

Article

Does Geopolitical Risk Affect Agricultural Exports? Chinese Evidence from the Perspective of Agricultural Land

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Abstract: Geopolitical conflicts and power games among major nations present substantial challenges to cross-border trade and global economic development; however, the existing literature has paid limited attention to the role of geopolitical risk in agricultural exports, especially the underlying macroimpact mechanisms from the perspective of agricultural land. This paper utilizes China's agricultural export data spanning 1995–2020 to empirically investigate the influence of geopolitical risk on China's agricultural exports and unveil its specific internal mechanisms. The findings reveal that China's agricultural exports are negatively affected when its trading partners are exposed to geopolitical risk. Notably, trading partners' agricultural land is instrumental in mitigating the adverse effects of geopolitical risk on China's agricultural exports. Moreover, a heterogeneity analysis shows that the impact of geopolitical risk on China's agricultural exports is more significant in non-Belt and Road countries than in Belt and Road countries. Given China's status as one of the world's major agricultural exporting nations, the results of this study hold significant importance in proactively addressing and alleviating the impact of geopolitical risks on both Chinese and global agricultural exports.

Keywords: geopolitical risks; agricultural exports; agricultural land; Belt and Road Initiative



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1. Introduction

Since joining the World Trade Organization, China has continuously expanded its openness to agriculture, leading to a rapid growth phase in agricultural trade. From 2001 to 2022, the trade volume of Chinese agricultural products increased 12-fold, rising from USD 27.45 billion to USD 334.32 billion, with an average annual growth rate of 12.6%, surpassing the global agricultural trade growth rate of 6.7% during the same period [1,2]. China's land policy places significant emphasis on protecting arable land and promoting sustainable agricultural development, which holds crucial significance for international agricultural trade [3,4]. The proportion of China's involvement in world agricultural trade increased from 3.2% in 2001 to 8.3% in 2021, with its global ranking in agricultural trade rising from 11th place to 2nd place. However, in recent years, China's export environment has not been optimized. The global geopolitical environment has become increasingly hostile, with risks arising from geopolitical events, such as the Russian–Ukrainian conflict, regional disputes in the Middle East, and ongoing trade disputes between China and the United States (US). Furthermore, prolonged epidemics have seriously affected the trade environment of partner countries. Given the complex geopolitical environment, it is vital to study how the geopolitical risks presented by trading partners affect China's agricultural exports.

In the context of rising geopolitical tensions, the question of how geopolitical risk influences the international economy has drawn the attention of many economists, investors, and scholars [5–7]. According to the Global Risks Report 2020, released by the World Economic Forum in Davos, geopolitical risks have become one of the top five risks affecting global economic development. Changes in a country's geopolitical risks affect not

only its own economy but also the economies of its trading partner countries. The peaceful foreign policy espoused by China aims to avoid direct entanglement with other countries, but the geopolitical risks associated with these countries can still cause dramatic changes in their bilateral trade with China. For example, the full escalation of the Russian–Ukrainian conflict from 2014 to 2022 and the outbreak of the Palestinian–Israeli conflict in October 2023 presented high geopolitical risks for the countries involved. This high geopolitical risk not only affects their own economies but also seriously impacts China’s trade through trade settlements and partial or total trade embargoes. Therefore, there is an urgent need to study the impact of geopolitical risk among trading partner countries on China’s agricultural export trade.

The early literature used several geopolitical events, such as conflicts, civil wars, international wars, and terrorist attacks, to analyze the impact of geopolitical risk on trade [8–11]. The negative international trade impacts of regional conflicts [12], such as the continued escalation of the Russian–Ukrainian conflict and economic sanctions against Russia, have led to a sharp decline in Russia’s oil export trade [13] and increased the volatility of oil prices [14]. Terrorism increases the costs of firms in trading nations, so terrorism reduces exports [15,16]. However, studies on these topics lack a comprehensive index to measure geopolitical risk, and the conclusions drawn are constrained by their timeliness.

In addition, several articles have examined the relationship between geopolitics and agricultural trade [17–20]. Li et al. [21] found, from the perspective of global geopolitical risk, that an increase in geopolitical risk weakens the positive correlation between equity and agricultural commodity prices. The study further examined the dynamic impact of geopolitical risk on this relationship by comparing the import and export of agricultural commodities relative to GDP. Monroe [22] explored how the import, production, and consumption of food in Qatar are influenced by geopolitics. Chatellier [23] found that the main importers of beef and veal, including the United States, China (with Hong Kong), Japan, and Russia, have different trajectories that depend on changes in the domestic demand for beef and veal, sanitary conditions in supplier countries, and geopolitical issues. Candau [24] found that agricultural product exports have a pacifying impact on ethnic conflicts in Africa. The above studies explore the relationship between geopolitical risk and a certain type of agricultural product trade from the perspective of global geopolitical risks or specific risk events.

Therefore, how do increasingly complex geopolitical risks affect China’s agricultural exports? The existing literature has considered only one category of geopolitical events when discussing the relationship between geopolitical risk and agricultural product trade. We adopt the perspective of geopolitical risk in China’s partner countries and utilize the Geopolitical Risk (GPR) index proposed by Caldara and Iacoviello [25] to measure the changes in the geopolitical risk in partner countries. The index covers geopolitical risk events such as interstate tension, war, conflict, terrorist acts, and threats arising from all potential risk factors. The index relates not only to global geopolitical events but also to country-specific risk environments. The originality of this GPR index is that it was constructed through an automated text search program that calculates the frequency of the occurrence of terms related to geopolitical risk events and tensions appearing in mainstream newspapers in the United States, Canada, and the United Kingdom. The GPR index has the advantage of being clearly defined compared to other measures of geopolitical risk [26,27]. The GPR measure is transparent, as its design framework, data sources, indicator construction, and algorithms are open to the public.

