Article

The Impact of U.S. Tariff Policies on Sino–US Aquatic Product Trade

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Abstract: Background/Objectives: This study analyzes China's aquatic product imports and exports during Donald Trump's presidency (2017–2021) to evaluate the net effects of U.S. tariff measures. Methods: Using trade between China and the United States as the treatment group and China's trade with major partners as the control group, the study applies an event study framework to isolate policy impacts. Conclusions: The findings indicate that U.S. tariff policies exerted a significant suppres-sive effect on China's aquatic product trade, particularly with developed economies. Event-study parallel trend tests, robustness checks, and placebo tests consistently confirm the reliability of the findings. Mechanism analysis reveals that import volume fully mediates the impact of tariffs, while export and total trade volumes serve as partial mediators. The study concludes with policy recommendations to help China mitigate the adverse effects of U.S. tariff measures and promote stable, long-term development of its aquatic product trade.

Keywords: Aquatic Product Trade; Tariff Policies; Export Trade

1. Introduction

Since Donald Trump's initial foray into politics in 2017, U.S. trade policy toward China has been marked by escalating conflict. His return to office in 2024, with executive power supported across all three branches of government, renders the ramifications of his renewed tariff strategy for China's aquatic products trade particularly significant. Developing appropriate countermeasures has thus become critically important for China.

China and the United States together account for the majority of global aquatic product production and consumption. According to data from China's General Administration of Customs, bilateral aquatic products trade reached US$ 3.012 billion in 2017, with the United States ranking as China's third-largest export market. Since 2024, in anticipation of further tariffs, exports of several product categories have increased. The United States remains China's largest export market for tilapia and the second-largest for cod. In 2024, China's tilapia exports to the United States surged by 17.58% in both volume and value, while cod exports rose by 31.21%. However, the Tariff Commission of the State Council announced that, beginning 10 April 2025, the U.S. government would again raise "reciprocal duties" on Chinese imports to 125%. In accordance with the Customs Tariff Law, the Customs Law, the Foreign Trade Law, and relevant principles of international law—and with State approval—China also increased its counter-tariffs on U.S. imports from 84% to 125%, effective April 12, 2025 [1]. Such elevated tariff barriers benefit neither side: in a worst-case scenario, China could lose 1.1% of its employment and 1% of its gross domestic product (GDP), while under a full-scale trade war, U.S. per capita wages could fall by 0.74%–1.29% [2,3].

This study employs an event study methodology to examine Sino–U.S. seafood import and export flows during Trump's first term (2017–2021), excluding 2020–2021 due

to the effects of the COVID-19 pandemic. Following the model specification of Ji and Sun [4], the study estimates the net impact of U.S. tariff policies and extrapolates likely policy implications under a second Trump administration. The marginal contributions of this research are twofold: first, by utilizing unique national datasets and the event study approach—distinct from prior empirical research—it provides robust causal evidence on the effects of U.S. tariffs, enhancing the generalizability of policy conclusions; second, it enriches and extends the existing literature on U.S. tariff influences on Sino–U.S. aquatic product trade, offering policy recommendations aligned with post-pandemic economic recovery. Overall, the study aims to support the long-term development of Sino–U.S. aquatic goods trade and strengthen China's broader international aquatic products sector.

2. Literature Review

Scholars generally agree that U.S. tariff measures have negatively affected Sino–U.S. trade in aquatic products. Lu et al. used a multi-country gravity model (MGM) with counterfactual analysis to examine the impact of tariff increases during the Trump administration, concluding that they exerted a detrimental effect on import levels [5]. Shen similarly found that two rounds of tariff impositions on Chinese seafood exports to the United States significantly reduced both the total value and volume of China's seafood exports [6]. He and Zhao, employing a three-way marginal analysis framework, reported that tariffs negatively influence both the extensive and intensive margins of bilateral aquatic product exports while increasing the price margin [7]. In contrast, Ji and Sun argued that although U.S. tariff policies negatively affect China's exports, they do not generate a consistently unidirectional effect on the import and export of aquatic products [4].

Jiang, drawing on Trump's 2024 campaign statements, forecasts that trade will remain the central arena in Sino–U.S. strategic competition, with tariffs functioning as a key policy instrument. He suggests that China strengthen economic and commercial ties with the European Union, ASEAN, Latin America, and Africa to collectively resist U.S. unilateralism and safeguard the multilateral trading system [8]. Tu et al. contend that a global power vacuum may deepen disorder in global governance and recommend that China intensify engagement with international capital, technology, and labor flows while encouraging enterprises to expand overseas and extend industrial and supply chains [9]. He et al. forecast that if the U.S. significantly subsidizes its aquatic product exports, U.S. products will gain substantial competitiveness in global markets, substituting for Chinese products, though at the cost of reduced social welfare. They recommend that China implement WTO-compliant industrial subsidies to support key export-dependent species such as cod and dried cod product [10].

A review of the literature reveals extensive research on Sino–U.S. aquatic product trade patterns, yet empirical studies addressing Trump's second term are limited. This gap is partly due to the unexpected nature of Trump's 2025 re-election, coupled with the strengthened political influence of his second-term administration, which heightened uncertainty in forecasting seafood trade dynamics. Furthermore, prior empirical research employing Difference-in-Differences (DID) may inadequately capture current policy effects due to temporal lags. In response, the present study applies an event study methodology following the framework of Ji and Sun [4]. Consistent with Zhang et al. who conducted a comparative analysis of China's aquatic products trade with the United States and other countries, expanding the number of countries in the comparison enhances the robustness and credibility of the conclusions [11].

3. Theoretical Analysis and Research Hypotheses

3.1. Definition of Core Concepts

Customs duties (tariffs) refer to taxes levied by government-authorized customs officials on goods imported or exported across national borders [12]. "Tariff policy"

denotes a trade strategy in which a country imposes tariff measures over a defined period to achieve specific economic, political, or strategic objectives [6]. In the contemporary era of globalization, tariff barriers substantially hinder China's aquatic product exports.

3.2. Theoretical Applicability of the Event Study Method

The event study methodology, originally developed in finance, evaluates how specific events influence firm value by analyzing financial market data. Owing to its robust theoretical foundations, logical rigor, and relatively simple computational procedures, it has been increasingly applied across disciplines to examine how discrete events affect organizational behavior [13]. The method is suitable for analyzing isolated or intermittently occurring events of the same type. Unlike approaches that assess the impact of a single event, event studies evaluate the effects of sporadic but comparable events by examining abnormal changes within a defined event window [14].

