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HÀM Ý TỪ HỆ THỐNG THƯƠNG MẠI KHÍ THẢI LIÊN MINH CHÂU ÂU VÀ BÀI HỌC CHO VIỆT NAM

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Tóm tắt

Hiện nay, chính phủ nhiều nước đang tích cực tìm kiếm các biện pháp giải quyết vấn đề môi trường nghiêm trọng như biến đổi khí hậu, phát thải khí nhà kính… Nhiều công cụ dựa trên cơ thế thị trường đã được sử dụng, bao gồm thuế xanh (green taxes), chính sách CAC, và các chương trình mua bán phát thải (cap-and-trade). Hệ thống thương mại khí thải của EU (EU ETS) là hệ thống thương mại mua bán phát thải đầu tiên, lớn nhất và thành công nhất trên thế giới. Bài viết nghiên cứu tình huống điển hình của EU ETS để phân tích hiệu quả của các chính sách thương mại khí thải. Thông qua nghiên cứu tình huống, chúng tôi kết luận rằng sự thành công của EU ETS là đã tuân thủ chặt chẽ các điều kiện của định đề Coase: chi phí giao dịch thấp và các quyền tài sản được xác định rõ ràng và các thủ tục quản lý hiệu quả. Đây cũng là giải pháp ngắn hạn để giảm phát thải và nhằm tạo ra mục tiêu cho các doanh nghiệp đầu tư vào các công nghệ giảm phát thải. Tuy nhiên, hệ thống này vẫn còn khó phát triển ở các nước đang phát triển, đòi hỏi sự nỗ lực không ngừng của chính phủ và các bộ ngành liên quan. Bài viết đề cập đến một số kinh nghiệm cho Việt Nam khi chính phủ đã lên kế hoạch thành lập thị trường thương mại khí thải vào năm 2022.

Từ khóa: EU ETS, mua bán phát thải, hiệu quả, dựa trên thị trường, hệ thống thương mại phát thải.

IMPLICATIONS FROM THE CASE OF EU EMISSION TRADING SYSTEM

Abstract

Currently, many governments are concerned about the measures to dangerous environmental problems such as climate change, greenhouse gases (GHG)emissions. Many market-based tools are employed to address these issues, including green taxes, command-and-control policies, and cap-and-trade programs. EU Emissions Trading System (EU ETS) is the first, largest and most successful cap-and-trade in the world. This working paper uses the case study of EU ETS to

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analyze the efficiency of cap-and-trade policies. Through the case study, we conclude that the success of EU ETS is attributed to the guarantee of Coase theorem's foundation of low transaction costs and well-defined property rights and effective management procedures. This is also a short-term solution to reduce emissions, and it aims to create a long-term solution for firms to invest in emission-reduction technology. However, this system seems difficult to develop in developing countries. It is not impossible to implement, but it requires many efforts from governments from developing countries. This study provides some implications for Vietnam, in which the country has envisioned the establishment of a carbon trading system in 2022.

Keywords: EU ETS, cap-and-trade, efficiency, market-based, emission trading system.

1. Introduction

Environmental issues, including global warming, climate changes, water pollution, have caught many concerns in recent years. Environmental economics arises as a branch of economics that propose the application of economic tools in addressing environmental problems and studies on the impact of environmental policies (Cropper & Oates, 1992). Thus, environmental economics is valuable assistance of environmental policymakers. In fact, many governments have introduced regulations and laws based on market-approached to address environmental issues such as command-and-control (CAC) policies (Philippines Clean Air Act), green taxes (in UK, USA), etc.

