



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



**Global Trade Analysis Project**

<https://www.gtap.agecon.purdue.edu/>

This paper is from the  
GTAP Annual Conference on Global Economic Analysis  
<https://www.gtap.agecon.purdue.edu/events/conferences/default.asp>

# The impact of EU's Carbon Border Adjustment Mechanism on China's economy

Jlanwu He, Shantong Li

In 2021, the EU released a detailed proposal for the Carbon Border Adjustment Mechanism (CBAM), which attempts to require products exported to the EU to pay carbon tariffs or purchase carbon emission rights. The EU is China's second largest export market, and the carbon emission intensity of China's export products is significantly higher than that of many other countries. Therefore, the full implementation of the carbon border adjustment mechanism will directly weaken the competitiveness of my country's exports to the EU, which will have a negative impact on the overall economy and employment. In the event of a larger impact, it is necessary to assess the relevant impact in advance and propose countermeasures.

## **1. Lower carbon price and higher carbon emission intensity determine the impact of EU carbon border regulation mechanism can not be underestimated.**

In order to comply with the stricter emission reduction targets proposed by the EU's "European Green New Deal", the EU considers adopting a carbon border adjustment mechanism to replace the previous "ETS emission rights free allocation + electricity price subsidy" measures to increase the carbon cost of EU imports and relatively increase EU companies' competitiveness, reduce carbon leakage (ie, the increased carbon emissions of companies moving to areas with lower carbon constraints offset the EU's carbon reductions), increase carbon revenue, and reduce the pressure of financial subsidies. The specific measure of the carbon border adjustment mechanism is to require products exported to the EU to bear the corresponding carbon cost according to the EU's carbon price and its own carbon emissions. Therefore, carbon price and product carbon emission intensity have become two important factors that determine the impact of the carbon border adjustment mechanism.

Carbon prices in China are much lower than in the EU. The draft CBAM basically refers explicitly to the price of the EU carbon market, but allows offsetting carbon costs already borne outside the EU. The carbon cost of exporting EU products therefore depends on the carbon price gap between the exporting country and the EU. China's nationwide carbon market has just started, and the average price per ton of CO<sub>2</sub> in the pilot market is less than \$4, while the EU's carbon price is close to \$50.

The carbon intensity of Chinese products is significantly higher than that of the EU and many other countries. On the one hand, coal dominates the overall energy consumption. The proportion of coal-fired power in my country is close to 70%, much higher than the EU (15%) and the global average (36%). On the other hand, the stage of development determines my country's role in the global division of labor to produce more energy-intensive and highly polluting products. For example, in 2020, 57% of the world's primary aluminum and primary steel are produced in China. These two reasons determine that China's carbon emission intensity is relatively high. In 2019, China's carbon emissions per unit of GDP was 0.1945 (kg carbon/dollar), which were 3.8 times and 1.7 times the EU average and the world average, respectively.

Lower carbon price, higher carbon emission intensity and the European Union as the second largest

export market in China determine the potential impact of the carbon border adjustment mechanism.

## **2. The carbon border adjustment mechanism can be roughly attributed to two different scenarios**

At present, there are still variables in the possibility of implementing the carbon border adjustment mechanism and the specific implementation time, method and scope, especially the scope of product coverage and the scope of product carbon emission measurement. In response to these uncertainties, two scenarios of carbon border adjustment mechanisms are designed to analyze their possible impacts.

The first is the partial scenario, that is, the scenario in which both the product coverage and the product carbon emission measurement range are narrow. The partial scenario only includes five categories of high-carbon-emitting products that are prioritized by the EU draft, namely steel, cement, fertilizer, aluminum and electricity. At the same time, when calculating the carbon emissions of products, only the direct carbon emissions prioritized by the EU in some scenarios, and other indirect carbon emissions are not considered for the time being.

The second is the comprehensive scenario, that is, the full coverage of products and carbon emissions. Products involve all primary products and industrial finished products, and the measurement range of carbon emissions from products includes not only direct carbon emissions, but also indirect carbon emissions for the production of intermediate inputs required for the production.

In addition, although the draft EU carbon border adjustment mechanism proposes three different ways of carbon tariffs, emission rights and consumption taxes, the essence is to increase the cost of imported products, but there are certain differences in the ways and links of the increase, and they can also be converted into The corresponding carbon tariff equivalent. To simplify processing, carbon tariffs are used in both scenarios.

