Proceedings of Business and Economic Studies, 2025, Volume 8, Issue 4
http://ojs.bbwpublisher.com/index.php/PBES
Online ISSN: 2209-265X
Print ISSN: 2209-2641

A Research Review of International Carbon Tax and the Comparative Analysis of International Carbon Tax Schemes

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Abstract. International carbon tax issues such as carbon leakage and carbon neutralization have become major topics of social concern. Based on the practical experience of carbon tax system in individual countries, this paper integrates the existing research of international carbon tax scholars to the classification and comparative analysis of international carbon tax schemes. Using a literature review approach, this dissertation mainly applies the method of qualitative analysis to explain and compare the contents of four international carbon tax options. Through the analysis and evaluation of individual countries' carbon tax practice, the two-country model is verified. Through the method of comparative analysis, the schemes are evaluated from four dimensions and an assessment is made. The difference of carbon tax among countries makes the internal policies of countries adjust accordingly with the changes of international environment, which promotes the gradual convergence of carbon tax schemes. The results intend to provide reference to further study the issue on international carbon tax.

Keywords: Carbon tax; International carbon tax schemes; Border-tax adjustment

Online publication: September 11, 2025

1. Introduction

According to the emission information provided by U.S. Environmental Protection Agency, carbon dioxide accounts for about 81% of greenhouse gases while methane and nitrous oxide only account for 10% and 7% of the total emissions respectively [1]. Since the United Nations Framework Convention on Climate Change (UNFCCC) came into effect, international attention to carbon emissions, especially carbon emissions trading and relevant schemes, has been increasing. Based on Sandmo's two-country model, this paper will study the different arrangement of carbon tax mechanism on different countries and focus on the interaction between countries. Potential factors which lead to the success or failure of carbon tax will also be inferred [2].

According to the simplified two-country model, countries in the world are roughly divided into developed

(relatively rich) countries and developing (relatively poor) countries, which raises the issue of policy interaction. Each individual country is affected by the environmental pollution of all other countries. Following the international carbon tax schemes fall into four categories, namely, uniform international taxes, non-uniform international taxes, harmonized domestic taxes, and domestic taxes & border-tax adjustment. This paper aims to explore the rationality and development prospects of carbon tax system.

2. International carton tax schemes

2.1. Background

OECD designed several models of greenhouse gas emission tax system in its publication "International economic instruments and climate change", which can be divided into two models: financing and stimulation according to tax purposes. Meanwhile, based on the level of international integration, the carbon taxes of the above two modes are divided into six types as shown in **Table 1**.

Table 1. Tax system model of greenhouse gas emission tax

Purpose	Unilateral national tax	Unilateral national tax	Unilateral national tax
Financing	I	II	III
Stimulation	IV	V	VI

Unilateral national tax means that a few countries levy carbon tax at the national level for the purpose of carbon emission reduction. However, in order to improve international competitiveness, some countries often set up a large number of preferential policies or even tax-free measures for energy intensive industries, which seriously restricts the favorable impact of carbon tax system on the environment and aggravates the imbalance of carbon tax burden between countries. This kind of tax system can be seen as a transitional stage to a tax system with high international consistency. The coordinated national tax is an extension of unilateral national tax, trying to coordinate the emission reduction measures of a single country with the carbon tax policies of various countries. International tax is a tax paid by each member state to international organizations. However, OECD also recognizes that such a scheme is almost impossible to achieve in the current international environment, and there is a high possibility of not implementing and evading the agreement.

2.2. Scheme 1: Uniform international taxes

The global unified international carbon tax was first proposed by Hoel [3]. He stated that in solving the problem of global warming, setting the same reduction target for each country under a certain target will surely lead to low efficiency, because this method does not take into account the cost differences of different countries to carry out the reduction plan. On the contrary, the use of tax may be an effective way, and this tax is the international carbon tax. He also stressed that the carbon tax can only be effective if a unified standard is implemented on a global scale, but it seems difficult to achieve. This difficulty is reflected in two aspects: one is that if carbon tax is managed internationally and collected by a central institution, it may involve political issues such as national sovereignty; the other is that if carbon tax is collected by different countries themselves, it will lead to free riding problem. Therefore, the carbon tax should be collected by a jointly recognized central organization, such as the United Nations Environment Program.

