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Green Nudges: A Review of Behavioral Economics Based Interventions for Reducing Carbon Emissions

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ABSTRACT

Climate change poses a great threat to human civilization as the signs of an upcoming climate disaster have started showing around the world in the form of heatwaves, forest fires, cyclones, and floods. One of the biggest contributors to climate change is carbon emissions which are the direct result of anthropogenic activities. With the fast-approaching climate crisis, countries require innovative and fast solutions to reduce their carbon emissions. With the slow rate of transition from the supply side, there is a need for more demand-side interventions to mitigate climate change. One such form of intervention is offered by behavioral economics in the form of Green Nudges which refer to changes in the decision-making environments in order to promote a more climate-responsible consumer behavior. This paper conducts a review of the green nudge interventions across the world and discusses their efficacy as a policy intervention in developing countries to mitigate climate change.

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1. Introduction

Climate change is one of the most crucial challenges faced by the world right now as the devastating effects of gradual changes in weather patterns have already started appearing in most countries in the form of heatwaves, floods, hurricanes, and other natural calamities. One of the biggest threats posed by climate change is global warming which refers to the rise in Earth's temperature (UNFCCC, 1992). The International Panel for Climate Change (IPCC) sixth assessment report predicted a 1.5-degree Celsius rise in global temperatures if the current patterns of human behavior do not change. Global warming is a result of the trapping of greenhouse gasses (Carbon Dioxide, Methane, Nitrous Oxide, and water vapor) in the atmosphere: the greenhouse effect. Ever since the beginning of the industrial revolution, human activities have resulted in altering the natural environment. Some of the "hot spot behaviors" that are considered to have the greatest climate impact include meat and dairy

consumption, use of fossil fuel-based energy, and air travel (Thøgersen, 2021). The IPCC report also alarmed that the net anthropogenic Greenhouse Gas (GHG) emissions have continued to rise in the past decade 2010-2019, while the annual GHG emissions were higher in 2010-2019 than in the previous decade. IPCC recommended that in order to mitigate harmful climate outcomes, GHG emissions, especially CO2 emissions must be reduced through geoengineering, green technologies, efficiency, and reducing overall consumption. However, the technical energy systems undermine the rate of progress required to significantly reduce GHG emissions, and hence, a demand-side approach that can deliver instant outcomes is needed. This paper aims to tap into the efficacy of the application of nudge theory in behavioral economics to reduce global GHG emissions. By analyzing the successes of different types of "green nudge" interventions that have taken place globally such as setting green defaults, changing social norms, and increasing salience, the paper will conclude with the limitations of the nudge theory and analyze the nudge theory as a tool for reducing emissions in the developing countries that require fast and innovative solutions for climate change mitigation.

2. Objective

The objective of this paper is to address the cause-and-effect relationship between human consumption patterns and greenhouse gas emissions as an efficient tool for targeted programs to reduce emissions. By using the concept of nudges and choice architecture, states can come up with cheap solutions to a much bigger problem of climate change. By building a case for using the nudge theory and choice architecture as tools to devise interventions aimed at reducing GHG emissions, this paper argues in favor of using human cognitive biases to achieve prosperity and well-being.

3. Theoretical Concepts

The Neoclassical theory in economics assumes that human beings are rational consumers and take rational decisions that maximize their utility. However, recently a new branch of economics has developed which argues that human beings are influenced by the environments they are a part of, and they do not always make rational decisions. This branch is called behavioral economics. A combination of psychology and economics, behavioral economics aims to investigate the subconscious struggles and limitations that humans face while making decisions (Cooper, 2017). States, policymakers, and firms have used the concepts of behavioral economics to influence consumer behavior in order to channel the demand in such a way that it maximizes social wellbeing.

Behavioral economists argue that human cognition operates based on a dual system having two classifications: System 1 and System 2 (Lundstrom, 2018). While System 1 involves impulsive and rapid thinking, System 2 is concerned with critical thinking. Kahneman (2003) argues that System 1 is responsible for decision-making due to the slow response rate of System 2. This implies that most of the decisions that humans make are based on intuition and impulse rather than critical rational thinking. Markets and firms have historically capitalized on human subconscious limitations to maximize their profits rather than aiming to eliminate them.

Developed by Richard Thaler and Cass Sunstein, the Nudge Theory in behavioral economics argues that these subconscious limitations can be influenced by how choices are framed in order to maximize well-being (Thaler & Sunstein 2008). They argue that for decisions that are rare and difficult to translate into future gains or losses with no feedback the human subconscious requires a nudge in the right direction. Their idea of nudge is rooted in the "stimulus-response compatibility" whereby humans tend to alter their response in relation to the signal or stimulus they receive (Thaler & Sunstein, 2008). Choice architecture is referred to as the context in which humans make decisions (Sunstein, 2013). The best kind of choice architecture is the one that does not confuse System 1 at all

