CLIMATE ENGINEERING IN AN INTERCONNECTED WORLD - THE ROLE OF TARIFFS

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Overview

The virtually unchanged reliance on the extraction and burning of fossil fuels has led to an increase of atmospheric concentrations of CO2 from roughly 280ppm at pre-industrial times to well over 400ppm at present. While this reliance has undoubtedly enabled modern ways of life not otherwise possible, the benefits have been bought by future damages due to anthropogenic change in the composition of earth's atmosphere and the consequent increases in temperature. Attempts to limit future damages have been notoriously slow due to a number of different reasons. The recent COP21 meeting in Paris generated some optimism in form of a new agreement, but the lack of sanction mechanisms and insufficient early contributions together with recent experimental evidence of strategic behavior in pledge and review processes curb enthusiasm. Changes in attitudes towards more nationalism and protectionism in some key-countries may make it even more difficult to optimally deal with a changing climate in the future.

Naturally then, scholars have suggested alternative, technical solutions to this problem, including climate- or geoengineering. The most promising technique so far proposed, the injection of sulphate aerosols into the stratosphere, aims at increasing earth's albedo -the proportion of reflected sunlight- and falls into the category of Solar Radiation Management (SRM). These aerosols increase reflectivity and therefore directly change the earth's radiation balance. It has been argued that this method would effectively and very timely lower global average temperatures with manageable projected costs. However, many authors point out that considerable drawbacks associated with SRM should not be neglected. Among many other potential problems, climate modellers expect highly asymmetric implementation effects due to changing precipitation patterns and, in general, warn of many unintended consequences not foreseen at present. Still, while the technologies suggested are imperfect substitutes for mitigation at best, more research on technical as well as economic incentive issues on geoengineering is needed, not only because of the continuing lack of deep abatement but also because of the increasing threat that many of earth's systems may pass a tipping point relatively soon. Some of these catastrophic regime shifts can potentially be avoided by appropriate technological intervention.

Our aim lies at identifying and investigating possible reactions of countries negatively affected by climate intervention of others. So how can one oppose climate intervention? Since the techniques discussed above do not require global reach -once aerosols have been injected locally, stratospheric winds will distribute them globally- directly interfering with geoengineering practices seems unlikely. Due to the projected costs and uncertainty whether SRM is covered by existing treaties, it can be implemented without universal participation, rendering veto power and voting mechanisms ineffective. While the potential for military conflict over the thermometer exists, we focus on an economic instrument often used in the past and present, namely tariffs.

Methods

To this end, we develop a dynamic bilateral trade model of strategic interaction between two countries. We first analyse a single agent dynamic optimization problem from the point of view of an exporting country with a geoengineering option. We thereafter extend this framework into a differential game with an opposing geoengineering-averse country and an engogenized tariff rate. Different organizational market setups are being analyzed.

Results

In this paper we argue that trade patterns between two countries can be affected by geoengineering and that potential effects on international trade should therefore not be neglected in a comprehensive debate about climate engineering. We show that, depending on the degree of aversion to geoengineering, countries have an incentive to increase tariffs when climate interfering technology is being used. The main argument stems from the implication that increased aversion to geoengineering increases tariffs because these increase total price and therefore decrease trade flow in terms of quantity. This, in turn, lowers total pollution levels, which results in less need to interfere with the climate system in the first place.

Conclusions

The goal of this paper is to demonstrate a plausible response to negative externalities caused by climate engineering in a global warming context. While it is unlikely countries may directly interfere with practices of geoengineering, one possible reaction to actions taken by others which cause real or perceived damages in an interconnected world is given by deploying trade sanctions, i.e. tariffs. By the means of a dynamic model we show that geoengineering-averse countries may have an incentive to implement/increase tariffs put on exports of other countries when climate interfering technology is being used.

An isolated analysis of abatement does not paint the full picture when countries have linked production and consumption patterns, especially when a global cooperative abatement strategy with broad participation is unobtainable. This paper sheds some light on possible future international tensions and significant losses in total welfare due to the possibility of rising tariffs.

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