

# Two perspectives on Implementation of Carbon Tax Tackling Climate Change: A Literature Review

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## ABSTRACT

The international community has been continuously discussing carbon tax as a means to tackle climate change. In July 2021 came the announcement of the European Union's Carbon Border Adjustment Mechanism (CBAM). Many countries have expressed their concerns over its impact on their economies. This article reviews a total of ten articles, including eight journal papers, one policy paper and one news article, related to the implementation of carbon tax. Two distinct perspectives over carbon tax can be discerned from this literature review. One sees that the introduction of carbon taxes can help to mitigate climate change. Another sees it leading to negative economic ripple effects, acting as a new kind of tax-free barrier. The CBAM policy itself is still just beginning to be implemented, so no one is sure how the outcome of its implementation will affect each country's economic structure. Neither is it clear how to do a detailed estimation without first knowing to what extent implementation of carbon tax would harm economic structure within developing countries, as well as the potential countermeasures and responses of each country. This review hopes to contribute to further studies in order to better understand the impact of carbon tax and carbon emissions reduction, in consideration of each country's economic structure and feature, can help countries prepare for its implementation.

## Introduction

Carbon tax as a means of tackling climate change has been continuously discussed within the international community. Carbon tax has been designed to reduce carbon dioxide emission in the way of imposing tax on carbon emission. Since the 1997 Kyoto Protocol Agreement, many researchers have examined its effectiveness on reducing carbon dioxide as well as the way to implement it in the real world. Despite repeated discussions at international meetings, no countries have instituted concrete policies to respond to climate change (Stiglitz, 2006, p.3). That changed in 2021.

On July 14, 2021, the European Union (EU) attracted worldwide attention by announcing Carbon Border Adjustment Mechanism (CBAM) to all EU members states (European Commission, 2021). Under CBAM, importers must purchase emission certificates as much as the amount of carbon emitted during the production process in other countries. Importers must submit these certificates to the EU authority to import products into Europe.

The two awardees of the 2021 Nobel Prize in Physics have focused their work on the relationship between carbon dioxide and global warming. Their work and award have triggered international interest towards countermeasures against global warming. In their studies, Manabe Syukuro, a meteorologist and climatologist who is a winner of Nobel Prize in Physics 2021, focused on how increased carbon dioxide leads to higher temperatures. Additionally, Klaus Hasselmann, an oceanographer and climate modeler who is a winner of Nobel Prize in Physics 2021, proved that human-generated carbon dioxide is a main reason of rising air temperature.

EU's CBAM is one of the legislations of *Fit for 55*, the legislative climate change policy package announced by the EU Commission on July 14, 2021. However, many countries exporting to the EU are showing high concerns related to the economic impact of CBAM on their countries (European Commission, 2021).

Numerous papers and policies mention that the introduction of a carbon tax will help slow down climate change. Nevertheless, implementing CBAM in regions such as the EU could lead to economic ripple effect on exporting and developing countries when considering that carbon tax can play its role as a non-tariff barrier (Mattoo, Subramanian, Mensbrugge, and He, 2009). Therefore, it seems necessary to closely review the negative aspects of carbon tax. In order to maximize the positive and minimize the negative effects of introducing the carbon tax, a sufficient understanding of the negative economic effects of the introduction of the carbon tax is needed.

This paper aims to closely review the impact of carbon tax and categorize various views on both climate change and economic aspects. The reviewed studies, a total of ten articles including eight journal papers, one policy paper, and one news article from The Guardian, were searched from the Google Scholar search engine. This paper attempted to select studies conducted in the EU and in seven different non-EU countries in order to review various views by different countries.

## **Two competing perspectives towards carbon tax**

In general, scholars in the field of carbon tax studies accept the idea that carbon tax is one of the means of tackling the ongoing climate change (Anbumozhi, 2015; Cecco, 2018; MPFD Policy Brief No. 107, 2020). Nevertheless, perspectives on carbon tax in terms of its effectiveness and potential side effects are mainly divided into two aspects. One group of studies argue the importance of implementing carbon tax policy. It emphasizes the role of the international community or neighboring countries' pressure on the countries that are hesitating to adopt carbon tax. Meanwhile, the other group of studies highlights the side effects of carbon tax, particularly the economic disparity between countries through its implementation. These studies further point out the reduced effectiveness of carbon tax to tackle climate change if it is implemented without considering such side effects.

This paper will review these two perspectives on carbon tax: one perspective which sees carbon tax as a moderator for climate change, and the other which sees carbon tax policy to an accelerator as the expansion of economic disparity.