U.S. tariff policies demonstrate clear event-driven characteristics. The Ministry of Commerce of the People's Republic of China reported that President Trump formally announced tariff increases in March 2018, with higher duties on aquatic products taking effect in June of that year. This explicit timeline aligns well with the criteria for event definition under the event study methodology. Compared with the DID approach, event studies offer several advantages: they provide more comprehensive insights into policy impacts and rely less on stringent identification assumptions [11]. Therefore, this study employs an event study framework to analyze discontinuous but comparable policy shocks, examining the effects of two tariff measures enacted during the Trump administration on Sino–U.S. aquatic product trade.

3.3. Theoretical Analysis and Research Hypotheses

3.3.1. Impact of U.S. Tariff Policies on Sino–U.S. Aquatic Products Trade

The imposition of additional U.S. tariffs has significantly reduced both the quantity and value of China's aquatic product exports, accompanied by declining export prices. These pressures have caused some aquatic processing firms to shut down, leading to job losses and affecting related sectors such as feed processing and aquaculture [15]. Using Guangdong Province as an example, the trade friction immediately increased tariff costs for its aquatic exports to the U.S., raising sales prices in the U.S. market. As a result, the competitiveness of Guangdong's products declined, prompting American consumers to switch to substitutes. Consequently, both the volume and value of exports to the United States sharply decreased [16].

Based on previous research, the effects of tariff increases on aquatic product trade are evident in the following areas:

(1) Market share contraction. Tariffs weakened price competitiveness and strained bilateral economic relations.

(2) Reduced business output and supply chain disruptions. These extremely high duties forced many Chinese exporters to halt U.S. trade entirely and redirect their products to other international markets or the domestic market, disrupting existing supply chains.

Based on the above analysis, the fundamental hypothesis is as follows:

H1: U.S. tariff policies on aquatic products have a considerable negative effect on the trade value of aquatic product imports and exports.

3.3.2. Mechanism Analysis

(1) Export Volume

Lu et al. argue that China's strong reliance on the U.S. market has made its aquatic product exports vulnerable, with recent Sino–U.S. trade tensions exerting a marginally negative effect on both export volume and value [5]. He et al. find that reciprocal tariff increases between China and the U.S. raised trade costs for aquatic products, resulting in

a decline in exports from both countries [10]. When the U.S. provides substantial subsidies to its aquaculture industry, American aquatic product exports rise, whereas Chinese exports fall. Xie et al., through product-level analysis, identified an inverted U-shaped effect of trade tensions on China's exports to the U.S.: a short-term "rush to export" occurs in the early and middle stages, followed by an eventual decline as adverse policy impacts intensify [17].

Based on this evidence, we posit that U.S. tariff policies influence China's aquatic product export volume, but it remains unclear whether the effect is consistently positive or negative, warranting further empirical examination. Accordingly, the following hypothesis is proposed:

H2: Export volume mediates the association between aquatic product tariff policies and the trade value of aquatic products.

(2) Import Volume

Lu et al. utilized the MGM model to demonstrate that Sino–U.S. trade frictions under the Trump administration led to increases in both the volume and value of China's aquatic product imports [5]. Wang et al. contend that intensifying great-power competition has deepened global market fragmentation and weakened advanced industrial supply chains; in this context, new import substitution effects may serve only as temporary measures [18]. Ji and Sun find no significant association between Sino–U.S. trade tensions and China's aquatic product imports [4].

We argue that U.S. tariff increases trigger a trade diversion effect in aquatic product trade, leading China to import more aquatic products from alternative suppliers. According to Viner's [19] classical trade theory, trade diversion occurs when a country shifts its imports from a more efficient supplier to a less efficient but lower-cost (or lower-tariff) supplier due to tariff changes. In this case, China reduces reliance on U.S. aquatic products and redirects sourcing to more cost-effective countries, while also reallocating some products to the domestic market to reduce import demand. Given mixed empirical findings—such as those reported by Ji and Sun who conclude that extra tariffs may not significantly affect import volumes—additional investigation is required [4]. Therefore, we propose the following hypothesis:

H3: Import volume moderates the correlation between aquatic product tariff policies and the trade value of aquatic product imports and exports.

(3) Import and Export Volumes

Ji and Sun found no significant relationship between the overall volume of Sino–U.S. import and export trade and Sino–U.S. trade friction [4]. He et al. further determined that although supplementary tariffs have a little effect on the production of aquatic products in China and the U.S., they exert a negative influence on the bilateral import and export of aquatic products [10]. Drawing on the research above, we argue that U.S. tariff policies are likely to adversely affect the volume of aquatic product imports and exports. However, differences in national data and methodological approaches across studies may yield varying conclusions. Based on this analysis, the following hypothesis is proposed:

H4: The volume of imports and exports influences the relationship between aquatic product tariff policies and the value of aquatic product trade.

(4) Import and Export Value of Goods

Xie et al. found that the Sino–U.S. trade conflict had the most significant negative impact on China's imports of capital goods, followed by consumer goods, while exerting no significant effect on intermediate goods [17]. Lv et al. argue that trade frictions immediately reduce bilateral trade volumes between China and the U.S., hindering the steady development of trade relations [20]. The imposition of tariffs on Chinese goods has led to a notable decline in U.S. exports to China, and China's countermeasures have similarly reduced its imports from the U.S. Li, using the Global Trade Analysis Project (GTAP) model, concluded that the Sino–U.S. trade conflict would simultaneously reduce global imports and exports of both countries [21]. Cui et al. further observed that trade frictions generate strong trade diversion effects, enabling goods from both nations to enter

each other's markets indirectly via third countries [22]. Our findings indicate that the Sino–U.S. tariff war damages the import and export value of goods between the two countries, though trade diversion effects may create short-lived positive outcomes [22]. The following hypothesis is therefore proposed:

H5: The value of commodities imported and exported moderates the effect of aquatic product tariff policies on the trade value of aquatic products.

4. Research Methodology

4.1. Sample Selection and Data Sources

This study's sample comprises 21 countries identified as leading partners in total seafood import and export trade with China, based on data from the General Administration of Customs of China. To ensure strong representativeness, the selected countries encompass Europe, North America, South America, Asia, and Oceania. The sample includes the United States, Norway, Ecuador, Thailand, India, the Russian Federation, Australia, Canada, Indonesia, Vietnam, Japan, Malaysia, the Philippines, Singapore, the United Kingdom, Germany, France, Spain, Chile, Mexico, and South Korea.

Data were sourced from the United Nations Statistics Division's World Trade Database, the World Bank, the General Administration of Customs of China, and the International Monetary Fund, accessed through the EPS China Commodity Trade Database. Control variables, including GDP, currency exchange rates, and foreign exchange reserves, were obtained from the International Monetary Fund and the World Bank. Data on import, export, and total trade volumes of aquatic products, as well as total merchandise trade values, were obtained from the General Administration of Customs of China. For the dependent variables, data on aquatic product imports, exports, and total trade values were obtained from the UN World Trade Database and the National Bureau of Statistics.