Among these regulations, the cap-and-trade program, or tradable permit market, is a crucial policy currently being undertaken by some countries to reduce emissions. The motivating principle for the emission permit market is the Coase theorem. Coase theorem was first introduced by British American economist Ronald Coase in 1960, and it paved the way for many incentive-driven regulatory systems (Medema, 2014). In his article *The Problem of Social Cost (1960),* Coase argued that when the property right is well-defined, and the transaction costs are zero, private parties can negotiate a mutually beneficial and socially desirable solution. Based on this essence, tradable pollution permits, or so-called cap-and-trade schemes, were developed. In the cap-and-trade program, the government entity assigns property rights over certain public property; in this case, it is the permit or the right to pollute. In this system, each company is entitled to a certain number of permits or the maximum amount of pollution that it can discharge. This permit can be obtained for free or through auction. Thus, firms that pollute less can sell their unused permits to firm pollution more at a negotiable price. Ultimately, permit markets make it more affordable for firms to comply with environmental regulations and build incentives for firms to adopt or invest in cheaper pollution-reducing technology (Freeman & Kolstad, 2006).

In this working paper, we focus on examining the implications from a case study of EU carbon permit markets: the efficiency and the effectiveness of this cap–and–trade program in reducing emission problems.

In the literature review, studies on cap-and-trade schemes are examined and evaluated. Then, we provide an overview of the EU tradeable market and discuss important findings from the cases. Finally, we also compare the EU carbon permit markets and other emission tradable markets in other regions to draw some conclusions on cap-and-trade programs as a whole.

2. Empirical studies on cap-and-trade programs

The efficiency of cap-and-trade programs in tackling emission problems has become a research topic for many scholars. However, there have been mixed views of the *efficiency* and *effectiveness* of cap-and-trade programs in real-life applications.

On the one hand, some studies demonstrated that the cap-and-trade program or tradable emission system does not result in desirable outcomes in reducing the emission. These articles were conducted since some cap-and-trade systems were in the first phase of operation, often before 2010. Ellerman and Dubroeucq (2006) assessed the response of firms to *the emission trading system* to estimate the efficiency of this policy. Using the analytic technique and unit-level data, the data showed that roughly 85% of the reduction in SO_2 emissions in the US was due to *cutting emissions on individual producing units (cleaning up old plants)* rather than *moving production from high-emitting to low-emitting units* (investing in the new green plant instead of old plants) since SO_2 cap-and-trade system was first introduced in 1995. In other words, enterprises responded to prices mainly by cutting emissions on their own plant instead of trading permits between firms. This action can be described as "cost-saving without emissions trading", which would go against the purpose of the cap-and-trade system that incentivizes the investment in green technology (Burtraw, 1996).

Andrew (2008) argued that the Emission Trading System (ETS) is more complex to implement and more uncertain in quantifying impact compared to other climate policies such as carbon tax. Analyzing some core sciences on climate change, he pointed out three disadvantages of ETS compared to Carbon tax: 1) The unpredictability of prices in an ETS has a negative effect on business operation in terms of investment decisions and economic activity; 2) ETS requires a range of new institutions, which is much more complex to implement than Carbon Tax; 3) ETS market is inherently more exposed to fraud and delusion. Briefly, the cap-and-trade program may not be appropriately designed to cope with the existing problems of climate change.

Applying Leontief's input-output model based on the data from the US Bureau of Economic Analysis, Chamberlain (2009) demonstrated that cap-and-trade does not represent a less costly way to deal with climate change in terms of economic impact, which is contrary to the target of cap-and-trade: cost-effectively reducing emission. This study discussed the macro-level impacts of cap-and-trade programs: income group, age group, US region, type of family, consumer prices.

Cap-and-trade system would restrict output and increase prices for carbon-intensive products. This study also revealed that the cap-and-trade scheme could hurt the US labour force by cutting 965.000 jobs, reducing economic output by $136 billion per year, decrease household earnings by $37.8 billion (equivalent to about $1.145 per household).

Hanemann (2010) addressed that cap-and-trade is still necessary but insufficient for an effective climate policy. In this study, the evidence from SO_2 trading indicated that its success in reducing SO_2 appears to be attributable not just to the price signal it created but also to the fact that it enforced a strict yet flexible performance standard on the regulated businesses. Another reason for its success is because the cap-and-trade program showed effects on a small number of companies, particularly fewer than 500 power producing companies. However, GHG emissions are widely distributed throughout the economy. The emission trading system is unlikely to be sufficient to attain the targeted reduction in GHG emissions without the complementary measures by policymakers. The author also pointed out that an upstream cap-and-trade theme will be more cost-effective and complete than a downstream cap-and-trade theme when applying.