Using the GPR index, the goal of this paper is to investigate the impact of geopolitical risk from trade partner countries on China’s agricultural export trade from 1995 to 2020. The findings show that geopolitical risk significantly negatively impacts China’s agricultural export trade. In other words, China reduces its agricultural export trade to countries with a high geopolitical risk. In addition, we find that agricultural land can weaken the negative impact of geopolitical risk on China’s agricultural exports. Furthermore, given the complex international geopolitical environment, from the perspective of China’s foreign policy,

we find a heterogeneous effect of the Belt and Road Initiative on the correlation between geopolitical risk and China's agricultural export trade.

Compared with the previous literature, this paper offers three major contributions. First, we explore a new factor affecting China's agricultural exports to partner countries. The literature on the factors influencing agricultural export trade has focused mainly on trade policies, environmental pollution, and trade personnel [19,28,29]. Research on the relationship between geopolitical risks and agricultural trade is relatively limited and is primarily confined to specific types of geopolitical events. In this paper, we investigate the influence of geopolitical risk on China's agricultural exports and unveil the specific internal mechanisms. This study enriches the research on how agricultural export trade can be shielded from geopolitical risks in partner countries. Second, we employ the agricultural land of partner countries as a moderating variable to investigate its mitigating role in the impact of geopolitical risk on China's agricultural exports. Third, from the perspective of the Belt and Road Initiative, we analyze the significant differences in the geopolitical risk impact elasticity of China's agricultural export trade between countries along the Belt and Road and non-Belt and Road countries.

The remainder of this article proceeds as follows. Section 2 presents the literature review and theoretical analysis. Section 3 discusses the model setting and data source. Section 4 analyses the estimation results, and Section 5 concludes the paper.

2. Methods

2.1. Theoretical Analysis and Hypotheses

As China's agricultural exports expand, China faces increasing international risks, most prominently geopolitical risks. The business environment in which multinational companies operate changes with the geopolitical climate. Geopolitical risk negatively impacts international trade through three main channels. First, multinational companies may suffer significant losses due to terrorist attacks or other geopolitical events, preventing the normal export of agricultural products [30]. Second, geopolitical risk may lead to domestic economic disorder, sluggish consumption, and shrinking production in destination countries, thus indirectly affecting the market environment for agricultural exports [31]. Third, according to transaction cost theory, as geopolitical risk increases, multinational companies must increase their security investments, leading to significant increases in trade and operating costs, and thereby reducing the volume of trade transactions [32]. Thus, we hypothesize the following:

H1. *Geopolitical risk negatively affects China's agricultural exports.*

If geopolitical risks have reduced China's agricultural exports to trading partner countries, are there factors that could diminish this negative impact? A larger area of agricultural land in trading partner countries indicates a greater consumption demand for agricultural products [33–35]. Countries with a high demand for agricultural products are likely to attract more Chinese economic and trade personnel who are willing to trade in agricultural exports with those countries. Chinese economic and trade personnel are diligent and courageous and have a pioneering entrepreneurial spirit. When a large-scale terrorist attack or war occurs in a trade destination country with a large amount of arable land, Chinese trade and economic personnel may not interrupt trade and economic exchanges with that country but may even exploit the absence of trade and economic personnel from other countries, who leave due to the high GPR, and gain more market share. This is a rational decision, made after a risk-adjusted cost and benefit analysis [36,37]. Therefore, we consider the moderating effect of agricultural land on the negative impact of geopolitical risk on China's agricultural exports and propose the following hypothesis:

H2. *The negative effect of geopolitical risk on China's agricultural exports is moderated by agricultural land.*

While economic globalization has limited the ability of countries to control their trade policy, foreign policy continues to have a significant impact on economic and trade relations between countries. The Belt and Road Initiative is a feature of China's foreign policy and has had significant implications for China's international trade as well as for its relations with other countries [37,38]. In this context, it is necessary to study the heterogeneity in the impact of geopolitical risks on China's agricultural exports to Belt and Road countries and nonparticipating countries. China's foreign policy adheres to the principles of "peaceful coexistence" and "noninterference", and this attitude can support the development of diplomatic relations between the two parties involved in trade and gain favor among the people of the Belt and Road countries, thus leading to a positive correspondence between the government and the people in terms of economic and trade relations [39–41]. Under the Belt and Road Initiative, China's exports and investments in countries along the Belt and Road are gradually increasing [39,42]. China's economic and political relations with the Belt and Road countries have developed well, and China's economic and trade personnel have relatively stable trade exchanges with these countries, which makes them immune to the impact of geopolitical risks. On the other hand, China's agricultural export trade to non-Belt and Road countries is more sensitive to geopolitical risk and more vulnerable to geopolitical risk fluctuations. Therefore, we propose the following hypothesis:

H3. *The elasticity of geopolitical risk regarding agricultural exports between China and the Belt and Road countries is lower than that between China and other countries.*

2.2. Sample and Variables

Due to the limitations of the GPR index dataset, we used 36 of China's agricultural trading partner countries in the empirical analysis: Argentina, Australia, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Indonesia, India, Israel, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, Peru, the Philippines, Portugal, Russia, Saudi Arabia, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, the United Kingdom, the United States, and Venezuela.

The dependent variable, China's agricultural export volume ($\ln_{agexp}$), is the total agricultural export volume from China to its trading partners. We used the Standard International Trade Classification (SITC) Revision 3 [18] to collect statistical data on China's agricultural exports. Although there is a revised version of SITC Rev.4, after SITC Rev.3, trade data for SITC Rev.4 have only been available since 2007. Therefore, the time period of the SITC Rev.4 trade data is relatively short and not suitable for econometric analysis. Therefore, we chose the SITC Rev.3. The data were obtained from the UN-Comtrade database.

The independent variable is the GPR index ($\ln_{gpr}$) of the sample countries. Since the GPR metric includes monthly data, we used the arithmetic mean of the monthly GPR as the annual value. The GPR data are available for download from <http://www.policyuncertainty.com/gpr.html> (accessed on 10 September 2023); on the website, we can obtain monthly GPR indices for 36 countries.