Missing data were handled using linear interpolation and panel fixed-effects imputation, according to variable characteristics. Specifically, missing monthly GDP values were imputed by averaging quarterly GDP data across the three corresponding months, while individual missing observations were interpolated linearly. Table 1 presents the descriptive statistics for all variables.

Table 1. Results of Descriptive Analysis.

Variable	Obs	Mean	Std. Dev.	Min	Max
Trade	756	19.37	1.145	15.522	21.825
DID	756	0.025	0.157	0	1
Treated	756	0.048	0.213	0	1
Period	756	0.528	0.5	0	1
GDP	756	11.412	1.211	9.037	14.408
Rate	756	1860.531	5574.082	.71	23359.93
Reserve	756	11.647	1.184	7.397	14.074
Import quantity	756	16.63	1.83	10.821	20.878
Export quantity	737	16.717	1,952	6.404	19.9
Sum quantity	756	17.859	1.296	13.806	20.946
Total	756	24.2	1.318	19.549	27.175

4.2. Selection and Elucidation of Variables

4.2.1. Dependent Variable

This analysis uses monthly trade data from January 2017 to December 2019 to avoid the substantial confounding effects of the COVID-19 pandemic on Sino–U.S. aquatic products trade in 2020. The aquatic product trade data include import, export, and total trade values for fish, crustaceans, mollusks, and other aquatic invertebrates, classified

under China's HS2012 and HS2017 code 03, obtained from the World Trade Database. The methodological approach follows Ji and Sun [4]. Logarithmic transformations are applied to import and export values, GDP, and foreign exchange reserves of trading partner nations.

4.2.2. Independent Variable

This study adopts the research framework developed by Ji and Sun [4]. Three variables are constructed: the national dummy variable "Treated," the policy-period dummy variable "Period," and their interaction term "Did." In the national dummy variable, the U.S. serves as the treatment group (value = 1), while all other countries constitute the control group (value = 0). President Trump announced the implementation of additional tariffs in March 2018, with tariffs on aquatic products taking effect in June 2018. Accordingly, June 2018 is used as the threshold for the policy-period dummy variable: the value is 0 before June 2018 and 1 for the period from June 2018 to December 2019.

4.2.3. Control Variables

Chen argues that exchange rate fluctuations influence aquatic product trade by generating exchange rate risks, which affect importers' and exporters' decisions and thereby alter trade volumes [23]. Zhang finds a positive relationship between a country's GDP and its total import and export volume [24]. Wang show that foreign exchange reserves significantly impact the overall value of trade imports and exports [25]. Based on these findings, this study includes GDP, exchange rate, and foreign exchange reserves as control variables. Details are presented in Table 2.

Table 2. Variable Specification.

Variable Type	Variable name	Symbol	Variable Specification
	Imports of aquatic products (log)	Import	Import trade value of aquatic products between China and trading nations
Dependent Variable	Exports of aquatic products (log)	Export	China's export trade value of aquatic products with trading nations
	Total aquatic products trade (log)	Trade	Total import–export Trade value of aquatic products between China and trading nations
	U.S. tariff policy interaction term	Did	Interaction between national dummy and policy-period dummy variables
Independent Variable	National dummy variable	Treated	Value = 1 for the U.S. (treatment group); value = 0 for all other countries (control group)
	Policy-period dummy variable	Period	Value = 0 before June 2018; value = 1 from June 2018 to December 2019
Control Variable	Exchange rate	Rate	Exchange rate fluctuations that may impact aquatic products exports

	Foreign exchange reserves (log)	Reserve	A key factor influencing import and export values of aquatic product trade
	GDP of trading nations (logarithm)	Gdp	Represents national economic strength and indicates fisheries production capacity
	Import volume of aquatic products (log)	Import quantity	Reflects the volume of aquatic product imports between China and its trading partners
	Export volume of aquatic products (log)	Export quantity	Reflects the volume of aquatic product exports between China and its trading partners
	Total import–export volume of aquatic products (log)	Sum quantity	Indicates the overall aquatic product trade engagement of each trading partner
Mechanism Variable	Total value of imports and exports of goods (log)	Total	Reflects the scale of a nation's international trade and distinguishes differences in actual trading conditions

4.3. Model Design

4.3.1. Baseline Regression Model

This study follows the approach of Ji and Sun to construct the baseline model [4]:

$$Trade_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{1}$$

In Equation (1), Trade represents the logarithm of the import–export trade volume of aquatic products between China and the U.S. Treated indicates whether a country belongs to the treatment group, while Period indicates the tariff-policy period. Did is the interaction term between Treated and Period. X represents the control variables, including Reserve (log of foreign exchange reserves), Rate (exchange rate), and GDP (log of gross domestic product). The term φ_i captures country fixed effects; ω_t captures monthly fixed effects; and ϵ_{it} is the random error term. Subscript i signifies country, and t represents time.

4.3.2. Event Study Model

Following the method of Zhang et al., the event study model is specified as [11]:

$$Trade_{it} = \gamma_i + \lambda_t + \sum_{k=-K}^{K} \zeta_k * D_{it}^k + YX_{it} + \epsilon_{it} \tag{2}$$

In Equation (2), γ_i denotes country fixed effects, and λ denotes monthly fixed effects. The term $\sum_{k=-K}^{K} \zeta_k * D_{it}^k$ captures the dynamic policy effects, where ζ_k represents the estimated coefficient for each period k. D_{it}^k is a time dummy variable: for example, k = −1 indicates the month preceding the tariff implementation, and k = 1 indicates one month after its implementation. $\sum_{k=-K}^{K}$ indicates the summation, which covers all periods from K months before the policy to K months after. X represents the same set of control variables as in Equation (1), and Υ represents the corresponding coefficient. ϵ_{it} is the random error term.

4.3.3. Mediation Model Design

To examine whether trade volumes of aquatic products serve as mediating variables, the following models are constructed:

$$Exportquantity_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{3}$$

$$Trade_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \alpha_5 Exportquantity_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{4}$$

To test for mediation effects using import volume, the model design is as follows:

$$Importquantity_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{5}$$

$$Trade_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \alpha_5 Importquantity_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{6}$$

To test for mediation effects using import and export volume, the model design is as follows:

$$Sumquantity_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{7}$$

$$Trade_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \alpha_5 Sumquantity_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{8}$$

To test for mediation effects using total value of goods imports and exports, the model design is as follows:

$$Total_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{9}$$

$$Trade_{it} = \alpha_0 + \alpha_1 Treat_{it} + \alpha_2 Period_{it} + \alpha_3 Did_{it} + \alpha_4 X_{it} + \alpha_5 Total_{it} + \varphi_i + \omega_t + \epsilon_{it} \tag{10}$$

In these models, Exportquantity represents export volume (Equation 3); Importquantity represents import volume (Equation 5), Sumquantity denotes the combined import and export volume (Equation 7), and Total measures the total value of imported and exported goods (Equation 9). All other variables retain the meanings specified previously.