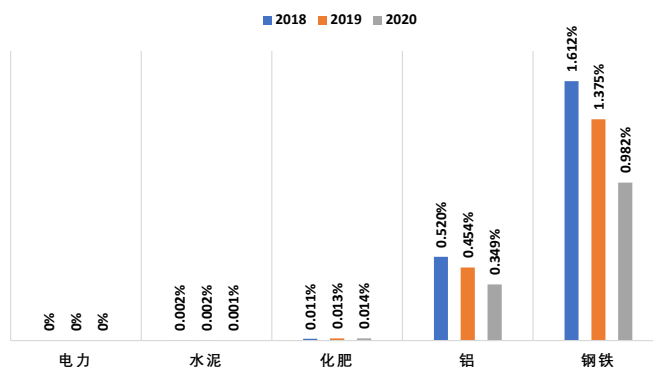
CBAM further affects the development of various countries' industries and the overall economy mainly by increasing trade costs. Therefore, a global model connecting different countries and regions around the world is used to simulate and analyze the impact of CBAM. The report first divides the world into 16 countries and regions (see Appendix 1), and calculates the carbon emissions of products in these countries and regions according to the GTAP global database (see Appendix 2). The difference in price (see Appendix 3) is used to estimate the carbon tariffs that need to be levied on CBAM-covered products (see Appendix 4), and finally two scenarios are simulated based on ENVISAGE, a globally computable general model built by World Bank. By comparing the simulation results under the two scenarios with the case of the no-carbon frontier adjustment mechanism, the difference is the impact of the carbon frontier adjustment mechanism.

## **3. The impact of the EU carbon border adjustment mechanism is very limited under the partial scenario**

If the carbon border adjustment mechanism covers only a few high-carbon products, China's impact will be very limited, both on its own and compared with other EU trading partners. The calculation results show that under the partial scenario, CBAM will lead to a 0.02% drop in China's GDP and a 0.07% drop in exports to the EU. There are four main reasons for this.

First, the five categories of products that preferentially participate in the carbon border adjustment

mechanism are not the main products China exports to the EU. Data show that in 2020, China’s exports of electricity, cement, fertilizers, aluminum and steel to the EU will be 0, 0.1, 0.5, 1.36 and 3.84 billion yuan, respectively, accounting for only 1.35% of China’s total exports (see Figure 1). For these products, China is not the EU's main source of imports; the steel with the largest export value only accounts for 8.6% of the EU's total steel imports.



Data source: <https://www.trademap.org/>

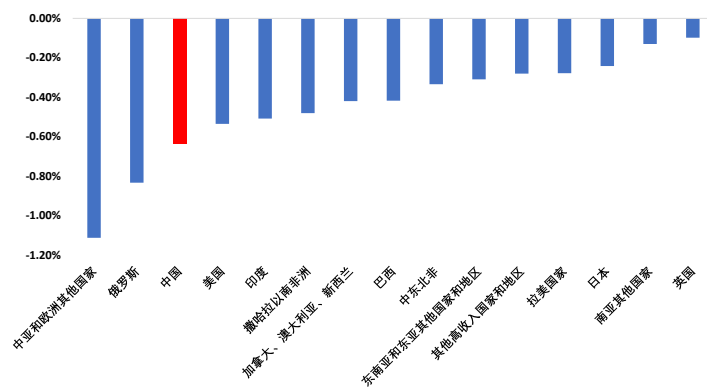
**Figure 1 The proportion of high carbon emission products identified by the EU in China’s total exports to the EU**

Second, only direct carbon emissions are considered in local scenarios, and the added carbon cost is limited. The EU draft proposal initially only involves direct emissions from the production process of products, and does not consider indirect emissions from the production of inputs (electricity and other products) in the production process. Under this setting, the carbon tariffs for five commodities including electricity, cement, fertilizer, aluminum and steel are 31.8%, 3.6%, 0.9%, 0.5% and 3.0% respectively. There is basically no export of electricity, and carbon tariffs on the other four commodities are relatively low.

Third, these products are basically upstream products with short industrial chains, so the indirect impact on other departments is relatively small. The five types of high-carbon products are basically intermediate inputs, which are in the upstream of the industrial chain, and their export restrictions have relatively little indirect impact on other industries. The calculation results show that the export of electricity, cement, fertilizer, aluminum and steel drives the output of other industries by 1.48, 1.35, 1.67, 1.58 and 1.20 US dollars per dollar respectively, which is smaller than the average level of manufactured products (1.64 US dollars) ( See Figure 2).

