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Has the Decline in Trade Policy Uncertainty Promoted China's Agricultural Exports?

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Abstract: This article describes China's entry into the World Trade Organization (WTO) as a quasi-natural experiment based on samples from the World Bank database, China Customs database, and China Industrial Enterprise Database from 2000 to 2007 and uses the difference-in-difference (DID) method to investigate the effect of trade policy uncertainty (TPU) on China's agricultural exports. The study found that, first, a decline in TPU significantly increases the export volume of Chinese agricultural firms. Second, the decline in TPU significantly boosts companies engaged in general trade. Regarding export destination countries, the decline in TPU significantly promotes the agricultural firms whose export destination countries are developing countries. Regarding firms' ownership, the promotion of agricultural exports by non-state-owned enterprises (non-SOEs) and Hong Kong-, Macao- and Taiwan-funded enterprises is even more pronounced. Third, the decline in TPU promotes the export of Chinese agricultural firms by alleviating their financing constraints. The study provides new explanations for changes in China's agricultural exports and enriches research on the evaluation of TPU effects.

Keywords: trade policy uncertainty; agricultural exports; difference-in-difference method; heterogeneity; financing constraints

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1. Introduction

Export trade plays a pivotal role in a country or region's economic development, not only promoting firms' productivity [1,2] and technological innovation [3,4], but also contributing to the upgrading of export products' quality [5,6]. Since the economic reform was introduced, especially since the accession to the World Trade Organization (WTO), the Chinese government has attached great importance to the development of export trade and has introduced a series of policies and measures to "stabilize foreign trade" as an important strategic objective; this has achieved remarkable results. According to the statistics, the average annual growth rate of China's agricultural export trade is as high as 20.6%. The export value of agricultural products was only USD 15.47 billion in 2001, but this climbed to USD 78.15 billion in 2020 (data source: UN Comtrade database). The rapid development of the agricultural export trade made China the 7th largest exporter of agricultural products worldwide in 2021 (data source: FAOSTAT database), reducing the agricultural trade deficit, which has also played a positive role in achieving China's goal of eradicating poverty ahead of schedule in the new era [7].

The policy shock of China's accession to the WTO provides an opportunity to answer a specific question. In fact, TPU may affect agricultural enterprises' exports through two channels: on the one hand, the WTO accession in 2001 gave China a permanent most-favored-nation (MFN) status, ending the long-standing threat of high column 2 tariff, and since then, the TPU faced by Chinese firms has declined significantly; on the other hand, as TPU declines, it is conducive to broadening enterprises' financing channels,

which manifests as changing from a single domestic financial market to both domestic and international financial markets [8]. This is of great significance to alleviate enterprise loan problems and promote agricultural firms' exports. Other related studies have found that China's accession to the WTO has boosted Chinese firms' import trade significantly [9]; therefore, has the decline in TPU caused by the policy shock of WTO accession also boosted China's agricultural export trade?

To answer these questions, this study uses a sample of matched firms from the China Industrial Enterprise Database and the China Customs Trade Database as the basis for analysis and treats China's accession to the WTO as an exogenous policy shock using a difference-in-difference (DID) model. Although the literature has focused more on the effect of a specific policy's implementation, this study takes a new perspective on TPU, which not only provides a fresh explanation for the dynamic changes in China's agricultural exports in recent years, but also enriches the research on assessing its economic effects. Simultaneously, in today's complex international economic environment, the study of TPU's effect on China's agricultural exports also responds to the call for a strategic change to "construct the new development pattern in which domestic and foreign markets boost each other, with the domestic market as the mainstay (dual-circulation)," and provides empirical support for promoting the construction of a modern distribution system and dual-circulation development pattern in the new era. This is of great significance not only for the exports of Chinese agricultural enterprises, but also for the agricultural exports from all over the world.

The remainder of the paper is structured as follows: Section 2 provides a review of the relevant literature; Section 3 presents the data processing and model construction. Section 4 provides the empirical analysis, and Section 5 provides further analysis. Finally, the conclusions and policy recommendations are provided in Section 6.