5. Empirical Analysis

5.1. Benchmark Regression Analysis

This study examines the impact of tariff policy on the import and export of aquatic products. Table 3 shows that in Column (1), the regression coefficient of the key explanatory variable—tariff policy—is -0.516, without the inclusion of control variables. This coefficient is significantly negative at the 1% level. The findings reveal that, after accounting for country and time fixed effects, the introduction of tariff policies resulted in an average reduction of 0.516 log units in the total import and export volume of countries in the treatment group. This corresponds to an approximate 40.3% decrease in China's overall aquatic product trade with the U.S. following the implementation of the tariff policy. The estimated impact is both economically and statistically significant.

Table 3. Comparison of Benchmark Regression Results.

Column	(1) Trade	(2) Trade	(3) Trade	(4) Trade
Did	-0.516***	-0.523***	-0.521***	-0.505***
	(0.135)	(0.138)	(0.145)	(0.147)
Reserve		-0.072	-0.072	-0.065
		(0.092)	(0.088)	(0.087)
rate			0.000	0.000
			(0.000)	(0.000)
Gdp				-0.774
				(1.402)
_cons	19.383***	20.217***	20.174***	28.917*
	(0.003)	(1.069)	(1.381)	(16.583)
Date fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
N	756	756	756	756
R2	0.914	0.915	0.915	0.915

Note: Robust standard errors clustered at the country level are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

In (2), after including foreign exchange reserves as a control variable, the coefficient for tariff policy becomes –0.523, remaining significant at the 1% level. In Column (3), following the inclusion of both foreign exchange reserves and the exchange rate, the coefficient is –0.521, also significant at the 1% level. In Column (4), which incorporates all control variables—foreign exchange reserves, exchange rate, and GDP—the coefficient is –0.505, again significant at the 1% level. All four models account for fixed effects for both time and country, thereby confirming Hypothesis 1. These findings align with Lu et al. and He, indicating consistent results across studies [5,7].

After including control variables, the coefficient of the key explanatory variable remains stable at approximately –0.505 and consistently significant at the 1% level. The estimated policy effects exhibit minimal sensitivity to the inclusion of different control variables, demonstrating the robustness of the baseline findings. The lack of statistical significance for the macroeconomic control variables may stem from their limited explanatory power once country and time fixed effects are accounted for. This highlights that the significant policy effect on aquatic product trade functions independently of broader macroeconomic conditions.

5.2. Parallel Trend Examination

Figure 1 illustrates the relative months surrounding the policy implementation (June 2018, Period 12), indicated by the red dashed line on the horizontal axis. The vertical axis denotes the estimated impact on seafood trade value (log-transformed). Blue dots represent coefficient estimates for each period, and the blue vertical lines show the 95% confidence intervals. The black horizontal line denotes the zero-effect baseline.
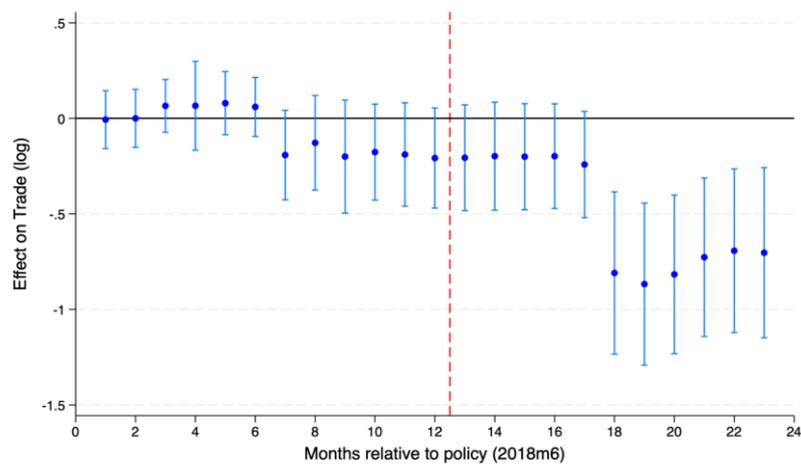

Figure 1. Results of the Parallel Trend Test (using June 2018 as the demarcation).

Before the implementation of the policy (i.e., prior to Period 12), the estimated coefficients cluster around zero, and all confidence intervals cross zero. This indicates no significant pre-treatment trend differences between the treatment and control groups, thereby supporting the parallel trends assumption. After the policy took effect (from Period 12 onward), the coefficients increasingly shift toward negative values, especially after Period 18, where values range roughly from –0.5 to –1.0. Most confidence intervals no longer include zero, signifying that the tariff policy significantly reduced trade volumes (a decline in log values reflecting real trade contractions). While the policy impact is minimal between Periods 12 and 15, a sustained and significant negative effect emerges from Period 18 onward—approximately six months after the tariff was imposed.

5.3. Robustness Examination

5.3.1. Adjusting the Sample Range

Following Ji and Sun, this study excludes two countries with significant missing data to evaluate the robustness of the main results [4]. Table 4 displays the results. The coefficient for the key explanatory variable Did is –0.379, significant at the 1% level and aligned with the baseline result. The model fit is high, with an R-squared value of 0.951, confirming the validity of the major findings.

Table 4. Robustness Test (Adjusted Sample Range).

Column	(1) Trade
Did	-0.379***
	(0.120)
Reserve	-0.069*
	(0.034)
Rate	-0.000
	(0.000)
Gdp	-0.876
	(1.084)
Constant	30.487**
	(12.485)
Country fixed effects	Yes
Date fixed effects	Yes
R-squared	0.951
Observations	684

Note: Figures in brackets denote standard errors; * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

5.3.2. Adjusting the Definition of Policy Timing

In line with Ji and Sun, the baseline model assumes the aquatic product tariff policy began in June 2018 [4]. For robustness, this study redefines the policy start date as March 2018, when President Trump announced additional tariffs on non-aquatic products. As shown in Figure 2, the pre-policy coefficients remain close to zero and include zero in their confidence intervals, again validating the parallel trends assumption. After the redefined implementation date, the coefficients steadily decline, becoming significantly negative—mirroring the baseline pattern.
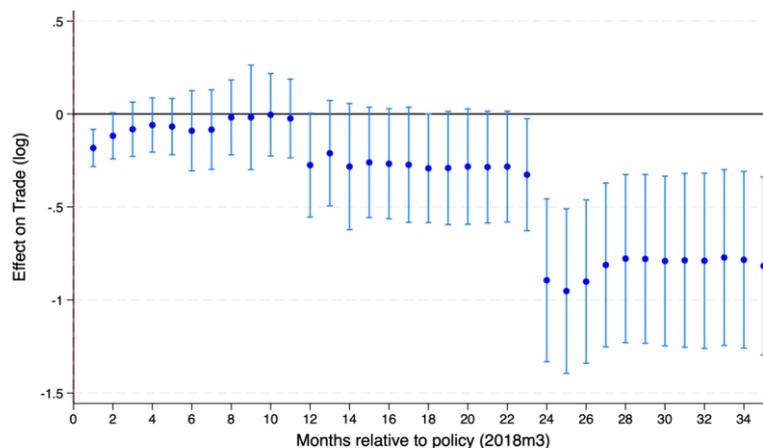

Figure 2. Results of the Robustness Test (using March 2018 as the demarcation).

