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The Impact of Carbon Emission and Carbon Price on International Trade Volume

Tianhao Mao[1,a,*]

[1]*Department of Mathematics, University College London, London, America*
a. Zcahtm1@ucl.ac.uk
**corresponding author*

Abstract: In recent years, environmental issues have become an international focus, under the influence of global climate change, greenhouse effect is becoming more severe with each passing day. Therefore, it is urgent to control greenhouse gas emissions and improve the quality of the ecological environment by reducing carbon emissions. However, in the context of the current low-carbon economy, the environmental costs of enterprises are bound to rise, which will inevitably have a more serious impact on enterprises and the national economy. This article will mainly focus on how low carbon economy policies affect a country's international trade over a given period of time based on a concrete example. Regarding the methodology, chose the object to be India's carbon related data which are carbon intensity, carbon emission and carbon price in the period 1990-2020. And mainly based on the regression model using excel. The results of the study show that the Carbon Intensity and Carbon emissions are positively correlated with International Trade while the Carbon Price is negatively correlated. The volume of India's International Trade will grow steadily as it moves towards Low-Carbon Economy policy. In summary, moving towards low carbon economy can increase the sustainability of international trade and reduce trade risks, while also creating more trade opportunities for countries, especially in the areas of environmental protection.

Keywords: Low carbon economy, international trade, foreign trade enterprises

1. Introduction

The low-carbon economy was originally a term applied to the economic sector, but as a result of rapid economic development, the low-carbon economy has gradually entered the trade sector and expanded its intrinsic value. The low carbon economy, as the name suggests, is the use of economical energy sources, reducing carbon emissions and output, realizing the control of energy, and reducing the pollution produced [1].

The low-carbon economy is used in a wide range of sectors in the international trading market, including technology, economics, and foreign trade. The main model of the low carbon economy is low energy, high energy, reducing the amount of carbon in compounds, and reducing the possible pollution and loss of energy. In addition, the low carbon economy has given rise to new energy industries, such as clean energy companies and environmental adaptation companies [2].

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The green development model fundamentally drives economic growth, stimulates trade inputs and outputs from both developing and developed countries in the trade market and realizes the true value of a low-carbon economy.

International trade, also known as business activities, refers to the exchange of goods and services between different countries. It covers both import and export aspects, so it can also be called import and export trade. International trade is also widely known as world trade [1].

By participating in international trade, countries can regulate the utilization of domestic factors of production and improve the global supply and demand relationship. This means that a country can selectively import the products or services it needs according to its own resources and technological advantages, and export them to other markets. Such complementary economic cooperation is conducive to improving the economic efficiency of all parties and promoting global economic growth.

2. Impact of the Low-Carbon economy on international trade

The low-carbon economy has had a multifaceted impact on international trade. First, the low-carbon economy has promoted the formulation and change of international trade rules. For example, some countries have begun to adopt trade protection measures, including carbon tariffs and green barriers, which have had a profound impact on international trade. Some countries have tried to realize emission reduction targets through the carbon trading market, which has also had an impact on international trade [2]. Secondly, the low-carbon economy has promoted the development of clean energy and low-carbon technologies. This has made some countries begin to pay more attention to energy efficiency and environmental protection in international trade, which has also led to changes in the structure of international trade commodities [3].

In addition, the low-carbon economy has promoted the development of cross-border trade. Some countries have begun to take measures to promote cross-border trade, such as promoting the development of cross-border e-commerce, which makes international trade more convenient and efficient [4,5].

Finally, the low-carbon economy has also had an impact on the economic development of developing countries. Some developing countries faced great challenges in addressing climate change and promoting low-carbon economic development, but at the same time, there were also opportunities, such as the development of clean energy technologies and increased cross-border trade [4,5].

Overall, the low-carbon economy had broad and far-reaching implications for international trade, which was becoming greener, more sustainable, and fairer [6].

3. Formatting the text

3.1. Carbon tariffs

The imposition of carbon tariffs will increase the cost of imported products, thereby reducing their competitiveness. For exporting countries, carbon tariffs will lead to an increase in the cost of their export products, thereby reducing their competitiveness in the international market, inhibiting product exports and possibly leading to a series of chain reactions such as shrinking employment and slowing economic growth. This could lead to trade frictions, which in turn could lead to changes in trade patterns.

In addition, the implementation of carbon tariffs may also trigger trade diversion effects. Some enterprises may export their products to countries or regions where carbon tariffs have not yet been implemented in order to avoid paying carbon tariffs, thus changing their export markets.

Overall, the impact of carbon tariffs on international trade is complex, with the possibility of increasing international trade costs and promoting technological innovation and industrial structure

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optimization. Therefore, the response to carbon tariffs needs to comprehensively consider various factors in order to realize the harmonious development of trade and environment [7].

3.2. Carbon leakage/excessive carbon emission

Carbon leakage may lead to higher carbon emission costs for consumers in some countries, as producers in those countries may pass on external costs to consumers. This could lead to a reduction in consumers' purchasing power, which in turn could affect global trade demand.

Carbon leakage may also have a negative impact on the global cause of environmental protection.