2. Literature Review

The literature on the effect of TPU on the exports of Chinese agricultural firms is centered on three main areas. The first one is the measurement of TPU indicators; the second one is its effects; the third one is changes in China's agricultural exports and the factors affecting them.

2.1. The Measurement of Indicators of Trade Policy Uncertainty

Professor Handley of the University of Michigan and Professor Limão of the University of Maryland are pioneers of TPU research and have made great contributions to studies in related fields; their ideas have been cited by many scholars. For example, Baker et al. [10] studied the number of articles with relevant keywords in newspapers using standardization, and Handley and Limão [11] extended this to the construction of a corresponding "TPU index". As this idea is highly subjective in the sample selection and usually not very representative, this measurement lacks accuracy. Subsequently, it focuses on examining the degree of the effect on firms. For example, Handley [12] argues that even in the WTO framework, there is a large degree of uncertainty regarding the real tariffs of exporters owing to the difference between the column 2 and MFN tariffs and gives a measurement of the TPU indicator after some analytical calculations. Later, Handley and Limão [13], in their study of the effect of TPU on Portuguese exports, argue that preferential trade agreements increase the integrity of trade policies between the agreement countries; they improved Handley's [12] measurement by using the difference between the two tariffs to measure the tariff uncertainty. In a follow-up study, Handley and Limão [14] further derive the sectoral gains from the US application of MFN and column 2 tariffs on China, obtaining a measurement of TPU.

2.2. Trade Policy Uncertainty–Trade Relationship

Studies on TPU's effect on trade fall into two main categories: one focuses on TPU's effects, and this part of the research focuses on the volume of trade as well as changes in

the binary margin [12–16]. For example, Handley [12] found that the lower the magnitude of tariff uncertainty in Australia is, the more favorable it is for foreign firms to export there; Handley and Limão [14] also found that reduced TPU is an important reason for the surge in Chinese export trade to the United States when examining trade between the two countries. Further decomposing exports, Feng et al. [15] found that the promotion effect of reduced TPU on firms' exports is mainly contributed by the extended margin, which was also confirmed by Carballo et al. [17]. Subsequently, regarding the mechanisms of TPU's effect on trade, Tornell and Westermann [8] argue that reduced TPU can broaden firms' financing channels and ease financing constraints, thus promoting their exports. Some scholars have delved into the specific product level and focused on TPU's effect on agricultural export trade. For example, Yu et al. [18] argue that increased TPU from the United States has reduced China's agricultural exports to them. Although the study noted the important effect of TPU on agricultural exports, the perspective is the TPU of the United States, and it does not focus on the policy shock of WTO accession. In fact, scholars have focused more on the effect of a specific trade policy actually implemented in the context of agricultural export growth. For example, Debaere and Mostashari [19] used disaggregated tariff data to find the effect of tariff changes on the broad margin of exports. They found that the effect of tariff cutting on the broad margin is moderate. Beestermöller et al. [20] examined the effect of the risk of denial of entry at European borders of Chinese agri-food exports on security grounds. The externalities and reputation of the information are crucial. Border refusals amplify the turnover between firms at the broad margins of trade. This risk inhibits small exporters, leading to a concentration of Chinese exports with prevalent exporters. Although many scholars have conducted relevant studies, there remains a space for further reflection on the research methodology and indicator measurement.