The trend in Figure 2 closely aligns with the Figure 1 and does not change the conclusions. The consistent direction and similarity across time specifications further confirm the robustness of the findings.

5.3.3. Replacing the Dependent Variable

To further validate the results, this study replaces the dependent variable with import, following Ji and Sun [4]. As shown in Table 5, the regression coefficient for the key explanatory variable is −0.808 with a p-value of 0.000. This indicates that tariff measures similarly impose a significant restrictive effect on imports, reducing them by approximately 55%. The control variables are insignificant, suggesting that the tariff policy—rather than macroeconomic fluctuations—is the primary driver of declining aquatic product imports. The significant F-test confirms the robustness of the model.

Table 5. Robustness Test (Changing the Dependent Variable).

Column	(1) Import
Did	-0.808***
	(0.125)
Reserve	-0.00924
	(0.0690)
Rate	-0.000130
	(0.000173)
Gdp	0.767
	(1.085)
Constant	9.805
	(12.85)
Country fixed effects	Yes
Date fixed effects	Yes
R-squared	0.961
Observations	756
Clusters	21

Note: Standard errors are shown in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

However, when substituting the dependent variable with export, the DID estimator becomes inestimable because all variables are absorbed. This reflects inadequate variation in export values across time and countries, rendering the DID model invalid for exports.

5.3.4. Heterogeneity Analysis

Following He et al., the sample is divided into developed and developing countries based on the United Nations' 2024 classification to examine heterogeneity [10]. Table 6 indicates that for developed nations, the regression coefficient for tariff policy is −0.245 with a p-value of 0.003, indicating a statistically significant negative effect at the 1% level. This indicates that after the policy was implemented, trade volumes of aquatic products in developed countries declined by approximately 24.5%. Among the control variables, exchange rate and GDP both exhibit significant negative effects. The R-squared value of 0.986 indicates excellent model fit.

Table 6. Results of the Heterogeneity Analysis.

Column	(1) Trade (Developed)	(2) Trade (Developing)
Processing group = 0	0.000 (.)	0.000 (.)

Processing group = 1	0.000 (.)	-
Policy period = 0	0.000 (.)	0.000 (.)
Policy period = 1	0.000 (.)	0.000 (.)
Processing group = 0 x Policy period = 0	0.000 (.)	0.000 (.)
Processing group = 0 x Policy period = 1	0.000 (.)	0.000 (.)
Processing group = 1 x Policy period = 0	0.000 (.)	-
Processing group = 1 x Policy period = 1	-0.245*** (0.060)	-
Reserve	-0.759 (0.449)	-0.099 (0.108)
Rate	-0.003*** (0.001)	-0.000 (0.000)
Gdp	-2.759** (1.038)	-1.709 (2.963)
Constant	62.231*** (14.126)	39.287 (33.277)
Country fixed effects	Yes	Yes
Date fixed effects	Yes	Yes
R-squared	0.986	0.855
Observations	360	396
Clusters	10	11

Note: Standard errors are shown in parentheses; * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

For developing countries, the regression coefficient for tariff policy is zero and systematically dropped from estimation, indicating that the treatment effect cannot be determined—likely due to negligible variation in outcomes. The control variables are also insignificant, and the R-squared of 0.855 suggests that tariff measures have limited influence on China's aquatic product trade with developing nations.

In summary, the tariff policy exerts a significant inhibitory effect on trade with developed countries but shows no statistically significant impact in developing countries, reflecting variation based on country-specific characteristics.

5.3.5. Placebo Evaluation

Following the methodology of Ji and Sun, this study also conducts a placebo test in which five countries are randomly assigned to a "virtual treatment group," and the DID regression was re-estimated [4]. The findings are presented in Table 7. In Columns (1) to (4), the DID coefficients are close to zero and statistically insignificant. Column (5) reports a DID coefficient of –0.249, significant at the 10% level—representing an isolated instance in which the estimated effect deviates from the main findings. In randomized placebo experiments, it is common for one or two coefficients to appear marginally significant due to statistical false positives occurring at the 5% or 10% probability level.

Table 7. Results of Placebo Testing (Five Randomly Selected Countries).

Column	(1) Trade	(2) Trade	(3) Trade	(4) Trade	(5) Trade
1. Treated_placebo1 #1. Period	0.000 (0.156)				
1. Treated_placebo2 #1. Period		-0.145 (0.143)			
1. Treated_placebo3 #1. Period			-0.110 (0.153)		
1. Treated_placebo4 #1. Period				-0.145 (0.143)	
1. Treated_placebo5 #1. Period					-0.249* (0.144)
Reserve	-0.060 (0.089)	-0.059 (0.087)	-0.061 (0.089)	-0.059 (0.087)	-0.060 (0.088)

Rate	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gdp	-0.891	-0.942	-0.921	-0.942	-0.941
	(1.394)	(1.393)	(1.391)	(1.393)	(1.389)
_cons	30.135*	30.709*	30.492*	30.709*	30.731*
	(16.602)	(16.568)	(16.548)	(16.568)	(16.513)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Date fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.913	0.913	0.913	0.913	0.914
Observations	756	756	756	756	756
Clusters	21	21	21	21	21

Note: Standard errors are shown in parentheses; * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. To maintain brevity, the table is presented in a condensed form.

All five models report R-squared values above 0.9, indicating strong overall model fit. More importantly, the majority of randomly assigned coefficients remain statistically insignificant, aligning with the primary findings and reinforcing the robustness of the study's key conclusions. These findings indicate that the estimated effects of the tariff policy are not driven by underlying sample trends or artefacts associated with dummy variables.