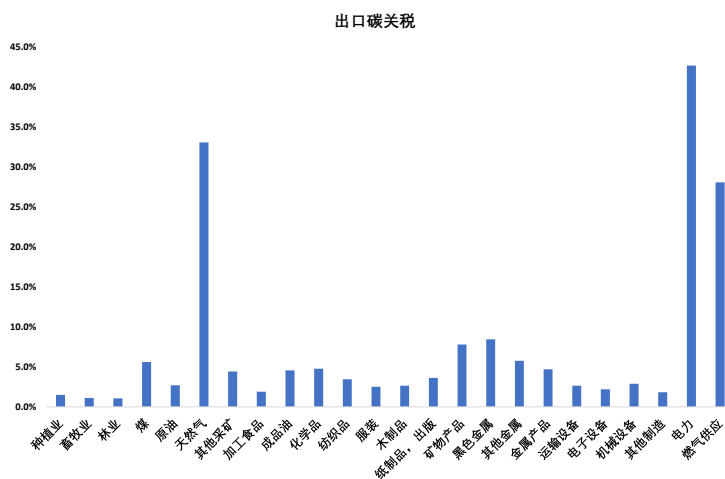


show that countries with closer trade links with the EU (especially high-carbon emission products trade links) and countries with higher carbon emission levels are more affected by the EU carbon border adjustment mechanism. Compared with not implementing the EU carbon border adjustment mechanism, China's GDP will be reduced by 0.64% under the full scenario, which is second only to countries with very close trade with the EU (such as Russia, Central Asia and other European countries and regions, etc.). In addition, once the EU carbon border adjustment mechanism is fully implemented, it will lead to a loss of about 2.3 million manufacturing jobs in China in the short term.



**Figure 4 The GDP of different countries and regions is affected by the carbon border adjustment mechanism under the comprehensive scenario**

Second, under the comprehensive scenario, the export cost of my country's manufactured goods to the EU will increase by 3% on average. The calculation results show that carbon tariffs are generally high due to the large amount of carbon emitted by energy products; in addition, ferrous metals (steel), mineral products (building materials), other metals (such as aluminum smelting), chemical products and other high energy consumption. The carbon tariff level of the industry is also relatively high, at 8.4%, 7.8%, 5.7% and 4.8% respectively; in comparison, the export carbon tariff of agricultural products, food and electronic products is relatively low, basically around 2%.

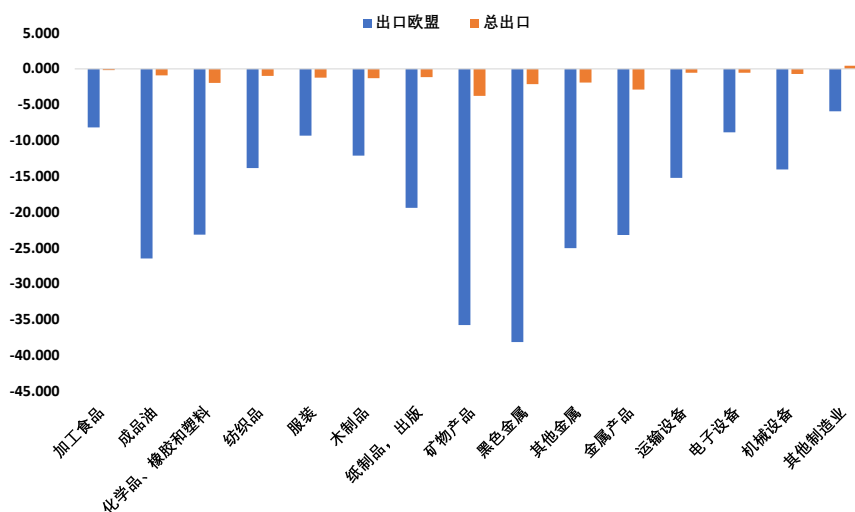


Data source: the author's calculation

**Figure 5 China's carbon tax levels in different industries exporting to the EU**

Third, China's exports to the EU will drop significantly under the comprehensive scenario. Exports are most directly affected by the EU carbon border regulation mechanism. The simulation results show that

in the full scenario, exports of manufactured goods to the EU as a whole would fall by around 13%. The impact on exports varies significantly by sector (see Figure 6). First, the energy sector has the greatest impact, although China's energy exports to the EU are very small and negligible. Secondly, ferrous metals, mineral products, other metals, petroleum processing, chemical products and other industries have a relatively large impact on EU exports, with a decline of 20%-40%. The largest ferrous metal exports to the EU fell by 38%. Third, industries such as food, clothing and electronic products have a relatively small impact on EU exports, basically around 8%. Affected by the decline in exports to the EU, China's total exports will drop by 1.2%, and the output of various manufacturing industries will drop by 0.8%-4%.