2.3. Changes in China's Agricultural Exports and the Factors Affecting Them

For example, Sugiharti et al. [21] found that demand variables, including income, market size, and sophistication, are key drivers of agricultural export growth. Wang et al. [22] found that green finance positively impacts China's agricultural export trade, which can expand the scale of agricultural exports. Xing et al. [23] found that many distance factors, such as geographical, cultural, economic, and institutional distances, can affect agricultural exports. The institutional, geographical, and cultural distances negatively impact China's agricultural exports significantly, while the economic distance significantly promotes exports. Liu et al. [24] focused on the effect of non-tariff measures on exports of agri-food products and found that technical barriers to trade and sanitary and phytosanitary measures have emerged as new barriers, with significant negative effects on the countries with relatively minimal crop varieties. Ferro et al. [25] analyzed the effect of food safety standards on international agricultural exports and found that developing countries' exports are typically subject to more stringent standards. Campi and Dueñas [26] examined the effect of enhanced intellectual property rights on agricultural trade after the signing of TRIPS during the period of 1995–2011 and found that stronger intellectual property rights regimes had a negative effect on the total exports of agricultural products, particularly for developing countries. Recently, explicit barriers to trade at the international level have been gradually reduced as a result of bilateral or multilateral efforts, but the trade of goods remains subject to cumbersome customs clearance procedures, and such "inefficient" hidden barriers to trade are receiving increasing scholarly attention. A study by Olayiwola et al. [27] found that economic integration and trade facilitation have a catalytic effect on agricultural exports in ECOWAS; Hendy and Zaki [28] used firm-level customs data from Egypt and World Bank data from 2005–2016 to examine the effect of trade facilitation on firms' exports and found that delays in customs clearance can hinder agricultural product exports. In addition, the recent trade dispute between the United States and China has led to a period of unprecedented trade friction between the two countries, making the effect of changes in the United States' TPU to China's agricultural exports and imports a new research hotspot. Yu et al. [18] found that an increase in the United States' TPU significantly reduces China's

agricultural exports to and imports from the United States, with an effect exceeding traditional exchange rate factors. It increased China's total agricultural imports from around the world. Further product-level analysis suggests that an increase in the US TPU does not threaten China's food security.

This study distinguishes itself from existing ones in the following aspects: First, for the growth of China's agricultural exports, existing studies focus on the effect of a specific policy implementation, whereas we take TPU as a focus and use the research methodology to systematically examine TPU's effect on China's agricultural exports. Second, for measuring TPU, this study takes the perspective to the industry level and uses the WTO accession as an exogenous policy shock to analyze the TPU's effect on China's agricultural exports using a DID model. Third, regarding sample selection, most of the existing studies use macro data from the UN Comtrade database, whereas we examine the TPU's effect on China's agricultural exports at the micro level. This study examines the effect of TPU on China's agricultural exports and its mechanism of action. We argue that an in-depth study of the behavior of agricultural exporters deepens our understanding of agricultural trade growth at the micro level, which is undoubtedly important for theoretical and practical aspects of China and other countries or regions.

3. Data, Model, and Method

3.1. Measuring Trade Policy Uncertainty

This study measures TPU using Equation (1), which was first proposed by Handley and Limão [14], in a paper in which they analyzed the effect of declining TPU on firms' exports.

$$TPU = 1 - \left(\frac{\tau_{MFN}}{\tau_{SH}}\right)^{\sigma} \quad (1)$$

In Equation (1), τ_{MFN} denotes the MFN tariff, and τ_{SH} denotes the column 2 tariff. Handley and Limão [14] compared various scenarios in their study for the setting of the parameter and ultimately found that the analysis was most stable at $\sigma = 3$. In line with their study, we also set the value of 2 for robustness testing (This study argues that although this approach was used by Handley and Limão [14] to investigate US–China trade, it was also used in Limão's study to research other countries, so it is reasonable to use this approach here). It is also important to note that, drawing on Pierce and Schott's [29] treatment, they are further summed as the SIC 4-digit code level here (Specifically, the summation is completed in two steps: initially, the HS-6-digit products are assigned to the China Industrial Classification of Industries 4-digit codes (CIC-4), and then the TPU index at the product level within each industry is averaged to obtain the industry-level TPU indicator).

3.2. Model

In this study, a DID model is constructed to identify the differences in firms' exports of products with high and low tariff differentials before and after China's accession to the WTO, and the model expression is shown in Equation (2):

$$Value_{ijt} = \alpha_i + \beta TPU_{j01} \times POST_{t02} + \gamma X_{ijt} + \delta_t + \gamma_j + \varepsilon_{ijt} \quad (2)$$

where the i denotes the firms, j denotes the industries, t denotes the years, δ_t is the time fixed effects, and γ_j is the industry fixed effects.

