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Game Theory of Economics

Climate change has many cataclysmic effects, most of which are global threats. Unfortunately, international climate negotiations have largely failed to address this problem, and climate change is a massive collective action problem. There are also a lot of transaction costs involved in finding an agreement. Although the benefits of greenhouse emissions are essentially internalized within a country, the costs of this change are almost spread worldwide.

Models of game theory have previously been applied to the dynamics of climate change in pursuit of predicting climate negotiations at the international level. The greenhouse effect essentially provides a very transparent illustration of the public goods problem. The main characteristics of public goods are that they are non-excludable and non-rival in provision and consumption, respectively. This can be implied by the premise that if one country reduces greenhouse emissions, the benefits will spread across vast geographic regions indefinitely (DeCanio). The particular consumption of this benefit is also inherently enjoyed by everyone. According to the game theory's implications, the climate change problem exhibits a perfect illustration of public good. This nature of public good also paves the way for the free-riding effects of mitigation. There is a strong potential for free riding which may or may not take the form of avoidance in terms of the cost of research and development. It is also known that the greater the amount of mitigation in these actions taken by a country or a particular block of countries, the greater the incentives for free-riding. A direct implication of this problem is that if

any approaches to reduce greenhouse emissions need to be implemented, those must be near-universal or universal in nature (Forgó). The dilemma is that no single country or even group of countries can successfully solve the climate change problem in isolation. In this scenario, the political reality is the subsequent aggravation of the free-riding problem. Other countries are bound to pay the cost of one country keeps stalling the mitigation process.

The increasing level of scientific uncertainty also persists in posing barriers to a lot of predictions as well. As a result, the national governments of the contemporary era find it difficult to comprehend the potential impacts of climate change and rational policy will not be formulated anytime soon (Wood).

The model in this game theory is a simple one. There are two players in the model, and the game is spread over three periods involving perfect information. The players can be viewed as the countries or state authorities. In the game, during two periods, the players can opt to implement or not implement the mitigation measures so that the emission of greenhouses can be reduced. In the third period, it can be ascertained that if mitigation measures in the first two periods were unsuccessful, countries could majorly suffer from climate change. The costs of mitigation in the second period are chiefly reliant on the level of mitigation undertaken in the first period of the game. This game theory model starts with the assumption of perfect information, which is a quintessential element of classical economics.

With respect to international relations and public policy, this is not realistic and several unknown problems are associated with this assumption. This assumption can be relaxed as time passes to assess the change in the outcomes. Early mitigation is also different from late mitigation; this distinction is important for several reasons. The primary reason behind this is

that for different countries, the parameters are different and this variation significantly alters the allocation of mitigation and its inherent burden.

The two players in this game can be labeled as China and the United States of America. Several reasons corroborate the involvement of these two countries in the game theoretic model of climate change. Primarily, America and China are regarded as the largest greenhouse emitting countries and in any attempt to curb the level of these emissions, these countries have a vital role to play. These two countries also appropriately represent the demarcation between the developing bloc and the developed world, which extends important ideas about their economic ambitions and conceptions about the redistribution of wealth. These two countries serve as proxies for developed and developing countries as these two groups are primarily in a conflict about the resulting outcomes of climate change.

This game theory model strives to stimulate the current actions and strategies the governments will implement in the future. The basis for this choice is the projection of potential merits and demerits.

The pay-off form of this model is purely derived from the sum of mitigation costs and the pertinent damages that will occur from climate change. This assurance game theory will have five possible outcomes. The first possible outcome will be that both countries simultaneously mitigate early and late mitigation. The second outcome is that China does early mitigation but the United States of America does not. Later, both countries do late mitigation. The third outcome is that America does early mitigation, but China does not; later, both do late mitigation to curb greenhouse emissions. The fourth possible outcome is that both countries do not practice early mitigation but get involved in late mitigation. The fifth possible outcome is that both

countries do not indulge in either early or late mitigation, and as a result, climate change continues to occur.

The dilemma of this game theory is that under the assumption of perfect information, each country would know what will be the action of the other in terms of late mitigation. On the other hand, in pursuit of preventing late mitigation, both the countries must involve themselves in late mitigation, and in this case, there is no substantial consideration for one country to undertake late mitigation if it is aware that the other player will not undertake late mitigation.

Therefore, the game just shrinks down to two crucial factors to assess one player's inclination towards the mitigation practices associated with climate change. The highlight of this model is the assumption about perfect information. As a result, the difficulties arising in the real-world politics associated with climate change are relevant to the information about which state authorities are largely irrelevant. These pieces of information are linked with the political, scientific, and the economic backdrop of developed and developing economies. For a productive outcome, which is also the first possible outcome of the game, uncertainty negatively affects cooperative behavior. In this model, cooperation is a virtue which is jointly pursued by the countries.

If one considers that the mitigation of greenhouse emissions is only rational in nature, if other countries choose to mitigate, it is vital to comprehend the advantages and disadvantages associated with the outcomes of one's own country and of the other countries as well. It can also be understood by the notion that if climate change is more damaging for one country, then there is a higher likelihood of mitigation practices. All the outcomes also have an intended effect of discouraging cooperation.

Works Cited:

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