Available at: http://insurance.lbl.gov/media/businessweek-6march08.pdf (accessed July 2019)

Theodori, G. L., & Luloff, A. E. (2002). Position on environmental issues and engagement in proenvironmental behaviors. *Society & Natural Resources*, 15, 471-482. https://doi.org/10.1080/08941920290069128

U.S. Census Bureau. (2017). American Community Survey, 2017 American Community Survey 5-Year Estimates. Generated using American FactFinder; <http://factfinder.census.gov>; (18 October 2019).

U.S. Postal Service Office of Inspector General. (2015). Will the Check Be in the Mail? An Examination of Paper
and Electronic Transactional Mail.
Report Number RARC-WP-15-006. Retrieved from: https://twosidesna.org/wp-content/uploads/sites/16/2018/05/Will-the-check-be-in-the-mail.pdf

Wichman, C. (2017). Information Provision and Consumer Behavior; A Natural Experiment in Billing Frequency. *Journal of Public Economics*, 152, 13-33. https://doi.org/10.1016/j.jpubeco.2017.05.004.

Wolsko, C., Ariceaga, H., & Seiden, J. (2016). Red, white, and blue enough to be green: Effects of moral framing on climate change attitudes and conservation behaviors. *Journal of Experimental Social Psychology*, 65, 7-19. https://doi.org/10.1016/j.jesp.2016.02.005.