This study uses the actual export value of agricultural firms to represent the explanatory variables ($Value_{ijt}$). The data are treated logarithmically to reduce dispersion. To avoid invalidating the logarithm when value is 0, they are all increased by 1, and then logged, which reflects the firm's ability to benefit from exports. TPU_{j01} is the core explanatory variable here, indicating the TPU faced by industry j prior to WTO accession; $POST_{t02}$ is a dummy variable for the time of China's accession to the WTO, where 1 is for 2002 and onwards, and 0 is for before this period; β indicates the size of the effect of the TPU decline on the exports of agricultural firms. Equation (2) includes other control variables,

specifically: firm total factor productivity (TFP_OP), firm output (q), firm age (age), firm size (scale), and capital intensity (cap_int).

In addition, this study includes firm fixed effects α_i, and ε_{ijt} for the random error term. Because the Smoot–Hawley Tariff Act was passed in 1930, this is treated as strictly exogenous in this research. Liu and Ma [30] and Feng et al. [15] have also adopted this assumption in their respective studies.

3.3. Data

The data used here are based on four sources: First, the World Bank database of import tariffs on products was used. Second, the Feenstra et al. [31] database of the column 2 and MFN tariffs imposed by the Unites States on Chinese products to measure industry-level indices was used. (Prior to WTO accession, the United States imposed column 2 tariff on China, which became an MFN tariff after accession.) Third, the Chinese Industrial Enterprise Database was used. Fourth, the China Customs Database was used.

This study draws on the methodology proposed by Brandt et al. [32] for cleaning the database, with the process shown in Table 1:

Table 1. China Industrial Enterprise Database and Customs Trade Database cleaning process.

	Steps		Practice
China Industrial Enterprise Database	First	Sequential identification	1. Matching by corporate code. 2. Matching by business name. 3. Matching by provincial, local, and county codes and names of legal representatives. 4. Matching by province, county code, business phone number and year of establishment. To identify the same business and give the successful match a new ID.
	Second	Adjusting industry codes	Because of the implementation of the new industry classification after 2003, in this paper, the authors adjust the CIC-4 industry codes around 2002 to be harmonized with the industry standards.
	Third	Remove outliers	Drawing on Cai and Liu [33], observations of key indicators that do not meet accounting standards are removed. (The study also excludes firms with key indicators such as gross industrial output value, sales, gross fixed assets and exports less than 0, and those with less than eight employees.)
Customs Trade Database	First	Summing monthly trade data to annual	Summing at the firm-product (HS-6)trade mode level (destination source) to obtain annual data. (Chinese customs codes at the HS-8 level often change, but the first 6 digits are consistent with international standards [34]; we sum up the product HS-8 level codes to product HS-6.)
	Second	Adjusting product codes	Adjustment of 2000 and 2001 data and 2007 data to the HS-2002 standard corresponding product codes based on the HS-1996 to HS-2002 cross-reference table and the HS-2002 to HS-2007 cross-reference table, respectively, to maintain consistency of products at the HS-6 level.
	Third	Excluding unrelated companies	Excluding firms not directly involved in production activities. (Although this group of trade intermediaries is not included in the sample, it does not affect the calculation of their share of trade in all firms in the text.)

This study draws on Fan et al.'s [34] matching process to match firms according to their codes in three rounds (This is because the firm code in the China Industrial Enterprise

Database is 9-digits-long, whereas the firm code in the China Customs Trade Database is 10-digits-long). Table 2 details the number and proportion of successful matches for the three rounds of indicators, showing that, respectively, 47.6% and 41.2% of the number of exporters and importers in the customs pool and 53.6% and 43% of the total export and import values of firms in the customs pool are successfully matched (This result is very close to the matching results of Fan et al. [34]). We further follow the methodology of Feenstra et al. [35] and Yu [36] by winsorizing the top and bottom 1% of all indicators to exclude the extreme value effects.

Table 2. Step-by-step matching results for the China Industrial Enterprise Database and Customs Trade Database.

