A Behavioral Economics Analysis of Environmental Policies in China and USA

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ABSTRACT

The purpose of this article is to compare the different environmental policies between China and USA, namely the policies aimed at tackling global warming. China produces about 23 percent of the world's carbon dioxide, compared to 21 percent from the United States with China being the world's largest emitter of carbon dioxide since about 2006. The current US administration has made it clear that tackling climate change is not high on the agenda of US policy. On the other hand, China has started to conduct central environmental inspections, carried out guidelines to control air, water and soil pollution, published its own plans to realize the 2030 Agenda for Sustainable Development. In this article, we will use a variety tools from behavioural economics to draw direct comparisons between USA and China in terms of the vastly different attitudes towards environmental policy. Specifically, we will use various techniques and models from behavioural economics, namely, reference dependence, hyperbolic discounting, loss aversion, status quo bias and other-regarding preferences to explain why environmental policy are so different between the two economies, despite the need for resolving environmental issues being integral to long-term sustainability.

Keywords: General environmental economics, energy government policy, sustainable development, general fiscal policies and behaviour of economic agents, microeconomic behavior: underlying principles

1. INTRODUCTION

Global warming is the phenomenon of increasing average temperatures near the surface of Earth over the past centuries. Many climate scientists agree that significant societal, economic, and ecological damage would result if global average temperatures rose by more than 2°C (3.6°F) in such a short time [1]. Associated damage would include increased extinction of many plant and animal species, shifts in patterns of agriculture, and rising sea levels. The heat is melting glaciers and sea ice, shifting precipitation patterns, and changing animals migration habits. Authors of a special report published by the Intergovernmental Panel on Climate Change (IPCC) in 2018 noted that if carbon emissions continue at their present rate, the increase in average near-surface air temperatures would reach 1.5 °C between 2030 and 2052. [1]

China produces about 23 percent of the world's carbon dioxide, compared to 21 percent from the United States. China produced 6.23 billion metric tons of carbon dioxide in 2006, compared to 5.8 billion metric tons of the United States. The increase was attributed mostly to increased coal consumption and cement production. However, the more startling measure is the per capita carbon dioxide usage rate in China seems to be on a fast trend to reach similar levels of other developed countries. On a per capita basis, USA produces around 19,278kg of carbon dioxide per person compared to China which produces 4783kg of carbon dioxide per person; given the fact that the population of China is five times larger than the US, this is a significant cause for environmental concern [2]. The US and China together account for 45 percent of the world's greenhouse gases, most of which is derived from coal.

In the US, the Environmental Protection Agency (EPA) had regulated the emissions of electricity-generating plants individually to ensure that they did not exceed pollution limits. The Obama administration was highly ambitious with its imposing of regulatory powers, using Clean Power Plan (CPP) to impose renewable-energy quotas on states and adopting thorough administrative fiat limits on carbon dioxide emissions that Congress had repeatedly declined to impose. The Trump administration has moved to change previous Obama-era actions that will strip many of the environmental protections in an effort to be less burdensome on local industries and further promote economic growth [2]. Further it has dropped climate change from its list of national security threats, been pulled from the global Paris climate agreement, and even modified federal websites that discuss or mention climate change.

On the other hand, China has started to conduct central environmental inspections, carried out guidelines to

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[1] Continued growth in human-made emissions of CO2 over this century and beyond would lead to an atmospheric concentration not experienced in tens to hundreds of millions of years.
What's more, the past 115 years are now the warmest such time span in at least the last 1,700 years. Global annually averaged surface air temperature has increased by about 1.8°F (1.0°C) since 1901

control air, water and soil pollution, published its own plans to realize the 2030 Agenda for Sustainable Development, and is implementing a national plan to tackle climate change. Key emphases of the work shall be adjusting economic structure and energy structure, optimizing the layout of the development of territorial space, improving the industrial layout in different regions and river valleys, fostering and expanding industries concerning energy conservation, environment protection, clean production and clean energy, encouraging simple, moderate, green, and low-carbon ways of life.