Another downside of cap-and-trade programs would be their vulnerability to regional changes. Especially during a recession, the output would reduce, causing the changes in demand for emissions allocations and then the permit prices of GHG emissions (Bailey, 2007). In addition, overgenerous cap allowance would undermine the desired environmental impacts of the cap-and-trade system.

On the other hand, many scholars proved the desirable results of cap-and-trade schemes in lowering emission level and appreciates the preferable long-term outcomes of this system. These studies were mainly executed in recent years since 2010, in which some cap-and-trade systems have been considerably reformed, entering the 2nd or 3rd phase of development. Particularly, Chan *et al.* (2012) argued that the US SO_2 Allowance Trading program had proven its great success by almost all measures. This study examined the design, legislation, execution, performance, and implications of this path-breaking application of economic reasoning to the environmental law system, drawing on a research workshop and a policy roundtable held at Harvard in May 2011. Cap-and-trade appears to be particularly well suited to tackling climate change, although GHG emissions are evenly distributed across the world atmosphere. This study highlighted that recent opposition to cap-and-trade in climate legislation debates in the United States might indicate the broader political nature of the issue rather than the substantive excellence of market-based regulation. The shortcoming of previous emission trading programs can be overcome with a cap-and-trade design and strong monitoring.

Zuckerman *et al.* (2014) argued that California would meet its targeted emission reduction under the cap-and-trade program as long as the cap is enforced and meet its long-term target of clean technology if the carbon price is high. By modelling abatement options across a range of carbon prices, they found that the modelled project investment would be profitable at any carbon price or even above the floor but only reach the firm's internal target on investment at a high carbon price. They also discovered that some fuel switching choices (tires) are financially appealing even without a carbon price, while others are extremely financially appealing with a carbon price (biomass, co-firing). Non-price barriers, on the other hand, are significant, particularly concerns regarding future availability and prices of alternative fuels.

Mu *et al.* (2018) investigated the impact of cap-and-trade on household income and social equity to further estimate its benefits. Using a computable general equilibrium (CGE) model, they discovered the economic impact of directly returning the government's revenue from the ETS to citizens in China. This study reveals that by 2050, some industries, such as the coal sector, will face a fall in employment by 63.8% and by 75.3% under the ETS scenario. However, this unemployment effect can be minimized by targeted transfers to the displaced coal work using ETS revenue. The study also found that if ETS revenues are redistributed by population, it could gradually reduce the gap between the poor and the rich. At the national level, ETS policies show a positive impact on GDP due to the income effect of revenue recycling.

The major advantage of the cap-and-trade system is that it provides the flexibility for regulated firms to comply with laws at low compliance costs (Stuhlmacher et al., 2019). The cap-and-trade system often results in the regional clustering of pollution if it is more economical for firms to buy emissions rather than implementing reducing emission technology.

Theoretically, cap-and-trade gives firms incentives to invest in cleaner technologies in the long run. Zhang *et al.* (2020) analyzed the impact of pilot ETS in China from the viewpoints of economic advancement, technological optimization, and innovation driven-development using the PSM-DID model based on 2005-2017 provincial panel data. This study showed that: 1) the pilot ETS program in China reduces carbon emission by 14.5% on 7 regulated sub-sector industries but also reduces GDP by 4.8%, without reaching the low-carbon economy target; 2) Economic development factors (GDP and gearing ratio) have a negative relationship with reducing emission while technological optimization and innovation, in contrast, are key factors to attain environmental benefits; 3) The Pilot ETS produced a 60.1% carbon emission inhibition effect and 23.2% GDP inhibition effect on sub-sector industries with higher environmental responsibility. In conclusion, the efficiency of Pilot ETS in reaching environmental benefits and the negative impact of ETS on the economy is an inevitability.