Year	Observations	Step 1: Company Name		Step 2: Phone Number and Postcode		Step 3: Phone Number and Head	
		Number of Successful Matches	Percentage	Number of Successful Matches	Percentage	Number of Successful Matches	Percentage
2000	20,387	16,710	81.9%	3256	15.9%	421	2.1%
2001	23,028	19,452	84.5%	3156	13.7%	420	1.8%
2002	25,578	22,242	87.0%	2949	11.5%	387	1.5%
2003	29,345	26,372	89.9%	2544	8.7%	429	1.5%
2004	45,299	41,351	91.3%	3301	7.3%	647	1.4%
2005	45,338	41,078	90.6%	3525	7.8%	735	1.6%
2006	53,230	49,223	92.5%	2935	5.5%	1072	2.0%
2007	69,162	51,306	74.2%	16,993	24.6%	863	1.2%
Total	311,367	267,734	86.0%	38,659	12.4%	4974	1.6%

Agricultural products are screened according to the HS-2002 product code cross-reference table (specifically, chapters 01–24 of the HS classification are selected as agricultural products), and then a sample of agricultural firms' exports is screened from the combined master table; a final sample of 31,316 firms is obtained in this study. The descriptive statistics of each variable are shown in Table 3.

Table 3. Summary statistics.

Variable Name	Definition	Metric Method	Mean	SD	Min	Max
TPU	Trade policy uncertainty	Calculated from above	0.934	0.072	0.165	1
Value	Export value of agricultural products	Export value	423,721	2,122,318	1	1.18×10^8
TFP_OP	Total Factor Productivity	OP	3.261	1.015	0.613	5.932
q	Output of firms	Total industrial output	111,158	235,031	540	8,154,813
age	Age of firms	Current time—built time (The time is specific to the month, for example, if a business is established in April 1998 and the sample year is 2004, the age of the business is 6.67, and for logarithmic convenience, we take all businesses age + 1)	7.768	6.708	0.667	48
scale	Scale of firms	Number of employees in the firms	292.070	663.076	8	16,348
cap_int	Capital intensity	Fixed assets/employment	104.461	175.672	0.016	3807.58
d_sub	Dummy of subsidies	Subsidized: *d_sub* = 1; Others: *d_sub* = 0	0.209	0.407	0	1
d_fore	Dummy variable for foreign invested enterprises (FIEs)	FIEs: *d_fore* = 1; Others: *d_fore* = 0	0.520	0.500	0	1
d_soe	Dummy variable for state owned enterprises (SOEs)	SOEs: *d_soe* = 1; Others: *d_fore* = 0	0.014	0.116	0	1
forereg	Foreign investment deregulation	Number of FIEs at industry level	3914.336	3507.650	1	7895
tariff	Tariffs on intermediate goods	Calculated (Specifically, we refer to Yu's approach [36])	15.144	9.330	0	91

Note: Descriptive statistics reported here are all values before taking logarithms.

4. Empirical Results and Discussion

4.1. Baseline Regression Results

Table 4 reports the basic regression results of this study. Column (1) reports the results controlling only for the firm and time fixed effects. The estimated coefficient of the cross term, which is the main focus here, is significantly positive, implying that firms with a larger decline in TPU (which had higher TPU before WTO accession) after China's accession have a larger increase in agricultural exports than the firms with a smaller decline in TPU do (which had lower TPU before WTO accession). The increase in agricultural exports was greater. To explore the effect of firm heterogeneity, this study adds additional control variables to control for firm-level influences. The results are shown in column (2) of Table 4, where the coefficient of the cross term remains significantly positive, indicating that the findings are robust. In addition, given the two typical facts of China's WTO accession—declining TPU and declining tariff rates—the inclusion of the control variable of tariffs on intermediate goods in column (3) shows that the estimated coefficient of tariffs on intermediate goods has a negative sign. This implies that the decline of import tariffs on intermediate goods contributes positively to China's agricultural exports, as Feng et al. [15] also conclude.

Table 4. Baseline models results.