5.3.6. Verification of Mechanism

(1) Mechanism Test for Import Quantities of Aquatic Products

This study uses import volume as a mediating variable to examine the mechanism, with findings reported in Table 8. In Model (1), the regression coefficient for Did is –0.505 and significant at the 1% level, satisfying the first condition for mediation analysis. In Model (2), the coefficient of Did on the mediating variable is -0.650 and also significant at the 1% level, fulfilling the second mediation criterion and indicating that the tariff policy significantly affects the mediator.

Table 8. Outcomes of Mechanism Validation (Import Volume).

Column	(1) Trade	(2) Importquantity	(3) Trade
Did	-0.505***	-0.650***	-0.130
	(0.147)	(0.150)	(0.080)
Reserve	-0.065	-0.069	-0.025
	(0.087)	(0.069)	(0.067)
Rate	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
Gdp	-0.774	1.669	-1.736*
	(1.402)	(1.323)	(1.004)
Importquantity			0.577***
			(0.175)
Constant	28.917*	-1.484	29.773**
	(16.583)	(15.354)	(11.544)
Country fixed effects	Yes	Yes	Yes
Date fixed effects	Yes	Yes	Yes
R-squared	0.915	0.954	0.954
Observations	756	756	756
Clusters	21	21	21

Note: Standard errors are shown in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In Model (3), the mediating variable (import volume) is added to the baseline regression. The coefficient for Importquantity is 0.577 and significant at the 1% level. The

coefficient for Did decreases to –0.130 and becomes statistically insignificant, satisfying the third criterion for mediation analysis. This indicates that import volume fully mediates the relationship between the aquatic products tariff policy and the value of aquatic product trade. Thus, Hypothesis 3 is supported.

From the standpoint of effect decomposition, the indirect effect is –0.37505 (i.e., –0.650 × 0.577), indicating that the tariff policy suppresses the import–export trade of aquatic products. The direct effect is –0.130 and statistically insignificant. The total effect, comprising the indirect and direct components, equals –0.505 (i.e., –0.37505 – 0.130), consistent with the results in Model (1).

The Bootstrap method (5000 iterations, clustered at the national level) was utilized to investigate the mediating effect of Importquantity. The findings demonstrate that the core variable exerts a significant indirect effect on Trade through Importquantity (Coefficient = –0.3690587, p = 0.033), with a 95% confidence interval of [–0.7082872, –0.0298303]. This indicates a significant adverse transmission effect, further confirming the validity of the proposed mechanism.

(2) Mechanism Assessment for Export Quantities of Aquatic Products

This study employs the original export volume dataset for mechanism testing, as imputing missing values may distort the results. The findings are presented in Table 9. In Model (1), the DID regression coefficient is –0.505 and significant at the 1% level, satisfying the first condition for mediation analysis. In Model (2), the DID coefficient is –0.123, significantly negative at the 10% level, satisfying the second mediation criterion. In Model (3), which incorporates export volume into the regression, the DID coefficient becomes –0.406 (its absolute value decreasing relative to Model (1)) and remains significant at the 1% level. The coefficient for Exportquantity is 0.492 and significant at the 1% level, thereby meeting the third requirement for mediation analysis. These results indicate that export volume partially mediates the relationship between aquatic product tariff policies and aquatic product trade. Thus, Hypothesis 2 is supported.

Table 9. Validation of Mechanism (Export Volume).

Column	(1) Trade	(2) Exportquantity	(3) Trade
Did	-0.505***	-0.123*	-0.406***
	(0.147)	(0.066)	(0.107)
Research	-0.065	0.055	-0.067
	(0.087)	(0.102)	(0.056)
Rate	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
Gdp	-0.774	0.343	-1.016
	(1.402)	(0.805)	(1.174)
Exportquantity			0.492***
			(0.078)
Constant	28.917*	12.540	23.280
	(16.583)	(9.806)	(13.951)
Country fixed effects	Yes	Yes	Yes
Date fixed effects	Yes	Yes	Yes
R-squared	0.915	0.985	0.932
Observations	756	737	737
Clusters	21	21	21

Note: Standard errors are shown in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

The Bootstrap method (5000 repetitions, clustered at the country level) further verifies the mediating effect of Exportquantity. Results indicate a significant indirect effect of the core variable on Trade through Exportquantity (Coefficient = -0.0605, p = 0.044),

with a 95% confidence interval (–0.119, –0.002). This confirms a significant negative transmission effect.

(3) Mechanism Assessment for Sum Quantities of Aquatic Products

This study employs both import and export quantities for mechanism assessment, with results presented in Table 10. In Column (1), the DID regression coefficient is –0.505 and significant at the 1% level, satisfying the initial condition for mediation analysis. In Column (2), the DID coefficient is –0.385, significant at the 5% level, meeting the second condition. In Column (3), the DID coefficient decreases to –0.170 and remains significant at the 1% level. The absolute value of the DID coefficient declines from –0.505 in Column (1) to –0.170 in Column (3). The regression coefficient for Sumquantity is 0.871, significantly positive at the 1% level, fulfilling the third mediation requirement. A Bootstrap test reveals a p-value of 0.016 for Sumquantity as the mediator, significant at the 5% level. These results indicate that combined import and export volumes partially mediate the relationship between aquatic product tariff policies and trade value, thereby confirming Hypothesis 4.

Table 10. Mechanism Verification (Import and Export Volumes).

	(1)	(2)	(3)
Column	Trade	Sumquantity	Trade
Did	-0.505***	-0.385**	-0.170***
	(0.147)	(0.165)	(0.040)
Reserve	-0.065	-0.088	0.011
	(0.087)	(0.086)	(0.020)
Rate	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Gdp	-0.774	0.125	-0.883
	(1.402)	(1.496)	(0.569)
Sumquantity			0.871***
			(0.029)
Constant	28.917*	17.406	13.761*
	(16.583)	(17.513)	(6.795)
Country fixed effects	Yes	Yes	Yes
Date fixed effects	Yes	Yes	Yes
R-squared	0.915	0.922	0.991
Observations	756	756	756
Clusters	21	21	21

Note: Standard errors are shown in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The Bootstrap procedure (5,000 iterations, clustered at the country level) further verifies the mediating effect of Sumquantity. The core explanatory variable exhibits a significant indirect effect on Trade through Sumquantity (coefficient = -0.03295497, p = 0.016), with a 95% confidence interval of (–0.5985435, –0.0605559), indicating a significant negative transmission effect.

(4) Overview of Mechanism Variable Bootstrap Tests (5000 Replications)

The principal explanatory variable—tariff policy—affects aquatic products trade primarily through three mediating variables: import volume, export volume, and total import–export volume. Among these, total import–export volume and import volume exhibit the most significant mediating effects. The indirect effect on export volumes alone is relatively small, suggesting some ambiguity concerning the overall volume mechanism. Table 11 presents the outcomes of the bootstrap tests (5,000 iterations) for the mediating variables. Appendix table A1 provides the detailed instrumental variable analyses for import and export quantities as mediators.

