

Article

Food Export Stability, Political Ties, and Land Resources

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Abstract: As a vital guarantee of food security for many countries, international food trade has been threatened by volatile international political ties in recent years. However, the existing literature lacks empirical evidence on the relationship between political ties and food export stability. Therefore, this article examines the impact of political ties on food export stability using United Nations General Assembly (UNGA) voting data and export data on food products from 2010 to 2018. The chosen timeframe ensures the exclusion of potential influences from both the financial crisis and the COVID-19 pandemic, enhancing the robustness of the findings. The test results show that the deterioration of political ties can reduce food export stability: the higher the voting dissimilarity of the trading partners in the UNGA, the less stable food exports. Mechanism analysis suggests that political ties can impede food export stability by increasing tariff and non-tariff barriers. The analysis of heterogeneity indicates that the advancement of urbanization in importing countries intensifies the adverse effects of political ties on food export stability. However, this negative impact is less pronounced when importing countries have more allocation and higher productivity regarding land resources such as cultivated land and forests. This article adds to the literature on the relationship between political ties, trade, land resource optimization, and food security. The findings of this study highlight the importance of land resources with respect to reducing the risk of food trade instability in the context of volatile international politics.

Keywords: international politics; instability risk; food security; cultivated land; forest



Citation: Zhou, H.; Fan, J.; Yang, X.; Duan, K. Food Export Stability, Political Ties, and Land Resources. *Land* **2023**, *12*, 1824. <https://doi.org/10.3390/land12101824>

Academic Editor: Mengyao Han

Received: 25 July 2023

Revised: 13 September 2023

Accepted: 20 September 2023

Published: 25 September 2023



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1. Introduction

The mismatch between the global distribution of population and arable land highlights the importance of stable food trade to food security. In 2019, East Asia accounted for 22% of the global population but only possessed 127.8 million hectares of arable land. On the contrary, North America, home to just 5% of the global population, boasted 198.8 million hectares of arable land. This imbalance has forced many countries to depend heavily on imports to secure their food supply. As a result, the proportion of food products in international trade has risen from 16.1% in 1995 to 21.0% in 2019 [1]. In food trade, export stability plays an important role. A higher degree of stability in food exports increases the likelihood that importing countries can consistently acquire food from international markets to bridge the gap between domestic food production and demand. This, in turn, bolsters the food security of importing countries. In the meantime, stable food exports enable exporting countries to transform natural resources into economic revenue more efficiently, thereby enhancing their income and productivity [2,3]. Therefore, as international trade tends to be unstable, the influencing factors and governance methods of food export stability have become important topics that need to be studied urgently [4].

Extensive research has been conducted on the factors impacting food export stability. Key factors include agricultural development in exporting countries, trade barriers, and the impact of free trade agreements (FTAs) between trading partners. Specifically, the international competitiveness of agricultural products and, consequently, stable exports, are enhanced by factors such as the degree of processing of agricultural products, scale of

agricultural land, diversification of rural export structures, and technological advantages of agricultural products [5,6]. Conversely, trade barriers, such as European food safety border inspections and U.S. sanitary and phytosanitary policy regulations, increase the cost and difficulty of food export, hindering its stability [7,8]. Lastly, studies suggest that increased market integration due to FTAs enhances food export stability [9,10].

International political ties can significantly impact food export stability. These political ties mainly refer to the diplomatic ties between countries, reflected in the similarity of foreign policy preferences and the consistency of their positions on specific international events [11,12]. Traditional international trade theories, represented by absolute cost theory and relative cost theory, regard changes in export costs as the fundamental source of export instability [13,14]. As an important factor affecting trade costs, changes in political ties have also been pointed out by some researchers as a cause of trade fluctuations [15,16]. Many scholars have examined the impact of political ties on international trade. For example, Du et al. [17] showed that political conflicts significantly and negatively affect related countries' exports to China. However, less attention has been given to the relationship between political ties and food export stability. Theoretically, we anticipate that a decrease in political ties will lead to unstable food exports. This instability arises because trade barriers hinder stable food exports [9,18–22], and the deterioration of political ties can increase these barriers. Lower political connections reduce the possibility of trade negotiations between trading partners, impeding the signing and implementation of trade agreements [16,23]. Moreover, loose political ties can increase the likelihood of trade sanctions, such as consumer boycotts and tariff retaliation by importing countries [24–26].

The allocation of land resources during urbanization is crucial in determining the role of political ties in food export stability. As land resources are essential for food supply, optimizing these resources during urbanization reduces reliance on food trade, diminishing the significance of political ties on food export stability [27,28]. Urbanization typically shifts resources from agriculture to industry and services, decreasing food supply capacity and increasing dependence on food imports [29,30]. Therefore, importing countries with limited land resources are more vulnerable to food export instability when political ties are volatile. Conversely, optimal allocation of cultivated and forest land resources during urbanization can reduce the impact of volatile political ties by minimizing dependence on food imports [31,32]. Deforestation, which leads to land degradation and a decline in arable land, limits food production capacity [33–35]. Moreover, forests are a vital food source for surrounding areas, so deforestation increases food procurement demand [36,37]. Therefore, optimally allocating and utilizing land resources may be the key to managing food trade instability risks caused by deteriorating international political ties during importing countries' urbanization.

To sum up, the deterioration of political ties can lead to increased tariff and non-tariff barriers for food exports by raising import tariffs, obstructing the negotiation of free trade agreements, and triggering consumer boycotts in importing countries, thus resulting in food export instability. Urbanization in importing countries causes the reallocation of land and other resources from agriculture to industry and services, widening the domestic food supply gap. This can strengthen the impact of political ties on food export stability from the demand side. Furthermore, protecting cultivated land and forest resources during urbanization can increase a country's food supply, thereby mitigating the impact of political changes on food export stability.

The role of political ties in food export stability has been neglected in the existing literature. To fill in this knowledge gap, this article attempts to explore the impact of political ties on food export stability and the governance effects of land resource allocation, using food export stability data from 2010 to 2018 and the corresponding United Nations General Assembly (UNGA) voting data. This study confirms that the deterioration of political ties among trading partners can decrease food export stability by enhancing trade barriers. Specifically, lower political ties can increase the import tariffs imposed by importing countries on food products, especially at the highest tariff level for large categories of

products. In terms of non-tariff barriers, weak political ties can impede food export stability as the number of Free Trade Agreements (FTAs) signed by trading parties decreases and the number increases with respect to anti-dumping lawsuits initiated by importing countries against exporting countries. The above conclusions remain consistent in a series of robustness checks and are not biased by factors such as institutional characteristics, trade scale, export comparative advantage, and the setting of export stability indicators. Additionally, endogenous problems are processed through instrumental variable (IV) estimation. In particular, this article explores the heterogeneity of the negative effects of political ties from the perspective of land resource allocation and productivity in importing countries during urbanization. The findings suggest that the negative impact of political ties on food export stability increases as the urbanization level of the importing country rises, suggesting that these countries have a higher reliance on food export stability. However, the phenomenon is less pronounced when importing countries increase the allocation of land resources in terms of cultivated land and forests. It is also noteworthy that in importing countries, improving agricultural production efficiency by using advanced technologies can also weaken the negative influence of political ties.