In terms of long-term benefit, using the DID and spatial panel model, Dong *et al.* (2020) pointed out that CETP (carbon emission trading policy) can effectively reduce CO_2 and SO_2 emissions by 19.1% and 37.0%, respectively; promote 6.1% of clean energy consumption and 4.6% of green technology. This study also analyzed further benefits from CTEP, which are residents' health and regional economic output improvement (by 12.4%).

In short, previous studies have examined many aspects of the cap-and-trade system. Scholars have a mixed view of the efficiency of the emission trading market. It is clear that before 2010, many studies critiqued the feasibility and efficiency of this environmental regulation. In the first phase of development, the operation of the cap-and-trade system may not be as smooth as expected, resulting in low desirable impacts. Since 2011, many other studies have provided convincing evidence of efficiency in reducing emissions by applying for cap-and-trade programs, especially for long-term incentivization on green technology. Also, in recent years, methods for quantifying the impacts of cap-and-trade programs were advanced to be more precise, producing a better estimation of cap-and-trade systems on the environment and the economy.

3. Case study: EU Emission Trading System (EU ETS)

3.1. An overview of the EU permit market

Established in 2005 as the first international emission trading system, European Union's Emissions Trading System (EU ETS) included more than 11,000 installations and covered roughly 40% of greenhouse gas (GHG) emissions (Feng et al., 2011). This cap-and-trade system has two important features: emission cap (the maximum amount of emission that firms can release) and EU emission allowances (EUAs) (European Commission, 2021). In addition, EU ETS's establishment gives rise to the other trading systems in many countries such as China, New Zealand, and South Korea (European Commission, 2021). EU ETS allows EUAs for free allocation or auction. To track to EUAs, EU ETS members are required to register in the Union registry. Trading EUAs does not require brokers and can be directly conducted through organized exchanges or via intermediaries (Joyeux & Milunovich, 2010). Thus, the system provides flexible and cost-effective ways to reduce GHG emissions.

The scheme has been separated into several trading periods. The first period is from January 2005 to December 2007, the next is from January 2008 to December 2012, and the third is from January 2013 to 2020, and currently in phase 4 from 2021 to 2030. The division in each phase implies a modification according to the changes in business environments and business activities in Europe, as well as the reevaluation of environmental commitment.

3.2. Research aspects of EU ETS

EU Emission Trading Scheme or so-called EU ETS also has the centre of some studies. These studies examined different aspects regarding the impacts of EU ETS. Bushnell, Chong and Mansur (2009) investigated how this trading system affected the firm's profit with a sample of 552 stocks from the EUROSTOXX index. The study showed that environmental trading regulation like this significantly impacted the stock price of firms, and it also predicts that the increased revenue would offset the increase in regulatory costs. Joyeux and Milunovich (2010) used the cost-of-carry model to examine the extent of market efficiency of EU ETS from June 2005 to December 2007. Feng, Zou and Wei (2011) used a random walk model and chaos theory to investigate the impact of carbon market internal mechanism of carbon prices, drawing some suggestions for regulating and developing the carbon market. Primarily before 2013, they did mention the impacts of this system on other aspects of firm operations but did not clearly examine the effectiveness of the market. Moreover, after 2018, EU ETS was subject to a significant change in its operation, which significantly evidenced the efficiency of the tradable market. Therefore, it is worth examining the current efficiency of EU ETS after the reformation.

3.3. Data evidence of GHG emission reduction success

The EU ETS has proven its effectiveness in reducing emissions economically. During 15 years from 2005 to 2019, installations covered by the ETS cut emissions by 15%.