Specific collection agencies and relevant supporting agencies should be set up. It is suggested that the carbon tax base should be the carbon dioxide emission, or the carbon dioxide reduction promised by each country; tax rates are consistent for each country; The carbon tax should be returned to countries in some way. The specific operation method is that at the end of each collection cycle (1 year or 3–5 years), the selected international central institution will debit the international carbon tax that a country should pay according to the carbon dioxide emissions of each country, and credit the return that the country should receive from the total tax revenue after deducting the management costs of international institutions. Therefore, the net tax paid by each country to the international carbon tax collection agency in each period is the difference between the tax payable and the return. This net tax may be positive or negative. When the management cost is ignored, the sum of the net taxes of the participating countries should be zero. Although it may be utopian to adopt rules based on unified background needs and managed by unified international tax authorities, the aim of this idealized scheme is to stimulate the discussion of resource sharing and international communication under the tone of increasing globalization.

The features are: (1) Carbon tax is levied on each country according to its emissions based on a unified tax rate, and (2) The tax revenue should be collected by independent international organizations and distributed according to the agreed rules.

2.3. Scheme 2: Non-uniform international taxes

The non-uniform international carbon tax scheme is very similar to the unified international carbon tax in terms of collection method, both of which advocate the unified collection and return of tax revenue through universally recognized international institutions. The main difference is that the former does not insist on the uniform tax rate for all countries, on the contrary, it advocates the differential tax rate. This kind of international carbon tax scheme was first proposed by Murty, which advocated the method of fiscal federalism, in which the domestic carbon tax was collected by each country, and the international carbon tax was collected and managed by international agencies, and the tax was returned according to the atmospheric conditions of each country [4]. In this way, the international carbon tax rate of each country will depend on its own carbon dioxide emissions, profit tax imposed on producers, production of carbon intensive products and other relevant variables.

To solve the problem of tax return, Gersbach designed a special international carbon tax operation scheme, the Global Refunding System (GRS) [5]. In the global return system, at first, the largest 20 developed countries injected start-up funds to form a global fund, and other countries decide whether to join or not. Countries can become GRS members as long as they accept the GRS regulations and pay the lowest level of carbon tax. Each member state sets its own carbon tax rate and submits the carbon tax revenue of each period to the global fund. The GRS allocates the Global Fund in proportion to each member country's share of the previous period's carbon dioxide emission reduction in the total emission reduction of all member countries. This kind of return may only use part of the tax revenue for return at the initial stage. When the fund amount accumulates to a certain extent and remains stable, the amount of return is equal to the total tax revenue plus the interest income of the fund. Member states are free to join or withdraw during the expropriation period. The return system of this model is set up according to the rules beneficial to developing countries, but once the country exits, it will lose the current refund.

Hoel, who supports the unified carbon tax policy, opposes the non-uniform carbon tax based on national background [4] . He focuses on criticizing its inefficiency and believes that the workload of determining differential tax rates and tax return according to specific national conditions is huge. In addition, there is uncertainty about whether countries' own emission monitoring is in place and whether there is concealment. Supervision also requi-

res a lot of human and material resources, which is almost impossible to achieve.

The features are: (1) There are non-uniform international carbon taxes in the world. The differences are reflected in the different tax rates imposed on different countries, and there is no clear requirement to take carbon dioxide emissions as a unified tax base, and (2) Specific institutions and systems are needed to implement the unified tax collection and realize the reasonable distribution and return of tax revenue.

2.4. Scheme 3: Harmonized domestic taxes

Since the Kyoto Protocol, some scholars advocate a unified carbon tax. A unified global carbon tax seems to achieve the emission reduction target more effectively, and it is also convenient for international coordination and management. What they advocate is to ask countries to achieve a unified domestic carbon tax by reaching an agreement.

Nordhaus confirmed the necessity of consistency of carbon tax in different countries and industries from the theoretical level, but this consistency may not be achieved in the implementation. Thus, his research aims to indicate that the ideal scheme should be taken as the guidance in the design of the system [6]. In the study of global warming, Stiglitz discusses two issues: one is that developed countries such as the United States refuse to accept and participate in carbon emission reduction plans; the other is that developing countries question the allocation of emission reduction targets, that is, why developed countries that previously emitted more carbon dioxide now have more emission targets than developing countries. In order to coordinate these international issues, everyone should be required to pay taxes equivalent to the social cost of carbon emissions, which can solve most of the distributional debate [7]. In addition, the tax design should be adjusted according to the development of technology and global warming, which means that the unified tax rate is not unchangeable and needs follow-up study and response according to the actual situation. As for tax revenue, Stiglitz believes that special funds can be established by agreement to invest in global public utilities, but it is more realistic for countries to keep and use tax revenue themselves, to avoid potential injustice and distribution disputes [7].