Agricultural land ($\ln_{agland}$) was chosen as the moderating variable. We measured agricultural land as land under temporary crops, temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land that was temporarily fallow. Due to the availability of agricultural land data, we obtained annual data for 36 of China's trading partner countries from the World Development Indicators database.

The control variables include trading partner market size ($\ln_{gdp}$), home country market size ($\ln_{cgdp}$), the money freedom index ($\ln_{moneyfree}$), the rural population ($\ln_{ruralpopu}$), and geographic distance ($\ln_{distance}$). These country-level characteristic variables were found to have an impact on international trade in the literature [43,44]. We used trading partners' GDP ($\ln_{gdp}$) and China's GDP ($\ln_{cgdp}$) to represent the trade market size. The data were obtained from the World Development Indicators database. We used the money freedom index ($\ln_{moneyfree}$) to measure the openness of each country's international trade market.

These data were obtained from the annual report published by the Heritage Foundation. We used the rural population (*lnruralpopu*) to represent the size of market demand for agricultural products. The data were collected from the World Development Indicators database. We took the absolute distance between the economic centers of the two countries as the geographic distance (*Indistance*). The data were collected from the CEPII database. The control variables were a set of country-level characteristics, and due to the availability of the data, the data for these variables are annual.

To examine the normality of the variables, we used the D’Agostino test. The results show that the original data sets for all variables do not obey a normal distribution, so we adopted a logarithmic treatment for all variables. The normality test was performed again for the logarithmic variables, and the results were all within the acceptable range. In addition, a panel unit root test was performed to ensure data stability. All logarithmic variables passed the panel unit root test at the 5% level, and the data were stable. Therefore, there is no problem with the panel regression.

Table 1 presents the descriptive statistical results, and Table 2 shows the correlation matrix of the main variables. All the explanatory variables have a low correlation with the independent variable. The variance inflation factors (VIFs) for the variables are less than 2, and the mean VIF is 1.28. Thus, multicollinearity can be disregarded in our analysis [45].

Table 1. Descriptive statistics.

Variables	N	Mean	Std. Dev	Min	Median	Max
lnagexport	927	19.11	1.92	13.49	19.30	23.23
lngpr	936	4.46	1.27	1.73	4.28	8.38
lnagland	931	15.72	1.64	12.56	15.59	19.02
lngdp	928	29.09	2.59	24.30	28.36	36.93
lncgdp	936	31.18	0.67	30.07	31.25	32.14
lnmoneyfree	915	4.34	0.19	2.82	4.39	6.63
lnruralpopu	936	15.93	1.61	12.31	16.07	20.63
Indistance	936	8.92	0.61	6.86	8.97	9.87

Note: This table presents descriptive statistics of all variables. The variables were logarithmically transformed.

Table 2. Correlation analysis.

Variables	lngpr	lngdp	lncgdp	lnmoneyfree	lnruralpopu	Indistance
lngpr	1.0000					
lngdp	0.1628	1.0000				
lncgdp	0.0328	0.0846	1.0000			
lnmoneyfree	0.0718	0.0168	0.0614	1.0000		
lnruralpopu	0.2889	0.5072	−0.0169	−0.2136	1.0000	
Indistance	−0.2199	−0.4189	−0.0020	−0.0900	−0.2285	1.0000

Notes: All reported correlations are significant at $p < 0.05$.

2.3. Model Specification

This study selected a panel data model to empirically test the impact of geopolitical risk on China’s agricultural exports. We utilized STATA software 15 and the xtreg command. On the basis of the theoretical background and Hypothesis 1, presented in Section 2, the specific regression model is as follows:

$$\ln agexp_{it} = \alpha + \beta_1 \ln gpr_{it} + \beta \text{Control}_{it} + \rho_i + \sigma_t + \varepsilon_{it} \quad (1)$$

where i represents a country and t indicates the year; $\ln agexp_{it}$ is the logarithm of China’s agricultural export trade volume to country i in year t ; $\ln gpr_{it}$ is the logarithm of geopolitical risk from country i in year t ; ρ_i and σ_t represent country fixed effects and year fixed effects, respectively, which are used to control for unobservable differences across countries and across years; and ε_{it} is the error term. The remaining explanatory variables in the equation are all control variables.

3. Results

3.1. Baseline Estimates

We determined the estimation of fixed effects using the Hausman test, and the results are shown in Table 3. We focused on the coefficient size and significance of the explanatory variable *lngpr*. As shown in Table 3, the GPR index significantly negatively impacts China's agricultural exports. This suggests that a higher geopolitical risk significantly reduces agricultural exports from China to trading partner countries. The results from this regression support H1 regarding the impact of geopolitical risk on China's agricultural exports. Geopolitical risks increase the transaction and security costs of agricultural export trade through the occurrence or threat of geopolitical events such as terrorism and war. Geopolitical events disrupt the trade environment and influence China's agricultural export trade by affecting demand in importing countries. Geopolitical risks lead to higher trade costs, which affects the willingness to export agricultural goods from the supply side. According to the transaction cost theory, higher costs lead to a reduction in agricultural trade volumes.

Table 3. The benchmark returns.

	Lnagexport
<i>lngpr</i>	−0.146 *** (0.036)
<i>lngdp</i>	0.915 *** (0.168)
<i>lncgdp</i>	1.163 *** (0.256)
<i>lnmoneyfree</i>	0.657 *** (0.134)
<i>lnruralpopu</i>	0.310 * (0.181)
<i>Indistance</i>	−0.002 (0.002)
constant	−50.895 *** (7.707)
RE or FE	FE
Year fixed effects	Yes
Country fixed effects	Yes
Observation	902
R ²	0.2972

Notes: This table reports the baseline results for China's agricultural export trade. The regressions control for year fixed effects and country fixed effects. Robust standard errors are reported in brackets. * and *** represent significance at the 10% and 1% levels, respectively.

