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Optimal learning on climate change: Why climate skeptics should reduce emissions

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ABSTRACT

Climate skeptics typically argue that the possibility that global warming is exogenous, implies that we should not take additional action towards reducing emissions until we know what drives warming. This paper however shows that even climate skeptics have an incentive to reduce emissions: such a directional change generates information on the causes of global warming. Since the optimal policy depends upon these causes, they are valuable to know. Although increasing emissions would also generate information, that option is inferior due its irreversibility. We show that optimality can even imply that climate skeptics should actually argue for lower emissions than believers.

Introduction

Many policy makers and members of the public question the supposed link between global warming and man-made emissions of greenhouse gases: according to a 2007/2008 Gallup Polls survey, 97% of all US adult citizens say they are aware of global warming, but only 49% of them believe that it is anthropogenic. Although there is more consensus among climate scientists, some remain uncertain as well: Farnsworth and Lichter (2011) for example report that 16% of climate scientists are not wholly convinced of the anthropogenic view. Skepticism among policy makers seems even more widespread: in 2006, the US president of that time (George W. Bush) expressed his concerns on global warming, but simultaneously stated that "there is a debate over whether it is man-made or naturally caused".[1] Corresponding views can for example be heard among policy makers in China (Xie Zhenhua, their lead negotiator in the last three UN Climate Conferences), the Czech Republic (their previous president Václav Klaus), and Russia (Vladimir Putin). More generally, virtually all countries have their climate skeptical political parties, Members of Parliament, *etc.*

Since the climate skeptic position is so widely represented in reality, this paper casts the underlying debate in a formal framework and provides a normative analysis of what the optimal policy for these skeptics actually looks like. We focus on

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[1] See http://georgewbush-whitehouse.archives.gov/news/releases/2006/06/20060626-2.html.

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skepticism on the causes of global warming (is it due to natural, or due to anthropogenic forces?) and define a climate skeptic as someone who is uncertain on these causes.[2] In practice, such skeptics typically propose a rather passive policy. They tend to argue that the possibility that global warming is driven by exogenous factors (like increases in solar activity) implies that we should not take additional action towards reducing greenhouse gas emissions until we know what causes our climate to change: Mitt Romney (the Republican candidate in the 2012 US elections) for example argued in October 2011 that "we do not know what is causing climate change on this planet" and that "the idea of spending trillions and trillions of dollars to try to reduce CO_2 emissions is not the right course for us".[3] Since this position opposes that of "IPCC believers" (who are convinced of the anthropogenic nature of climate change and therefore argue in favor of emission reductions), these contrasting views on the causes of global warming have led to a fierce policy debate.

Although the argument that genuine uncertainty on the causes of global warming weakens the case for emission reductions may make intuitive sense at first sight, this paper shows that it is incomplete as it neglects the production of information and the accompanying learning process on how our climate functions. Once this learning process is taken into account, it is shown that uncertainty is not a reason for inaction, but a powerful motive for action instead. In particular, we show that even climate skeptics have an incentive to reduce greenhouse gas emissions relative to current levels: when uncertain on the relationship between a control variable (such as emissions) and a potentially dependent variable (such as global temperature), decision makers obtain an incentive to change the control through a policy shift (like reducing emissions). The reason is that such a change of direction produces information on whether the potentially dependent variable is indeed dependent. Since the optimal policy depends on whether this is the case or not, information on the causes of global warming is valuable.

Although an equally sized *increase* in emissions could be just as informative, that strategy suffers from the fact that emitting these gases is irreversible. Consequently, there is the risk that decision makers cannot adjust their policy to the additional information they have produced over time – thereby rendering this information useless. After all, information is only valuable if it is able to change behavior. If we (after consciously emitting more greenhouse gases) learn that global warming is indeed caused by this channel, we cannot use this information by undoing the previous policy via removing these gases from the atmosphere (although we have by then found out that they are harmful).

In contrast, a cautious policy leaves all options open – making it more robust: if this policy teaches us that there is a link between the stock of greenhouse gases and global temperature, the prudence was justified. Alternatively, we can always increase future consumption of greenhouse gases if the cautious policy tells us that there is no such link. So under the cautious strategy, the information that is produced over time is actually useful as decision makers can improve their future actions by incorporating it.

One may of course question whether outspoken characters (like Al Gore in the "IPCC camp" or Václav Klaus in the "non-believers camp") actually want to learn and are willing to change their beliefs in response to new data.[4] Even in the most extreme case where this is not so, more outspoken data would make it more likely that new policy makers (who have not joined a particular camp yet) will adopt the correct view – especially if more informative data also raises the proportion of voters with correct beliefs (as this increases the probability that they will elect politicians who share these beliefs).

At this stage, we wish to emphasize that this paper is normative in nature and intentionally abstracts from political-strategic considerations: we take policy makers for their word if they claim to be climate skeptic and assume that they are genuinely uncertain on the causes of climate change (descriptively, this assumption seems most appropriate for skeptical voters). Subsequently, we ask what the optimal policy for these skeptics looks like, and find that even they should argue (or vote) for emission reductions relative to current levels. This brings consensus in the policy debate, while it – ironically – also reduces the political attractiveness of the climate skeptic position. In fact, we will show that it is even possible that a climate skeptic should actually argue for tighter emission standards than a convinced IPCC believer!

The remainder of this paper is structured as follows. After linking this paper to the existing literature in section "Related literature" , the section "Learning the causes of global warming" illustrates that the learning process on the causes of global warming is facilitated by either increasing or decreasing greenhouse gas emissions relative to some uninformative emission level. The section "Optimizing model" will then show that an optimizing agent, who is faced with the irreversibilities related to the emission of greenhouse gases, prefers to experiment by *reducing* emissions. The section "Discussion" discusses this result and its implications, after which section "Conclusion" concludes.

[2] This seems the most common form of climate skepticism, but there are others. Note that this is different from someone who is 100% certain that global warming is exogenous. This extremer position, which leaves no room for learning, is relatively rare among policy makers (*cf.* the aforementioned quote by George W. Bush, where he talks about "a debate", while Xie Zhenhua has stated that China is keeping "an open attitude" on the causes of climate change). It is moreover also inconsistent with the standard definition of a skeptic (a person inclined to question or doubt accepted opinions).

[3] See "Mitt Romney Embraces Climate Denial: 'We Don't Know What's Causing Climate Change' " in *The Huffington Post* of October 28, 2011.

[4] But keep in mind that agents have updated their beliefs in similar debates which had equally polarized starts, like that on acid rain (see section "Related literature" below). Also note that the former Russian president Dmitry Medvedev did "switch camps" by abandoning his initial skepticism (see "6 Global Warming Skeptics Who Changed Their Minds" in *The Week* of September 1, 2010). So did the Australian prime minister Tony Abbott: although he initially dismissed the man-made global warming hypothesis (famously stating in 2009 that "the argument is absolute crap"), he said in 2013 that "climate change is real" and that "humanity makes a contribution" (*cf.* http://www.abc.net.au/insiders/content/2012/s3838363.htm). This still did not prevent him from scrapping Australia's carbon tax, though. Also see "The Conversion of a Climate-Change Skeptic" in *The New York Times* of July 28, 2012 for an account of a former climate skeptic (Richard A. Muller, professor of physics at UC Berkeley) who has become an IPCC believer after seeing more data points.