This article provides marginal contributions to the existing literature, mainly in three aspects. First, this article empirically proves the negative impact of political ties deterioration on food export stability, adding to the literature with respect to the relationship between political ties and international trade. Second, two crucial channels were identified through which political ties impact food export stability: tariff and non-tariff barriers. Third, this study finds that for the importing country, improvements in the allocation and productivity of land resources, cultivated land, and forest can reduce the negative impact of political ties on food export stability, suggesting that the protection of land resources and the application of advanced agricultural technologies are effective governance methods. The findings enrich the literature with respect to export stability, political ties on trade, land resource allocation, and food security. Meanwhile, in international political complexity, this study provides valuable policy implications for managing the risk of food trade instability.

2. Methodology

2.1. Data and Variables

The data consist of exported food products in 52 major exporting countries¹ from 2010 to 2018 and are compiled from three sources: the United Nations Comtrade database (UNCD), the World Bank database (NW), and the United Nations website (UNW). The UNCD includes export data with respect to food products, which are classified by HS-4 code from 1100 to 1300; the WBD comprises a series of national characteristics; and the UNW contains vote data of nations regarding issues of the UNGA. Selecting the 2010 to 2018 timeframe helps mitigate the influence of two global shocks, the financial crisis and the COVID-19 epidemic, on food export stability. This choice enhances the validity of the findings concerning the impact of political ties on food export stability.

2.1.1. Dependent Variable: Export Stability

Referring to Daruich et al. [3], structural changes in major export destinations are used to reflect export stability. The average sum of the export shares of the top ten export destinations for food exports within the sample time interval fluctuates between 78.116% and 80.704%. This fluctuation indicates that the exporting country experienced a geographic shift from 78.116% to 80.704% of its exports, signifying high export instability. This measure of food export stability aligns with the research framework of this article. The measurement process is as follows:

Trade data regarding food products from the UNCD is used to construct a dummy variable $Top10_{ijpt}$ based on Formula (1):

$$Top10_{ijmt} = \begin{cases} 1, & \text{if } rank_{ijmt} \leq 10 \\ 0, & \text{if } rank_{ijmt} > 10 \end{cases} \quad (1)$$

where $rank_{ijmt}$ denotes the descending rank of the proportion of country i 's exports of food product m to country j at time t , in relation to country i 's total exports of product m to all countries. Subsequently, model (2) is estimated:

$$Top10_{ijp,t+1} = \alpha + \beta \cdot Top10_{ijp,t} + \varepsilon \quad (2)$$

where β represents the probability that the top ten export destinations in period t maintain their top ten status at time $t + 1$. A smaller value of β indicates that more exports have shifted geographically, implying lower export stability.

β is used as the export stability and denote it as $Stability10_{ijmt}$ to better distinguish it from the coefficient value in empirical models. Figure 1 shows that the whole sample mean of $Stability10_{ijmt}$ fluctuated between 0.166 and 0.191 from 2010 to 2018, indicating that at least 63.2% to 65.1% of food exports could not maintain a stable state during the sample time interval. In 2012 and 2018, the level of food export stability dropped significantly. This phenomenon should be related to the European debt crisis and the China-US trade war. It also proves that this indicator can effectively reflect the reality of export instability.

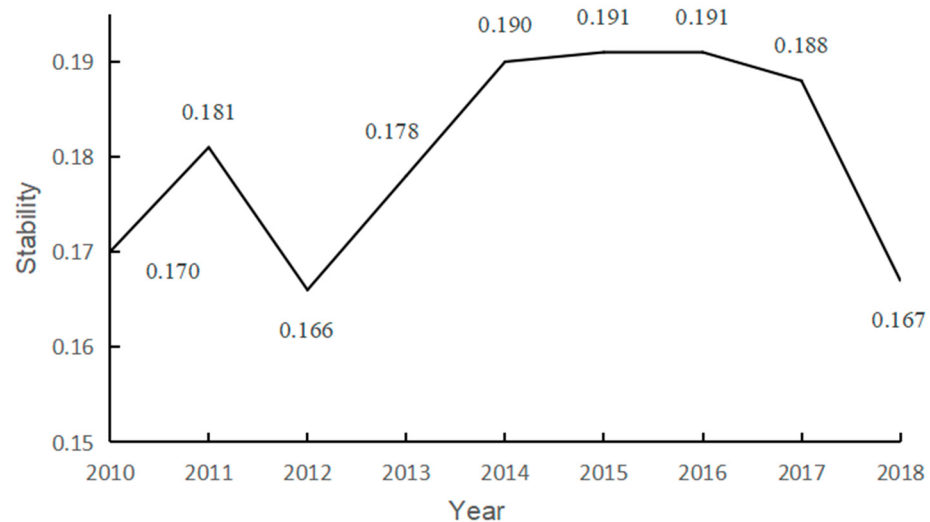


Figure 1. Trends in food export stability.

2.1.2. Core Independent Variable: Political Ties

Following the methodologies of Ambrocio and Hasan [11] and Bailey et al. [12], this paper reflects the political ties by using the voting dissimilarity of trading partners in the UNGA. The United Nations is the world's largest international political organization. Within this context, the voting dissimilarity of trading partners in the UNGA reflects the similarity of the foreign policy preferences between the two countries, effectively representing their diplomatic positions on specific international events. Therefore, this indicator is consistent with the definition and connotation of international political ties and meets the measurement needs of political ties within the research framework of this article. In addition, due to the broad membership of the United Nations and the availability of data, the voting data of the UNGA is suitable for studying international political ties in a multinational context. Since the establishment of the UN, scholars have used UN voting extensively to measure political ties since its inception, with 75 papers using the indicator to study international political ties between 1998 and 2012 alone [12]. Extensive research has demonstrated the validity and reliability of the indicator. In the voting on specific issues of the UNGA, state members have four voting options: yes, no, abstention, and absence. The

issues with absentee votes were excluded by referring to Umana Dajud [16], and political ties were calculated using the model (3):

$$politic_{ijt} = \frac{f_{ijt} + \frac{1}{2}g_{ijt}}{N_{ijt}} \times 100 \quad (3)$$

where i and j denote countries and t denotes year. f_{ijt} represents the number of issues with disagreement (i.e., one voted for yes and the other voted for no); g_{ijt} represents the number of issues with partial agreement (i.e., one voted for yes or no and the other abstention); N_{ijt} represents the number of issues in which both countries participated in all votes. The issues of the UNGA focus on international security, poverty, human rights, and other social issues but do not involve trade. Issues are proposed by the departments and member states of the UN based on UN development plans or specific events of that year. When the resolution involves a specific country, the country concerned does not have the right to vote. The voting data used to calculate political ties were collected on the official website of the UN, where the results of 1381 voting issues of the UNGA for the period 2009–2018 were manually searched.