### **A) Moderator for climate change**

Stiglitz (2006) points out in "A New Agenda for Global Warming" that global warming is a universal and ongoing problem which the whole world is facing. He also emphasizes that discussing the solution of global economic problems is meaningless without countermeasures for global warming. Thus, he underlines the Kyoto Protocol, which is currently stalled, and stresses the importance of visible means of making the United States (US) actively engage on issues concerning global warming. He suggests two specific solutions to make the US pay keen attention to the harmful effects of global warming and participate in activities to reduce carbon dioxide emission.

First, Stiglitz describes an example of US import restrictions on Thai shrimp. Since 1996, the U.S. has banned the import of shrimp if it is not approved by the U.S. even if it uses nets with or without Turtle Excluder Device (TED), and endangered sea turtle escape device, with the aim of protecting endangered sea turtles. He recommends the other countries in like fashion ban the import of US energy-intensive technologies and products or imposing higher taxes on these US energy-intensive technologies and products as one of the solutions.

Second, Stiglitz urges other signatories of the Kyoto Protocol, such as Japan and European countries, to immediately file a lawsuit to the WTO against the US by claiming unfair subsidies to those energy-intensive products of the US and induce the US imposing energy tariffs. According to Stiglitz, while American companies have long benefited from unfair trade based on cheap energy sources, they have also contributed to escalating global warming. Therefore, the rest of the world, which is suffering from global warming, deserves to give pressure to the US by arguing for the necessity of energy tariffs.

Karp & Zhao (2008) also agree that trade measures will help to prevent climate change. However, they point out that there are many restrictions in each country that hinder them from participating in climate agreements and further participating in carbon emission reduction. For this reason, they suggest that when designing the successor to the Kyoto Protocol, it should be designed to benefit the member countries as much as possible, and later it should be a design that can be 'forced'. Their proposals follow important parts of the Kyoto Protocol but suggest that escape clauses should be put in order to encourage countries to join membership and to solve the issue of how to promote its implementation.

Poterba (1991) analyzes several issues related to the design and implementation of the carbon tax, unlike conventional carbon tax discussions that focused only on multilateral actions. Poterba (1991) provides the basic structure of carbon taxes, which includes the distribution burden of carbon taxes across income groups, distortion of production and consumption due to carbon taxes, long-term and short-term macroeconomic effects of carbon taxes, and design issues related to carbon taxes. Through this study, he proposes a direct tax or transfer program to make up for the weak points of the carbon taxes. In addition, he points out that a higher carbon tax can affect production in reality, although a higher carbon tax is necessary, as the efficiency cost, the act of saving money by changing a product or process in economic terms, of the current carbon tax is low. He also states that the key point of carbon tax design is harmony with other financial instruments concerning the issues of the greenhouse gas (GHG) effect. In general, he supports carbon taxes in his paper, but he notes that international agreements, participation, and flexibility in policy will help to avoid the distortion and difficulties caused by the introduction of carbon taxes in reality.

The effects of a carbon tax have been proved in the case of Canada's British Columbia, which has collected the world's first carbon tax on fossil fuel emissions. According to Cecco (2018), British Columbia in Canada collected a carbon tax on fossil fuel emissions as a climate change measure for the protection of forests and implemented tax cuts for residents with a carbon tax collected in 2008. Cecco (2018) cited that Karen Tam Wu of the Pembina Institute, an environmental research institute, mentioned the world's first carbon tax attempt was remarkably successful. In the example of British Columbia, when the government imposed a carbon tax on fossil fuels, companies with high emissions passed on their increased costs to consumers by raising prices. At this time, the government redeems increased costs that consumers should pay by redistributing carbon taxes collected by companies in the form of tax cuts and exemptions for taxpayers.

In Cecco (2018)'s article, Premier Gordon Campbell mentioned that those who purchased high-emission products spent more money due to carbon taxes, and those who wanted to pay less taxes reduced the tax burden by revising their behavior and purchasing low-emission products. In other words, those who were actively involved in reducing emissions eventually benefited. According to the Cecco (2018)'s article, British Columbia's case reduced concerns that the carbon tax would have a negative impact on the economy due to a breakthrough drop in fossil fuel consumption and a large economic growth rate in carbon tax-implemented areas. Indeed, this case became a model for suppressing carbon emissions to prevent global warming at a United Nations (UN) meeting in Katowice, Poland 10 years later, and was supported by many economists and environmentalists.

MPFD Policy Briefs (2020) also describes the positive impact of a carbon tax to tackle green gas emissions. This paper introduces that there is broad agreement that greenhouse gas (GHG) emissions should be reduced to prevent the climate change crisis. To do so, it emphasizes the importance of carbon pricing. As a result, more and more countries are implementing or planning to implement a carbon tax or emission trading system. However, this paper recognizes the potential problem that could occur by implementing unilateral carbon tax, as it could increase concerns over the competitiveness of domestic industry. By reviewing previous studies, however, this paper describes that environmental tax or carbon pricing has more positive effects than negative ones.