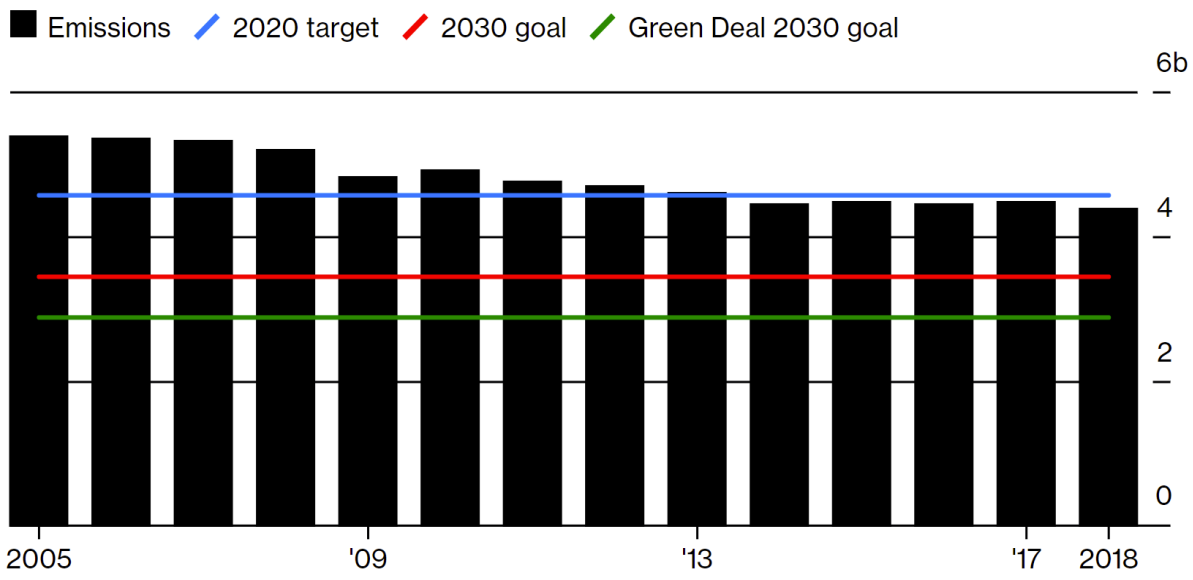

Figure 1. EU Emissions, in metric tons of CO_2 equivalent

Source: European Environment Agency (2021)

Figure 1 illustrates the carbon emission in the EU since 2005, when the EU ETS was introduced. The carbon emission decreased gradually over the years and achieved the target for better than expected. Notably, the carbon emission reached the 2020 target (the blue line) in 2014.

Thus, EU emissions can reach the 2030 target of cutting pollution by at least 55% from 1990 levels and the Green deal 2030 goal of making the region carbon neutral before the deadline.

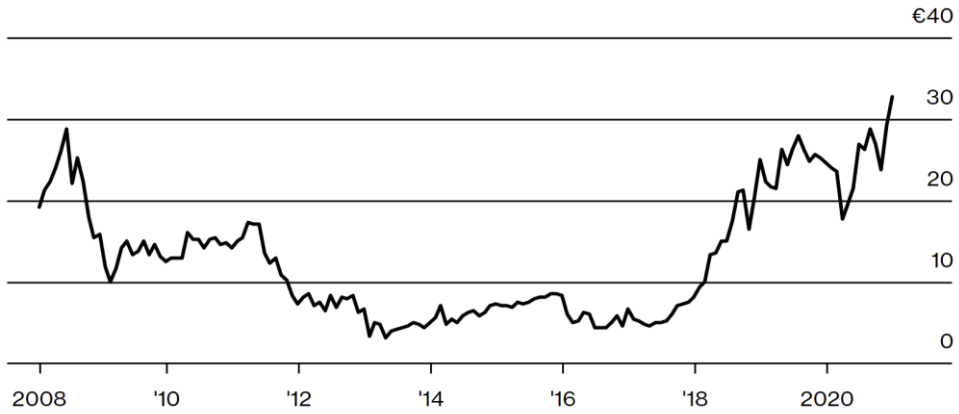

Figure 2. Price of permit allowance of 1 metric ton of CO_2 equivalent

Source: European Environment Agency (2021)

Figure 2 illustrates the price of permit allowance over the years. It can be seen that the price of carbon permits is relatively low, less than 10 euros since the global crisis in 2008. Since 2018, the carbon permits have soared to 25 euros. Currently, the price of the permit allowance is 32.7 euros. EU ETS has limited permit allowances, and the supply for permits also shrank. The price of permit allowance began to rise in 2013, in alignment with the volume of permits that were issued by EU ETS contracted by 1.74% annually and will reduce 2.2% in 2021 (European Environment Agency, 2021).