2.1.3. Control Variables

A series of control variables collected from the WBD were also included in the analysis. Specifically, the empirical models include the following covariates: (1) Socio-economic characteristics, such as GDP, population, inflation rate, net terms of trade index, and total factor productivity; (2) the importance of grain export to the exporting country, which is reflected in the proportion of grain product exports in the exporting country's total exports; (3) other factors that may affect grain export, such as the geographical distance and exchange rate between trading partners. The statistical characteristics of relevant variables are detailed in Table A1.

2.2. Model Specifications

2.2.1. Baseline Model

The baseline model is constructed as Formula (4):

$$Stability10_{ijmt} = \alpha + \gamma \cdot Politic_{ij,t-1} + \mu \cdot X_{ijm,t-1} + v_i + \tau_j + \zeta_m + \lambda_t + \varepsilon \quad (4)$$

where $Stability10_{ijmt}$ is food export stability, $Politic_{ij,t-1}$ is political ties, and $X_{ijm,t-1}$ is a set of control variables. v_i , τ_j , ζ_m , and λ_t represent four types of fixed effects: exporting country, importing country, product, and time, respectively. If the value of γ is significantly negative, the deterioration of political ties can significantly weaken food export stability.

2.2.2. Instrumental Variable Model

The benchmark test result may face challenges from endogeneity issues. First, there may be an endogeneity problem caused by reverse causality. The decline in food export stability may also lead to the deterioration of political ties by harming the profits of interest groups and triggering political retaliation. Second, there may also be an endogeneity issue caused by omitted variables, which are factors that may affect food export stability but cannot be fully controlled. The instrumental variable method was adopted to address these endogeneity concerns.

To address concerns of endogeneity, an instrumental variable (V_{ijt}) is used: the number of controversial proposals that may lead to voting differences between the trading parties in the UNGA. These proposals meet the following two standards: (1) The proposals primarily focus on specific issues in specific countries; (2) one of the trading parties participating in the voting is in the same geographical region as the proposal country², while the other is in a different geographical region from the proposal country. The first standard was established because voting countries are more likely to disagree on country-specific proposals on specific issues, such as the Israeli-Palestinian conflict, than on general proposals

focused on global matters, such as protecting the environment. The second standard was established because, in the voting of country-specific proposals, voting countries with different geographical locations and strategic interests are more likely to have differences³. The continent on which a country is located is utilized as the standard for geographical location differentiation. The effectiveness of this standard and the specific measurement process for instrumental variables are detailed in Appendix A.2. The number of controversial proposals corresponding to each country group annually was identified and tallied. This instrumental variable measures the structure of voting issues in the UNGA from the perspective of specific country groups.

The instrumental variable meets the relevancy restriction. The voting dissimilarity of trading partners at the UNGA is a proxy variable for political ties. The voting results of UNGA will be influenced by the structure of the voting issues in that year [12]. Given that the total number of voting proposals at the UNGA is relatively small each year, the larger the number of controversial proposals in a given year, the more inconsistent the trading parties may be in voting on more proposals. This will lead to an increase in the voting dissimilarity of trading partners, reflected in the increase in the values of political ties indicators in this article. Therefore, the number of controversial proposals in the UNGA will significantly impact the indicator of political ties. The test results are expected to prove a significant positive correlation between the instrumental variable and the dependent variable in the first-stage test.

In addition, the instrumental variable meets the exclusion restriction. This variable is a structural feature of the voting agenda of the UNGA. The structure of voting issues is an internal characteristic of voting activities in the UNGA. Moreover, it is difficult to significantly impact other factors except for the consistency of voting among voting countries. That is, the instrumental variable makes it difficult to affect the stability of services exported through channels other than explanatory variables, which meets the exclusion restriction of the instrumental variable.

The first-stage and second-stage models of the instrument variable regression are specified as Formulas (5) and (6):

$$Politic_{ij,t-1} = \alpha + \vartheta \cdot V_{ij,t-1} + \mu \cdot X_{ijm,t-1} + v_i + \tau_j + \xi_m + \lambda_t + \varepsilon \quad (5)$$

$$Stability10_{ijmt} = \alpha + \gamma \cdot \widehat{Politic}_{ij,t-1} + \mu \cdot X_{ijm,t-1} + v_i + \tau_j + \xi_m + \lambda_t + \varepsilon \quad (6)$$

where $V_{ij,t-1}$ represents the number of divergent proposals, and $\widehat{Politic}_{ij,t-1}$ is the political tie index obtained from the simulation based on instrumental variables. If the value of ϑ is significantly positive, it means that the impact of instrumental variables on political ties is in line with expectations. If the value of γ is significantly negative, it means that, after excluding concerns about endogenous issues, the deterioration of political ties will still reduce food export stability.

2.2.3. Mechanism Model

Based on the theoretical analysis in the Introduction section, political ties may affect food export stability by improving tariff and non-tariff barriers. Models (7) to (9) are utilized for mechanism tests.

$$Tariff_{ijmt} = \alpha + \rho \cdot Politic_{ij,t-1} + \mu \cdot X_{ijm,t-1} + v_i + \tau_j + \xi_m + \lambda_t + \varepsilon \quad (7)$$

$$FTA_{ijt} = \alpha + \sigma \cdot Politic_{ij,t-1} + \mu \cdot X_{ijm,t-1} + v_i + \tau_j + \xi_m + \lambda_t + \varepsilon \quad (8)$$

$$Anti_{ijt} = \alpha + \tau \cdot Politic_{ij,t-1} + \mu \cdot X_{ijm,t-1} + v_i + \tau_j + \xi_m + \lambda_t + \varepsilon \quad (9)$$

where $Tariff_{ijmt}$ is the import tariff imposed by the importing country on the exporting country; FTA_{ijt} is the number of FTA agreements signed by trading partners; and $Anti_{ijt}$ is the number of anti-dumping lawsuits initiated by the importing country against the exporting country. If ρ is significantly positive, it indicates that the deterioration of political

ties can weaken food export stability by improving tariff barriers. If σ is significantly negative and τ is significantly positive, it indicates that the deterioration of political ties can reduce food export stability by improving non-tariff trade barriers.

3. Results

3.1. Benchmark Result

Table 1 shows the test results of model (4). Column (1) is the result without fixed effects. Columns (2) to (5) are the test results after sequentially adding exporting country fixed effects, importing country fixed effects, product fixed effects, and time fixed effects. The coefficients of $Politic_{ij,t-1}$ are all less than 0 and are all statistically significant at the 1% level, which indicates that the deterioration of political ties can weaken food export stability. The test results in column (5) of Table 1 are taken as the benchmark results, and the coefficient of $Politic_{ij,t-1}$ is -0.082 (1% level). The results show that a unit increase in the voting dissimilarity of the trade partners in the UNGA can decrease food export stability by 0.082 units. The impact of political ties on food export stability has clear significance in both statistical and economic dimensions.

Table 1. Baseline results.