Table 11. Bootstrap Test Outcomes for Mechanism Variables (5,000 Replications).

bootMediator	Column	Observed coefficient	Bootstrap std. err.	z	P>|z|	Normal-based [95% conf. interval]		sig.
Importquantity	_bs_1	-0.3690587	0.1730789	-2.13	0.033	-0.7082872	-0.0298303	*
Exportquantity	_bs_1	-0.0604975	0.0300064	-2.02	0.044	-0.1193089	-0.001686	*
Sumquantity	_bs_1	-0.3295497	0.1372443	-2.4	0.016	-0.5985435	-0.0605559	***
Total	_bs_1	-0.3726354	0.2218582	-1.68	0.093	-0.8074696	0.0621988	n.s.

6. Conclusions and Recommendations

6.1. Conclusions

This study employed an event study approach to analyze the net policy effects of U.S. tariff measures on China's aquatic product trade. Using trade data between China and the U.S. during President Trump's tenure (2017–2021), and comparing it with China's trade with other major aquatic product partners, the analysis shows that U.S. tariffs had a significantly detrimental impact on China's aquatic product trade volume. The event-study based parallel trend tests were satisfied, and multiple robustness checks—adjusting the sample, redefining treatment periods, and substituting dependent variables—confirmed the integrity of the main findings. The placebo tests further indicated that most randomly generated DID estimates were insignificant, confirming the reliability of the baseline results.

Heterogeneity analysis revealed a significantly stronger negative impact among high-income countries, indicating a greater suppression effect, whereas the impact was insignificant for developing economies. Mechanism analyses demonstrated that import volumes fully mediate the association between aquatic product tariff policies and trade flows, while export volumes and total trade volumes act as partial mediators. These findings offer valuable insights for supporting the long-term development of Sino–U.S. aquatic product trade and enhancing the broader advancement of China's aquatic product exports.

Although the present study reveals important findings, it has several limitations. First, sample and data constraints—limited country coverage, restricted data availability, and a relatively short study period—may introduce selection bias. Second, the set of control variables is somewhat narrow, omitting additional factors that may influence seafood trade. Third, although the placebo test results are predominantly robust, one significant outcome remains, indicating that future research should incorporate additional robustness checks.

6.2. Recommendations

First, in terms of international cooperation, industrialized nations exhibit greater sensitivity to policy shocks than developing countries because their trading systems are more deeply embedded within global regulations and institutional frameworks. Enhancing policy coordination and institutional alignment with developed countries is therefore essential to alleviate negative impacts. Second, developing countries demonstrate lower vulnerability to tariff shocks, likely due to more diversified trade structures or lower levels of integration into the global trading system, leading to reduced reliance on international markets. This offers emerging economies greater strategic flexibility. Nonetheless, these nations should continue to deepen their integration into global supply chains. Third, regarding macroeconomic regulation, factors such as foreign exchange reserves, exchange rates, and GDP exert significant influence on aquatic products trade. Policymakers should carefully evaluate the potential restraining effects of these variables when designing policies and adjusting related economic instruments.

Appendix

Table A1: Mechanism test for the total volume of goods imported and exported

The results are presented in Table A1. Column (1) reports the benchmark regression results for the effect of tariff policy on the import and export value of aquatic products. After controlling for country fixed effects, time fixed effects, foreign exchange reserves, exchange rates, and GDP, the regression coefficient for the core explanatory variable—tariff policy—is –0.505, with a p-value of 0.003 < 0.01, indicating a significant negative effect at the 1% level. This confirms that the implementation of tariff policy significantly suppresses the value of aquatic product imports and exports, establishing the presence of a total effect.

In Column (2), the regression coefficient of tariff policy on the mediating variable, total goods imports and exports (Total), is –0.1582806, with a p-value of 0.000 < 0.01, indicating a significant negative effect at the 1% level. This satisfies the second condition for mediation testing, confirming that tariff policy significantly influences the mediating channel.

In Column (3), the mediating variable "Total Goods Imports and Exports" is incorporated into the baseline regression. The coefficient for Total Goods Imports and Exports is 2.383816, with a p-value of 0.090 < 0.1, indicating marginal significance at the 10% level. The coefficient for the core explanatory variable Did becomes –0.127875 with a p-value of 0.584, rendering it statistically insignificant. This suggests that the total volume of goods imported and exported fully mediates the relationship between tariff policy and aquatic product trade. In this case, tariff policy does not directly inhibit aquatic products trade, and the statistical significance of the mediating effect is relatively weak (0.009).

From the perspective of effect decomposition, the indirect effect is –0.377 (i.e., –0.158 × 2.384), indicating a negative impact that suppresses aquatic product trade. The direct effect is –0.128, which is statistically insignificant. The total effect, being the sum of indirect and direct effects, is –0.505 (i.e., –0.377 – 0.128), consistent with the result in Column (1).

However, the mediating effect of Total was further examined using the bootstrap method (5,000 repetitions, clustered at the country level). The results indicate that the core variable exerts an indirect effect on trade via total (coefficient = –0.3726354, p = 0.093), with a 95% confidence interval of (–0.8074696, 0.0621988), which includes zero. This indicates a weak or unstable transmission effect at the 10% threshold.

Overall, this study identifies an indirect pathway through which tariff policies reduce aquatic product trade by decreasing total goods import–export volumes. The statistical significance is close to the 0.1 level, suggesting that tariff policies may partially constrain aquatic product trade by tightening overall trade flows. Possible explanations include limited sample size, measurement error in the mediating variable, or the presence of other more influential mediating mechanisms or moderating factors. Future research employing larger samples or more precise measurement tools could provide stronger evidence for this pathway.

Table A1. Mechanism verification results (Total).

Column	(1) Trade	(2) Total	(3) Trade
Did	-0.505***	-0.158***	-0.128
	(0.147)	(0.018)	(0.230)
Reserve	-0.065	0.013	-0.097
	(0.087)	(0.013)	(0.084)
Rate	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Gdp	-0.774	-0.037	-0.685
	(1.402)	(0.201)	(1.225)
Total			2.384*
			(1.337)
Constant	28.917*	24.439***	-29.342
	(16.583)	(2.352)	(27.694)
Country fixed effects	Yes	Yes	Yes
Date fixed effects	Yes	Yes	Yes
R-squared	0.915	0.998	0.930
Observations	756	756	756
Clusters	21	21	21

Note: Standard errors are shown in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

References

1. Customs Tariff Commission of the State Council, "Announcement on adjusting tariff surcharges on imports originating from the United States," Ministry of Finance of the People's Republic of China, Apr. 11, 2025. [Online]. Available: https://gss.mof.gov.cn/gzdt/zhengcefabu/202504/t20250411_3961823.htm. [Accessed: Mar. 3, 2026].