With the supply for permits shrinking, the company now needs to consider a more long-term solution of investing in low-carbon emission devices. It is the main target of the program: EU ETS will gradually reduce the market size of the carbon permits, ultimately putting pressure on the producers to change to clean operation. If producers hesitate to change to the low-carbon emission method, they will face the substantially high cost of buying carbon permits.

4. Discussion

4.1. Foundation for the efficiency of the EU ETS system

It should be noted that the EU ETS system achieves its efficiency in tackling emission reduction because the conditions under the Coase theorem were guaranteed.

The cap-and-trade system operates according to this essence. Then, who is the first owner of the property right? Specifically, in cases of environmental problems, the property rights are classified as government-owned. After coming up with a desirable aggregate level of pollution, the government will issue a specific number of permits, each allowing firms to produce a certain amount of polluters. The government may distribute the permits to the industry through auctions or free allocation. The government is the actor that ensures the property is well-defined and

publicly guarantees this property right for firms. All firms in this system are aware of the clear and well-defined property rights of the firm itself and other firms. After this distribution, some firms may find the allowable amount of pollution too costly for them to meet, and they start to demand more permits, while the other firms find they do not need as many permits as they have and are willing to trade it for money. Transactions kick in, and eventually, a market for permits is established. Notable, in this cap-and-trade system, the substantially low transaction cost is attributed to a number of reasons. The transaction costs include the costs of finding potential trading partners, negotiating contracts, tracking the compliance of the trading partners, etc. The formation of the Emissions Trading Registry, a web-based application that records CO_2 allowances and units distributed to and held by person and government accounts, enables the reduction of transaction costs (European Commission, 2021). The website also enables traders to know how allowances and units are traded between accounts, the number of annual verified emissions of installations, and the annual compliance status of installation as well (European Commission, 2021). Thanks to the support of this website, trading parties can easily identify and negotiate with other partners without incurring the costs of intermediaries. Information is also guaranteed to be perfect, reducing the additional costs caused by asymmetric information. Also, the website also helps trading parties monitor the compliance of their partners.

The process of buying and selling emission permit is the process in which property rights are granted from one firm to another, and it works just as the Coase theorem's essence: If one firm finds the benefit of gaining more emission allowances (profits from producing more) higher than the cost of that (price of permits), it will continue to buy more permits until cost and benefit equalize each other.

The cap-and-trade system is a large-scale, two-staged Coasean Negotiation with a large number of parties. In the first stage, the property right is granted to the industry by the government, and in the second stage, property right is transacted among the firms.

Besides the guarantee of Coase theorem's foundation, EU ETS's management ability by operators was also attributed to the success of the system. The system also required its members to register the permits for each year to examine and control the action of the market. In fact, the EU ETS system has two-level organization involving central management and environmental protection departments from governments of members (Knight, 2011).

4.2. Feasibility of EU ETS in the long run

The effectiveness and efficiency of the EU ETS are shown clearly on their yearly reports, and the system succeeded in gaining 2020's GHG emission target in 2014. However, this is where its backsides started to be revealed.

From 2008 to 2018, the price of tradable market volatility was worth considering. The carbon permit price was significantly low, even lower than 10 euros. It raised concerns about whether the regulation can effectively reduce pollution. When the price of permits is low, firms are more likely to discharge more and buy permits from others instead of investing in technology to reduce emissions. It may go against the purpose of the program: provide incentives for firms to innovate emission-cut technology.

