

Study on the Influence of Green Economy on Foreign Trade of Zhejiang

—Taking Old and New Three Types as Examples

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Abstract

Today more and more countries and regions are focusing their efforts on green industries and the greening of traditional industries. Zhejiang Province of China is committed to the construction of green industry and its coordinated development with traditional industries. This paper studies the impact of green economy development on foreign trade of Zhejiang Province, with special attention to the impact on the “old and new three types”. We measure and analyze competitiveness of the “old and new three types”, and find out the impact of green economy on them. Then empirical VAR analyses will be carried out to explore the relationship between carbon emissions and Zhejiang Province’s foreign trade dependence. Under the background of green economy, Zhejiang Province can control carbon emissions to manage trade dependence within a reasonable range. Finally, a series of policy recommendations are put forward.

Keywords

Green Economy, “Old Three Types”, “New Three Types”, VAR Model

1. Introduction

A green economy integrates human health with sustainable economic development by employing methods that conserve and recycle resources to achieve ecological balance. Many countries have implemented policies to support this economic model. Developed nations are capitalizing on the low-carbon economic opportunities presented by the global environmental crisis to forge new competitive advantages. For China, the green economy aligns perfectly with its current objectives, including transforming growth mechanisms, adjusting industrial structures, and promoting energy conservation and emission reduction. High-pollu-

tion and high-consumption products in international trade are increasingly being supplanted by environmentally friendly alternatives. Mechanical and electrical products (MEP), clothing, and furniture, formerly known as the “old three types” of traditional industries, are actively transforming and upgrading. In contrast, battery electric vehicles (BEV), solar cells, and lithium batteries, dubbed the “new three types” in the green industry, have emerged as the new engines of export growth. Exploring how to transform high-tech and high-value-added products to lead the green wave in Zhejiang Province’s export is meritorious.

Since Industrial Revolution, the environmental impact of economic activities has become increasingly apparent, leading to a heightened awareness of the importance of the ecological environment. In *The Limits to Growth*, the Club of Rome highlighted the onset of an era of energy scarcity (Meadows et al., 1972). The term “green economy” was first introduced in *Blueprint for a Green Economy*, and it has since then gained widespread recognition (Pearce et al., 1989). Hu Angang argued that China must embrace a green development mode characterized by low energy consumption and low pollution soon (Hu, 2005). He further advocated for the adoption of a green model for energy conservation and emission reduction in response to the worsening global climate crisis (Hu, 2010). Yu Ji, through the case of Anji in Zhejiang Province, proposed using ecological civilization to spearhead the green development of regional economies (Yu, 2015).

A theoretical model was employed to analyze the impact of trade on environmental pollution, categorizing the impact into three effects: scale, technology, and composition. The model determined that the technology and scale effects can mitigate pollution (Antweiler et al., 2001). Cross-sectional data from various countries was also analyzed to explore the relationship between trade and per capita income, and it concluded that the trade growth enhances environmental quality (Frankel & Rose, 2005). An empirical study on the trade-pollution nexus revealed a detrimental impact of trade on the environment, which varies according to country-specific factors (Kellenberg, 2008). Scholars often observed that trade liberalization up to a certain point benefits the environment (e.g., Chen & Chen, 2009). The effect along the reverse direction was checked as well. An indicator system for sustainable foreign trade reported that a low-carbon recycling economy could elevate the level of foreign trade development (Ouyang & Xie, 2012).

Wyckoff and Roop were the pioneers in estimating the carbon emissions implied by trade, finding a positive correlation between the degree of trade and carbon emissions (Wyckoff & Roop, 1994). Later on, the carbon footprint of global trade was assessed, concluding that developed nations transfer high emissions to developing nations through trade (Schaeffer & de Sa, 1996). An increase in China’s carbon emissions resulting from its trade with the United States was noticed in academia (Shui & Harriss, 2006). Scientists investigated the trade dynamics between China and the United Kingdom and found that China absorbs the UK’s share of carbon emissions, thus exacerbating global CO₂ emissions (Li & Hewitt, 2008). Trade-related carbon emissions by industry were quantified (Gao et al., 2011). The emissions suggested adjustments to the industrial structure to

foster low-carbon sectors. Recently, referencing Tapio theory, a weak decoupling relationship between China's trade growth and carbon emissions established, which could strengthen the pertinency of policy intervention (Hu et al., 2017).