On the political stage, the most significant action the Chinese President, Xi Jinping, has so far taken was in October 2017, during the 19th Congress, where he coined the catchphrase, "Building a Beautiful China". This was a signal to his party members, Chinese citizens, and people around the world of China's commitment to both environmental protection and creating a greener economy. In America, the view of environmental matters is politicized whereas in China the situation is largely outside of the political grasp of the average person.

The American public seems to care less about environmental issues than they did in the past. In a 2015 survey, Americans are less concerned about the environment now than they were in the 1980s/1990s and has since remained a low priority [3]. The survey also suggested that Americans were most concerned about drinking polluted water and least worried about global warming, and even then, these concerns have diminished over time. It was also noted that the overall state of the economy can play a role in how concerned Americans are with respect to the environment, suggesting that when the economy is doing well, environmental concerns are a higher priority.

With the continuous increase of large vehicles in America, the pursuit for strong economic growth and increases in living standard, climate change is an undoubtedly important and relevant issue. The rate of pollution is increasing faster than the advances of technology which can counter those emissions. China is also facing the same problem. China has 1.42 billion people within its borders, which is more than five times the population of the US. China has higher demands for resources such as water, food and land. With better living standards and rapid economic growth, more people migrate to cities for better education, healthcare, job opportunities and infrastructure. One of the reasons why China attaches more importance to environmental governance than the US is that China has been bearing heavier international pressure. Additionally, the expansion of production scale brings more waste and intermediary consumption, has meant that China has had to implement policies of comprehensive ecological improvement.

In this article, we will use a variety tools from behavioural economics to draw direct comparisons between USA and China in terms of the vastly different attitudes towards environmental policy. For example, US citizens may have a different status quo compared to Chinese citizens with respect to environmental policy, due to different attitudes that these citizens have to environmental issues.

Specifically we will use various techniques and models from behavioural economics, namely, reference dependence, hyperbolic discounting, loss aversion, status quo bias and other-regarding preferences to explain why environmental policy are so different between the two economies, despite the need for resolving environmental issues being integral to long-term sustainability. The remaining structure of the paper will be a brief literature review followed by the main analysis section; this section will introduce and define all the technical concepts used in the subsequent analysis. The final section provides a summary alongside concluding remarks.

2. LITERATURE REVIEW

2.1. China

Nowadays, China is considered a country that is going through its industrialization stage. Increasing urbanization and the rising use of cars in China have led to numerous environmental problems, particularly in major cities such as Beijing, Guangzhou, and Shanghai. Concurrent to economic development, the contradictions caused by environmental problems are becoming increasingly acute, threatening the essence of long-term survival and development. The problems of smog, water resource pollution, solid waste pollution, ecological destruction of forest and grassland, soil erosion and other ecological environmental problems are continuously serious. The traditional economic development concept of the growth of social material wealth with GDP as the core highlights the huge drawbacks. One of the main reasons that emissions were able to reach such high levels is the lack of effective management and supervision from the ministry of environmental protection with regards to local environmental protection departments. Insufficient enforcement of environmental law, and the inadequate implementation of the government's environmental protection and governance policies is attributed to the fact that the distribution of environmental management power and the division of management responsibilities between the central government and the local government are often not clear. For further information on climate change in China, we refer you to [4].

Additionally, for firms to maximize profits, the environmental costs caused by unregulated pollutions emissions (and pollutants, in general) are not represented in production costs. If the government does not manage and control the pollution of production, enterprises will simply over-produce and lack of market supervision will lead to systematic market failure in the allocation of environmental resources.