According to this brief, in order to derive these positive results, the government should increase the use of corporate efficiency and introduce incentives through preceding plans and transitions. Then, such climate change measures will eventually lead to new job creation in the economic sector. It says that negative effects on the economy can be reduced, and strong sanctions will be possible, when linking the carbon market globally through regional cooperation and conversion.

## B) Concerns as an accelerator of the expansion of economic disparity

Mattoo et al. (2009) examined the possible effects of the joint report of the WTO and the United Nations Environmental Program, which cautiously ruled in favor of allowing border tax adjustments on imports and exports under certain conditions, and the optimal design for them. They analyzed that whether the imported carbon content or the domestic carbon content is a key factor influencing Border Tax Adjustment (BTA). According to their study, it was found that when the country fully adjusts its origin emission intensity, BTA causes a lot of loss to the lower-and-middle income country. In addition, they found that BTA based on domestic emissions can solve concerns about domestic competitiveness while causing less damage to developing countries. In their study, imposing tariffs based on the carbon content of imported goods calms concerns about domestic producers' competitiveness and contributes to further reduction in emissions, but export losses occur in terms of trade. However, if tariffs are applied symmetrically to imports and exports based on domestic carbon content, energy-intensive producers in rich countries were able to recover competitiveness due to emission reduction measures, and trade results with developing countries were less serious.

However, Mattoo et al. said that the absence of BTA is the best trade outcome, but with BTA already mentioned and supported, including at the WTO, the least desirable alternative they have found through this study could compensate for trade vulnerabilities in developing countries. In addition, they concluded that the implementation of extreme policy measures shown in the experiment would not only harm developing countries but also lead to actual atmospheric damage, making it difficult to achieve international cooperation in climate change.

Boehringer, Fischer, and Rosendahl (2010) also describe the possible negative economic effects on developing countries by implementing carbon tax. According to them, member countries of the organization for Economic Cooperation and Development (OECD) seeking climate agreement related legislation will take trade-related measures due to increased concerns over the competitiveness of domestic energy-intensive industries and carbon leaks overseas. However, Boehringer et al. (2010) also point out that these measures could harm economies in developing countries.

Authors explore the effects of unilateral climate policies implemented by the U.S. and EU on welfare around the world, competitiveness of energy-intensive industries, and carbon leakage. Then, they argue that these trade-related measures are unilateral climate policies, and this approach lacks an understanding of how these policies affect the global trade system. Through their research, they found that subglobal climate policy affects not only the countries implementing climate policy but also their trade partners. In addition, since global energy price changes cause significant leaks, none of the countervailing policies are effective in lowering the leakage rate. In their study, output-based rebates (OBR) and Border Adjustments, which have a significant impact on the energy-intensive sector, alleviated changes in domestic production and reduced overseas exports. Therefore, the authors argue that developed countries should understand that efforts to reduce greenhouse gas emissions do not provide substantial economic benefits to most developing countries, while developing countries should also recognize that anti-leakage policy enforcement sectors do not necessarily lead to competitive losses.

Kaggwa (2018) studied the potential impact of carbon taxes on the job market in South Africa and the potential for unemployment. His study argued that the potential job losses in South Africa may not be caused by an increase in the operating costs of companies resulting from carbon taxes, but due to a decrease in corporate competitiveness. If taxes are imposed on high-emission products, the price of the product will rise, and consumers will use low-carbon products instead of expensive high-emission products, which will increase the production of low-emission products. In other words, the carbon tax increases the unit price of high-emission products, thereby reducing the competitiveness of high-emission products and increasing the competitiveness of low-emission products. However, considering the enormous cost of introducing low-emission technologies to make low-emission products, it is unclear whether employment in low-emission industries will necessarily increase. Therefore, Kaggwa (2018) argues that the carbon tax should be delayed or stopped until a safe countermeasure for South Africa's job market is prepared.

Gang (1996) analyzes the impact of the climate change agreement on Korea's industrial structure. He compared the proportion of industrial emissions to carbon dioxide emissions to distinguish between the high energy consumption industry and the low consumption industry. In addition, industrial sectors with large direct and indirect emission effects were classified, and the effects of inter-industry linkage were examined. Taking the results of the study together, he predicts that the imposition of energy and carbon tax would have a significant impact on the price of products in the Korean industrial sector. Therefore, it was argued that long-term industrial restructuring is necessary to induce energy efficiency and consumption savings in the entire industrial sector in preparation for the climate change agreement. He also mentions that economic measures such as energy and carbon tax should be gradually introduced to parallel direct regulations such as energy demand management and make long-term plans.