Existing research primarily addresses the national level, with limited focus on the development of the green economy in cities and regions. This study aims to analyze the import and export competitiveness of Zhejiang, focusing on the products of the "old three types" and "new three types", and providing corresponding policy recommendations.

2. Impact of the Green Economy on Foreign Trade of Zhejiang Province

The green economy, a new economic model, seeks to balance economic progress with environmental protection, centering on human and ecological well-being. It involves two main objectives: developing green industries and greening traditional industries, such as promoting energy efficiency and pollution reduction. Consequently, the green economy is poised to influence various industries, thereby affecting trade and exports.

2.1. The Green Economy Development Plan of Zhejiang Province

Zhejiang aims to significantly optimize its industrial and energy structures, greatly enhance resource utilization and green technology innovation, increase the greening level of public infrastructure, and establish a preliminary green, low-carbon recycling economic system by 2025. The concept of "green mountains are gold mountains", proposed by President Xi, will be more deeply entrenched, and the construction of Beautiful China eco-demonstration regions is expected to show notable progress by 2030. By 2035, the green economy should reach an advanced level and carbon emissions should steadily decline.

Zhejiang is committed to rectify high-carbon and low-efficiency industries, strictly enforcing capacity replacements in high-energy-consuming and high-polluting sectors, such as iron, steel, building materials, and petrochemicals. Additionally, the province plans to adopt clean and environmentally friendly technologies to promote the green and low-carbon transformation of various industries. Zhejiang promotes the growth of the digital economy, new materials manufacturing, and other emerging industries, strongly supports the public listing and financing of green enterprises and collaborates with third parties to manage energy, water resources, and the ecological environment.

In the terms of green agriculture, Zhejiang is determined to build modernized agriculture through scientific and technological innovation and machinery manufacturing, and by developing new multi-functional agricultural equipment. Furthermore, the province aims to improve the management of agricultural and rural pollution, promote water-saving irrigation technologies, increase the agricultural regeneration rate, advance the forestry circular economy, and leverage the healthy green economy to drive the progress of tourism and culture.

Moreover, Zhejiang will adjust and optimize its energy structure, increase the use of clean and renewable energy sources, such as bioenergy and marine energy, and focus on wind power, photovoltaic power, and nuclear power generation projects. It plans to reform energy governance and build an intelligent energy-based power grid, accompanied by a new pricing mechanism.

For new infrastructures, standard for energy-saving management and energy consumption constraints will be established. Key projects in municipal governments, transportation, and buildings will be developed in intelligent, low-carbon, and green ways. Concurrently, Zhejiang aims to accelerate the development of charging facilities, including personal charging piles, to create an integrated digital management platform.

2.2. Impact on Trade in the “Old Three Types” and the “New Three Types”

The export volume of MEP in Zhejiang continues to expand, targeting Europe, the United States, Southeast Asia, the Middle East, and other regions, with the United States being the primary destination, followed by Europe. The export market is becoming increasingly diversified. Private enterprises are the main exporters, although the presence of state-owned and foreign-funded enterprises is also steadily increasing, with the private sector accounting for over half.

Zhejiang is a leading player in China’s furniture exports. Furniture companies are expanding into emerging markets in the Middle East, Africa, and ASEAN, and have participated in expositions in the Central and Eastern Europe and Dubai. They are actively developing products like ergonomic chairs to enhance their international competitiveness. However, the clothing sector has faced considerable difficulties, with poor exports and sluggish domestic sales due to changing global consumption trend and an oversupply in the market.

In recent years, the Zhejiang provincial government has vigorously stimulated the proliferation of new energy industry. Products such as new energy vehicles, lithium batteries, and solar cells are gaining traction in both domestic and international markets. Acceptance of new energy vehicles is rising, and the demand for these vehicles continues to grow, attracting more companies to the sector. As competition intensifies, the breakthroughs in key technologies for new energy vehicles are being made, driving down production costs.

The “new three types” confront challenges from technical barriers to trade. Various countries have imposed restrictions on exports from Zhejiang. For example, Solar World once lodged a complaint with U.S. International Trade Commission accusing Zhejiang of dumping photovoltaic cells. In 2024, the U.S. raised tariffs on BEVs from 25% to 100%, on lithium batteries from 7.5% to 25%, and on solar cells from 25% to 50%. These unreasonable tariff adjustments pose severe challenges to exports. The concentration of export destinations in Europe and the United States is disadvantageous in addressing these adverse policies. In addition, many enterprises rely on foreign technology transfers and their capacity for independent innovation ability is limited. If they only focus solely on the output with-

out the mastery of core technologies, they risk their survival.