	(1)	(2)	(3)	(4)	(5)	(6)
$TPU1_{j01} \times POST_{t02}$	1.217 **	1.252 **	1.090 *	1.314 **	1.150 **	
	(0.571)	(0.569)	(0.573)	(0.569)	(0.573)	
$TPU2_{j01} \times POST_{t02}$						1.251 *
						(0.648)
q		0.324 ***	0.321 ***	0.319 ***	0.316 ***	0.317 ***
		(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
scale		−0.207 ***	−0.209 ***	−0.208 ***	−0.210 ***	−0.210 ***
		(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
age		0.017 ***	0.017 ***	0.016 ***	0.016 ***	0.016 ***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
TFP_OP		−0.105 ***	−0.104 ***	−0.105 ***	−0.104 ***	−0.105 ***
		(0.031)	(0.031)	(0.030)	(0.030)	(0.030)
cap_int		−0.133 ***	−0.133 ***	−0.139 ***	−0.138 ***	−0.139 ***
		(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
d_sub		0.076 *	0.076 *	0.074 *	0.074 *	0.074 *
		(0.042)	(0.042)	(0.042)	(0.042)	(0.042)
d_soe		−0.404 **	−0.415 **	−0.419 **	−0.431 **	−0.431 **
		(0.191)	(0.191)	(0.191)	(0.191)	(0.191)
d_fore		0.031	0.037	0.039	0.044	0.045
		(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
tariff			−0.019 **		−0.020 **	−0.021 **
			(0.009)		(0.009)	(0.009)
forereg				0.079 ***	0.079 ***	0.080 ***
				(0.021)	(0.021)	(0.021)
Controls	11.367 ***	9.957 ***	10.200 ***	10.892 ***	11.146 ***	11.098 ***
	(0.449)	(0.482)	(0.494)	(0.545)	(0.556)	(0.616)
Industry category variables	Yes	Yes	Yes	Yes	Yes	Yes
Corporate fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	31,233	31,233	31,233	31,233	31,233	31,233
R^2	0.0001	0.0032	0.0032	0.0031	0.0031	0.0031

Note: standard errors in parentheses; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

In fact, the major reform policy of deregulating the entry of foreign capital around the time of China's accession to the WTO may also have had a significant effect on firms' export trade. Therefore, the model includes the variable of deregulation of foreign investment

entry, and the results in column (4) of Table 4 show that the coefficient of the cross term remains positive, indicating that the regression results are relatively robust. The coefficient of foreign capital deregulation is also significantly positive, indicating that foreign capital deregulation can effectively promote Chinese agricultural firms' exports. The results in column (5), which control for both export trade liberalization and foreign deregulation, also confirm that reduced TPU has a significant effect on firms' export expansion. Column (6) reports the results of regressions using indicators of tariff differentials measured in another way, which was constructed by drawing on Handley and Limão's work [14] (denoted by $TPU2_{j01}$). The results show that the coefficients of the cross terms in both columns are significantly positive, indicating that the decline in TPU boosts the exports of Chinese agricultural firms significantly. This finding does not change with the different measurements of TPU, and the results are robust.

4.2. Validity and Robustness Tests of the DID Model Setting

4.2.1. Parallel Trend Test

The DID method can avoid the interference of the endogeneity problem of the model to a greater extent, but the premise of its application requires that agricultural exports facing different TPUs must have the same trend of change before China's WTO accession, otherwise the estimated coefficients of the core explanatory variables also contain the differences between the treatment group and the control group itself, rather than the fully real policy effects. In this paper, the year 2000 before the policy was implemented is used as the default comparison group, and the cross term of $TPU1_{j01}$ and the dummy variable *Year* are used instead of $TPU1_{j01} \times POST_{t02}$ to regress the export value of enterprises' agricultural products and to test whether the export of the treatment and control groups before China's accession to WTO satisfies the parallel trend hypothesis by comparing whether the regression coefficient of the cross term before the policy occurred is significantly different from zero The results of the parallel trend test are shown in column (1) of Table 5, where 2002 is the year of policy implementation. the coefficient of $TPU1_{j01} \times Year$ are not significant in 2002 and before, indicating that the treatment and control groups have approximately the same evolutionary trend before China's accession to the WTO and satisfy the parallel trend test hypothesis. The dynamic effect of TPU on firms' agricultural exports can also be observed by comparing the cross term coefficients after the occurrence of the policy. The cross term coefficients of $TPU1_{j01} \times Year$ are significantly positive for consecutive years after 2003, indicating that the decline of TPU after China's accession to the WTO plays a positive role in promoting firms' agricultural exports.

Table 5. Validity and robustness tests of DID model settings.