Aldy and Stavins support a unified domestic tax rather than an international carbon tax levied by specialized agencies, believing that the former is more acceptable to most of the countries [8]. Each country can reach an agreement on domestic carbon tax, levy a unified carbon tax rate and dispose of the carbon tax revenue separately. Since the uniform carbon tax rate is inherently unfair, it needs international transfer payment; the developed countries transfer to the developing countries according to the principle of agreement or the developed countries use the carbon tax revenue to finance the research of zero carbon technology projects and other carbon emission reduction projects of the developing countries. In the face of the lack of fairness brought about by the unified tax rate, they proposed to levy carbon tax only on countries with a certain income level in the short term and exempt those countries with lower income level and less historical emissions. This is equivalent to dividing international countries into two batches, one is similar to developed countries, the other is similar to developing countries, which is consistent with Sandmo's two-country model [9]. As the developed countries generally emit more than the developing countries, they should undertake more emission reduction obligations. Through the unilateral payment of developed countries to developing countries, the equity of global carbon emission reduction obligations can be maintained. However, Stiglitz also stressed the potential risk of aggravating the opposition of some developed countries under this transfer payment policy [7].

The features are: (1) All countries reach an international agreement on domestic carbon tax, and the tax rate is required to be consistent in theory, but the implementation can be adjusted according to the situation, and (2)

Countries collect and dispose the income by themselves rather than by special international organization.

2.5. Scheme 4: Domestic taxes & border tax adjustment

Considering that unilateral carbon tax in developed countries will reduce the international market competitiveness of their domestic industries and lead to carbon leakage, many scholars believe that border-tax adjustment can be regarded as an effective means to protect the competitiveness of domestic industries and prevent carbon leakage. The border-tax adjustment discussed in this dissertation refers to the principle of maintaining tax neutrality by taxing the imported products without carbon tax so that the tax rate and price of the imported products are equivalent to those of the same products with carbon tax. This combination of domestic carbon tax and regulatory tax achieves carbon emission reduction targets and safeguards domestic interests.

The original intention was to hope that EU countries could impose import tax on goods that did not comply with the Kyoto protocol. Otherwise, after the EU carbon emission trading mechanism began to operate, the goods produced by EU countries would encounter unfair competition, especially in high energy consuming industries. Some studies suggest that the border regulation tax system can be used to reduce the impact on the competitiveness of the country [10,11]. In practice, the report of Sweden's national trade agency proposes three ways to collect the border regulation tax. One is to levy adjustment tax according to the carbon emission of imported products in the production process, which requires the imported products to provide the necessary emission certificate. Second, the importing country sets up a unified standard border regulation tax according to the product category and does not need to hold a carbon emission certificate. The third is to integrate the first two methods. The importing country sets emission standards for each product and sets adjustment tax. If the carbon emission of imported products is lower than the standards set by the importing country, the tax can be reduced.

Mattoo *et al.* also proposed that industrial countries that implement carbon emission reduction impose additional border taxes on imports from countries with lower carbon prices, namely carbon-tax adjustment [12]. The adjustment of border tax based on the carbon content of domestic production will effectively solve the competitiveness of producers in high-income countries and reduce the adverse impact on the trade of developing countries. In addition, aiming at the problem of carbon leakage, through the general equilibrium model, it is predicted that in the 14 years since 2000, the imposition of import carbon tariffs on non-OECD countries to OECD countries will probably reduce the carbon leakage by as much as 80% [13]. In March 2021, the European Parliament passed a resolution on the EU carbon border regulation mechanism (CBAM) compatible with the WTO. The proposal claims that if some countries that trade with the EU fail to comply with carbon emission regulations, the EU will impose carbon tariffs on their imports. The logic of imposing a carbon-tax adjustment seems to be very simple, that is, without it, the EU may reduce emissions by transferring polluting production, which will harm global climate benefits. On the one hand, the additional tax can ensure the tax on high carbon products in order to promote industrial transformation; on the other hand, it can protect European manufacturers from the impact of products from countries with lower environmental standards.

The features are: (1) Some countries implement carbon tax, and impose border-tax adjustment on imports from countries that do not implement carbon tax, and (2) There is no independent international body to manage the carbon tax, no international distribution of tax revenue and international transfer payment.