(Thaler & Sunstein, 2008). Hence, Thaler & Sunstein propose nudges as alterations in the choice architecture that aim to make predictable changes in human decisions without directly prohibiting them from alternative options or altering the economic incentives for making the choice. Effective nudging can help people make the best decisions for their well-being and is cheap and easy to implement (Miłaszewicz, 2022). Instead of being coercive like laws and regulations, nudging gives people freedom of choice but just makes the desirable "right" decision easier to make. Thaler & Sunstein name this phenomenon "paternal libertarianism" where the paternal aspect refers to the interferences in the choice architecture surrounding individuals are made to steer while the libertarian aspect implies the conservation of freedom and available alternatives (Siipi & Koi, 2021). A good choice architecture as per Thaler & Sustain (2008) should have nudges that are designed being cognizant of the right incentives to the right audience, mapping of future aspects, the power of defaults and feedback mechanisms, and expecting errors and lastly structuring complex problems in a simplified manner.

In the context of climate change, while most consumers agree that they need to adopt more sustainable options, they fail to translate that into active choices, and this is called the intention-action gap (UNEP, 2017). IPCC (2022) has indicated that comprehensive demand-side interventions can reduce global greenhouse gas emissions by 40%-70% by 2050. In such a scenario, nudges can be used as tools by policymakers to overcome psychological barriers to the ecological problem of climate change to promote sustainable behaviors (Petel, 2020). A climate nudge or a green nudge is defined as an intentional change in the choice architecture in order to promote a more climate-friendly behavior from the consumers. Miłaszewicz (2022) states some of the common types of climate nudges that have been used by governments and the private sector to promote a more climate-responsible consumer behavior. These include: setting green defaults, appealing to peoples' individual and social identities such as "green consumers", setting up collective social norms, giving people regular feedback, and changing the physical environment around them to enable them to make sustainable choices. The next section is going to discuss each of these types of green nudges as policy interventions across the world through a review of the literature.

4. Discussion

4.1 Setting Green Defaults

The default effect is believed to be a consequence of individuals' processing limitations (Brown and Krishna 2004). They choose the default in order to avoid taking an immediate decision or because they implicitly assume that the default was chosen for a reason (Keller et al. 2011). People also have a status quo bias as they may choose the default due to loss aversion because the potential losses involved in moving away from the default seem larger than the potential gains (Johnson & Goldstein, 2003).

An example of green defaults is opt-out schemes where consumers are automatically enrolled in sustainable options, and they can choose to opt out of those. One such intervention took place in Germany where the electricity providers signed up their consumers for a green tariff by default and they would have to reach out to the service provider to opt out of that tariff. Using a multivariate logistic regression model on micro-level data from the German Socio-Economic Panel (GSOEP) covering private households, Kaiser et al. (2020) found that electricity consumers in Germany were more likely to stay in default green tariffs they were enrolled in by their electricity provider even though it was more expensive than the other available tariff options.

In order to reduce paper consumption, Rutgers University in 2008 set the printers across their campus to a default setting of "print on both sides" rather than print on one side. This resulted in a significant decrease in the paper consumption patterns across the campus as the three Rutgers

campuses saved 62 million sheets of paper between 2008 and June 2011 (Cho, 2013). Araña & León (2012) conducted a field experiment in Gran Canaria as a part of a carbon offsetting program targeted toward subjects using air travel for attending conferences and conventions. Amongst the two treatment groups, one was presented with an opt-in scheme where they were told the amount of GHG emissions their travel will contribute and as compensation, they can choose to donate some amount to programs that aim at reducing GHG emissions. Whereas the second treatment group was given an opt-out scheme where they were by default charged an amount to compensate for the GHG emissions their travel would cause, and they could choose to opt-out of contributing that amount. Results from their field experiments showed that the treatment group which was given an opt-out scheme was more likely to support the carbon offsetting programs as compensation for their air travel. Another study conducted in Denmark in 2011 is analyzed by Toft et al. (2014) as part of the improsume project, financed by Energinet.dk in the framework of EraNet Smart Grid measured the number of respondents who would choose a smart meter that made the electricity provider control some aspects of the consumer's electricity supply. The respondents were given opt-in and opt-out schemes randomly and Toft et al. (2014) report that 60% of respondents given the opt-in scheme agreed to have smart meters while 79% of the respondents given the option to opt out chose to have smart meters in their homes.

4.2 Giving Feedbacks

A well-designed choice architecture is the one that gives people feedback on their progress so far (Thaler & Sunstein, 2008). In the context of green nudges, feedback serves as reminders and better information on the energy consumption of the individuals. The feedback green nudge has been used in different interventions as a way to promote climate-responsible behavior.