We briefly analyzed the results for the control variables. The regression coefficients of *lngdp*, *lncgdp*, *lnmoneyfree*, and *lnruralpopu* are all positive, indicating that these control variables are factors attracting exports from China. These control variables represent the market size, trade freedom, and demand of trading partner countries, which all have a positive impact on China's agricultural export trade. The regression coefficient of geographical distance is significantly negative, indicating that distance is a significant factor impeding trade. The greater the distance between China and its partner country, the greater the trade cost, leading China to curtail exports to that country.

3.2. Robustness Tests

We conducted several robustness tests in this subsection to verify the above results.

3.2.1. Endogeneity

For the endogeneity test, we explored the dynamic aspects of China's agricultural export trade. We introduce lagged values of China's agricultural export trade as an explanatory variable and use the system generalized method of moments (GMM) as an estimator. The estimated results for the system GMM are reported in Table 4. The results show that the GPR index has a significant negative effect on agricultural export trade, which is consistent with the results in Table 3. Table 4 also reports the results of the residual sequence autocorrelation test and overidentifying restriction test, demonstrating the effectiveness of the system GMM estimation results. Therefore, the conclusions of this paper are robust.

Table 4. Alternative estimators.

	Lnagexport
lag lnagexport	0.810 *** (0.031)
lngpr	−0.067 ** (0.027)
Control variables	Yes
AR(1) (<i>p</i> -value)	0.009
AR(2) (<i>p</i> -value)	0.293
Sargan test (<i>p</i> -value)	0.366
Observation	876

Notes: This table reports the results of the system GMM. AR(1) and AR(2) are tests for residual sequence autocorrelation. The Sargan test is a test for overidentifying restrictions. Robust standard errors are reported in brackets. ** and *** represent significance at the 5% and 1% levels, respectively.

3.2.2. Reverse Causality Test

Due to its major role as a global actor, China's international trade may affect other countries' geopolitical risk indices. We next consider whether China's agricultural export trade affects geopolitical risk in partner countries. Specifically, as bilateral trade expands and bilateral relations improve, partner countries face fewer geopolitical events, such as terrorism and war conflicts. Therefore, we replaced the current values in Equation (1) with one-period lagged, two-period lagged, and three-period lagged values of the GPR index. The regression estimates are shown in Table 5. According to the regression results in columns (1)–(3), the GPR index exerts a significant negative effect on agricultural export trade, which is consistent with the benchmark regression results. However, the elasticity of the impact decreases as the number of lags increases. Therefore, the reverse causal effect of the GPR index and China's agricultural exports is not significant. This may be because China has maintained or even promoted friendly relations with its partner countries, but the partner countries also face tensions with other countries, so their own geopolitical risks do not significantly change.

Table 5. Lagged regression results.

	Lnagexport		
	(1)	(2)	(3)
lngpr_t-1	−0.147 *** (0.035)		
lngpr_t-2		−0.071 ** (0.033)	
lngpr_t-3			−0.031 (0.032)

Table 5. Cont.

	Lnagexport		
	(1)	(2)	(3)
Control variables	Yes	Yes	Yes
FEs	Yes	Yes	Yes
Observation	878	848	817
R ²	0.2979	0.3072	0.3098

Notes: This table reports the regression results with lagged values replacing the GPR index. Columns (1)–(3) report the results of replacing the current value of the GPR index with lagged values. Robust standard errors are reported in brackets. ** and *** represent significance at the 5% and 1% levels, respectively.

3.2.3. Alternative Explanatory Variables

This section tests the robustness of the results by replacing the GPR index with other indices [25], namely, the geopolitical threat (GPT) and geopolitical act (GPA) indices. The GPT index is constructed based on searches for articles that include words directly mentioning risks, while the GPA index is based on searches for articles that include words directly mentioning adverse events. These two indices allow us to separate the shocks of geopolitical threats from the shocks caused by geopolitical acts. As shown in Table 6, the coefficient estimates of the GPT and GPA indices are different. However, the direction of the signs and their significance are consistent, indicating that the conclusions drawn in the previous sections remain robust. In addition, we find that the elasticity coefficient of the GPT index is greater than that of the GPA index, indicating that geopolitical threats have a stronger negative impact on agricultural exports than geopolitical acts; therefore, agricultural traders should pay close attention to changes in geopolitical threats and make strategic adjustments in a timely manner.

Table 6. Replacement of the variable GPR index.

	Lnagexport	
	(1)	(2)
GPT	−0.468 *** (0.076)	
GPA		−0.067 * (0.039)
Control variables	Yes	Yes
FE	Yes	Yes
Observation	902	902
R ²	0.3061	0.3168

Notes: This table reports the results of replacing the variable GPR index. Columns (1) and (2) report the results of replacing the GPR index with GPT and GPA, respectively. Robust standard errors are reported in brackets. * and *** represent significance at the 10% and 1% levels, respectively.

3.3. Moderating Effect of Agricultural Land

To test the moderating effect of agricultural land posited in Hypothesis 2, we constructed the following models:

$$\begin{aligned} \ln agexp_{it} = & \alpha + \beta_1 \ln gpr_{it} + \beta_2 \ln gpr_{it} \times \ln agland_{it} + \beta_3 \ln agland_{it} \\ & + \beta \text{Control}_{it} + \mu_i + \delta_t + \varepsilon_{it} \end{aligned} \quad (2)$$

where $\ln agexp_{it}$ is the logarithm of China's agricultural export trade volume to country i in year t , $\ln gpr_{it}$ is the logarithm of geopolitical risk from country i in year t , $\ln agland_{it}$ is the agricultural land area in partner country i in year t , and the interaction term $\ln gpr_{it} \times \ln agland_{it}$ is the key explanatory variable of these models. A positive coefficient

β_2 of the interaction term indicates that agricultural land can moderate the negative impact of geopolitical risk on China's agricultural exports. The other variables were described in the baseline equation and will not be repeated here.