	(1)	(2)	(3)	(4)	(5)
	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>
<i>Politic_{ij,t-1}</i>	−0.119 *** (0.028)	−0.107 *** (0.030)	−0.092 *** (0.028)	−0.092 *** (0.028)	−0.082 *** (0.029)
Control variable	Y	Y	Y	Y	Y
Export country FE		Y	Y	Y	Y
Import country FE			Y	Y	Y
Product FE				Y	Y
Time FE					Y
Observations	47,866	47,866	47,866	47,866	47,866
R ²	0.118	0.146	0.192	0.197	0.198

Note: *** represent the statistical significance at 1%. Robust standard errors (in parentheses) are clustered at the country group level.

3.2. Robustness Check

Several robustness checks were performed to verify the robustness of baseline conclusions:

(1) The effect of the institutional characteristics of trading partners was controlled for. In addition to political ties, the institutional characteristics of trading partners may also impact food export stability. To this end, the impact of the level of government stability, external conflict, ethnic tension, and democratic level of trading partners was controlled for, and the test results are shown in column (1) of Table 2. The coefficient of $Politic_{ij,t-1}$ is still significantly negative, indicating that the impact of political ties on food export stability still exists after controlling for institutional characteristics.

(2) The impact of the export scale was eliminated. The export scale may determine export stability and thus affect the reliability of the conclusions drawn in this paper. In column (2) of Table 2, the export value was controlled, and the coefficient of $Politic_{ij,t-1}$ is -0.082 (1% level). This indicates that export stability is not solely influenced by export value, suggesting that examining the effect of political ties on export stability can offer new insights beyond the current scope of research.

Table 2. Robustness checks.

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability5_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>
<i>Politic_{ij,t-1}</i>	−0.083 *** (0.029)	−0.082 *** (0.029)	−0.082 *** (0.029)	−0.061 ** (0.026)	−0.089 *** (0.029)	
<i>Politic_gro_{ij,t-1}</i>						−0.010 *** (0.003)
<i>Export_v_{ijm,t-1}</i>		0.147 (0.117)	0.137 (0.115)	0.327 * (0.170)	0.127 (0.110)	0.138 (0.115)
<i>Advantage_{ijm,t-1}</i>			0.011 *** (0.003)	0.007 *** (0.003)	0.012 *** (0.003)	0.012 *** (0.003)
Institutional features	Yes	Yes	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes	Yes	Yes	Yes
Import country FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47,866	47,866	47,866	47,866	42,444	47,866
R ²	0.198	0.200	0.201	0.182	0.202	0.201

Note: ***, **, and * represent the statistical significance at 1%, 5%, and 10%, respectively. Robust standard errors (in parentheses) are clustered at the country group level.

(3) The effect of changes in the comparative advantage of the exporting country was controlled for. If an exporting country's comparative advantage in exporting food products is significantly improved, its exports may be more stable. To remove the impact of changes in comparative advantage on the baseline result, the comparative advantage (*Advantage_{im,t-1}*) of exporting countries in grain exports⁴ was controlled for. The test results are shown in column (3) of Table 2. The coefficient of *Advantage_{im,t-1}* is 0.011 (1% level), indicating that changes in the comparative advantage of exporting countries affect exports. After adding the change in comparative advantage, the coefficient of *Politic_{ij,t-1}* is still significantly negative, indicating that the baseline conclusion is not determined by the comparative advantage of the exporting country in food exports.

(4) The dividing line of the export destination ranking was adjusted. In this paper, export stability is measured based on the retention probability of the ranking of export destinations, and the choice of ranking boundary may also affect the test results. The cut-off line for the ranking level was reduced from 10 to 5. Column (4) of Table 2 is the regression result of the influence of political relations on the retention probability of the *Top5* status. The coefficient of *Politic_{ij,t-1}* is −0.061 (5% level), and the baseline conclusion still holds.

(5) The effect of special years was removed. In 2018, global food exports became unstable due to the economic conflict between China and the United States. The data this year may not be conducive to detecting the impact of political ties on food export stability. In column (5) of Table 2, the data from 2018 for testing were excluded, and the coefficient of *Politic_{ij,t-1}* is still significantly negative, indicating that the baseline conclusion is not affected by the data of the special year.

(6) The measurement form of the political ties indicator was changed. In column (6) of Table 2, the growth rate of the dissimilarity of votes among trade parties in the UN General Assembly was used as an explanatory variable to test. Political ties can still have a significant impact on food export stability.

In addition, the possibility that the data dimension reduction problem in the process of export stability calculation would affect the baseline conclusion was also ruled out. The

relevant test results are presented in Appendix A.4. The above test results collectively credit the robustness of the baseline conclusion.

3.3. Instrumental Variable Estimation

Table 3 shows the results of models (5) and (6). The odd and even columns are the results of the first-stage and second-stage tests, respectively. The coefficient for $V_{ij,t-1}$ is 0.017 (1% level). This means that the increase in the number of divisive bills will lead to an increase in the voting dissimilarity between the trading partners in the UNGA, which aligns with expectations. Simultaneously, the value of K-PF in the first-stage test exceeds 10, thereby ruling out the issue of weak instrumental variables. The coefficient value of $\widehat{Politic}_{ij,t-1}$ is 0.571 (1% level), indicating that the political ties variable simulated based on instrumental variables can still significantly negatively impact food export stability. Columns (3) and (4) of Table 2 show that the conclusion of the IV test still holds after the cut-off line of the ranking is lowered to 5. In summary, after addressing endogeneity concerns, the baseline conclusions remain unchanged.

Table 3. Instrumental variable regression results.

	(1)	(2)	(3)	(4)
	First Stage $Politic_{ijt}$	Second Stage $Stability10_{ijmt}$	First Stage $Politic_{ijt}$	Second Stage $Stability5_{ijmt}$
$V_{ij,t-1}$	0.017 *** (0.001)		0.017 *** (0.002)	
$\widehat{Politic}_{ij,t-1}$		−0.571 *** (0.178)		−0.531 *** (0.164)
$Export_v_{ijm,t-1}$	−0.019 (0.012)	0.131 (0.113)	−0.019 (0.012)	0.321 * (0.167)
$Advantage_{ijm,t-1}$	0.001 *** (0.000)	0.012 *** (0.003)	0.001 *** (0.000)	0.007 *** (0.002)
Institutional features	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes	Yes
Import country FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	47,866	47,866	47,866	47,866
R ²		0.054		0.064
K-P F	112.29		112.29	

Note: *** and * represent the statistical significance at 1% and 10%, respectively. Robust standard errors (in parentheses) are clustered at the country group level.

3.4. Mechanism Analysis

Columns (1) to (4) of Table 4 show the test results of the mediating effect of tariffs. We take average import tariffs and weighted average import tariffs as mechanism variables in columns (1) and (2), respectively. The coefficients of $\widehat{Politic}_{ij,t-1}$ are 0.245 and 0.206 (1% level), respectively, indicating that the deterioration of political ties can improve the import tariff for food. Columns (3) and (4) show that improved political ties can improve minimum and maximum tariffs set by importing countries under the broad category of food products. Judging from the coefficient value, the highest tariff is more affected by political ties than the lowest tariff. The above results prove that the deterioration of political ties can weaken food export stability by reducing import tariffs.