In 2015, China endorsed and aims to implement the 2030 Agenda for Sustainable Development which is a universal call from the UN to end poverty and protect the planet in order to improve lives for everyone, wherever they are. Some of the goals related to environmental issues are

access to clean water and sanitation, affordable and clean energy, sustainable cities and communities, responsible consumption and production, and general improved climate action for water and land ecosystems. China are strong supporters and have a clear outline of a plan in order to execute their goals as laid out by the Agenda for Sustainable Development. China's focus has and is the focus of economic growth but now with a much greater appreciation for the need to grow sustainably, in a net environmentally friendly way. We refer the reader to [5] for further reading on the Agenda for Sustainable Development

2.2. America

One of the main sources of pollution comes from vehicle emissions, so the US government was inclined to improve issues related to traffic, whilst implementing stricter laws on vehicle travel e.g. carpooling. Currently, the US government is facing a decision involving large opportunity costs. The presence of the CPP and the EPA was estimated to decline US coal production by about 26%, or 230 million tons, between 2015 and 2040. Additionally, the wind and solar industries employ around 360,000 people. This reduction in emissions, and these jobs in green technology are at serious and significant risk if the CCP is repealed and other environmental, climate, and energy regulations are rolled back. We refer the reader to [4, 6, 7, 8, 9] for further reading on US environmental policy.

With rapid development of economic growth and global trade, the ecological environment problems are clear. From 1940 to 1970, the deterioration of environmental factors in the United States was quite serious. Over time, the US government has been gradually responsive to environmental problems. Energy sources are the main and fastest-growing source if greenhouse-gases [10]. Thus, it seems natural that policies should be targeted towards those emissions for the greatest benefits. Although the US government are also supporters of the 2030 Agenda, the current administration's environmental policies have not been representative of all the climate change goals, rather, focusing on development and economic growth.

Standard economic theory does not always provide a realistic framework to understand and predict individual and social behavior (Kahneman and Tversky, 1979 [1]; Tversky and Kahneman, 1981 [11]). The canonical theoretical framework postulates that individuals make decisions based on the standard utility maximization model and often in cases of complete information. Individuals act under perfect self-control and consider nothing but their own self-interest. Moreover, they have well-formed and time-consistent preferences, which remain unaffected by the way the decision is framed or by the impact it has on others (Della Vigna, 2009 [12]). This type of decision-maker is often denoted as homo-economicus. However, when it comes to environmental issues, rational behavior often is not a good predictor for observed behavior. For example, those who are biased by

their status quo are people who are used to polluting and causing negative externalities, despite it not being fully rational to do so, at least in terms of long run costs and benefits. Additionally, from the firm-side, polluters know that newer green technologies may work more efficiently, with unit cost that may even be lower than current technology. However, the initial sunk cost may be deemed too high to invest regardless of the long-run benefits. This form of irrational behavior can be sufficiently remedied through institutional arrangements, such as government subsidies or insurance.

This paper will provide an in-depth and broad technical analysis in order to explain the key differences in the US and China policies. We will explore the different channels of thinking and attempt to understand the main reasons as to why the policies are unique in their interpretation of environmental issues. Using behavioral economics allows a direct comparison between the standard economic theory arguments with models that are arguable more evidence-based and psychologically founded.

3. PRIMER

If the reader is well versed in behavioral economics and microeconomics, then the following primer can serve as a reminder or can be skipped.

3.1. Prospect Theory

Prospect theory is the Nobel prize winning work, originally devised by Kahneman and Tversky (79), as an alternative model of behavior. This encompasses diminishing sensitivity and loss aversion, all centered about a point of reference.[2] What makes prospect theory so appealing is that uses simple modelling to explore sophisticated behavior that may not be easily explained by classical theory (as shown in Figure 1). Insofar as this is true, the main elements of prospect theory can be summarized succinctly through the famous value function diagram, as shown below.

Firstly, we can see that there is a distinct kink at the reference point. It is from this point that people make comparisons when making decisions e.g. status quo (previously bought goods, income, etc…). This means that anything greater or better than the current reference point is considered a gain whereas something worse than the reference point is considered a loss, thus allowing some form of asymmetry about a point of reference. Secondly, these valuations are different depending on whether we gain from the reference point, or if we lose. This is what is referred to as loss aversion. Loss aversion is when people dislike loses more compared to relative gains. We can see this from the steeper slopes in the loss domain compared