To examine whether agricultural land moderates the negative effect of geopolitical risk on China's agricultural exports, we add the interaction term between geopolitical risk and agricultural land to the model. The moderation regression results are listed in Table 7. We find that the coefficient of the interaction term between agricultural land and geopolitical risk is positive, indicating that the negative impact of geopolitical risk on China's agricultural exports can be moderated by the presence of agricultural land. The results support H2. These results suggest that the impact of geopolitical risk events, such as terrorist attacks and war, on China's agricultural exports to trading partner countries could be mitigated in countries with a large area of agricultural land. Larger areas of agricultural land represent a high demand for agricultural products, which may make multinational enterprises more inclined to trade with these countries, even in the case of geopolitical risk events.

Table 7. Moderation of agricultural land.

	Lnagexport
Ingpr	−1.041 *** (0.357)
Ingpr × Inagland	0.057 ** (0.023)
Inagland	−0.596 *** (0.173)
Control variables	Yes
Year fixed effects	Yes
Country fixed effects	Yes
R ²	0.2592

Notes: This table reports the moderation of agricultural land. Robust standard errors are reported in brackets. ** and *** represent significance at the 5% and 1% levels, respectively.

3.4. Heterogeneity of the Belt and Road Initiative

The Belt and Road Initiative is a feature of China's foreign policy and has significance in China's international trade as well as in relations with other countries. With the progress of the Belt and Road Initiative, Chinese exports to countries along the Belt and Road are gradually increasing [4,38,39,46]. In this context, it is necessary to study the heterogeneity in the impact of geopolitical risks among Belt and Road countries and nonparticipating countries on China's agricultural exports. We divided the 36 sample countries into Belt and Road countries (India, Indonesia, Israel, Malaysia, the Philippines, Russia, Saudi Arabia, Thailand, Turkey, and Ukraine) and non-Belt and Road countries (Argentina, Australia, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Italy, Japan, Mexico, the Netherlands, Norway, Peru, Portugal, South Africa, South Korea, Spain, Sweden, Switzerland, the United Kingdom, the United States, and Venezuela), and the shares of both groups of researched countries in Chinese exports of agricultural products were similar.

Table 8 shows that the GPR index negatively impacts China's agricultural export trade in both groups of countries. The regression results for both subsamples support H3. However, the impact elasticity for Belt and Road countries (0.041) is significantly lower than that for non-Belt and Road countries (0.187). The results suggest that the implementation of the Belt and Road Initiative attenuates the impact of geopolitical risks in partner countries. Chinese agricultural export traders are insensitive to geopolitical risks in Belt and Road countries but reduce their agricultural export trade when geopolitical risks in non-Belt and Road countries are elevated. This result may be due to the implementation of the Belt

and Road Initiative, which has fast-tracked China's economic and political relations with Belt and Road countries. Good bilateral relations reduce the impact of geopolitical risk on agricultural export trade. When making decisions, multinational enterprises may consider the trade security offered by the range of policies proposed by the Belt and Road Initiative. Given the support of these policies, enterprises are more inclined to export agricultural products to Belt and Road countries, despite the high geopolitical risk, than to non-Belt and Road countries, even if those countries have a low geopolitical risk.

Table 8. Heterogeneity across partner countries.

	(1)	(2)
	Belt and Road Countries	Non-Belt and Road Countries
Lngpr	−0.041 (0.049)	−0.187 *** (0.045)
Control variables	Yes	Yes
Year FE	Yes	Yes
Country FE	Yes	Yes
observation	252	650
R ²	0.2214	0.2431

Notes: This table reports a subsample regression for two groups of countries. Column (1) reports the results of the regression of the GPR index on agricultural exports for the Belt and Road countries, while Column (2) reports the results for the non-Belt and Road countries. Robust standard errors are reported in brackets. *** indicates significance at the 1% level.

Table 9 shows the results for the moderating effects for the two subsamples of Belt and Road and non-Belt and Road countries. The results show that the impact elasticity of the GPR index for Belt and Road countries (0.177) is significantly lower than that for non-Belt and Road countries (0.886), which again verifies that China's agricultural exports are more sensitive and cautious in non-Belt and Road countries with a greater geopolitical risk. These results again validate H3. How can the significant negative impact of geopolitical risks be mitigated in non-Belt and Road countries? To answer this question, we need to focus on the interaction terms between agricultural land and geopolitical risk presented in Table 9. As shown in Table 9, the signs of the coefficient estimate for the interaction term between agricultural land and geopolitical risk in the two subsamples are consistent with those in the total sample. However, there are significant differences in the coefficient elasticities. The coefficient elasticity of non-Belt and Road countries (0.046) is significantly greater than that of Belt and Road countries (0.007). These results suggest that agricultural land more significantly moderates the negative effects of geopolitical risk on China's agricultural exports in non-Belt and Road countries. Therefore, when China exports agricultural products to non-Belt and Road countries, it can choose countries with larger agricultural land areas as partners, thus weakening the negative impact of geopolitical risks on agricultural exports.

Table 9. Heterogeneity across partner countries (moderating effect).

	(1)	(2)
	Belt and Road Countries	Non-Belt and Road Countries
lngpr	−0.177 (0.459)	−0.886 * (0.498)
lngpr × lnagland	0.007 (0.028)	0.046 ** (0.033)
lnagland	−0.633 (0.422)	−0.545 *** (0.193)

Table 9. Cont.

	(1)	(2)
	Belt and Road Countries	Non-Belt and Road Countries
Control variables	Yes	Yes
Year FE	Yes	Yes
Country FE	Yes	Yes
observation	252	650
R ²	0.1913	0.2012

Notes: Columns (1) reports the results on the moderating effect for the Belt and Road countries, while Columns (2) reports those for the non-Belt and Road countries. Robust standard errors are reported in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

4. Discussion

The results of this paper show that geopolitical risk negatively affects China's agricultural exports. In other words, our findings demonstrate that geopolitical risk and geopolitical tensions exert significant impacts on agricultural export flows. These results are consistent with the findings in the relevant literature [47–49]; however, we improve upon the prior findings by employing a novel measure of geopolitical risk. As mentioned earlier, the new GPR index developed by Caldara and Iacoviello [25] accounts for multiple dimensions of geopolitical risks. It can be argued that the increase in protectionist and populist policies is one of the reasons for the heightened tensions among countries. Geopolitical risks increased during periods such as the Gulf War, 9/11, and the Iran Nuclear Tension in 2006. We found that these events had a detrimental impact on trade flows. The full escalation of the Russian–Ukrainian conflict in 2022 led to a sharp decline in the agricultural product exports of Russia and Ukraine. As major agricultural trading nations, the heightened geopolitical risks in Russia and Ukraine will significantly impact the international agricultural logistics chain, negatively affecting agricultural trade in numerous countries.