3. The International Competitiveness of “New and Old Three Types” in Zhejiang Province

3.1. Trade Competitiveness Index (TC)

Trade Competitiveness (TC) index is a commonly used measure in international competitiveness analysis, and is expressed as the proportion of the balance of export and import of a country in the total export and import:

$$TC = \frac{X_{ic} - M_{ic}}{X_{ic} + M_{ic}} \quad (1)$$

where X_{ic} is the export value of product c in country i and M_{ic} is the import value of product c in country i . $X_{ic} - M_{ic}$ represents the net export of product c in country i and $X_{ic} + M_{ic}$ represents its total trade value. When the index approaches 1, country i only exports, and when TC closes to -1 , c does not export. The trade data are collected from EPSDATA database.

In **Table 1**, the overall trade competitiveness of the “new three types” in Zhejiang is very strong. During our sample period 2017-2023, TC is lower than 0.9 only in 2017, whose value is 0.87. TC of BEV (Battery electric vehicles, or simply pure electric cars) is lower than 0.9 only in 2017 as well, whose value is 0.76. And TC of lithium batteries is lower than 0.9 only in 2017 and 2018, at 0.89 and 0.88.

Table 1. TC index of “new three types” of Zhejiang in 2017-2023.

Item	2017	2018	2019	2020	2021	2022	2023
Solar Cells	0.87	0.94	0.97	0.98	0.92	0.94	0.96
BEV	0.76	0.97	0.99	1.00	0.99	0.99	0.99
Lithium Batteries	0.89	0.88	0.93	0.93	0.96	0.98	0.98
New 3 Types	0.87	0.93	0.96	0.98	0.94	0.96	0.98

Table 2 shows that China’s trade competitiveness in BEV tends to be average, though it has a strong comparative advantage in lithium batteries. From the latest data of the first quarter in 2024, Asia has surpassed Europe to become the largest market for China’s exports of photovoltaic products, accounting for 48%. The United States remains the largest market for China’s lithium battery exports, accounting for 22%. Taking the two tables together, we find that the trade competitiveness of the “new three types” in Zhejiang Province is considerably ahead of other regions.

Table 2. TC index of BEV and lithium batteries in some countries in 2022.

Item	China	USA	Japan	Germany
BEV	-0.078	-0.488	0.782	-0.629
Lithium Batteries	0.871	-0.705	0.288	-0.390

TC of “old three types” in Zhejiang is still rather strong. The TC of MEP fluctuates

tuates up and down at 0.77; clothing products rise from 0.85 in 2017 to 0.88 in 2023; and furniture rises from 0.80 in 2017 to 0.91 in 2023. Overall, the TC of “old three types” rises from 0.75 in 2017 to 0.85 in 2023. The overall TC index of “new three types” almost always remains above 0.9, while in the “old three types” only TC of furniture in 2022 and 2023 goes beyond 0.9. The overall trade competitiveness of the “old three types” is therefore relatively weaker than the “new three types”. See **Table 3**.

Table 3. TC index of “old three types” of Zhejiang in 2017-2023.

Item	2017	2018	2019	2020	2021	2022	2023
MEP	0.77	0.76	0.76	0.77	0.77	0.78	0.78
Clothing	0.85	0.86	0.87	0.85	0.84	0.89	0.88
Furniture	0.80	0.82	0.83	0.87	0.89	0.90	0.91
Old 3 Types	0.75	0.77	0.78	0.80	0.83	0.84	0.85

3.2. Revealed Comparative Advantage Index (RCA)

The RCA index represents the share of a region’s exports of a certain commodity in its total exports to the share of exports of that commodity in the world’s total exports,

$$RCA_{ic} = \frac{X_{ic}/X_i}{X_c/X} \quad (2)$$

where RCA_{ic} is the revealed comparative advantage index of product c in country i . X_{ic} means the trade value of product c exported from country i . X_i represents the total export value of country i . X_c denotes the export value of product c in the whole world. X is the world total export value. When RCA is greater than 2.5, the product owns strong competitiveness; When RCA locates in [1.25, 2.5], the product is relatively competitive. If it is between 0.8 and 1.25, it indicates moderate competitiveness. Lastly, when RCA is less than 0.8, the international competitiveness is weak.