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[2] Normally, prospect theory also includes probability weighting but in this analysis, we are not considering gambles/lotteries that involve probabilities

to the slope in the gains domain. For example, there is evidence to suggest that an individual who own an item is less likely to sell that item at an acceptable price, simply because he/she owns that item. In essence, the act of giving up the item requires further compensation beyond the value of the item. Thirdly, the effects from the reference point are diminishing (i.e. concave in gains, convex in losses) which refers to diminishing sensitivity.[3] This means that achieving additional gains/losses that are further away from the reference point will require larger stimuli to achieve the same initial effects. The main elements of prospect theory that will be used in the following analysis will be analyzing different reference points with loss aversion.
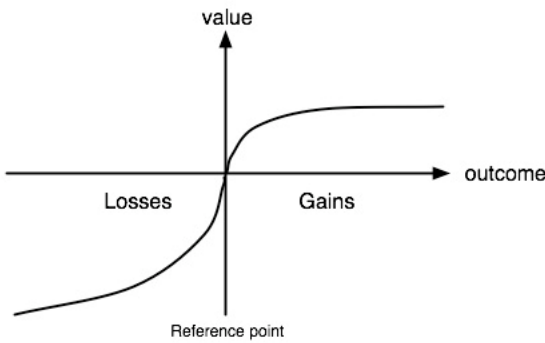

Figure 1 Value Function of Prospect Theory

3.2. Other-regarding preferences

Classically in economics, we think of agents as being completely selfish in the sense that agents only take into account their own payoffs when decision making. Agents only make choices to maximise their own payoffs and do not consider the payoffs of others. If an agent does consider other people's payoffs in a positive way, this would suggest that the agent derives positive utility from other people having higher payoffs. On the other hand, if an agent considers other people's payoffs in a negative way, the agent feels worse off from other people having higher payoffs. This behavioral assumption can be incorporated into the standard utility model by simply allowing other players' payoffs to be included in the utility functions of other agents.

For example, a classic example of this is the convex ultimatum game whereby utility functions can also include the payoffs for both responder and receiver [13]. Consider the following utility function:

$$U_{responder}(\pi_{responder}, \pi_{proposer}) = \pi_{responder} + \alpha\pi_{proposer} \quad (1)$$

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[3] Not dissimilar in notion to the standard utility function.

If α is equal to zero, then the responder only cares about his own payoff, but α is different from zero, then responder takes into account the proposer's payoff. For example, if α is positive, it means the responder also cares about the proposer's payoff, but if α is negative, it means the responder feels worse about the proposer getting a higher payoff.

3.3. Quasi-hyperbolic Discounting

The commonest way that we deviate from exponential discounting is quasi-hyperbolic discounting. This refers to a specific form of time-inconsistent preferences whereby agents care substantially more about their current period of decision-making, thus seemingly acting inconsistently from a previous period's point of view. This can be seen by the example formula below. The agent cares more about the current period consumption because the agent discounts the future more heavily than in the usual exponential discounting case (as β is different from zero). However, when it comes to the next period, then the agent again discounts the future heavily but strongly favors the current period, despite last period behavior.

$$U(c_1, c_2, \ldots, c_{12}) = u(c_1) + \beta[\delta u(c_2) + \delta^2 u(c_3) + \cdots + \delta^{11}u(c_{12})] \quad (2)$$

$$U(c_2, \ldots, c_{12}) = u(c_2) + \beta[\delta u(c_3) + \delta^2 u(c_4) + \cdots + \delta^{11}u(c_{12})] \quad (3)$$

For example, suppose each time period refers to one month of a year. From (2), in January, the agent cares substantially more about January than the preceding months. The agent not only discounts them as future periods for consumption (δ), but is also generally biased towards January (β). When February arrives, from (3) we can see the agent is similarly biased towards February and heavily discounts future periods again, despite the fact that February was heavily discounted from the perspective of January.

This can also be seen from an inter-temporal marginal rate of substitution argument. Suppose we compare consumption in February with consumption in March from January's perspective (2). In January, the agent only discounts by an additional factor δ. However, from (3), in February, the agent discounts March, by $\beta * \delta$, hence there is a time inconsistency between periods, and a heavier bias toward current month consumption. When, $\beta = 0$, we go back to standard time-consistent preferences.