The quick plummet in the emission trading market sent negative signals to EU ETS operators to reform the system. EU ETS soon responded to it by withdrawing certificates of permits from the market. With the supply of permits decreasing, the manufacturers now need to consider a more permanent solution, that is, to invest in low-carbon equipment. The main objective of the EU ETS is the gradual reduction in the size of the carbon permit market, ultimately putting pressure on manufacturers to change to a cleaner operation. If manufacturers hesitate to change to a low-carbon approach, they will eventually have to cut production as they face substantially high permit prices.

4.3. ETS system encounters difficulties to effectuate in many developing countries

Many environmentalists call for local, regional, and international permit markets to be established to tackle GHG. Nevertheless, it is exceptionally challenging for many such parties to come to a convention. Moreover, especially for developing countries like India, a restraint on carbon emission will hinder economic growth. Therefore, developing a carbon market solely from well-intentioned participants will not solve the problem, as any progress made to limit the carbon emissions of industrialized countries will be offset by countries not a party to the agreement.

This is partly due to the nature of GHG, as it is produced by numerous utilities and industries in every country. It is arguable that environmental problems caused by fewer actors, like pollution of rivers, will be more suitable for a cap-and-trade system. Reaching an agreement among many parties in developing countries seems particularly challenging, and it requires governments to make many efforts. The effectiveness of cap-and-trade systems also depends on the management ability of the operators themselves, but in developing countries, creating a well-designed management tool for controlling and tracking the emission market is relatively difficult. As a result, it is still questionable to introduce this system in many developing countries.

4.4. Comparison to other cap-and-trade programs in Asia

The introduction and operation of EU ETS have inspired the implementation of other cap-and-trade programs in other regions, especially in Asia. Some existing cap-and-trade programs in Asia include South Korea's ETS, China's ETS, Japan's two sub-national ETS in Tokyo and Saitama (Ritchie, 2020). The tradable emission market in Asia is still relatively young and new since the major instrument to tackle GHG emission is carbon taxes. This environmental program

is primarily implemented in top technologically advanced countries and also the largest contributors to global greenhouse gas emissions, i.e., South Korea, China, and Japan, but the operation is still limited, not as smooth as in the EU. ETS systems in Asian countries functioned in the same way as EU ETS and often responded to the changes in EU ETS. In other words, EU ETS acted as a benchmark for these systems in Asia to follow and adjust their permit prices. Notably, Asian countries often run pilot programs before reaching the final agreement of forming and launching ETS.

However, the ETS systems in Asia covered a smaller number of key sectors that significantly impact the level of greenhouse gas emission; for example, in China's ETS covers only 8 sectors. Moreover, the cap-and-trade programs in Asia are still limited in each country boundary and have not formed an inter-regional system like EU ETS.

Notable, some developing countries such as Indonesia, Vietnam, Thailand are currently in the progress of building such emission systems. However, the difficulties that such many developing countries face in developing a cap-and-trade system are limited private financing, lack of a regulatory system, corruption due to the central economy, accessibility to information, and local capacity to manage the system.

4.5. Implications from EU ETS for Vietnam

In November 2020, Vietnam's National Assembly revised Law on environmental protection and proposed a framework for establishing a domestic emission trading scheme. Ministry of Finance (MOF) and the Ministry of Naural Resources and Environment (MONRE) envisioned the timeline for the ETS scheme, in which a pilot system will start by 2025 and fully operate by 2027 (World Bank, 2021).

An important step towards the implementation of the ETS system in Vietnam is the installation of an MRV system (Monitoring, Reporting and Verification system). MRV system contributes to envisioning, calculating and managing the emission trading in the ETS system. It requires the country to carefully outline the relevant reporting frameworks for reporting the GHG emissions for sectors. Besides, the country also needs to develop a thorough emission abatement measure to calculate the suitable cap allocated each year. Discussion with experienced partners like the EU and the US would be preferable for Vietnam to gain more experience and consultation.