According to Caldara and Iacoviello [25], geopolitical risks result in higher export costs, increased security spending, and reduced insurance coverage for trade flows due to the perception of elevated geopolitical risks. Essentially, geopolitical risks can directly impact agricultural export flows through increased export costs and greater spending on insurance and security measures.

During periods of heightened geopolitical risk, there may be policy implications for maintaining trade flows. For instance, policymakers could offer direct subsidies to agricultural exporters as a means to sustain trade flows during periods of increased geopolitical risk. More specifically, public authorities can offset insurance coverage and security spending costs. Furthermore, the provision of trade credits with lower interest rates during periods of heightened geopolitical risk can serve as a significant policy tool to mitigate the adverse effects of geopolitical risk on agricultural export flows. Similarly, implementing tax relief and tax privileges for agricultural exporting companies can have crucial policy implications during periods of increasing geopolitical risk. Another suggestion is that companies should diversify their export markets, which could help to mitigate the negative effects of geopolitical risks on agricultural export flows, particularly during periods of heightened geopolitical risk. An increase in geopolitical risk may cause delays in agricultural export activities and decisions as a result of concerns regarding security and stability.

Among the control variables, we can observe that the GDPs of both the exporting and importing countries are positively correlated with agricultural exports. The results are consistent with the conclusions in the previous literature [39,49]. This finding suggests that global economic growth plays a crucial role in driving global agricultural export flows. Our findings also suggest that monetary freedom promotes agricultural exports, aligning with the conclusions drawn by Head et al. [50] and Martin et al. [51]. Monetary freedom represents the trade openness and flexibility of partner countries. These findings suggest that trade freedom is a key determinant of agricultural exports. Trade freedom, in

particular, plays a crucial role in ensuring the sustainability of agricultural exports. The population of partner countries is positively correlated with China's agricultural exports. This indicates that the greater the market size of the export destination country, the larger the volume of China's agricultural exports to that country. Finally, the findings indicate that despite the decrease in communication and transportation costs that has occurred since the 1990s, when the globalization process accelerated, distance remains a variable that exerts a negative impact on global trade flows.

From the perspective of agricultural land, we identified mechanisms to mitigate the negative impact of geopolitical risks on agricultural exports. To put it differently, when countries with more agricultural land face geopolitical risks, the impact on agricultural exporters' exports to those countries will be reduced. Vast agricultural land represents a larger agricultural product consumer market. After rational decision-making, Chinese agricultural exporters may be attracted to this market, which we call the "spirit of adventure" hypothesis. Hence, with increasing geopolitical risk, agricultural exporters will endeavor to maintain stable export trade as long as the partner country boasts a sizable consumer market. According to the heterogeneity analysis, the Belt and Road Initiative has significantly promoted China's agricultural exports. When the trading partner country is a Belt and Road country, Chinese agricultural exporters exhibit relative immunity to geopolitical risks. Nevertheless, when exporting to non-Belt and Road countries, it is essential to consider the geopolitical landscape, which may render exporters more vulnerable to geopolitical risk influences. The Belt and Road Initiative has provided a range of facilitative policies for China and its trading partner countries, making a significant contribution to ensuring the sustainable and stable development of the agricultural export trade.

5. Conclusions

Taking China as the subject of our study, we examined the impact of geopolitical risks on agricultural exports. Our mechanistic study explored the role of agricultural land in the impact of geopolitical risk on agricultural exports. We further explored the heterogeneity introduced by the Belt and Road Initiative in this relationship. The basic conclusions are as follows. First, elevated geopolitical risks in trading partner countries could dampen China's agricultural export trade. Second, from the perspective of trading partner countries, we find that the presence of agricultural land can weaken the negative impact of geopolitical risk on China's agricultural exports. Finally, according to the Belt and Road Initiative, we can categorize trading partner countries into two groups and find that China's agricultural exports are relatively immune to geopolitical risks in countries along the Belt and Road. Furthermore, agricultural land mitigates the negative effects of geopolitical risk on China's agricultural exports more significantly in non-Belt and Road countries.

Considering China's position as a prominent agricultural exporter globally, the findings of this study carry significant theoretical implications for proactively addressing and mitigating the influence of geopolitical risks on agricultural exports, both within China and internationally. Drawing on the results of this study, when geopolitical risks increase in trading partner countries, shifting the export targets for the exporting country is a choice worth considering. Based on these findings, we present the following policy implications. On the one hand, China should strengthen its monitoring of, and the provision of early warnings for, geopolitical risks among its trading partner countries, enhance its security and protection measures, and improve its emergency response mechanism. On the other hand, given the relative immunity of China's agricultural exports to the geopolitical risks in countries along the Belt and Road, China should give full play to the trade advantages of the Belt and Road Initiative, form a more complete framework for strategic cooperation, and promote the mutual integration and common prosperity of multilateral cooperation mechanisms to actively cope with the impacts of geopolitical risks.

In future research, this analysis can also be extended to the agricultural export trade structure. In the increasingly complex international geopolitical environment, the development of China's agricultural export trade has slowed. An important reason for this is the

imperfect agricultural export trade structure. Studying the factors influencing agricultural export trade structure optimization can help to promote domestic economic development and ensure the stable development of the agricultural export trade. From this perspective, we can study the impact of geopolitical risk in trading partner countries on China's agricultural export trade structure. Furthermore, when facing geopolitical risks, we compared the export responses of two groups of countries: those participating in the Belt and Road Initiative and those not participating. Some of the countries from both groups have signed free trade agreements (FTAs) with China. Which has a stronger impact on China's exports when its trading partners are exposed to geopolitical risk, the Belt and Road Initiative or the creation of an FTA? This question is also a topic for future exploration.