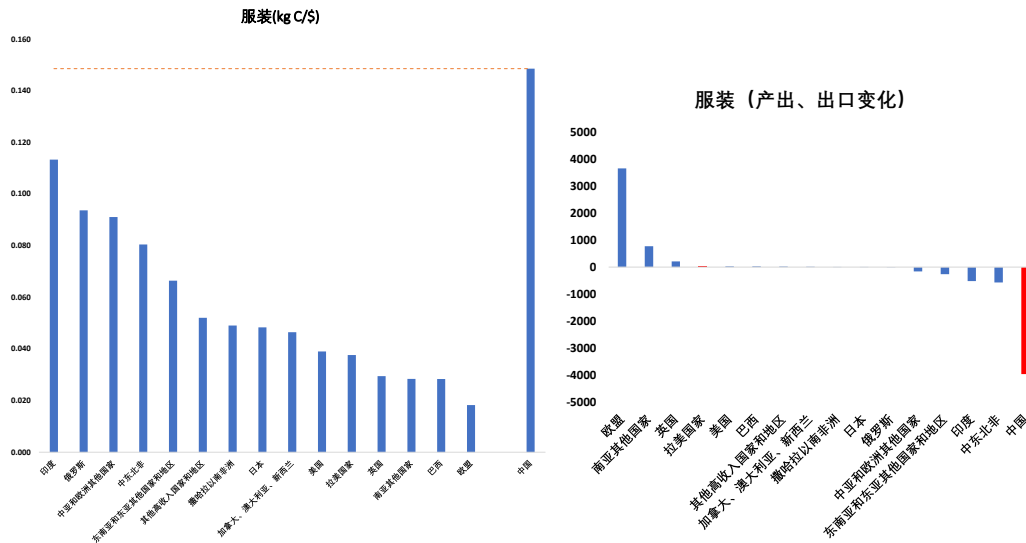
Data source: the author's calculation

**Figure 6 Decline in China's exports of manufactured goods under the full scenario (%)**

Fourth, the EU carbon border adjustment mechanism under the comprehensive scenario will lead to a "double" outward transfer of Chinese industries. The EU carbon border adjustment mechanism will also affect the global industrial layout. This layout adjustment includes not only the readjustment of the EU's own market share, but also the readjustment of the market share of other countries and regions due to changes in product prices caused by changes in EU demand. However, from the perspective of the scale of adjustment, it is the former that has a greater impact. Other countries and regions will redistribute the EU market share according to the carbon content of their EU exports and the difference with the EU carbon price. For China, the readjustment of the EU's own market involves two aspects.

On the one hand, other developing countries will squeeze China's market share in labor-intensive industries such as clothing in the EU. The carbon emission intensity of labor-intensive industries in China is significantly higher than that of other developing countries. The carbon emission intensity of Chinese clothing products is 0.149 kg C/\$, which is 2-5 times that of developing countries in Southeast Asia, South Asia and Africa. The carbon border adjustment mechanism will worsen China's competitive advantage over other developing countries in labor-intensive industries. The simulation results show that once the carbon border adjustment mechanism is fully implemented, China's exports of labor-intensive products (such as clothing) to the EU will be reduced by 10%-20%; in addition to the EU, other countries in South Asia (excluding India) are the biggest beneficiaries. 25% of China's reduced share of the EU market will go to these developing countries.

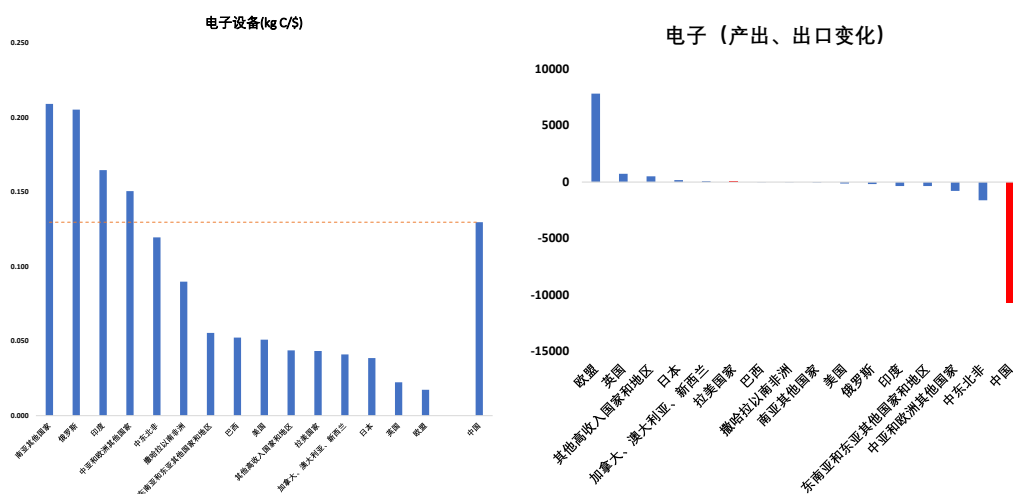




Note: The left half is the carbon emission intensity of the apparel industry in different countries and regions (kg C/\$); the right half is the changes in EU output and exports to the EU from other countries and regions (million US dollars) under the full scenario. Data source: the author's calculation