Table 4. Mechanism analysis.

	(1)	(2)	(3)	(4)	(5)	(6)
	Average Tariff	Weighted Tariff	Min Tariff	Max Tariff	FTA	Anti-Dumping
	$Tariff_{ijtM}$	$Tariff_{ijtM}$	$Tariff_{ijtM}$	$Tariff_{ijtM}$	FTA_{ijt}	$Anti_{ijt}$
$Politic_{ij,t-1}$	0.245 *** (0.049)	0.206 *** (0.053)	0.122 *** (0.045)	0.280 *** (0.050)	−0.182 ** (0.087)	0.803 *** (0.089)
$Export_v_{ijm,t-1}$	−0.147 *** (0.044)	−0.092 (0.066)	−0.231 ** (0.105)	−0.074 ** (0.056)	0.003 (0.060)	−0.077 ** (0.035)
$Advantage_{ijm,t-1}$	−0.004 (0.006)	0.000 (0.007)	−0.015 ** (0.006)	0.009 (0.005)	−0.004 (0.002)	0.008 *** (0.001)
Institutional features	Yes	Yes	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes	Yes	Yes	Yes
Import country FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39,115	37,648	39,420	39,420	47,606	47,606
R ²	0.671	0.593	0.461	0.659	0.131	0.366

Note: *** and ** represent the statistical significance at 1% and 5%, respectively. Robust standard errors (in parentheses) are clustered at the country group level.

In columns (5) and (6) of Table 4, we use the number of FTAs signed by trade parties and anti-dumping lawsuits as proxy variables for non-tariff barriers, respectively. The coefficients for $Politic_{ij,t-1}$ are −0.182 (5% level) and 0.803 (1% level), respectively. This indicates that the deterioration of political ties can decrease the number of FTAs among trading partners and increase the number of anti-dumping lawsuits by importing countries against exporting countries. That is, the deterioration of political ties can weaken food export stability by improving non-tariff barriers. In summary, political ties can affect food export stability by changing tariff and non-tariff barriers.

3.5. Heterogeneity Analysis

This section shows the test results of the heterogeneity caused by the urbanization level of the importing country and the heterogeneity caused by the optimization of land resource allocation in the process of urbanization, consistent with the theoretical analysis results in the Introduction section.

3.5.1. Effects of Urbanization in Importing Countries

The expansion of cities will encroach on some farmland and transfer some agricultural production resources to other industries. This will increase the dependence of importing countries on food imports, making related food trade activities more likely to become the target of political trade sanctions, thereby amplifying the impact of political ties on food export stability. The proportion of urban population in the importing country is used as a proxy variable for its urbanization level, and a heterogeneity test is conducted through a classification test. Columns (1) and (2) of Table 5 show the test results using the proportion of the total urban population in the total population of the importing country as the classification standard. The coefficients of $Politic_{ij,t-1}$ are −0.099 (5% level) and −0.072 (10% level), respectively, indicating that the impact of political ties on food export stability will be strengthened as the urbanization level of the importing country increases.

Table 5. The test results of heterogeneity, which were caused by the level of urbanization in the importing country.

	(1)	(2)	(3)	(4)	(5)	(6)
	Proportion of Urban Population		Proportion of Population in Big Cities		Proportion of Largest City Population	
	High <i>Stability10_{ijmt}</i>	Low <i>Stability10_{ijmt}</i>	High <i>Stability10_{ijmt}</i>	Low <i>Stability10_{ijmt}</i>	High <i>Stability10_{ijmt}</i>	Low <i>Stability10_{ijmt}</i>
<i>Politic_{ij,t-1}</i>	−0.099 ** (0.040)	−0.072 * (0.040)	−0.077 * (0.041)	−0.058 (0.049)	−0.120 *** (0.046)	−0.076 ** (0.038)
<i>Export_v_{ijm,t-1}</i>	−0.042 (0.068)	0.643 *** (0.128)	0.102 (0.122)	0.081 (0.169)	0.154 (0.173)	0.124 (0.140)
<i>Advantage_{ijm,t-1}</i>	0.015 *** (0.004)	0.005 (0.003)	0.018 *** (0.004)	0.010 ** (0.004)	0.013 *** (0.004)	0.012 *** (0.004)
Institutional features	Yes	Yes	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes	Yes	Yes	Yes
Import country FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,319	23,659	20,288	20,755	20,257	24,646
R ²	0.223	0.205	0.219	0.205	0.205	0.199

Note: ***, **, and * represent the statistical significance at 1%, 5%, and 10%, respectively. Robust standard errors (in parentheses) are clustered at the country group level.

There is an obvious difference in the industrial structure of cities and towns of different sizes: the proportion of the agricultural sector can be higher in small cities than in large cities. Can this difference lead to heterogeneity in the impact of political ties on food export stability? To answer this question, columns (3) and (4) of Table 5 use the population proportion of large cities in the importing country, specifically cities with a population exceeding one million, as the classification criterion for testing. When the proportion of large cities is higher than the sample average value, the impact of political ties is significantly negative. However, when the proportion of large cities is lower than the sample average, the influence of political ties is not significant. This means that as the urbanization level increases, the negative impact of political ties on food export stability is more pronounced. In particular, for the special urbanization pattern in Mexico and other countries where a large number of urban populations are concentrated in one or two cities, we use the population proportion of the largest city in the importing country as the classification standard for testing. Columns (5) and (6) of Table 5 show that the heterogeneity characteristics caused by urbanization level still exist in the corresponding tests. The above results show that the impact of political ties on food export stability is an important issue that will become increasingly prominent with the deepening of the urbanization process in importing countries. While formulating and implementing urbanization strategies, relevant countries that rely on the international market for food supply need to formulate corresponding governance plans in advance to address the negative impact of political ties on food export stability.

3.5.2. Allocation of Land Resources in Importing Countries

Strengthening the protection of domestic cultivated land and forests during urbanization can optimize the allocation of land resources and enhance the food self-sufficiency capacity of importing countries. This helps to reduce the importance of food imports to importing countries, thereby weakening the impact of political ties on food export stability.

To address food security resulting from deteriorated political ties, this section focused on the role of land resources. First, the proportion of arable land per capita in the importing country is used as the classification standard for group testing. Columns (1) and (2) of Table 6 show the corresponding test results. Political ties significantly impact food export stability only when the proportion of cultivated land per capita is lower than the average value of the full sample. Considering the level of urbanization, an increase in the proportion of cultivated land per capita in importing countries can reduce the impact of political ties on food export stability. Columns (3) and (4) of Table 6 show the test results of the sub-samples where the proportion of cultivated land in the importing country is lower or higher than the sample mean. The impact of political ties on food export stability is significant only when the proportion of cultivated land in the importing country is relatively low. In columns (5) and (6), the classification criteria are adjusted to assess whether the grain arable land area of the importing country surpasses the sample average, confirming the continued influence of arable land resources. The above results show that the protection and intensification of cultivated land resources in importing countries can reduce the negative impact of political ties on the stability of food exports.