4. MAIN ANALYSIS

The following section will make use of standard economic arguments coupled with the aforementioned behavioral concepts to provide an explanation as to the differences between environmental policies between China and the USA.

4.1. Reference Point(S)

The behavior of firms and industries may be influenced by various reference points. One such reference point could be previous levels of pollution that they were allowed to emit. Before global warming was considered a real issue, firms may have considered polluting to be an intrinsic right and consequence of being a successful firm, especially in manufacturing. However, we now exist in a society in which environmental issues are at the fore of decision-making for firms with levels of pollution (and effectively production) being constrained. Compared to what these firms were doing previously, these environmental restrictions may not allow firms to make as much profit. Thus, even if firms are still able to make positive profits after taking into account environmental costs, this reduction will always be perceived as a loss, given the reference point. This is because firms are, in essence, making a loss in comparison to what they could have been making without the environmental imposition.

If we take the reference point as other firms levels of pollution, this would also follow a similar argument as above. For example, on a firm-level, if one firm compares themselves to an equivalent, that has not had environmental restrictions put in place (for example, different provinces/states may have different rules or different timelines for implementation), then these firms may feel as if they have been treated harshly, even if they are still able to be successful. This is also true for equivalent firms in China and the US. If a Chinese firm is competing with an equivalent US firm, the Chinese firm may feel that it is unfair that they are being hampered by additional restrictions unlike the US counterpart. This provides a compelling argument as to why Chinese environmental policies work strongly in favor of firms/industries that have environmental regulations (e.g. subsidies). Another interpretation of this is so-called endowment effect (when an individual possesses an item, the item is valued higher than what the individual would have acquired it for). New environmental policies that restrict existing firms will be worse off than those new firms that are entering the market. This is because the existing polluting firms were already used to/capable of producing at a certain level, so giving this up (to a certain extent) will feel worse than a firm that is not used to these new restrictions.

This leads naturally on to reference points at an economy/country level. As China is the country that is seemingly pushing for stronger environmental policies as well as being the greatest greenhouse gas emitters, other countries might decide that they feel entitled to have higher levels of emissions. Another interpretation of this is essentially a free-rider problem, in the sense that other countries believe that China should be doing the most to reduce their emissions. Also, as they are the largest greenhouse gas emitters, any initial reduction in pollution will be larger in China than any other country due to the increasing costs/diminishing benefits of reducing pollution. This interpretation can give some explanation as to why the US are pulling away from environmental issues, despite the fact that they are the second largest greenhouse gas emitters in the world. In terms of direct economic competition, the current US administration do not want to restrict themselves in terms of GDP/GDP growth in the short-run, despite the essential medium/long-run benefits of tackling climate change. As Chinese environmental policy appears to be more hyperopic than US environmental policy, the US are seemingly more worried about strong Chinese economic growth, at the expense of the global environment, further justified in their policy choices by the fact that China are the worst greenhouse gas emitters.

4.2. Loss Aversion

Recall that loss aversion is the disproportionate feeling of a loss relative to a comparative gain. From the perspective of firms/industries that have not been subject to large restrictions on their pollution rates, to reduce their level of emissions (via reduced production or better technology) will be considered a much bigger issue than it would be if they were allowed to increase their level of emissions (i.e. production) by an equivalent amount. The restriction on production/emissions is considered a loss and is thus a worse experience than if they were to increase production/emissions by the same amount. Losses may be offset by other forms of gains such as medium/long-run benefits and/or additional gains from being seen as a firm/industry that is tackling climate change. However, from a net gain/loss viewpoint, any firm/industry that is loss averse will always feel hard done by reductions in emissions, and to a larger extent than the actual loss in profit. For example, beyond the monetary losses, there may be a sense that overall entrepreneurial drive and business opportunities are diminished due to additional constraints on profit maximization activities. This is linked to a pre-existing idea that China was going through what was considered its industrial revolution (and arguably is still going strong, given its manufacturing sector). Many other developed countries have already gone through their industrial revolutions which led to arguably necessary levels of pollution to achieve their current economic strength. Thus, combined with a diminishing sensitivity argument, China may have a much greater sense of loss aversion if under pressure to reduce emissions, compared to the developed countries that have already undergone their industrial revolutions and have transitioned away from manufacturing. We refer you to [6] for further

information on the implementation of the Clean Power Plan (CPP) influence the U.S. coal production.