2.6. Summary

In this chapter, four mainstream international carbon tax proposals are summarized, and their respective

characteristics are briefly concluded. The specific comparison of their characteristics is shown in the **Table 2** below.

Table 2. Characteristics comparison of four schemes

Features	Scheme 1	Scheme 2	Scheme 3	Scheme 4
Unified tax rate?	R	Q	R (Adjusted)	Q
Tax refund?	R	R	R	Q
Transfer payment?	Q	Q	R	Q
Independent international organizations?	R	R	Q	Q
Border adjustment?	Q	Q	Q	R

3. Comparative analysis of four options

3.1. Cost effectiveness

Cost-effective analysis is a method to evaluate the value of a project by comparing the total cost and benefit of the project. The realization of cost-effectiveness requires the maximization of benefit under the same cost condition or the minimization of cost under the same benefit condition [14]. Applying the principle to implementation of international carbon tax, the marginal cost of emission reduction in various countries should be basically consistent.

Uniform International Taxes advocate taking a country's total carbon emissions as the collection object, and the collected carbon tax should be returned to all countries according to the pre-agreed refund ratio. Since the income returned is determined in advance, the amount of refund changes little with the change of tax paid, which is almost negligible. Therefore, in order to maximize income, many countries tend to make the cost of carbon dioxide emission reduction equal to the international carbon tax rate, which means that a high-intensity carbon tax policy is not necessarily the best choice. If a country's emission reduction cost is greater than the international carbon tax, it can choose to reduce emissions reduction to increase revenue. If it is less, the country can choose to increase the intensity of emission reduction to increase emission reduction, so as ensure the stability of income. Therefore, the marginal cost of carbon dioxide emission reduction will always be consistent with the international carbon tax, and the maximum income of the country will be most likely to be achieved. Therefore, under the international carbon tax background of implementing the uniform carbon tax rate in Scheme 1, the marginal emission reduction cost of all countries will be basically consistent with the international carbon tax, and the fluctuation range will not be too large, which can be considered as the realization of cost-effectiveness.

In Scheme 2, non-uniform international carbon taxes, the carbon tax rates of different countries are different, and there is no clear unified tax base based on carbon dioxide emissions. Therefore, cost-effectiveness is hard to achieve.

Although Scheme 3 theoretically requires the unification of domestic taxes by reaching international agreements, it does not require complete unification. There is still room for it to adjust according to its own situation. This means that tax rates are likely to be different across countries. Secondly, each country's tax system is different, even if the same tax rate is guaranteed, the actual cost of carbon tax to the country may be different. In addition, given that the country itself can offset the carbon tax effect by reducing other direct or indirect taxes and increasing additional subsidies, it is almost impossible for countries to unify the actual carbon tax burden.

Many variables will affect the consistency of cost, so the theoretical cost-effectiveness of this scheme may not be realized.

Scheme 4 supports the implementation of carbon tax by some countries and border-tax adjustment on imports. This method maintains the balance of domestic carbon emission reduction cost; the domestic market realizes the unification of domestic and imported goods emission reduction cost, so as to ensure that domestic goods and imported goods without carbon tax have the same competitiveness. However, this option does not try to solve the problem of cost consistency of international emission reduction. Therefore, it does not achieve cost-effectiveness in the international context.

In conclusion, in terms of cost-effectiveness, Scheme 1 may be the best, Scheme 4 is likely to be the worst in the international level, and Scheme 3 is slightly better than or equal to Scheme 2.

3.2. Fairness

Aldy and Stavins advocated fairness in international emission reduction cooperation, which means that relatively rich countries should first undertake emission reduction obligations, implement carbon tax and other emission reduction measures, and bear more emission reduction costs than relatively poor countries [8]. Carbon dioxide emission is not only a global issue, but also a historical issue. Due to decades of development in developed countries, infrastructure construction and production based on fossil fuels will inevitably lead to carbon emissions of relatively rich countries far greater than those of less developed countries and regions. Therefore, considering the different historical responsibilities of developed and developing countries, the implementation of international carbon tax pays more attention to fairness and adhere to the principle of "common but differentiated".

Scheme 1 treats all countries equally, but it does not mean that it is completely fair. The proportion of tax refund is also a factor affecting fairness. When the tax rate is fixed, if the tax refund ratio can correctly reflect the historical responsibility of developed and developing countries, then fairness can be achieved. Otherwise, the disharmony between refund ratio and responsibility will destroy fairness, which is likely to benefit the developed countries and damage the interests of the developing countries [9]. Thus, the fairness of the scheme depends on the balance between refund and responsibility.

