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Why Did China Design Its Emission Trading System Different than the EU?

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Abstract: Emission trading systems (ETS) contribute to economic efficiency by facilitating emission reductions where it is cheapest to achieve them. Polluters who would find it costly to reduce their emissions can buy emission allowances from polluters that can abate at lower costs. Through the comparison between the carbon trading market of the EU and China and an overview of each market, including key strategies and market performance, the reasons why China's designed its carbon trading market most suitable for its economy, along with the edges and costs of each market will be analyzed. This study indicates that China's current ETS design is beneficial for its current economic development; however, this design limits technological developments in renewable energy and transformations in economic structure. This will impact China's economic development in the future.

Keywords: the comparison between the EU and China's carbon trading market

1. Introduction

Many countries and regions have adopted carbon trading as a policy tool to limit greenhouse gas emissions through market-based instruments. By 2021, a total of 33 ETS will be in operation worldwide, covering power, industry, aviation, buildings, etc. as of 2021, 33 carbon trading systems have been put into operation, covering power, industry, aviation, construction, and other industries.

At the end of 2017, the overall design of China's ETS was completed and officially launched. China's National ETS Construction Plan (Power Generation Sector) clarifies that the ETS is a policy tool to control greenhouse gas emissions. The national ETS construction will take the power generation industry as the breakthrough point and will be steadily promoted in phases. On July 16, 2021, the national ETS was officially launched online. As of December 31, 2021, the cumulative volume of carbon emission allowances (CEA) traded in the ETS reached 179 million tons, with a turnover of 76.84%. Since 2013, seven pilot ETS has been launched in China.

As of December 31, 2021, the cumulative volume of carbon emission allowances traded in the seven pilots' ETS reached 483 million tons, with a turnover of RMB 8.622 billion. The pilot ETS is expected to continue to operate in parallel with the national ETS for some time, gradually becoming a national market [1].

Major ETS worldwide include the EU carbon market, the US Regional Greenhouse Gas Initiative, the Korean carbon market, the New Zealand carbon market, and China's national and pilot regional carbon markets. As of 2021, there are 33 operational carbon trading systems worldwide.

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The total GDP of these regions accounts for about 54% of the global total, and the population accounts for about 1/3 of the global population. Therefore, they cover about 16% of the total global greenhouse gas emissions (GHG).

The various ETS has raised more than $103 billion by auctioning allowances. In addition, eight ETSs are about to begin operations, and 14 are under construction.

2. Overview of EU's ETS

The EU ETS, the world's first carbon market to be launched, has seen its carbon price reach a record high in 2021. The EU ETS covers about 40% of the European Economic Area's emissions from the power sector, manufacturing, and aviation. It is the longest-running ETS in the world and is currently the second largest. 2020 is the last year of operation of the EU ETS's third phase and the intensive ETS's fourth phase. Although the carbon price dropped for a short period in March and April, from a high of US$29.68/t in January to a low of $18.04/t in April, the price gradually recovered after May and reached $33.89/t in July.

However, the price gradually recovered after May and reached $33.89/mt in July and has been hovering around $30/mt since then, finally reaching $42.16/mt in December. [1,2]. In 2021, the fourth phase of the EU ETS will be launched, increasing the annual total discount factor from 1.74% in the third phase to 2.20% and revising the benchmark value of free allocation for manufacturing [3-5]. In 2021, the European Commission submitted amendments to expand the coverage of the ETS further, adjust the market stabilization reserve mechanism, and establish a carbon border adjustment tax to prevent carbon leakage. The more stringent emission reduction targets have led to unusual activity in the EU carbon market in 2021, with carbon prices continuing to rise sharply, repeatedly setting new records.

The price of carbon has continued to increase dramatically, setting new records and reaching $75 per ton by the end of September 2021, much higher than other carbon markets.

3. Overview of China's ETS

On July 16, 2021, China's ETS went live, with the pilot ETS parallel to the national ETS. The trading center of the national ETS is located in Shanghai, and the carbon allowance registration system is in Wuhan. The two places will jointly assume the role of the pillar of the national carbon emission trading system.

The critical emission units covered by the national ETS are power generation enterprises (including self-provided enterprises in other industries) that emitted 26,000 tons of carbon dioxide equivalent (about 10,000 tons of standard coal) from 2013 to 2019. As a result, the power generation industry became the first to be included in the national carbon market. These enterprises emit more than 4.5 billion tons of carbon dioxide.

The Ministry of Ecology and Environment issued the "Carbon Emissions Trading Management Measures (Trial)," stipulating that the national ETS and the local pilot ETS will co-exist. As a result, enterprises not yet included in the national ETS will continue to trade in the pilot carbon market. In contrast, critical emission units included in the national ETS will not participate in the local pilot ETS.

The trading product is the carbon emission allowance (CEA) spot, which can take the form of an agreement. The specific forms of trading include listed agreement trading and bulk agreement trading. The transaction price of the listed agreement is determined between ±10% of the closing price of the previous trading day, and the transaction price of the block agreement is determined between ±30% of the closing price of the previous trading day.