The current US government administration has weakened its policies on environmental governance so that they are essentially able to pollute at higher rates. By doing so, firms/industries no longer need to internalize any costs associated with the externalities of polluting, thus achieving higher levels of profit. More directly, firms will not have to incur losses from investing in green technology, which would have been felt much more than the actual cost if firms/industries are loss averse, given a reference point of no previous green technology requirement. In essence, with some prior knowledge of loss aversion in polluting industries, the current US administration overcomes losses and the excessiveness of loss aversion by pushing the reference point such that additional emissions are only met with profits. However, by doing so, there is a lack of consideration in terms of the global negative externalities which are, in effect, losses for everyone. However, current US policy means that firms simply do not feel the need to do anything to assuage environmental issues.

One of the most serious problems is that, there are a lot of firms which are on a small scale of production. This means that it may be much more difficult for these smaller firms to reduce their pollution compared to larger firms as they may not have as many resources. Larger firms will have access to relatively cheaper technological advancements than smaller firms, making it easier to drop their pollution levels. Also, the initial reduction in pollution will appear to be much greater in absolute value for larger firms as they simply pollute more. In essence smaller firms would have a much more difficult task if pollution reduction targets are set in absolute terms. However, as an overall externality, given that there are many small firms, it is still important that they reduce their individual levels of pollution, as collectively this will lead to larger drops.

Another issue related to reference dependence is that of status quo bias. A large proportion of Americans, including well-respected experts and academics, do not perceive there to be a large issue when it comes to the environment and climate change. This could be a bias due to their status quo, as these types of issues have only really come into the public domain in recent years. In essence their status quo was that there were no issues related to climate change in the past, but even though there is much more awareness and scientific backing, people are still unwilling to change their behavior. In other words, there is behavioral inertia as a direct consequence of believing that there is no need to consider climate change as a serious issue.

4.3. Other-regarding Preferences

Another distinction that can be made between US policy and Chinese policy is through the lens of standard preferences (selfish) versus other-regarding preferences. Typically, and obviously so, governments of each nation have to devise their own policies for their own people. For example, labor laws in the EU versus the US are vastly different and are much more appropriate for the respective nations. However, it is arguable that environmental policies are far-reaching in terms of global externalities. China is the largest greenhouse gas emitter and therefore are the cause of the greatest negative externalities in terms of greenhouse gases. However, recent policy in China is attempting to reduce this in a sustainable and effective way, not only for Chinese citizens, but for everyone. Although the emissions of China are its own responsibility, as a country belonging to this planet, there is also a global obligation to tackle climate change. This suggests that Chinese policies are more in line with other-regarding preferences compared to the US policies. In some sense, the US are less concerned with their global negative externalities, not just in terms of current periods, but also future generations, given that the benefits of environmental policies are long run.

4.4. Quasi-hyperbolic Discounting

The benefit of using greener technology is actually a positive externality, the usefulness of the technology for production can have large benefits on the environment, especially if a majority of firms also commit to the technology. However, there are large debates about whether the up-front cost of green technology is really worth it. Conditional on climate change being a real and fundamental issue, it is clear that green technology investment is worthwhile, so we appeal to hyperbolic discounting to discuss why firms/governments may not agree with the consensus.

Consider the following basic two-period numerical example:

Suppose $\beta = 1/2$ and $\delta = 1$, the new technology has an initial cost of 100 and has a future benefit of 150, whilst doing nothing has no net benefit or cost .