Table 6. Test results of the governance effects of optimal allocation of land resources in importing countries.

	(1)	(2)	(3)	(4)	(5)	(6)
	Per Capita Arable Land Area Low	High	Proportion of Cultivated Land Low	High	Grain Arable Land Area Low	High
	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>
<i>Politic_{ij,t-1}</i>	−0.154 *** (0.042)	−0.015 (0.040)	−0.073 ** (0.036)	−0.043 (0.050)	−0.105 ** (0.047)	−0.097 ** (0.039)
<i>City_{j,t-1}</i>	0.595 (0.390)	0.211 (0.498)	0.708 * (0.372)	0.297 (0.490)	0.492 (0.450)	0.847 ** (0.411)
<i>Export_{vijm,t-1}</i>	0.043 (0.088)	0.405 (0.297)	0.231 (0.202)	−0.070 (0.142)	0.265 (0.190)	0.087 (0.122)
<i>Advantage_{ijm,t-1}</i>	0.021 *** (0.004)	0.002 (0.004)	0.015 *** (0.004)	0.009 ** (0.004)	0.013 *** (0.003)	0.011 *** (0.004)
Institutional features	Yes	Yes	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes	Yes	Yes	Yes
Import country FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,071	23,795	23,190	24,676	22,990	23,243
R ²	0.239	0.183	0.188	0.215	0.192	0.207

Note: ***, **, and * represent the statistical significance at 1%, 5%, and 10%, respectively. Robust standard errors (in parentheses) are clustered at the country group level.

In columns (1) and (2) of Table 7, the criteria for group testing are based on whether the proportion of forest area in the importing country exceeds the sample average value. Only when the proportion of forest area in the importing country is low is the coefficient of *Politic_{ij,t-1}* significantly negative. This means that reductions in forest area in importing countries intensify the influence of political ties on food export stability. In columns (3) and (4) of Table 7, the classification standard is adjusted to the forest rent level of the importing country for testing. The lower the level of forest rent, the more abundant the forest resources; that is, the higher the level of forest protection. The coefficients of *Politic_{ij,t-1}* in columns (3) and (4) are −0.071 (10% level) and −0.123 (1% level), respectively. The heterogeneity characteristics caused by differences in forest resource protection still exist. The results

show that the protection of forest resources in importing countries can also weaken the negative impact of political ties on food export stability. In the process of urbanization, relevant countries and departments should consider the harmonious coexistence between urban land and cultivated land and further consider the protection of forest land resources.

Table 7. Test results of the impact of forest land resource allocation in importing countries.

	(1)	(2)	(3)	(4)
	Proportion of Forest Area		The Level of Forest Rent	
	Low	High	Low	High
	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>	<i>Stability10_{ijmt}</i>
<i>Politic_{ij,t-1}</i>	−0.168 *** (0.037)	0.013 (0.046)	−0.071 * (0.038)	−0.123 *** (0.042)
<i>City_{j,t-1}</i>	0.536 (0.339)	0.294 (0.491)	1.475 ** (0.635)	0.126 (0.348)
<i>Export_{ijm,t-1}</i>	0.454 *** (0.132)	0.001 (0.080)	0.021 (0.083)	0.792 *** (0.195)
<i>Advantage_{ijm,t-1}</i>	0.017 *** (0.004)	0.004 (0.003)	0.019 *** (0.004)	0.002 (0.003)
Institutional features	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes	Yes
Import country FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	23,529	24,337	24,737	23,129
R ²	0.213	0.210	0.205	0.206

Note: ***, **, and * represent the statistical significance at 1%, 5%, and 10%, respectively. Robust standard errors (in parentheses) are clustered at the country group level; institutional characteristics include the level of external conflict, ethnic tension, and level of democracy among trading partners.

3.5.3. Agricultural Productivity in Importing Countries

Like optimizing land resource allocation, improving agricultural production efficiency can also reduce importing countries' dependence on food imports. Therefore, the importing country's agricultural production efficiency may also moderate the influence of political ties on food export stability. In columns (1) and (2) of Table 8, the quantity of agricultural machinery in the importing country is used as a categorical variable for testing⁵. The results show that the influence of political ties on the stability of food exports will weaken as the scale of agricultural machinery application in the importing country increases. In columns (3) and (4) of Table 8, the crop production index⁶ of the importing country is used as a comprehensive proxy variable for its breeding technology and other agricultural production technologies. The coefficient significance of *Politic_{ij,t-1}* decreases as the crop production index of the importing country increases, indicating that the improvement of agricultural production technology in the importing country can also weaken the impact of political ties on food export stability. Relevant countries should actively promote the R&D and application of agricultural technology, such as agricultural machinery application and breeding technology, while optimizing land resource allocation and ameliorating the potential negative impact of volatile international political food trade.

Table 8. Test results of the governance function of agricultural production efficiency.

	(1)	(2)	(3)	(4)
	Number of Agricultural Machinery		Crop Production Index	
	Low <i>Stability10_{ijmt}</i>	High <i>Stability10_{ijmt}</i>	Low <i>Stability10_{ijmt}</i>	High <i>Stability10_{ijmt}</i>
<i>Politic_{ij,t-1}</i>	−0.094 *	−0.022	−0.090 ***	−0.077 *
	(0.050)	(0.051)	(0.032)	(0.041)
<i>City_{j,t-1}</i>	0.639	1.158	0.060	0.549
	(0.550)	(0.758)	(0.400)	(0.534)
<i>Export _v_{ijm,t-1}</i>	0.696	0.064	0.259	0.085
	(0.521)	(0.108)	(0.160)	(0.110)
<i>Advantage_{ijm,t-1}</i>	0.006	0.007	0.004	0.018 ***
	(0.004)	(0.004)	(0.003)	(0.003)
Institutional features	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes
Export country FE	Yes	Yes	Yes	Yes
Import country FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	15,892	16,349	23,309	24,557
R ²	0.168	0.183	0.202	0.206

Note: *** and * represent the statistical significance at 1% and 10%, respectively. Robust standard errors (in parentheses) are clustered at the country group level; institutional characteristics include the level of external conflict, ethnic tension, and level of democracy among trading partners.

4. Discussion

Amid the rising prominence of international food trade in global food security, this paper underscores the imperative of optimizing land resource allocation from the perspective of export stability, especially in food-importing countries. This is pivotal, as optimal allocation of land resources in these countries attenuates the adverse impact of deteriorating international political ties on food export stability.