**Figure 7 Changes in the carbon emission intensity of the apparel industry and exports under the full-scale scenario**

On the other hand, technology-intensive industries such as electronics will face the risk of returning to developed countries. The carbon emission intensity of technology-intensive industries such as electronics in China is significantly higher than that in developed countries. The carbon emission intensity of China's electronic products is 0.130 kg C/\$, which is lower than that of developing countries and regions such as South Asia and Central Asia, but still 2-7 times that of developed countries such as Europe and the United States. The implementation of the carbon border adjustment mechanism will widen China's disadvantage relative to developed countries in technology-intensive industries. The simulation results show that once the carbon border adjustment mechanism is fully implemented, China's exports of technology-intensive products (such as electronics) to the EU will be reduced by 8%-15%; unlike labor-intensive industries, other than the EU, other beneficiaries are mainly developed countries and regions.



Note: The left half is the carbon emission intensity of the electronics industry in different countries and regions (kg C/\$); the right half is the changes in the EU output of the electronics industry and exports to the EU from other countries and regions (million US dollars) under the full scenario. Data source: the author's calculation

### **Figure 8 Changes in the carbon emission intensity of the electronics industry and exports under the full-scale scenario**

#### **5. Cultivate both internal and external, and actively respond to the carbon border adjustment mechanism**

Although the partial scenarios of the carbon border adjustment mechanism have little impact on my country, with the increasing pressure to deal with climate change, the carbon border adjustment mechanism is very likely to be fully implemented, and may even be imitated by other developed countries, so it must be actively dealt with, plan early.

1. Adhere to the "common but differentiated" responsibility for addressing climate change among countries and strive for more development space for China. On the one hand, in the global negotiation on climate change, it is necessary to advocate that developing countries and developed countries assume different emission reduction responsibilities, stress that historical responsibility and the principle of per capita must be considered in the sharing of emission reduction responsibilities, and resolutely oppose the pretension of addressing climate change. Take unilateral trade protection measures in name. On the other hand, it is necessary to actively publicize China's specific goals and policies on "carbon peaking and carbon neutrality", encourage domestic think tanks to cooperate with international think tanks to study China's carbon emission reduction work, and let the international community fully understand China's efforts to reduce global carbon emissions. Great effort and achievement by the platoon.

2. Systematic planning to transform the "dual carbon" action into China's low-carbon international competitiveness. Achieving "carbon peaking and carbon neutrality" is not only my country's commitment to the international community, but also an inevitable requirement to actively shape China's low-carbon international competitiveness. When formulating a "dual carbon" plan or action plan, it is necessary to systematically plan, not only to consider the impact of the "dual carbon" action on the domestic economy, society, ecological environment, etc., but also to consider the international game and enhance China's low-carbon international Competitiveness needs. It is necessary to actively learn from the experience and lessons of the EU and other developed countries and regions in coordinating the relationship between carbon control and maintaining the international competitiveness of the industry, and design a "dual carbon" realization path and policy combination suitable for China's development stage and long-term goals.

3. Carry out full-chain carbon emission monitoring and accounting, and explore the development of low-carbon certification services. It is necessary to pay attention not only to the direct carbon emissions of product production, but also to the carbon emissions of the entire production chain. Encourage research institutions and environmental statistics departments to carry out carbon emission monitoring and accounting of the entire chain, and establish a carbon emission database for the entire production chain. Actively explore the development of low-carbon certification services, and provide low-carbon data support for enterprise exports after the implementation of CBAM.

4. Accelerate the improvement of carbon emission rights trading market and other mechanisms, and

encourage local governments to take more market-oriented emission reduction measures. At present, China's carbon emission trading market is still in its infancy, and its role in carbon emission reduction is still very limited. It is necessary to speed up the improvement of the basic conditions of the carbon emissions trading market, and encourage more products and more regions to participate in carbon emissions trading. At the same time, accelerate the research and introduction of relevant market-oriented emission reduction measures such as carbon tax, to replace the "one-size-fits-all" and administrative emission reduction measures adopted by various regions. This can not only provide companies with stable carbon reduction expectations and reduce the impact on economic activities, but also make China's carbon reduction efforts explicit, preventing developed countries from underestimating their emission reduction responsibilities due to the lack of an explicit carbon price.