In October 2021, the Ministry of Ecology and Environment issued the Notice on the First

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Compliance Cycle of the National Carbon Emissions Trading Market, requiring the provincial carbon market authorities to complete the approval and payment of allowances for the first compliance cycle and to strengthen the interface with the relevant systems of the national ETS. To ensure that 95% of the critical emission units in the administrative region complete compliance by 17:00 on December 15, 2021, and all critical emission units complete compliance by 17:00 on December 31. Critical Emission units may use national certified voluntary emission reductions to offset allowance payments, but not more than 5% of the allowances are to be paid.

4. Analysis and Discussion

As the most significant GHG emitter globally, China is under pressure to reduce its increasing carbon emission while maintaining rapid economic growth simultaneously. To meet the guidelines under the Paris Agreement and its ambitious economic growth targets as a developing country, China has established an emission trading system to regulate emissions and minimize the cost of emission reduction. Thus, to fulfill both circumstances in China, the Chinese have designed its ETS with several distinctions from the European Union's (EU) ETS. China's design of its ETS is distinct from the EU's because they do not have an absolute cap, does not create strong incentives for renewable energy, and has a significant disparity in its carbon prices.

A notable distinction between the two ETSs is that the Chinese ETS does not have an absolute cap. Instead, in China, the free allocation of an entity is determined by comparing its emissions against the average carbon intensity of the relevant sector [6]. Carbon intensity refers to carbon dioxide emissions per unit of GDP. Generally, carbon intensity indicators decrease with technological progress and economic growth. As a result, an entity's free allocation allowance will correspond to its verified emissions. Therefore, the current Chinese ETS does not work entirely based on a 'cap-and-trade' system. In contrast, the EU ETS works on a principle of 'cap-and-trade,' where there is a total limit set on the total GHG emission allowed by all entities under the system.

China's design of its ETS is beneficial for its economic growth because it ensures productivity. China's carbon intensity has also always been higher than the EU's. China's carbon intensity was 10.1 tons per person in 2019, while the EU's was only 6.8 tons per person [7]. This means that when China and the EU produce or generate the same substance, China will emit more CO2 than the EU. Therefore, if China currently adopts the same policy as the EU, it will disadvantage China's economic growth opportunities. China will not be able to produce or generate as much under a strict cap. This will reduce entities' revenue and affect China's overall economic development. Thus, a flexible cap is suitable for China in current circumstances. As China's technological development progresses, its policies may change gradually.

On the contrary, having no absolute cap will not encourage technological development. As the EU ETS imposes strict emissions limits on every entity under its system, these entities will not be able to produce or generate as much substance as they used to [8]. To ensure the same profit and revenue, entities may be forced to innovate and discover new methods to maintain their usual productivity with less emission. This will force development in technology. Such technological development will help the world reduce greenhouse gas emissions, thereby accelerating the pace of the world's realization of carbon neutrality. Because China's policy on emission caps is relatively flexible, many entities will not experience a significant reduction in their productivity [2,6]. Thus, many may not feel the necessity for rapid innovation and the utilization of new methods to protect their benefits. Though entities in China will gradually begin their innovative process to maintain and increase their productivity, China's technological development in many sectors will fall behind.

Chinese ETS design differs from the EU's because its policies do not create strong incentives for renewable energy. China's design of an emission cap principled on carbon intensity does not replace coal with renewable energy, instead only phasing out the less efficient coal plants [9]. The lack of

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incentive for China to make a transition from coal to renewables is due to this principle. The policy only favors coal plants that are more efficient than those that are less efficient because a more efficient coal plant can generate the same volume of electricity without the ETS but with a lower emission overall. As a result, China can work towards its emission target without jeopardizing the nation's energy security.

On the contrary, the EU incentivizes a transition from coal to renewables. Because their system is built based on cap and trade, where every ton of carbon an entity emit over its permit will be penalized financially [3-6]. Developing new renewable technologies will benefit European entities while sustaining their ETC compliance obligations; entities can maintain, if not enhance, their productivity without buying permits from other entities. This can increase their profit. At the same time, developing new renewable technologies can potentially create new business opportunities for the entity by selling their technologies to other needy entities. These will promote economic activities and communications in the region, thus stimulating economic growth.

China's ETS design is conducive to economic development. In 2021, coal account for 56% of China's total energy consumption [10]. Although solar and wind are now the cheapest energy sources, coal is used the most because wind and solar cannot generate electricity consistently. In addition, they are limited to many geographic areas and are highly weather-dependent. At the same time, current technology does not allow for large-capacity storage of renewable energy [11].

In contrast, there will be no large-scale power outages since coal can continue to generate electricity at any time and place. However, if China's ETS is designed to strongly encourage renewable energy and impose strict restrictions on fossil fuels to encourage a rapid transition from fossil fuels to renewable energy, commerce and industries will be forced to suspend operations. This will significantly impact the pace of China's economic development. Therefore, China's ETS design, which does not create strong incentives for renewable energy, provides a stable and consistent development environment for the economy.