Becker & Seligan (1978) conduct an empirical analysis of a study conducted in New Jersey in which a signaling device was installed in households using air conditioners during summers to tell the users when the outside temperature was low enough for them to open windows and doors instead of using air conditioning in order to counter wasteful air conditioning and energy consumption. Their findings reported that the signaling device was an effective tool in reducing the households' energy consumption. Another example of green nudge in the form of feedback is a series of programs conducted by the energy company OPOWER in the United States as per which the company sent out Home Energy Report letters to over 600,000 residential utility customers, comparing their electricity use to that of their neighbors (Allcott, 2011). The programs resulted in an energy use decrease of between 1.4% and 3.3%, with an average energy consumption reduction of 2% (Allcott, 2011). This result is equivalent to an 11-20% short-run increase in electricity prices, and the cost of the programs was similar to that of traditional energy conservation programs (Allcott, 2011). Furthermore, Lynham et al. (2016) discuss a study conducted in 65 residential households of an apartment complex in the US using a randomized-control experiment. The experiment had two treatment groups both of which had an in-house display of energy usage installed in their homes for different amounts of time: the first group for the full 90 days of the experiment, the other treatment group for a period of 60 days. The in-house displays would provide households with live information on their electricity consumption and serve as feedback. Lynman et al. (2016) found that providing real-time feedback through in-house displays reduces the average household electricity consumption by up to 11%. To further reiterate the positive effects of feedback, they also noted that the effect diminished over time, as displays were removed indicating that it was the constant reminders that contributed to the reduction in energy consumption of the households.

4.3 Changes in the Physical Environment & Increasing Salience

Salience is a type of nudge that caters to the low attention spans of people as it simplifies the

information presented to them (Sunstein, 2013). Cooper (2017) identifies the US Department of Energy and the Environmental Protection Agency's Energy Star label as a salient feature as the label is easy to recognize which makes it easier for consumers to recognize and pick from grocery stores' shelves. Another example of applying salience nudge is a study conducted by Szekely & Brocke (2016) which involved 1350 participants and presented evaluation results of their behavior. They created flight booking platforms with options for low, medium, and high amounts of carbon emission by one passenger. The fact that there were different stations based on carbon emissions increased the salience of the number of emissions they would cause as a result of their air travel. A donation box for 0-12 Euros was also placed beside the ticket counter. The results showed that exposure to carbon emission amounts impacted the number of voluntary donations made. Therefore, the carbon emission amount was used to nudge people to react against climate change. In Gravert and Kurz (2017), a similar outcome of salience was found when a restaurant rearranged its menu in favor of a vegetarian option. As a result of placing the vegetarian dish at the top of the menu, the restaurant was able to reduce the share of meat dishes ordered from 50% of the total orders to around 30%. Moreover, in a study by Tiefenbeck et al. (2016), an animation of a polar bear standing on melting ice was used to give feedback on energy consumption. As a result of this salient nudge, the average shower time was reduced by 22%.

Another type of nudge that caters to the low attention span of individuals is the change in the physical environment. In cases when individuals have limited attention or the environment serves as a barrier to desirable behavior, these types of nudges bring about optimal outcomes (Carlsson et al., 2019). An example of change in the physical environment is discussed by Kallbekken and Saelen (2013) who evaluated the effectiveness of a green nudge provided through the physical environment, aiming to reduce food wastage in restaurants. Plates 50% smaller than the standard size were provided as a nudge and as a result, a 20% reduction in the food wasted was recorded.

5. Limitations of the Nudge Theory

Although from the above literature review it can be seen that nudges serve as effective tools to promote climate-friendly behavior. However, there have been some ethical arguments against the Nudge theory that should also be highlighted in order to come up with the best solutions to reduce carbon emissions. One of the arguments against nudge theory is that it is undemocratic. While nudges focus on channeling individuals to make decisions that are in their best interest, the underlying question is how can someone else define an individual's best interest? (Brooks, 2013) Moreover, another argument against the nudge theory is that although Thaler & Sunstein have argued that nudges are transparent, they are still a form of manipulation where the individual is being manipulated into making a choice (Binder, 2014). Hausman & Welch (2010) on the other hand, claim that although there is a loss of autonomy when applying the nudge theory, the social benefits that have historically resulted from them outweigh the cost of lost autonomy.

6. Conclusion

Climate change for our generation is like a ticking bomb with very limited time to correct the wrongs. Global GHG emissions pose a serious threat to climate patterns, further exacerbating the devastating effects. While major supply-side changes are difficult to make immediately, there is a crucial need to shift towards demand-side interventions to alter the way individuals consume in an economy and channel consumption patterns towards sustainable practices. This paper built a case for the nudges as effective policy tools by highlighting the effective usage of different types of nudges such as green defaults, feedback on energy consumption, the salience of sustainable products, and the change in the physical environment. It can be seen that across all interventions, nudges proved to be successful in channeling individuals and households towards making sustainable choices.

Although there are some ethical limitations to nudging, however, the literature reveals that the social benefits are much greater. Hence, in crucial situations like that of climate change which requires immediate action and results, nudges should be used by policymakers in order to mitigate the effects of climate change by reducing GHG emissions. In the context of developing countries that face a greater vulnerability to climate change, green nudges could serve as an innovative climate-responsible action for these emerging markets. However, the successes of behavioral economics-based green nudges in the developed world could also be a result of the well-structured institutions and mechanisms in place, a characteristic that lacks in most developing countries. Hence, effective public-private partnerships in these countries are required to build channels through which green nudge interventions would serve as a solution to reduce their greenhouse gas emissions in the face of rising consumerism.

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