In **Table 4**, the “new three types” in Zhejiang have strong competitive advantages on average. The RCA index from 2017 to 2021 stays between 1.25 and 2.5, and in 2022 it even exceeds 2.5 and climbs to 3.52, which indicates very strong competitiveness. Among them, the weakest is lithium batteries, whose RCA index is below 2. The most competitive product is the solar cells, whose RCA is all above 2.5 except 2017, and especially in 2022 whose RCA even reaches 9.24. BEV is less competitive until 2021. After 2021 it turns to be competitive.

Table 4. RCA index of “new three types” of Zhejiang in 2017-2023.

Item	2017	2018	2019	2020	2021	2022
Solar Cells	2.43	3.42	4.08	3.17	4.03	9.24
BEV	0.32	0.38	0.27	1.09	1.25	2.07
Lithium Batteries	0.73	0.69	0.67	0.55	0.74	1.076
New 3 Types	1.76	2.18	2.23	1.78	2.09	3.52

If comparing the “new three types” internationally, as shown in **Table 5**, we may draw a similar conclusion, that is, China has a sharp advantage in the international competitiveness of solar cells and lithium batteries, while its BEV is relatively weak.

Table 5. RCA index of “new three types” in some countries in 2022.

Item	China	USA	Japan	Germany
Solar Cells	2.899	/	/	/
Lithium Batteries	2.980	0.375	1.351	0.9
BEV	0.389	0.878	3.630	0.291

In **Table 6**, the overall competitiveness of the “old three types” in Zhejiang is at a medium level. The overall RCA in 2022 is 1.28, indicating relatively strong competitiveness. Among “old three types” the competitiveness of furniture is the strongest. Its RCA index is more than 4 in all sample periods. The competitiveness of apparel is also strong, but the trend is descending, from 3.76 in 2017 to 2.88 in 2022. MEP is weak. Compared with the “new three types”, the competitiveness of solar cells is the strongest, followed by furniture, clothing, BEV, MEP, and lithium batteries is the weakest.

Table 6. TC index of “old three types” of Zhejiang in 2017-2023.

Item	2017	2018	2019	2020	2021	2022
MEP	0.97	0.99	0.97	1.01	1.07	1.13
Clothing	3.76	3.73	3.26	2.70	2.66	2.88
Furniture	4.58	4.77	4.26	4.25	4.40	4.84
Old 3 Types	1.19	1.21	1.16	1.16	1.23	1.28

4. Empirical Analysis of the Impact of Green Economy on Foreign Trade of Zhejiang Province

4.1. Model Construction

In order to examine the relationship between green economy and foreign trade of Zhejiang, we consider a p-lag bivariate vector autoregressive (VAR) system:

$$\begin{cases} y_{1t} = \alpha_{10} + \sum_{l=1}^p \alpha_{1l} y_{1,t-l} + \sum_{l=1}^p \beta_{1l} y_{2,t-l} + \epsilon_{1t} \\ y_{2t} = \alpha_{20} + \sum_{l=1}^p \alpha_{2l} y_{1,t-l} + \sum_{l=1}^p \beta_{2l} y_{2,t-l} + \epsilon_{2t} \end{cases} \quad (3)$$

Here ϵ_{1t} and ϵ_{2t} obey $\text{IID}(0, \sigma_{11}^2)$ and $\text{IID}(0, \sigma_{22}^2)$ respectively. $\text{Cov}(\epsilon_{1t}, \epsilon_{2t}) = \sigma_{12}$ and $\text{Cov}(\epsilon_{1t}, \epsilon_{2s}) = 0$. For $t \neq s$, this system can be rewritten as a matrix form:

$$\mathbf{y}_t = \mathbf{\Gamma}_0 + \sum_{l=1}^p \mathbf{\Gamma}_l \mathbf{y}_{t-l} + \boldsymbol{\epsilon}_t$$

$$\mathbf{y}_t \equiv \begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix}, \mathbf{\Gamma}_0 \equiv \begin{pmatrix} \alpha_{10} \\ \alpha_{20} \end{pmatrix}, \mathbf{\Gamma}_l \equiv \begin{pmatrix} \alpha_{1l} & \beta_{1l} \\ \alpha_{2l} & \beta_{2l} \end{pmatrix}, \boldsymbol{\epsilon}_t \equiv \begin{pmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{pmatrix}. \quad (4)$$