Alternatively, this design of China's ETS will limit China's future economic development because it does not encourage technological development. China's flexibility in many of its ETS policies in comparison to the EU's is because China is still classified as a developing country. Under the Paris Agreement's guidelines, China is allowed to emit more GHGs than developed countries. As China continues to develop, it will eventually meet the standards of a developed nation. At the same time, the global ultimate emission target is to reach carbon neutrality by 2060 [12]. Therefore, China will have to transition from coal to renewable energy. However, as the current design does not encourage development in renewable, China will be uncompetitive in the future in the energy market when competing with European countries that were forced to incentivize renewable energy development at the beginning (European countries will most likely be able to produce cheaper and more effective renewable energies). Thus, China's current design of its ETS may set unfavorable conditions for China's economic growth in prospects.

Finally, another distinction between China's ETS design with the EU's is that China's carbon price is significantly lower. In 2022, carbon price in China is $9.29/ mtCO2e and $80.91/ mtCO2e in the EU [13]. This is essentially the money an entity must pay for one extra ton of emission allowance if one exceeds its permit. The carbon price in China is expected to rise to $10.50 in 2025 and subsequently rise to $13.75 by 2030 [14]. This demonstrates China's intention to gradually tighten its ETS policy and support a more widespread switch from fossil fuels to renewable energy sources. However, compared to the carbon price under the EU ETS today, the disparity is still significant to the expected carbon price under the Chinese ETS in 2030.

This ETS design favors China's economic development because it protects the industrial sector. The Industrial sector is the biggest in China economically, generating approximately 32% of China's GDP and accounting for roughly 50% of China's total emissions [15]. This data shows that the

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Chinese economy depends significantly on the industrial sector, which heavily relies on burning fossil fuels for energy. To protect the industrial sector while sustaining its emission targets, China has to set a carbon price to impose restrictions to limit emissions within a generally affordable range. If China sets its carbon price too high, almost all entities within the sector cannot afford extra emissions. This will significantly reduce their productivity and hence revenue. As a result, it is possible to see a substantial reduction in the Chinese GDP. This will discourage rapid economic development from occurring. Thus, setting the carbon price at a relatively affordable range will decrease emissions to some extent while ensuring somewhat sustainable development of the industrial sector.

From an alternative perspective, China's ETS design with lower carbon prices will affect the adjustment of China's economic structure. As mentioned previously, the Chinese economy is dependent on the industrial sector, and this ETS design ensures that the industrial sector can continue to grow sustainably while meeting its emissions targets. If the industrial sector occupies a large proportion of China's economic structure, the proportion of developing other sectors will be smaller. China will not have the energy to focus on developing the world's cutting-edge technologies and industries that align with the world's future economic trends: renewable energy, artificial intelligence, and biopharmaceuticals are expected to be the direction of development in the global economy. Since the global climate goal is to achieve carbon neutrality by 2060, the industrial sector will be limited in the future in proportion to its carbon emissions. The industrial sector will no longer be able to occupy and produce the current proportion. Therefore, if China maintains its current economic structure, the Chinese economy will lose its ability to sustain growth and will not be able to maintain its current global economic position. This will also make China uncompetitive in the development of emerging industries. In contrast, if China can optimize its economic development structure and make emerging industries gradually become an essential part of China's economic structure, this will benefit China's future economic growth.

5. Conclusion

In conclusion, though having no absolute cap and not incentivizing renewable energy ensures productivity and provides favorable conditions for the Chinese economy, both policies do not encourage renewable energy development. Furthermore, though having a lower carbon price help sustain the development of the industrial sector and other GHG emission-dependent sectors, it does not help optimize China's economic structure to make it more supportive of emerging industries. China's distinctive ETS design successfully ensures and promotes current economic developments; however, it will restrict China's economic development in the future.

This study is significant because it provides insights into potential adjustments to the Chinese ETS. Policies under the system should promote economic development in the short term and simultaneously lay the groundwork for future development. Chinese ETS should incentivize renewable energy development to ensure long-term sustainable economic growth instead of rapid, short-term development. The world is changing at a rapid pace; the focus of the global economy will be shifting to emerging industries. This study hints that the Chinese ETS should adapt its policy correspondingly to future economic directions and trends. China should transform its economic structure to support the development of emerging industries and gradually shift its dependence away from GHG emission-dependent industries.

Future investigations can focus on a specific ETS design in China and discover possible solutions to integrate the short-term and long-term economic development goals. By doing so, the design can not only support China's desire to claim a high global economic status while sustaining its economic position in the future. In the meantime, China should also discover methods to make its design more efficient by reducing emissions. For the world to reduce emissions effectively, the need for China,

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the largest emitter in the world, to take large initiative and make significant contributions becomes a necessity.

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