From today's perspective, should firms/industries be using new technology today?

$$-100 + 1/2 * 1 * 150 = -100 + 75 = -25 < 0$$

From today's perspective, should firms/industries be using new technology tomorrow?

$$0 + 1/2 * 1 * (150 - 100) = 25 > 0$$

Even from this basic example, it is clear that a quasi-hyperbolic discounter is not incentivized to invest into new, green technology, whereas an exponential discounter sees that the net benefits are positive and would definitely invest. In fact, even if the benefits are as high as nearly double the costs (e.g. 199), then firms/industries may still not invest.

From today's perspective, should they be using new technology today?

$$-100 + 1/2 * 1 * 199 = -100 + 99.5 = -0.5 < 0$$

From today's perspective, should they be using new technology tomorrow?

$$0 + 1/2 * 1 * (199 - 100) = 49.5 > 0$$

This simple example shows that even if future benefits are extremely high compared to the initial costs, for example, even if there are massive tax credits or subsidies for using green technology or large gains in positive reputation, there is still incentive not to invest in the current period. Another way to examine this issue is that it may be that firms/industries believe that they face initial costs that are too high, seemingly outweighing any future benefits, despite the fact that initial costs are mainly sunk costs and the benefits accumulate over time. In essence, trying to make firms/industries/economies internalize the externalities of overproduction may be considered too costly to warrant investment.

This basic analysis can indeed show the differences in behavior between the US and China and their policies by likening the US to a hyperbolic discounter. Even though there is large consensus that the benefits are large, a hyperbolic discounter would still not invest in green technology to reap the future benefits. This is because the current US administration are much less likely to invest and promote green technology than China, which is what the example above shows for a hyperbolic discounter.

5. CONCLUSION

The purpose of this article is to compare the different environmental policies between China and USA, namely the policies aimed at tackling global warming. China produces about 23 percent of the world's carbon dioxide, compared to 21 percent from the United States with China being the world's largest emitter of carbon dioxide since about 2006. The current US administration has made it clear that tackling climate change is not high on the agenda of US policy. On the other hand, China has started to conduct central environmental inspections, carried out guidelines to control air, water and soil pollution, published its own plans to realize the 2030 Agenda for Sustainable Development.

Using behavioral economics, this paper is able to address the differences in the environmental policies. Firstly, the behavior of firms and industries may be influenced by a variety of reference points. Making decisions in comparison to other firms/industries and/or countries, may result in policy that is very different across countries, especially in terms of international competition, as well as market competition. This was analyzed using a variety of reference points, namely, other firms' levels of pollution, previous levels of pollution (endowment effect), and other countries environmental policies (reactionary), and the overall status quo i.e. the general impression of the importance of climate change. All of these reference points are able to influence the decisions of policy as to whether they promote improvements to the environment, or not. Another important behavioral avenue of thought is loss aversion which was analyzed using various factors, the direct reduction of pollution (compared to an equivalent increase in production), the direct sunk cost of greener technologies, and comparisons across firms of different size. In essence, by not accounting for the fact that losses are felt far more than gains, it can be increasingly difficult to incentivize more environmentally friendly behavior. Another factor considered was along the lines of classical economic preferences versus other-regarding preferences. Compared with the US policies, Chinese policies are more in line with other-regarding preferences. The US are seemingly less concerned about their global negative externalities, not just in terms of current periods, but also future generations, given that the benefits of environmental policies are long run, which is in strong contrast with China. Using a simple model of time-inconsistency, it was very clear to show why the USA are more myopic in their policy decisions compared with China's more long-run based environmental policies are undoubtedly different.

For further interest, comparisons with other countries may provide further intuition into differences between environmental policies, even if their respective policies are not so start in difference. Additionally, within country comparisons would also be informative, for example, there are many devolved powers across the different provinces of China as well as the different states of the US. In fact, even within the US, attitudes towards environmental issues can vary substantially. Although this paper is qualitatively based using technical skills and models, it still provides strong insight into the difference in environmental policies between US and China. Data permitting, it may have been possible to better explain these differences, for example, a data-driven technique to estimate and compare the parameters of the hyperbolic discounting model between the US and China in order to the short-run bias difference between the two. These points are left for further research.

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