Vietnam has planned to run a pilot program on several emission-intensive sectors, including steel, solid wastes, and power sectors. The pilot program aims to test the efficiency of the ETS system as well as check whether the expansion to other sectors is feasible. When it comes to the final scale of the ETS system, it is preferable that it should cover all sectors rather than just sectors in the pilot programs. According to (Nong et al., 2020), in the long run, Vietnam's ETS system

should be designed to include all sectors rather than just GHG emission-intensive sectors since some adverse effects of the ETS system (reducing GDP, PPP, etc.) would be minimized when the system would be implemented in the large scales with various sectors.

Lowering the transaction costs by simplifying the procedures is a crucial factor to improve the efficiency of the ETS system. The government should consider the digitalization of procedures and intensive training for businesses in order to help them engage in the digital ETS system more effectively. Moreover, public trading must be carefully regulated, and frauds must be fined heavily to improve the overall transparency of the system. It would be a challenge for Vietnam since the democratic system would easily result in corruption and illegal emission trading, distorting the objectives of the ETS system.

Furthermore, the government should be aware that the ETS system should incentivize investment into green technologies in all sectors. As a result, the cap for each year should be gradually reduced, and investments or grants by the government should be provided to businesses to accelerate the transformation to new green technology.

Another implication for Vietnam's ETS is that the government can consider the regional linkage ETS system. In the EU, the ETS system was linked among members countries in which they can trade emissions across borders (Nong et al., 2020). In ASEAN, there are also some countries that would envision plans to establish an ETS system, including Thailand, Indonesia, Philippines. Regional linkage would somewhat reduce GHG costs and provide more incentives for firms to adopt green technology for competition. However, market design, compensation as well as political issues must be taken into consideration for the regional ETS system (Nong et al., 2020).

5. Conclusion

The cap-and-trade program, or the so-called tradable permit market, is considered an important and efficient way to discuss environmental problems, especially in emission reduction. EU ETS is the first and the largest permit tradable market in the world. Its success in achieving emission reduction goals is attributed to the strong compliance with the Coase theorem of well-defined property rights and low transaction costs, and effective management procedures. From 2008 to 2018, many concerns were evoked about the effectiveness of the system as the price dropped to a remarkably low level. Fortunately, the recent reformation with the withdrawal of permits to push the permit prices up has shown its effects. It should be noted that the tradable market is a short-term solution to tackle emission cuts, and this system should be designed to create incentives for firms to adopt and invest in emission-effective technology. Technological innovation in reducing emissions is a long-term and more sustainable solution.

The success of EU ETS has inspired the introduction of other emission tradable markets in the world, such as in some developed countries in Asia. However, it should be noted that although the cap-and-trade systems are a very "attractive" way to tackle pollution problems, implementation and management this system in developing countries still meets some challenges. The major obstacles include limited private financing, lack of a regulatory system, corruption due to the central economy, accessibility to information, and local capacity to manage the system.

Findings from the EU ETS have provided some implications for other cap-and-trade programs. Firstly, the cap-and-trade system must have a well-managed procedure to ensure transparency and perfect information among parties and keep track of the trading activities in the market. Secondly, adjusting the permit prices is also important. As the goal of the cap-and-trade system is to provide incentives for firms to invest in emission-reduction technology in the long run, it should gradually withdraw the number of permits in the market, and the number of permits to withdraw must be calculated very carefully. Thirdly, developing the inter-regional tradable systems can reduce the emissions better than developing the sole system in each country. This joint system can enable many countries to join hands and assist each other in reducing the emission at a more affordable price, but it also requires much management effort. Forming the inter-regional emissions carbon systems can enable many developing countries to have a chance to reduce the emissions more quickly than the conventional permit quotas policies.

Vietnam has recently proposed a plan to implement the ETS scheme, starting with a pilot study by 2025. There are some considerations for the ETS scheme, including the broad coverage of sectors in order to lower the output reduction, MRV system and transaction cost minimization, as well as the regional connection with some developing countries.

The cap-and-trade market is an exciting topic that requires more research. Future research could investigate the capacity and feasibility of developing such systems in developing countries and propose some recommendations for policymakers to better enhance the performance of emission trading systems.

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