2. T. T. L. Chong and X. Li, "Understanding the China–US trade war: causes, economic impact, and the worst-case scenario," *Econ. Political Stud.*, vol. 7, no. 2, pp. 185–202, 2019, doi: 10.1080/20954816.2019.1595328.

3. S. A. Rosyadi and T. Widodo, "Impact of Donald Trump's tariff increase against Chinese imports on the global economy: global Trade Analysis Project (GTAP) model," *J. Chin. Econ. Bus. Stud.*, vol. 16, no. 2, pp. 125–145, 2018, doi: 10.1080/14765284.2018.1427930.

4. J. Ji and M. Sun, "The impact of Sino-US trade friction on China's aquatic product import and export trade: an empirical test based on the difference-in-differences method," *Mar. Econ.*, vol. 13, no. 6, 2023, doi: 10.19426/j.cnki.cn12-1424/p.2023.06.005.

5. K. Lu, X. Wang, and F. Pierre, "Impact measurement of Sino-US trade friction on the international trade level of Chinese aquatic products," *Issues Agric. Econ.*, no. 8, pp. 125–134, 2021, doi: 10.13246/j.cnki.iae.20210617.001.

6. C. Shen, "The impact of trade barriers on China's aquatic product exports to the United States," Master's thesis, Shanghai Ocean Univ., Shanghai, China, 2021, doi: 10.27314/d.cnki.gsscu.2021.000778.

7. M. He and P. Zhao, "Impact of tariffs on the triple margin of Sino-US Bilateral aquatic product exports," *Guangdong Agric. Sci.*, vol. 48, no. 6, 2021, doi: 10.16768/j.issn.1004-874X.2021.06.019.

8. D. Jiang, "Prospects of US economic policy and Sino-US economic and trade relations," *People's Tribune · Acad. Front*, 2025, doi: 10.16619/j.cnki.rmltxsqy.2025.05.013.

9. X. Tu, J. Tian, and J. Li, "The shock of Trump's second-term trade policy, its global impact, and China's response," *Asia-Pacific Econ. Rev.*, no. 2, 2025, doi: 10.16407/j.cnki.1000-6052.2025.02.002.

10. L. He, X. Zhen, and P. Lv, "Adjustment and trend prediction of Sino-US aquatic product trade policies under the trade war," *Chin. Fish. Econ.*, vol. 42, no. 1, 2024. [Online]. Available: https://kns.cnki.net/kcms2/article/abstract?v=Z3g7xh44_Zg-01v_p0YPONz9J5fcuF2MTSc9ofCTn0S8KOhP593GYbLyW7HUV8zRMWYPtoTREQ0vhftRsH5f_hUu-V-

ByzNlQW8B3CG2eLXVM3tWy368A__R1qmUwzOaQQflpPQkHG3NY7qUp6W-cAxbusGqXwDE5Rhl1YF2k9muu66K-ct0qw==&uniplatform=NZKPT&language=CHS.

11. Z. Zhang and W. Huang, "The implementation, problems, and extensions of event study methodology," *J. Quant. Tech. Econ.*, vol. 40, no. 9, 2023, doi: 10.13653/j.cnki.jqte.20230725.003.

12. M. Du, *Introduction to International Trade*. Beijing, China: Univ. of International Business and Economics Press, 2001.

13. S. Yang and J. Feng, "An empirical study on the performance of YTO Express's backdoor listing—From the perspective of the event study method," *J. Yunnan Univ. Finance Econ.*, vol. 33, no. 4, pp. 133–140, 2017, doi: 10.16537/j.cnki.jynufe.000227.

14. Q. Gao and T. Xiong, "Are various regulatory policies for China's vegetable industry really effective? — a study based on event study methodology," *Res. Agric. Modernization*, vol. 36, no. 6, 2015, doi: 10.13872/j.1000-0275.2015.0146.

15. X. Wu, "A study on the impact of Sino-US trade friction on Zhanjiang's aquatic product exports and countermeasures," Master's thesis, Guangdong Ocean Univ., Zhanjiang, China, 2021, doi: 10.27788/d.cnki.ggdhy.2021.000123.

16. W. Peng, H. Chen, T. Zhang, et al., "Impact of China–U.S. trade frictions on Guangdong's aquatic product exports to the United States and corresponding countermeasures," *Guangdong Agric. Sci.*, vol. 47, no. 3, pp. 131–138, 2020, doi: 10.16768/j.issn.1004-874X.2020.03.018.

17. J. Xie and X. Wang, "The trade consequences of the Sino-US trade conflict: a study based on disaggregated Sino-US trade product data," *Theory Pract. Finance Econ.*, vol. 42, no. 1, 2021, doi: 10.16339/j.cnkihdxbcjb.2021.01.012.

18. Y. Wang, "New import substitution strategy: China's new industrial policy and governance from the perspective of great power competition," *Int. Econ. Trade Res.*, vol. 40, no. 9, 2024, doi: 10.13687/j.cnki.gjjmts.20240830.002.

19. J. Viner, *The Customs Union Issue*, P. Oslington, Ed. New York, NY, USA: Oxford Univ. Press, 1950.

20. Y. Lv, C. Lou, Y. Du, and X. Tu, "Analysis of the impact effects of trade friction based on the Sino-US tariff lists," *J. Finance Econ.*, vol. 45, no. 2, 2019, doi: 10.16538/j.cnki.jfe.2019.02.005.

21. X. Li, "Sino-US trade friction: an analysis based on the GTAP computable general equilibrium model," *J. Int. Trade*, no. 11, 2012, doi: 10.13510/j.cnki.jit.2012.11.003.

22. B. C. Lian, L. Zhu, and M. L. S. Ma, "Assessment of the international economic impact of Sino-US trade friction," *J. Finance Econ.*, vol. 44, no. 12, 2018, doi: 10.16538/j.cnki.jfe.2018.12.001.

23. Y. Chen, "Study on the impact of exchange rate fluctuations on China's aquatic product import trade from major RCEP member countries," Master's thesis, Shanghai Ocean Univ., Shanghai, China, 2022, doi: 10.27314/d.cnki.gsscu.2022.000078.

24. X. Zhang, "An empirical analysis of factors affecting China's total import and export volume," *China Market*, no. 11, 2016, doi: 10.13939/j.cnki.zgsc.2016.11.173.

25. T. Wang, "Measurement of export trade costs of Chinese cultural products and analysis of influencing factors—An empirical test based on panel data of China's cultural trade exports," *Contemp. Finance Econ.*, no. 10, pp. 97–107, 2014, doi: 10.13676/j.cnki.cn36-1030/f.2014.10.010.