In this paper y_{1t} reflects the trade of Zhejiang, while y_{2t} is a sort of green index. The model only includes the two variables, because the more variables in y_t , the more coefficients to be determined in the matrix Γ_t . Note that our sample is not large. The notion “green economy” catches the attention in academia during the recent few decades, which implies the relevant time series data is rare. In addition, the targeted region is restrained within Zhejiang, hence the lack of green data in the city and county level removes our possibilities to transfer our model into panel data or panel VAR. From the theory perspective, a prolonged time horizon in data usually leads to more convincing analysis. But in practice, subject to our finite sample, we must exclude too many uncertainties in our model. Consequently, only trade of Zhejiang and a green index will be considered, and no other control variables.

4.2. Choice of Indicators

The interdependence indicator is utilized to depict the trade situation of Zhejiang. The CO₂ emissions are selected to denote the extent of implementation of green economy in Zhejiang. The advancement of green economy will directly affect the CO₂ emissions. In turn, to restrict CO₂ emissions will influence production, and then will further cause the change of trade interdependence. Usually, the normalized export EX/GDP or the normalized net export NX/GDP are adopted to express one’s foreign trade. Some papers compute both EX/GDP and IM/GDP as the indicator. As mentioned previously, the data volume does not allow too much room to assign identical indices to measure one single concept. Much emphasis will be put on NX/GDP . However, another problem arises. As the leading province opening to the world, Zhejiang has imported incrementally goods in recent years, such that its IM is comparable to EX , making NX approach to 0. Thus, we step back to define $\text{TradeDepend} = (EX + IM)/GDP$, to display the state of both export and import of Zhejiang. This avoids the difficulty in the estimation brought by NX .

There are a variety of measures connecting to green economy. Yet, the academia demands a unified index. The time horizon of index products designed by Shanghai Environment and Energy Exchange is still too short for meaningful time series analysis. In our paper the index makes use of the consumption of eight energy resources in commodities—crude oil, kerosene, fuel oil, diesel, gasoline, natural gas, coal and coke—to exhibit how green an economy is. The data of original resource consumption can be extracted from *China Energy Statistical Yearbook*. Then the IPCC approach is used to convert it and generate the corresponding CO₂ emissions. For more details, please refer to CEADs (Carbon Emission Accounts and Datasets). The data in CEADs is very approximate to the data reported by China’s government. To wrap up, statistics of the trade and emission sequences are shown in **Table 7**. If without explicit explanation, all data in this section is processed by EXCEL and STATA.

As with traditional time series models, we need a VAR that is both economically

significant and stable, economically significant in the sense that the two economic variables in this paper need to be truly causally related (Granger test) and that there is some equilibrium-induced long-run correlation between them (cointegration test). Stability is demonstrated not only by the stability of the time series data (unit root test), but also by the stability of the VAR model when the time series data are put into the VAR model (unit circle test).

Table 7. Summary of the data: TradeDepend and CO₂ emissions.

Variable Name	Number of Observations	Mean	Stand. Err	Min	Max
TradeDepend	42	0.5719	0.0841	0.4319	0.7270
CO ₂ emissions	42	338.0575	78.9185	156.4792	450

4.3. Results and Reports

First do the ADF test for each time series. TradeDepend as well as CO₂ emissions, like numerous time series data, have a unit root in the primary series and their first order differences are stable. Granger test and cointegration test will be performed to determine whether these two data series are really linked in an economic sense. See **Table 8**.

Table 8. ADF test.

Variable	1% Critical Value	5% Critical Value	10% Critical Value	t-statistic	p-value	Stability
TradeDepend	-3.750	-3.000	-2.630	-1.970	0.3000	Unstable
Δ TradeDepend	-3.750	-3.000	-2.630	-3.006	0.0344	Stable
CO ₂ emissions	-3.750	-3.000	-2.630	-2.282	0.1780	Unstable
Δ CO ₂ emissios	-3.750	-3.000	-2.630	-4.528	0.0002	Stable

In this step we need to flesh out the model by first combining the VAR model with the data to find the optimal lag order of the VAR. With consideration and judgment, we choose a lag order of $p = 3$, thus constituting a VAR (3) model. See **Table 9**.

Table 9. Choice of lags.