Scheme 2 implements different carbon tax rates for different countries according to certain conditions and returns tax revenue according to regulations. The fairness of the scheme is reflected in the consideration of the differences in economic conditions. However, it is uncertain, because it cannot truly reflect the social and historical responsibility.

Scheme 3 requires all countries to implement a unified domestic carbon tax, and international agreements need to attach the rules of transfer payment or other assistance from developed countries to developing countries. This kind of transfer payment reflects the principle of fairness to a certain extent. Fairness can be realized as long as the transfer payment system can correctly handle and solve the problem of the difference of historical responsibility between developed and developing countries.

Scheme 4 assumes that developed countries bear most of the carbon tax costs and their emission reduction burden is heavy because they have priority over other countries in implementing and paying carbon taxes. In order to reduce the pressure of international commodity price competition, the products exported from developing countries to developed countries need to bear part of the tax burden. From the perspective of developed countries, this is conducive to the economic interests of the importing countries and seems to be more conducive to the maintenance of fairness. However, the situation in developing countries will not be optimistic. On the surface,

only products exported to developed countries by developing countries will bear this share of the tax. In fact, developing countries not only undertake the obligation of emission reduction, but also have the problem of net tax loss. Because there is no uniform tax refund system and transfer payment system in the world, developing countries cannot obtain tax return and transfer payment after they pay these taxes to export destination country, which will result in irreparable economic losses. Besides, due to the increase of export costs and the decline of price competitiveness, the export industry of developing countries will suffer a huge blow. Taking China as an example, Mattoo et al. confirmed the negative impact of such a scheme on the trading partners who are subject to the border regulation tax [12]. The export volume of China's manufacturing industry will drop to four–fifths of its original value. The export volume of low and middle-income countries will drop by 15%, and their income will correspondingly drop by 2.5%. In addition to the impact on the economy and trade, whether the border regulation policy is in line with the international trade law is also worrying, and the important factor to be considered is fairness.

Based on the analysis, the fairness of the first three depends on the system design (tax return system & transfer payment system). Theoretically, if the system design can be implemented and play a role, the three schemes will achieve fairness. In comparison, Scheme 4 seems rather unfair. This kind of carbon tax on imported products will evolve into a green trade barrier, which is not conducive to the free circulation of global goods and the development of international trade.

3.3. Participation

The extent of participation is based on the idea that the more countries participate in and the more perfect the relevant supporting institutional arrangements, the higher the degree of participation. Ensuring extensive participation will effectively promote the coordination of global emission reduction measures and reduce the risk of carbon leakage (energy intensive industries are transferred from emission reduction countries to non-emission reduction countries). The scope of participation is embodied in two aspects: before and after the agreement.

Before the agreement, the number of participating countries is the determinant of participation. Considering that all four schemes are in the stage of conceptual design, it is impossible to compare the actual number of participating countries in the implementation. This paper regards incentive measures as an agent to help judge participation to consider the design of incentive mechanism that affects participation instead of the number of participating countries for comparative analysis. Scheme 1 and Scheme 3 basically require all countries to participate in the design of carbon tax system. Regrettably, some countries refuse to recognize climate change and bear corresponding responsibilities and obligations, and international consultations have great uncertainty. Scheme 2 is implemented by developed countries first and supplemented by developing countries later. Due to the historical responsibility of developed countries for emission reduction, carbon emission reduction is a matter for developed countries and the driving force for emission reduction is relatively large. Since then, the participation of developing countries in carbon emission reduction has been basically icing on the cake with advantages outweighing disadvantages. Therefore, the incentive effect of the scheme will be better than that of Scheme 1 and Scheme 3, and the corresponding degree of participation will also be higher than the two schemes. The border-tax adjustment of Scheme 4 is mainly aimed at the internal protection tax of developed countries, which is only applicable to some relatively rich countries. Carbon tariff of the USA is a typical example of achieving this goal. Therefore, only some countries will participate and form an informal alliance, so it could not achieve extensive participation.

After the agreement, participation is mainly reflected in the compliance after the implementation of the policy. Institutional supervision and breach clause are the most effective ways to ensure compliance. Thus, the analysis will consider the supervision and management of the implementation of the participating countries in the program design and the punishment for violation of international agreements. The system design of Scheme 1 and Scheme 3 does not involve the specific content of breach of contract while Scheme 2 gives certain punishment to the withdrawal behavior of the participating countries, that is, the person who withdraws from the agreement will lose the current tax refund. Scheme 4 is only implemented within some countries, and there is no international uniform agreement, so it does not involve breach of contract.