Hufbauer & Kim (2009) mention the *Bali Action Plan*, which was adopted to recommend taking appropriate measures to reduce greenhouse gas emission to both developed countries and developing countries. They also saying that curbing greenhouse gas emissions is a top priority for both domestic and international agendas, and that special attention is focused on the relationship between the WTO and the emerging international climate change system. However, they state that there are disagreements between the US, other developed countries, and major GHG emitters due to differences in interpretation of the provisions of the Bali Action Plan's "common but differentiated response". The US and other developed countries demand binding commitments from major GHG emitters Brazil, India, China (BICs) and developing countries, while India and China only insist on "best effects." Because of India and China's stance on setting emission targets, some developed countries are worried that their strict greenhouse gas control programs will weaken their companies' competitiveness in the global market. Under these concerns, Hufbauer & Kim (2009) notes that domestic measures by developed countries will not contribute to climate change without effective handling of large emitters such as China and India. In order to resolve competitiveness concerns, there is an option to use Border Adjustment as a policy option, However, this approach may affect trade while making it difficult to predict how it will comply with the WTO regulations.

Table 1 summarizes two competing perspectives over the introduction of carbon tax to tackle climate change.

**Table1.** The summary of two competing perspectives over the introduction of carbon tax.

Aggressive approach towards carbon tax	Poterba (1991)	<ul style="list-style-type: none"> <li>▶ Proposed direct tax or transfer program to compensate for the side effect of carbon tax by analyzing specific issues related to the design and implementation of carbon tax</li> <li>▶ Emphasized the flexibility of international agreements, participation, and policies as an auxiliary means for successful carbon tax implementation</li> </ul>
	Stiglitz (2006)	▶ Claimed the importance of implementing carbon tax to reduce carbon emissions
	Karp & Zhao (2008)	▶ suggested escape clause and a trade measure design that can force member counties
	Cecco (2018)	▶ Claimed the positive effect of carbon tax to mitigate climate change by introducing the case of British Columbia in Canada, where implemented carbon tax for the first time in the world
	MPFD Policy Brief (2020)	▶ Argued the positive impact of the carbon on reducing greenhouse gas emissions
Deliberate consideration towards carbon tax	Gang (1996)	▶ Emphasized the importance of having long-term plan as well as gradual introduction of carbon tax as it brings a significant impact on product price

	Mattoo et al. (2009)	▶ Claimed that border tax brings negative impact on economy. Thus, argued avoiding extreme measures while preparing for alternatives to compensate for trade vulnerabilities in developing countries
	Hufbauer & Kim (2009)	▶ Pointed out that measures to curb greenhouse gas in developed countries will not contribute to climate change if it fails to encourage large-scale emission countries such as China and India to properly participate
	Kaggwa (2018)	▶ Argued negative effect of the introduction of carbon tax by describing how corporate competitiveness as well as job market in South Africa decreased
	Boehringer et al. (2010)	▶ Claimed that unilateral trade-related measures to prevent carbon leakage could harm the economy of developing countries

## Conclusions

Discussions about carbon tax have been going on for three decades now, and it is about to be implemented in real-world policies. The reviewed articles show that discussion over carbon tax has been widely divided into two competing arguments: the positive impact of carbon tax on climate change and the negative impact on economic structures, particularly within developing countries. Therefore, in the 'Moderator for climate change' section, I have reviewed articles arguing that introducing carbon tax will greatly contribute to reducing greenhouse gas, the main culprit of global warming facing the international community (Cecco, 2018; MPFD Policy Briefs, 2020; Poterba, 1991; and Stiglitz, 2006). Meanwhile, in the category entitled 'Concerns as an accelerator of the expansion of economic disparity' section, I have reviewed articles expressing the position that gradual and careful introduction of carbon tax while avoiding unilateral implementation led by developed countries (Boehringer et al., 2010; Fischer and Fox, 2012; Gang, 1996; Hufbauer et al., 2009; Kaggwa, 2018; and Mattoo et al., 2009).

Considering the reviewed articles, it can be said that the CBAM policy is still on the verge of implementation, so no one is sure how the outcome of that implementation will affect each country's economic structure. In particular, as Fischer and Fox (2012) argue, we should keep in mind that the impact of carbon tax can vary depending on the situation of a specific sector or each country that will be a party to its implementation. Despite the policy's positive impact on climate change, it seems that the policy should consider the context of each country before being implemented.

Also, the reviewed articles were a bit lacking to focus on detailed estimation on to what extent implementation of carbon tax would harm economic structure within developing countries, as well as potential countermeasures and response of each country.

This review may contribute to future studies so that more specific studies could conduct research on the impact of carbon tax and carbon emissions reduction in consideration of each country's economic structure and help countries that introduce this policy or those that need to prepare for it.

## Acknowledgments

I would like to thank my advisor Dr. Allen Sher for guiding me in this project.

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