Lag	LL	LR	p	AIC	HQIC	SBIC
0	-65.0533			7.88863	7.89837	7.98665
1	-41.1137	47.879	0.000	5.54278	5.57202	5.83686
2	-32.8016	16.624*	0.002	5.03549	5.08421	5.52561*
3	-28.3609	8.8815	0.064	4.98363*	5.05184*	5.66981
4	-25.8302	5.0613	0.281	5.15649	5.24419	6.03872

By the Granger causality Wald test in **Table 10**, CO₂ emissions is the Granger

causality of TradeDepend. Hence CO₂ emissions will be the explanatory variable, and indeed TradeDepend is the explained variable.

Table 10. Granger causality Wald test.

Equation	Exclude	Chi2	df	Prob > Chi2
TradeDepend	CO ₂ emissions	9.8909	3	0.020
TradeDepend	ALL	9.8909	3	0.020
CO ₂ emissions	TradeDepend	6.2788	3	0.099
CO ₂ emissions	ALL	6.2788	3	0.099

According to the theory of Johansen cointegration test, there will be at most one cointegration relationship between the two variables, which is confirmed from **Table 11**. Thus we say that TradeDepend and CO₂ emissions are first order cointegration I(1).

Table 11. Johansen cointegration test.

Max Rank	Number of Parameters	LL Value	Eigenvalue	Trace-Statistic	5% Critical Value
0	10	-41.533919		23.0409	15.41
1	13	-31.787928	0.66138	3.5490*	3.76
2	14	-30.013447	0.17894		

Now transform VAR (3) into VECM (Vector Error Correction Model) to treat the original problem:

$$\Delta y_t = \Gamma_0 + \Phi_0 y_{t-1} + \Phi_1 \Delta y_{t-1} + \Phi_2 \Delta y_{t-2} + \varepsilon_t \quad (5)$$

$\Phi_0 y_{t-1}$ is the long-run correction to the steady state of y_{t-1} . Estimate the coefficients of this equation See the results in **Table 12**:

Table 12. VECM model.

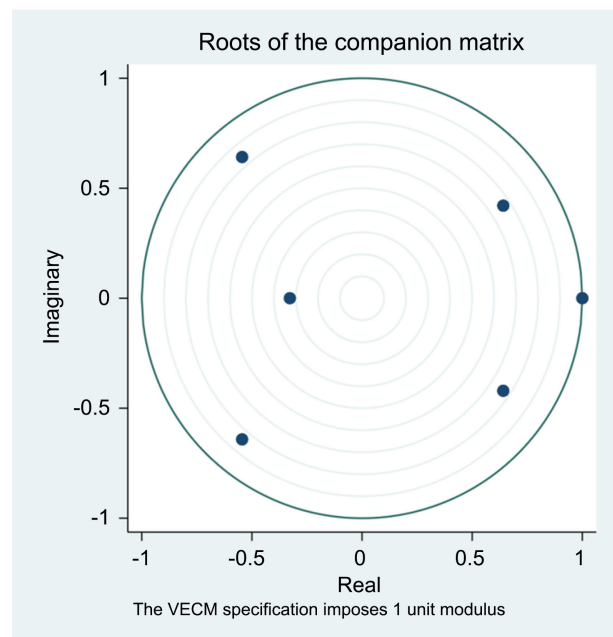
	Coefficients	Stand. Err	z	p > z	95% C.I.	
TradeDepend	1					
CO ₂ emissions	0.0004526	0.0001726	2.62	0.009	0.0001143	0.000791
_cons	-0.4928496					

Although the coefficient before CO₂ emissions is very small at 0.0004526, it is highly significant with a *p*-value of 0.009. The small coefficient is due to the difference in the units of carbon emissions (in millions of tons) and trade dependence (in %). The unit conversion causes the difference in magnitude.

Next conduct an ex post test. Given the coefficients of the VECM and also given the lag order determined by the VAR, is this concrete model stable under the data Δ TradeDepend and Δ CO₂ emissions? See **Table 13** and **Figure 1**.

Table 13. Stability test.

Eigenvalue	Modulus
1.0000	1.0000
$-0.5444 + 0.6417i$	0.8416
$-0.5444 + 0.6417i$	0.8416
$0.6411 + 0.4209i$	0.7669
$0.6411 - 0.4209i$	0.7669
-0.3276	0.3276

**Figure 1.** VECM stability test.

The figure displays that the model is stable. One of the characteristic roots on the unit circle is due to the setting of the VECM model itself. We further make the impulse response function, which shows how the international trade of Zhejiang Province fluctuates in the next 10 periods, i.e., from $t = 1$ to $t = 10$, if there is an unexpected fluctuation in CO₂ emissions, i.e., if there is a sudden increase of 1 standard deviation in CO₂ emissions at $t = 0$.