The impact of climate change on international trade is increasing if the extent of carbon leakage, and hence climate change, grows further, e.g. extreme weather events may lead to disruptions in production and trade in a number of countries, which in turn may affect global supply chains. In addition, some countries may resort to protectionist measures in response to the impact of climate change on their domestic economies [8,9]

3.3. Carbon price

The price of carbon directly affects international trade. If the price of carbon is relatively high, then some industries and products with high carbon emissions may move to other countries with lower carbon prices. This means that countries with higher carbon prices may lose some export markets, while countries with lower carbon prices may gain some exports.

In addition, higher carbon prices may also induce some firms to invest in low-carbon technologies to reduce their carbon emissions. This could lead to the development of some new technologies and an increase in international trade.

However, changes in carbon prices may also lead to a decrease in the competitiveness of some industries and firms. For example, industries and products with high carbon emissions may face upward pressure on prices, and this may lead to a decrease in the competitiveness of these products in international trade [10].

3.4. Carbon intensity

Carbon intensity is the amount of carbon emitted per unit of economic output. Different industries and products produce different amounts of carbon emissions in the course of their production, and thus carbon intensity also affects international trade.

On the one hand, if certain countries or regions have stricter limits on carbon emissions, industries and products with higher carbon intensity may be restricted or penalized, while industries and products with lower carbon intensity may be encouraged or rewarded. This may result in some low-carbon industries and products becoming more competitive in the international market.

On the other hand, if there are large differences in the carbon intensity of different countries or regions, the problem of carbon leakage may arise in international trade. For example, some high-carbon-emitting industries may move their production to other countries or regions with lower carbon intensity to circumvent carbon emission restrictions and penalties. This may lead to a decline in the competitiveness of some low-carbon industries and products in the international market [9].

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4. Analysis of India's carbon-related Data for 1990-2020 in Relation to Its International Trade

4.1. Data sources and variable settings

This article uses data from Kaggle.This paper uses Excel for regression analysis. The independent variable consists of three indicators. The three indicators are carbon intensity, carbon price and carbon emissions. The dependent variable is India's international trade over the period 1990-2020.

Y: The international trade of India in the period 1990-2020
X1: Carbon intensity
X2: Carbon Price
X3: Carbon Emission
All data are counted in years and used after normalizing.

4.2. Analysis of Results

As shown in table 1, time series data from 1990-2020 related variables were used. R square and Adjusted R square are both greater than 50% indicating a good fit of the data to the model. Data processing results are presented at R Square is 0.60. This value implies that Carbon intensity, Carbon Price, and Carbon Emission have 60% explanatory power for The international trade of India.

Table 1: Regression analysis result

Regression Statistics	
Multiple R	0.776622537
R Square	0.603142566
Adjusted R Square	0.559047295
Standard Error	4.778374133
Observed Value	31

Table 2: Regression analysis result

	Intercept	Carbon Intensity	Carbon Price	Carbon Emission
Coefficients	40.99105095	1.234503964	-0.43814288	0.009194644
Standard Error	24.27643557	59.0458424	0.220602785	0.003198714
t Stat	1.688511924	0.020907551	-1.98611672	2.874481201
P-value	0.102831793	0.98347315	0.057258957	0.007797577
Lower 95%	-8.820080391	-119.9175574	-0.890782407	0.002631425
Upper 95%	90.80218228	122.3865653	0.014496647	0.015757864
Lower 95.0%	-8.820080391	-119.9175574	-0.890782407	0.002631425
Upper 95.0%	90.80218228	122.3865653	0.014496647	0.015757864

As shown in table 2, P-value <0.05 indicates that the regression equation is significant. The effect of variable Carbon Intensity on International trade volume is non-significant as P>0.05. The effect of variable Carbon Price on International trade volume is significant at 10% level of significance as its P-value is 0.057 < 0.1. And the effect of variable Carbon Emissions on International trade volume is significant at 1% level of significance as its P-value is 0.007 < 0.01.

Holding other variables constant, for every unit increase in Carbon Intensity the International trade volume increases by an average of 1.2345 units. Again, holding other variables constant, for every

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unit increase in Carbon Emissions the International trade volume increases by an average of 0.0092 units.

Similarly, holding other variables constant, for every unit increase in Carbon Price the International trade volume decreases by an average of 0.4381 units.

Which shows that the Carbon Intensity and Carbon emissions are positively correlated with International Trade while the Carbon Price is negatively correlated.

5. Conclusion

A country's entry into a LCE (Low-Carbon economy) can have positive impacts on its International trade:

Reducing carbon emissions: Contributes to the global response to climate change. This can improve the country's international reputation and may reduce trade barriers to its products in other countries. Energy efficiency and cost reduction: LCE tends to encourage more efficient energy use and production methods. This can reduce energy costs for firms and improve their international competitiveness, thereby increasing export opportunities. Favored by trading partners: Some countries and trading partners prefer to trade with countries that have adopted climate-friendly policies. LCE policies may help attract these partners and expand trade opportunities. Reduced energy dependence: An LCE is likely to reduce dependence on imported fossil fuels, therefore reducing the risk to the country's economy from fluctuations in international energy prices. Opportunities for International cooperation:

The adoption of LCE policies may strengthen international relations by encouraging international cooperation, including the joint development and diffusion of clean technologies with other countries. In summary, moving towards a LCE can increase the sustainability of international trade and reduce trade risks, while also creating more trade opportunities for countries, especially in the areas of environmental protection.

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