Based on the food export stability data from 2010 to 2018 and the UNGA voting data, this paper delves into how political ties influence food export stability and its governance methods. Notably, a deterioration in political ties negatively impacts food export stability even after controlling various factors like export size and the institutional characteristics of trading partners. Political ties have been shown to affect food export stability in multiple ways, including changing import tariffs and increasing non-tariff trade barriers. The diversified mechanism ensures the findings' broader applicability, suggesting that even if one intermediary mechanism falters in a particular national context, political tie degradation can still diminish food export stability through other channels. Simultaneously, urbanization in importing countries can introduce potential risks from the perspective of international food trade. As urbanization can drive the shift of certain agricultural resources to other sectors and escalate a country's food import reliance, it can amplify the repercussions of political ties on food export stability. Luckily, these challenges can be adeptly managed. The strategic optimization of land resource allocation during urbanization, like bolstering cultivated land and forest preservation, can enhance an importing country's food self-sufficiency ability. This can curb its import reliance and hence mitigate the negative implications of deteriorating political ties. Technological advancements in agricultural production technology in importing countries can have a similar effect.

This study reaffirmed the core findings from previous works [15,17,26], emphasizing that the deterioration of bilateral political ties significantly impacts international trade. Given that food export stability plays a crucial role in a trade partner's economic growth

and social development [2,3], relevant findings can also provide an important intermediary mechanism for further discussions into how evolving international political ties influence countries' socio-economic trajectories. Moreover, the results of the heterogeneity analysis broaden the discourse on urbanization and land resource allocation from the perspective of international trade and politics.

Nonetheless, there are still some limitations to this research. Limited by data availability, the study's reliance on annual panel data might overlook short-lived political conflicts' impacts, like the short-term friction between Russia and North Atlantic Treaty Organization countries. Furthermore, while the findings confirm the universal impact of political ties on food export stability across multiple countries, in-depth discussions pertaining to specific countries were curtailed due to space constraints. In addition, when discussing the impact of three factors—urbanization, land resource allocation, and agricultural technological progress—this article used relevant data from the World Bank database. While this data ensures accuracy and availability suitable for the study's framework, their granularities are sometimes lacking. For instance, while they provide overall trends in agricultural machinery usage, they may not specify the breakdown between different types of machinery. Such limitations curtail more nuanced heterogeneity analyses. For subsequent, country-specific research, sourcing finer-grained data could allow for detailed studies on governance methods in particular contexts.

5. Conclusions

In the current complex international political landscape, food product trade is constantly impacted. This article highlights the significance of ensuring food security from the perspective of land resource optimization in terms of allocation and productivity. The baseline result demonstrates the negative impact of deteriorating political ties on food export stability. This conclusion offers important insights from the perspective of international political ties for countries reliant on international food imports to ensure their food security. Additionally, the analysis of the governance roles of urbanization, land resource allocation, and agricultural production efficiency offers useful guidance for optimizing the work of the government departments of development planning land resources in relevant countries.

Based on the analysis of this article, several policy implications are provided: First, major food-trading countries should pay attention to the influence of political ties, as their deterioration can result in unstable food exports. Second, countries reliant on international food imports can mitigate the negative impact of volatile political ties on food exports by optimizing land resource allocation during urbanization, ensuring harmonious coexistence among urban land, cultivated land, and forest. Third, the Department of Agriculture needs to improve agricultural production efficiency through agricultural mechanization or breeding, based on optimizing land resource allocation. This can further mitigate the risk of instability in the international food supply caused by the deterioration of political ties.

Future research can explore the impact of relevant political ties on food export stability using double-difference tests based on monthly or more granular data. Such endeavors could enhance understanding of short-term impacts, juxtaposing them with existing conclusions to discern variations in political ties' effects on food export stability over diverse timeframes. Meanwhile, further discussions of the impact of political ties on food export stability in a specific country are also of interest. China and other large food trading countries are a direction worth exploring in the future. Comparing the implications of political ties on food export stability across multiple countries versus individual nations can offer nuanced insights beneficial for tailoring country-specific policies. Furthermore, while this study mainly discussed land resource allocation governance during urbanization in importing countries, other governance methods await exploration. Subsequent research in this direction can refine and diversify the framework on political ties and food export stability, presenting policymakers with a broader spectrum of policy options.

Author Contributions: Conceptualization, H.Z. and J.F.; methodology, J.F.; software, J.F.; formal analysis, X.Y.; data curation, J.F.; writing—original draft preparation, X.Y.; writing—review and editing, K.D., X.Y., J.F. and H.Z.; supervision, H.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research received the support from the Natural Science Foundation of Fujian Province (2023J05098) and the Social Science Foundation of Fujian Province (FJ2023C035).

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: The authors are thankful for the support of Shangrun Wang, who was involved in the collation of UN voting data. We would like to thank the editor and the anonymous reviewers for their helpful suggestions and comments.

Conflicts of Interest: The authors declare that they have no conflict of interest.

Appendix A

Appendix A.1. Descriptive Statistics for Variables

Table A1. Descriptive statistics.

Variable	Description	Mean	Min	Max	Source
<i>Stability10_{ijmt}</i>	Food export stability.	0.196	0.000	1.000	Calculated by the author
<i>Politic_{ij,t-1}</i>	Political ties.	0.138	0.000	0.911	Calculated by the author
<i>I_{govj,t-1}</i>	Government stability of importing countries.	2.111	1.617	2.484	ICRG
<i>I_{excj,t-1}</i>	External conflicts of importing countries.	2.386	1.871	2.564	ICRG
<i>I_{ethj,t-1}</i>	Racial tension of importing country.	1.606	1.098	1.945	ICRG
<i>I_{demj,t-1}</i>	Democracy of the importing country.	1.764	0.652	1.945	ICRG
<i>I_{GDPj,t-1}</i>	GDP of importing country.	26.868	23.301	30.602	World bank
<i>I_{pGDPj,t-1}</i>	GDP per capita of importing country.	9.968	7.005	11.685	World bank
<i>I_{infj,t-1}</i>	Inflation of importing country.	1.041	−2.553	3.906	World bank
<i>I_{traj,t-1}</i>	Net terms of trade index of importing countries.	4.662	3.935	5.432	World bank
<i>I_{allj,t-1}</i>	The total factor productivity of importing country.	0.695	0.571	0.792	University of Groningen
<i>E_{govj,t-1}</i>	Government stability of exporting countries.	2.113	1.617	2.484	ICRG
<i>E_{excj,t-1}</i>	External conflicts of exporting countries.	2.387	1.891	2.564	ICRG
<i>E_{ethj,t-1}</i>	Racial tension of exporting country.	1.589	1.098	1.945	ICRG
<i>E_{demj,t-1}</i>	Democracy of the exporting country.	1.771	0.652	1.945	ICRG
<i>E_{GDPi,t-1}</i>	GDP of exporting country.	26.832	23.301	30.602	World bank
<i>E_{pGDPi,t-1}</i>	GDP per capita of exporting country.	9.955	7.005	11.685	World bank
<i>E_{infj,t-1}</i>	Inflation of exporting country.	1.031	−2.553	3.906	World bank
<i>E_{traj,t-1}</i>	Net terms of trade index of exporting countries.	4.658	3.935	5.432	World bank
<i>E_{agrj,t-1}</i>	The proportion of food exports in the total exports of exporting countries.	0.985	0.000	2.596	World bank
<i>E_{allj,t-1}</i>	The total factor productivity of exporting country.	0.695	0.570	0.792	University of Groningen
<i>Export_{vijm,t-1}</i>	Export value.	0.011	0.000	5.608	UN-Comtrade
<i>Advantage_{ijm,t-1}</i>	Comparative advantage of export.	6.035	0.014	9.804	Calculated by the author
<i>Exch_{ij,t-1}</i>	exchange rate between trading partners.	1.502	0.000	11.319	IMF
<i>Dist_{ij,t-1}</i>	Distance between exporting and importing countries.	6.456	0.160	19.539	CEPII