Using this response function in **Figure 2** and the data from 2001-2020 within the sample, we can go ahead and make projections of carbon emissions and trade over the next 5 years, especially for the ultra-short term 2024. The red line in **Figure 3** is the real observed data available, especially noticing that the carbon emissions fitting the blue forecast line (dashed line). Factors that may affect the trade volume of Zhejiang are more than carbon emissions, so the forecast of trade dependence deviates slightly from the actual value. But the shaded area is the 95% confidence interval, and the red line is still within that interval, implying that the forecast is reasonable on the whole.

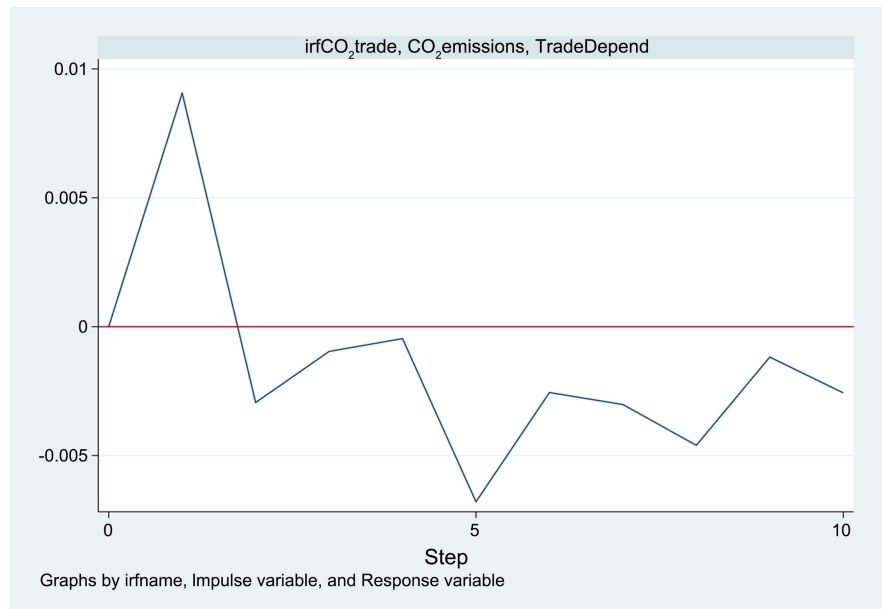


Figure 2. Impulse response function of international trade of Zhejiang.

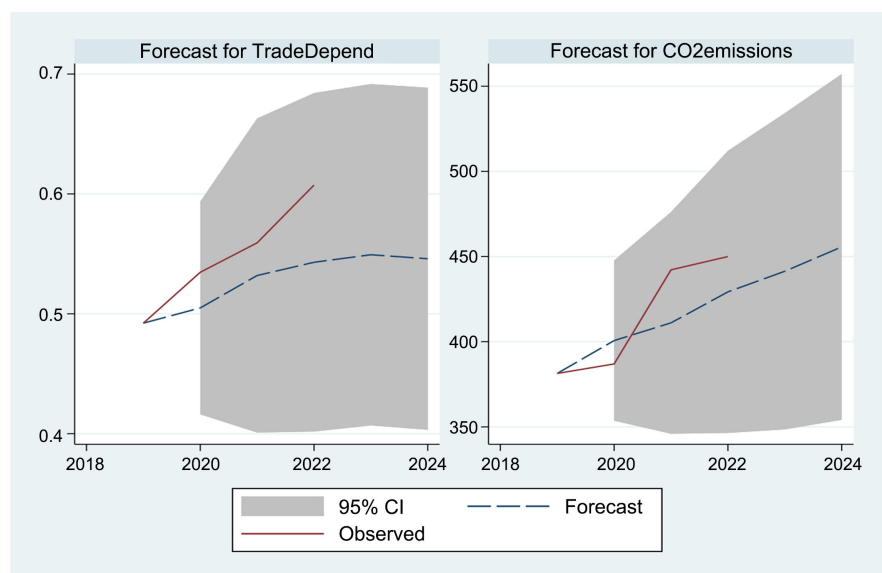


Figure 3. Projections of future carbon emissions and trade volumes.