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References

1. Gao, P.C.; Xie, Y.R.; Song, C.Q.; Cheng, C.X.; Ye, S.J. Exploring detailed urban-rural development under intersecting population growth and food production scenarios: Trajectories for China's most populous agricultural province to 2030. *J. Geogr. Sci.* **2023**, *33*, 222–224. [\[CrossRef\]](#)
2. Cai, S.Y.; Zhao, X.; Pittelkow, C.M.; Fan, M.S.; Zhang, X.; Yan, X.Y. Optimal nitrogen rate strategy for sustainable rice production in China. *Nature* **2023**, *615*, 73–79. [\[CrossRef\]](#)
3. Shi, X.J.; Gao, X.W.; Fang, S.L. Land system reform in rural china: Path and mechanism. *Land* **2022**, *11*, 1241. [\[CrossRef\]](#)
4. Liu, X.W.; Zhao, C.L.; Song, W. Review of the evolution of cultivated land protection policies in the period following China's reform and liberalization. *Land Use Policy* **2017**, *67*, 660–669. [\[CrossRef\]](#)
5. Lee, C.C.; Chen, M.P. Do natural disasters and geopolitical risks matter for cross-border country exchange-traded fund returns? *N. Am. J. Econ. Financ.* **2020**, *51*, 101054. [\[CrossRef\]](#)
6. Mansour-Ichraquie, L.; Zeaiter, H. The role of geopolitical risks on the Turkish economy opportunity or threat. *N. Am. J. Econ. Financ.* **2019**, *50*, 101000. [\[CrossRef\]](#)
7. Wang, Q.Y.; Huang, Q.; Wu, X.F.; Tan, J.; Sun, P.X. Categorical uncertainty in policy and bitcoin volatility. *Financ. Res. Lett.* **2023**, *58*, 101664. [\[CrossRef\]](#)
8. Martin, P.; Mayer, T.; Thoenig, M. Make trade not war? *Rev. Econ. Stud.* **2008**, *75*, 865–900. [\[CrossRef\]](#)
9. Martin, P.; Mayer, T.; Thoenig, M. Civil wars and international trade. *J. Eur. Econ. Assoc.* **2008**, *6*, 541–550. [\[CrossRef\]](#)
10. Anderton, C.H.; Carter, J.R. The impact of war on trade: An interrupted times-series study. *J. Peace Res.* **2001**, *38*, 445–457. [\[CrossRef\]](#)
11. Glick, R.; Taylor, A.M. Collateral damage: Trade disruption and the economic impact of war. *Rev. Econ. Stat.* **2010**, *92*, 102–127. [\[CrossRef\]](#)
12. Qureshi, M.S. Trade and thy neighbor's war. *J. Dev. Econ.* **2013**, *105*, 178–195. [\[CrossRef\]](#)
13. Nguyen, T.T.; Do, M.H. Impact of economic sanctions and counter-sanctions on the Russian Federation's trade. *Econ. Anal. Pol.* **2021**, *71*, 267–278. [\[CrossRef\]](#)
14. Yagi, M.; Managi, S. The spillover effects of rising energy prices following 2022 Russian invasion of Ukraine. *Econ. Anal. Pol.* **2023**, *77*, 680–695. [\[CrossRef\]](#)
15. Bandyopadhyay, S.; Sandler, T.; Younas, J. Trade and terrorism: A disaggregated approach. *J. Peace Res.* **2018**, *55*, 656–670. [\[CrossRef\]](#)
16. Sekrafi, H.; Abid, M.; Assidi, S. The impact of terrorism on formal and informal economy in African countries. *Int. J. Financ. Econ.* **2021**, *26*, 1163–1180. [\[CrossRef\]](#)
17. Yang, A.X.; Ye, J.Q.; Wang, Y.H. Coupling and Coordination Relationship between Livelihood Capital and Livelihood Stability of Farmers in Different Agricultural Regions. *Land* **2022**, *11*, 2049. [\[CrossRef\]](#)
18. Tiwari, A.K.; Boachie, M.K.; Suleman, M.T.; Gupta, R. Structure dependence between oil and agricultural commodities returns: The role of geopolitical risks. *Energy* **2021**, *219*, 119584. [\[CrossRef\]](#)