Appendix A.2. Specific Calculation Method of Instrumental Variable

The specific calculation method for the instrumental variable is as follows:

The continents where countries are located serve as the standard for the division of geographical regions. This helps ascertain the geographical relationship between the proposal country and each voting country during the United Nations General Assembly's voting on country-specific proposals in year t . The location of each country's continent is determined by historical factors, which can reflect the geographical ownership of the political and economic centers of the relevant countries. It is one of the important reference indicators for dividing geopolitical regions and is not influenced by the subjective factors of researchers. Taking the continent as the criterion for dividing geographic regions helps optimize the relevancy and exclusion restrictions of instrumental variables⁷. In a voting proposal g in year t , if voting country i and proposal country k are in the same continent, record it as $Area_{gikt} = 1$; otherwise, $Area_{gikt} = -1$.

Then, identifying whether each voting proposal involving a specific country in each year is a proposal that voting country i and country j may have different voting. Specifically, a proxy variable $Area_{gijkt} = Area_{gikt} \times Area_{gjkt}$ is constructed. If in the proposal g in year t , voting country i and proposal country k are in the same geographical area ($Area_{gikt} = 1$), but voting country j and k are not in the same geographical area ($Area_{gjkt} = -1$), then country i and country j may have differences in the vote on the proposal ($Area_{gijkt} = -1$).

V_{ijt} , the instrumental variable, is constructed as the number of proposals with the characteristic of $Area_{gijkt} = -1$ that country i and country j voted together in the UNGA each year from 2009 to 2018. Specifically, variable $Number_{gijkt}$ is initially constructed, and $Number_{gijkt} = 1$ when $Area_{gijkt} = -1$, otherwise $Number_{gijkt} = 0$. Let e represent the total amount of proposals involving specific countries in the United Nations General Assembly in year t , then $V_{ijt} = \sum_{g=1}^e Number_{gijkt}$.

Appendix A.3. Calculation Method of Comparative Advantage

Based on the export data of the UN-Comtrade database, the revealed comparative advantage is calculated based on Formula (A1):

$$Advantage_{imt} = \frac{Xe_{imt} / Xe_{it}}{\sum_i Xe_{imt} / Xe_{it}} \quad (A1)$$

where $Advantage_{imt}$ is revealed as a comparative advantage; Xe_{imt} represents the total export of country i in m product in period t ; and Xe_{it} represents the total export of country i in period t .

Appendix A.4. Robustness Check

Referring to the method of Daruich et al. (2019), model (A2) is constructed for testing the impact of political relations on grain export stability:

$$Top10_{ijm,2018} = \alpha + \beta \cdot Top10_{ijm,2009} + \gamma \cdot Politic_{ij,2009} + \delta \cdot Politic_{ij,2009} \times Top10_{ijm,2009} + X_{ijm,2009} + \varepsilon \quad (A2)$$

where $Politic_{ij,2009} \times Top10_{ijm,2009}$ is the interaction term between the political tie and the $Top10$ variable in year 2009. δ is the main concerned coefficient of the model, which represents the common influence of $Politic_{ij,2009}$ and $Top10_{ijm,2009}$ on $Top10_{ijm,2018}$. If the δ value is significantly negative, it means that the deterioration of political ties can weaken food export stability.

Compared with model (4), model (A2) does not need to calculate export stability data through data dimensionality reduction. The robustness test based on the model (A2) can eliminate the influence of data dimensionality reduction on the baseline test result. However, model (A2) is a test model based on cross-sectional data and cannot add time-

fixed effects like model (4) to exclude the influence of time trends. Therefore, we use model (4) as the benchmark test model and model (A2) as the robustness test model.

Table A2. Robustness checks with the alternative model.

	(1)	(2)
	<i>Top10_{ijm,2018}</i>	<i>Top5_{ijm,2018}</i>
<i>Politic_{ij,2009} X Top10_{ijm,2009}</i>	−0.027 *** (0.009)	
<i>Politic_{ij,2009} X Top5_{ijm,2009}</i>		−0.043 *** (0.011)
<i>Export_{vijmt}</i>	0.014 *** (0.002)	0.013 *** (0.001)
<i>Advantage_{ijmt}</i>	0.023 *** (0.004)	0.019 *** (0.004)
Institutional features	Yes	Yes
Control variable	Yes	Yes
Export country FE	Yes	Yes
Import country FE	Yes	Yes
Product FE	Yes	Yes
Time FE	Yes	Yes
Observations	11,993	11,993
R ²	0.224	0.246

Note: *** represent the statistical significance at 1%. Robust standard errors (in parentheses) are clustered at the country level; institutional characteristics include the level of external conflict, ethnic tension, and level of democracy among trading partners; due to space limitations, the control variable estimates are not listed.

Column (1) of Table A2 shows the test results of model (A2). The coefficient of *Politic_{ij,2009} × Top10_{ij,2009}* is 0.089 (1% level), and the deterioration of political ties can still significantly weaken food export stability. Column (2) of Table A2 shows that political ties can still significantly negatively impact food export stability after downgrading the ranking of export destinations to 5. The above results show that the reliability of the baseline result will not be affected by a reduction in data dimensionality in the calculation process of export stability.

Notes

- ¹ The export scale of the OECD countries with the smallest export scale in 2018 is used as the standard to select the main exporting countries.
- ² The proposal country refers to the country that is discussed in a specific national proposal. For example, in the proposal which focuses on Iran's nuclear program, Iran is the proposed country.
- ³ For example, in the proposal on Ukraine, it is easier for countries in the European region to reach an agreement. However, countries located in Asia or the Americas have differences in strategic interests compared to European countries, which is more likely to lead to voting differences.
- ⁴ The calculation method of comparative advantage is detailed in Appendix A.3.
- ⁵ Due to data limitations, the number of agricultural machinery in relevant countries in 2005 is used as the classification standard, and the data comes from the World Bank database.
- ⁶ The crop production index shows the annual agricultural output relative to the base period of 2014–2016. It can reflect the overall impact of relevant agricultural technology factors on agricultural production under the background of relatively small changes in the cultivated land area of each country.
- ⁷ Although the distance between countries can also be used as a reference index to identify geographic regions. However, if the geographical distance is used as a reference index, author must subjectively determine the boundary value of geographical distance to distinguish whether countries are in the same geographical area, which may lead to measurement bias.

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