Through this empirical analysis, the main conclusion is that when the carbon emissions in Zhejiang Province change by one unit, the foreign trade dependence of Zhejiang Province will change by 0.0004526 units, that is to say, if the carbon emissions increase or decrease by one million tons, the foreign trade dependence will increase or decrease by 0.0004526%.

An increase in trade dependence is accompanied by an increase in exports and imports, which boosts domestic production and carbon emissions. The increase of trade dependence has a promotional effect on the development of the economy, which can expand the market, attract foreign investment, and optimize the industrial structure. But at the same time will bring certain risks, when the international

trade environment changes, such as wars, trade wars, financial crisis, economic recession, etc. Trade-dependent regions will face great pressure of economic downturn. The higher the trade dependence, the higher the sensitivity of the economy to the external environment, and the changes in foreign trade will have a greater impact on the economy. Therefore, to deal with the impact of trade dependence, we should comprehensively consider all the factors of economic development and control the trade dependence in a reasonable range. Without restricting or relying on foreign trade too much, controlling the growth or reduction of carbon emissions can also be regarded as an approach to control the growth or reduction of trade dependence.

5. Suggestions and Discussions

5.1. Suggestions on Foreign Trade of Zhejiang Province

Leveraging comparative advantages, as well as resource and technological strengths, we will concentrate on environmentally related industries while simultaneously enhancing the transformation of various sectors. In the process of transformation, more attention should be paid to clean and environmentally friendly production process that consume less and pollute minimally. All industries should be guided to prioritize ecological and environmental protection, technological innovation, recycling and remanufacturing.

As the green economy evolves, our government has established numerous laws and regulations related to environmental protection. The Zhejiang provincial government should guide enterprises to actively seek product quality certifications.

Trade associations should be fully utilized. Acting as a bridge between enterprises and the government, these associations can collaborate with business to counteract unfair competition, safeguard enterprises' legitimate rights and interests, communicate relevant government regulations and international economic and trade information, and convey the problems and needs of enterprises to appropriate government bodies. Associations can also offer consulting services on international green trade barriers and gather intelligence on the demand for green products globally.

5.2. Suggestions on the “Old Three Types”

The technology level of an enterprise greatly influences products quality. Given that high technical standards are central to the green economy, narrowing the technological gap with developed countries is imperative. Special focus should be on reinforcing enterprises' capabilities for technological innovation. Encouraging collaboration between enterprises and academic or research institutions can address key challenges and foster the transformation and upgrading of enterprises.

The active recruitment and training of professional and technical personnel, as well as foreign trade staff, are crucial. High-tech and high-value-added green products must be marketed both domestically and internationally, implying that in-house training should be align with green economy principles or environmen-

tal, social and corporate governance (ESG) topics.

Enterprises must integrate green environmental practices throughout all aspects of production, transportation, packaging, and sales, building a green supply chain. This will reduce operational costs, improve resource efficiency, promote sustainable development, and finally achieve the harmony and unity of economic activities and environmental protection.

5.3. Suggestions on the “New Three Types”

Authority should support the implementation of the “new three types” projects in Zhejiang and expand the export their export scale to include “China-Europe Express” and “One Belt, One Road” countries to diversify markets and mitigate the risks associated with dependency on single market. New energy enterprises are encouraged to participate international project exchanges and industrial cooperation in technology, which could enhance their brand image and raise their international visibility.

Enterprises are also encouraged to establish factories overseas while simultaneously setting up protection mechanisms and risk early warning systems for their overseas interests in the trade process. This strategy will provide greater protection in diverse regulatory and market environments, ultimately facilitating a dual circulation model, both internally and externally.

The approval process for funds in cross-border trade should be simplified, and more “new three types” enterprises should be incorporated into the foreign-exchange-facilitation operations. Additionally, the capabilities of financial institutions should be strengthened to support domestic and international linkages, enabling them to provide services such as policy consultation, risk early warning, and currency settlement for “new three types” enterprises, helping them to expand their business groups and sales channels.

Authors’ Contributions

Conceptualization, H.Y.; data collection, H.Y. and L.B.; software, L.B.; analyzed data, H.Y. and L.B.; validation, W.Z.; writing—original draft preparation, H.Y.; writing—review and editing, H.Y., L.B. and W.Z.; visualization, L.B.; supervision, L.B. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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