In general, under the known system design conditions, the participation of Scheme 2 is likely to be more extensive than other schemes.

3.4. Operability

Operability usually refers to the feasibility or difficulty of the operation of the scheme.

Scheme 1 requires all countries to reach an agreement on the tax rate, and it is necessary to choose an independent organization to manage and distribute the tax revenue. In view of the current international situation, most individual countries are dominated by their own interests, and the unified tax rate is bound to damage the interests of some countries. Therefore, it is difficult to reach a consensus and maneuverability is weak.

Similar to Scheme 1, Scheme 2 also needs special international institutions and international carbon tax system, but it does not need to reach a unified tax rate, so negotiation might succeed in the initial stage.

Scheme 3 does not need a unified independent agency to manage tax collection and distribution, but it is still difficult to achieve a unified carbon tax agreement in the short term. Moreover, the formulation and implementation of transfer payment system from developed countries to developing countries will also face obstacles. Taking Germany as an example, Li and Du showed that the transfer payment for the purpose of regional redistribution may be invalid [15]. However, since the program is mainly implemented and coordinated within a country, it is more operable than Scheme 1.

In contrast, the institutional design of Scheme 4 seems to be freer and more coordinated. Although the scheme was once influenced by uncertain factors and opposed by developing countries, some developed countries have carried out theoretical research on the design of Scheme 4, and the theoretical basis and design ideas have been determined. In terms of implementation, domestic tax and border-tax adjustment do not need to be negotiated by many countries, and the implementation details of the plan are determined by sovereign countries [9]. Although it is likely to cause trade frictions, there is no doubt about its strong operability. The EU's measures to regulate the border carbon emission rights have provided reference for the implementation of border carbon tax regulation.

In general, when it comes to operability, Scheme 4 should be the best, followed by scheme 2 and scheme 3, and scheme 1 is the most difficult.

3.5. Discussion

According to the above analysis, the comparison results of the four dimensions are summarized in **Table 3**. The symbol ">" means better than; "≥" means may be better than or equal to, "≈" means approximately equal to.

Table 3. Results of the comparative analysis

Dimensions	Scheme 1
Cost-effectiveness	$1 > 3 \geq 2 > 4$
Fairness	$1 \approx 2 \approx 3 > 4$
Participation	$2 > 1 \approx 3 > 4$
Operability	$4 > 2 \geq 3 > 1$

According to the conclusion of the above four dimensions, the order of optimal, sub-optimal, medium and low, the values are assigned to score 4, 3, 2 and 1 respectively. The assignment results are summarized in **Table 4**. Through a simple assignment, it can be found that there is almost no difference in the scores of the first three schemes, while the score of Scheme 4 is significantly different from those of the first three schemes. Does this mean that Scheme 1, 2, 3 have the same degree of advantages and disadvantages, while the performance of the fourth scheme must be worse? This issue requires further discussion.

Table 4. Comparison of International Carbon Tax Schemes

Comparison point	Scheme 1	Scheme 2	Scheme 3	Scheme 4
Cost-effectiveness	4	2	3	1
Fairness	4	4	4	1
Participation	3	4	3	1
Operability	1	3	2	4
Total	12	13	12	7

4. Conclusion

The purpose of this dissertation is to do a research review of international carbon tax. International carbon tax schemes can be divided into four categories according to the existing proposals. From the theoretical analysis results of four dimensions, the first three schemes seem to be better, and the fourth scheme seems the worst. However, the first three schemes need certain preconditions which are quite difficult to meet all at the same time, while Scheme 4 is more easily implemented without necessary prerequisites and widely favored by the international community. Therefore, the discussion indicates that the process from Scheme 4 to the first three schemes is most likely to be realized.

This dissertation has a certain subjectivity and needs more further research and verification in the field of time and space. In addition, this study cannot include all variables. The content analysis also tends to be narrowed to some specific countries so that ignoring other factors that have not been taken into account. In view of the differences in institutional mechanism, social structure, industrial culture, the conclusion may not be effective under any circumstances. A more comprehensive and systematic research may be needed in the future, involving the experience and practice of more economies, breaking through the theoretical level, so as to make the international carbon tax research more practical and valuable.

Disclosure statement

The author declares no conflict of interest.

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