19. Khan, Z.A.; Koondhar, M.A.; Khan, A.; Zhang, Z.X.; Ali, U.; Nurgazina, Z.; Liu, T.J. Exploring the impact of carbon emissions and co-macroeconomic determinants on China's sustainable apple export. *Environ. Sci. Pollut. Res.* **2023**, *30*, 104603–104619. [\[CrossRef\]](#)
20. Cupp, O.S.; Walker, D.E.; Hillison, J. Agroterrorism in the U.S.: Key Security Challenge for the 21 st Century. *Biosecur. Bioterror.* **2004**, *2*, 97–105. [\[CrossRef\]](#)
21. Li, S.; Lin, N.Y.; Song, X.P. Effects of Geopolitical Risk on Equity-Agricultural-Commodity Correlations. Available at SSRN, 29 September 2022.
22. Monroe, K.V. Geopolitics, Food Security, and Imaginings of the State in Qatar's Desert Landscape. *Cult. Agric. Food Environ.* **2020**, *42*, 25–35. [\[CrossRef\]](#)
23. Chatellier, V. Trade in live cattle and beef meat at world and EU levels: Productive and commercial trajectories for the main countries involved. *INRAE Prod. Anim.* **2017**, *30*, 199–217. [\[CrossRef\]](#)
24. Candau, F.; Gbandi, T.; Guepie, G. Beyond the income effect of international trade on ethnic wars in Africa. *Econ. Transit. Institutional Chang.* **2021**, *30*, 517–534. [\[CrossRef\]](#)
25. Caldara, D.; Iacoviello, M. Measuring geopolitical risk. *Am. Econ. Rev.* **2022**, *112*, 1194–1225. [\[CrossRef\]](#)
26. Berkman, H.; Jacobsen, B.; Lee, J.B. Time-Varying rare disaster risk and stock returns. *J. Financ. Econ.* **2011**, *101*, 313–332. [\[CrossRef\]](#)
27. Munoz, B.; García-Verdugo, J.; San-Martín, E. Quantifying the geopolitical dimension of energy risks: A tool for energy modelling and planning. *Energy* **2015**, *82*, 479–500. [\[CrossRef\]](#)
28. Cipollina, M.; Salvatici, L. On the effects of EU trade policy: Agricultural tariffs still matter. *Eur. Rev. Agric. Econ.* **2020**, *47*, 1367–1401. [\[CrossRef\]](#)
29. Lin, F.Q. Agriculture exports, child labor and youth education: Evidence from 68 developing countries. *Rev. Int. Econ.* **2022**, *30*, 490–513. [\[CrossRef\]](#)
30. Marshall, B.R.; Nguyen, N.H.; Visaltanachoti, N. Frontier market transaction costs and diversification. *J. Financ. Mark* **2015**, *24*, 1–24. [\[CrossRef\]](#)
31. Jack, W.; Suri, T. Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *Am. Econ. Rev.* **2014**, *104*, 183–223. [\[CrossRef\]](#)
32. Zhang, Q.; Cai, C.X.; Keasey, K. Market reaction to earnings news: A unified test of information risk and transaction costs. *J. Account. Econ.* **2013**, *56*, 251–266. [\[CrossRef\]](#)
33. Sadler, M.; Magnan, N. Grain import dependency in the MENA region: Risk management options. *Food Secur.* **2011**, *3*, S77–S89. [\[CrossRef\]](#)
34. Han, M.Y.; Li, S.C. Transfer Patterns and Drivers of Embodied Agricultural Land within China: Based on Multi-Regional Decomposition Analysis. *Land* **2021**, *10*, 213. [\[CrossRef\]](#)
35. Rauschendorfer, J.; Shepherd, B. Trade, conflict and informality: Evidence from the South Sudanese civil war. *World Econ.* **2021**, *43*, 867–894. [\[CrossRef\]](#)
36. Balcilar, M.; Bonato, M.; Demirer, R.; Gupta, R. Geopolitical risks and stock market dynamics of the BRICS. *Econ. Syst.* **2018**, *42*, 295–306. [\[CrossRef\]](#)
37. Cunado, J.; Gupta, R.; Lau, C.K.M.; Sheng, X. Time-varying impact of geopolitical risks on oil prices. *Def. Peace Econ.* **2020**, *31*, 692–706. [\[CrossRef\]](#)
38. Foo, N.; Lean, H.H.; Salim, R. The impact of China's one belt one road initiative on international trade in the ASEAN region. *N. Am. J. Econ. Financ.* **2020**, *54*, 101089. [\[CrossRef\]](#)
39. Nugent, J.B.; Lu, J.X. China's outward foreign direct investment in the belt and road initiative: What are the motives for Chinese firms to invest? *China Econ. Rev.* **2021**, *68*, 101628. [\[CrossRef\]](#)
40. Yu, L.; Zhao, D.; Niu, H.; Lu, F.T. Does the belt and road initiative expand China's export potential to countries along the belt and road? *China Econ. Rev.* **2020**, *60*, 101419. [\[CrossRef\]](#)
41. Wolszczak-Derlacz, J.; Lu, Y. The role of the One-Belt One-Road initiative in China's exports and global value chains. *Equilibrium Q. J. Econ. Econ. Policy* **2022**, *17*, 317–341. [\[CrossRef\]](#)
42. Wu, Y.; Chen, C.L. The impact of China's outward foreign direct investment on trade intensity with belt and road countries. *Emerg. Mark. Financ. Trade* **2021**, *57*, 1773–1792. [\[CrossRef\]](#)
43. Anderson, J.E.; Wincoop, E.V. Gravity with gravitas: A solution to the border puzzle. *Am. Econ. Rev.* **2003**, *93*, 170–192. [\[CrossRef\]](#)
44. Beraldi, P.; Violi, A.; Ferrara, M.; Ciancio, C.; Pansera, B.A. Dealing with complex transaction costs in portfolio management. *Ann. Oper. Res.* **2021**, *299*, 7–22. [\[CrossRef\]](#)
45. Neter, J.; Kutner, M.H.; Nachtsheim, C.J.; Wasserman, W. *Applied Linear Statistical Models*; Irwin: Chicago, IL, USA, 1996.
46. Herrero, A.G.; Xu, J. China's belt and road Initiative: Can Europe expect trade gains? *China World Econ.* **2017**, *25*, 84–99. [\[CrossRef\]](#)
47. Salameh, R.; Chedid, R. Economic and geopolitical implications of natural gas export from the East Mediterranean: The case of Lebanon. *Energy Policy* **2020**, *140*, 111369. [\[CrossRef\]](#)
48. Shen, H.Y.; Liang, Y.; Li, H.W.; Liu, J.; Lu, G.X. Does geopolitical risk promote mergers and acquisitions of listed companies in energy and electric power industries. *Energy Econ.* **2021**, *95*, 105115. [\[CrossRef\]](#)
49. Gupta, R.; Gozgor, G.; Kaya, H.; Demir, E. Effects of geopolitical risks on trade flows evidence from the gravity model. *Eur. Econ. Rev.* **2019**, *9*, 515–530. [\[CrossRef\]](#)

-
50. Head, K.; Mayer, T.; Ries, J. The erosion of colonial trade linkages after independence. *J. Int. Econ.* **2010**, *81*, 1–14. [[CrossRef](#)]
 51. Martin, P.; Mayer, T.; Thoenig, M. The geography of conflicts and regional trade agreements. *Am. Econ. J. Macroecon.* **2012**, *4*, 1–35. [[CrossRef](#)]

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