	(1)	(2)	(3)	(4)	(5)
	Parallel Trend Test	**Expected Effects**	**Placebo Test**	**Controlling Industrial Time Trends**	**Two-Period Multiplier Method**
$TPU1_{j01} \times POST_{t02}$		1.486 *		1.175 **	1.241 **
		(0.807)		(0.573)	(0.483)
$TPU1_{j01} \times Year_{t01}$	0.412	0.392			
	(0.887)	(0.979)			
$TPU1_{j01} \times Year_{t02}$	0.579				
	(0.721)				
$TPU1_{j01} \times Year_{t03}$	0.736 *				
	(0.425)				
$TPU1_{j01} \times Year_{t04}$	0.893 *				
	(0.496)				
$TPU1_{j01} \times Year_{t05}$	0.994 **				
	(0.499)				

Table 5. *Cont.*

	(1)	(2)	(3)	(4)	(5)
	Parallel Trend Test	**Expected Effects**	**Placebo Test**	**Controlling Industrial Time Trends**	**Two-Period Multiplier Method**
$TPU1_{j01} \times Year_{t06}$	1.012 ** (0.480)				
$TPU1_{j01} \times Year_{t07}$	1.105 ** (0.471)				
TPU			−0.042 (0.926)		
N	31,233	31,233	1782	31,233	31,233
R^2	0.0041	0.0043	0.0016	0.0040	0.0400

Note: Controlling for firm and year fixed effects, regression results for each control variable and constant term are not reported owing to space constraints. This is the same for all following tables. ** $p < 0.05$; * $p < 0.1$.

4.2.2. Expected Effect

To test the validity of the DID estimation, we first need to test whether there is an expectation effect for agricultural firms. We introduce the variable, $TPU1_{j01} \times Year_{t01}$, on the basis of column (5) in Table 4, where $Year_{t01}$ is a time dummy variable, taking 0 before 2001 and 1 for after. If the coefficient of this cross term is not 0 and is highly significant, it means that the firms formed certain adjustment expectations before China's WTO accession, and the DID model setting is reasonable in this study. The outcome variables set for the treatment and control groups are not comparable prior to the occurrence of the WTO accession policy shock, and the estimation results are biased. Column (2) of Table 5 reports the results of the accession: the estimated coefficients of the cross term $TPU1_{j01} \times Year_{t01}$ are not significant, indicating that the sample of agricultural exporters examined did not form adjustment expectations prior to China's accession to the WTO; that is, the WTO accession event is highly exogenous.

4.2.3. Placebo Test

This study examines the reliability of the DID model estimation results using a placebo test on a sample of Chinese pre-accession firms. Theoretically, the variation in the tariff differential of products prior to WTO accession is small, and therefore, TPU should not have a significant effect on the exports of agricultural firms prior to accession. If the estimated coefficients of the model's core explanatory variables are highly significant, then there are confounding factors that bias the estimation results. The result in column (3) of Table 5 shows that the estimated coefficient of TPU is negative, but not significant, indicating that there was no significant effect before WTO accession, which is a side indication that the estimation results here are reliable.

4.2.4. Control of Industrial Time Trends

The DID model used here makes the assumption that the core explanatory variables $TPU1_{j01} \times POST_{t02}$ are not correlated with the random error term ε_{fit} for given values of $(X'_{fit}, \alpha_f, \gamma_t)$. The results are shown in column (4) of Table 5, where the sign of the regression coefficient on the cross term $TPU1_{j01} \times POST_{t02}$ remains unchanged and significant, indicating that our findings are valid.

4.2.5. Two-Period Multiplier Method

To control for the effect of potential serial correlation of the multi-period multiplicative approach on the regression results, this study further employs the two-period multiplicative approach for the regressions. The regression results in column (5) of Table 5 show that the cross term is significantly positive, indicating that the decline in TPU significantly boosted

the exports of Chinese agricultural firms, which is consistent with the results obtained in the previous estimation.

5. Further Analysis

5.1. Heterogeneity of Effects

5.1.1. Business Trading Methods

In this study, the research samples are divided into processing, general, and mixed trade firms according to their different trade modes, but as the samples of firms engaged in mixed trade are very small, with only 23 samples, they were excluded from specific examination here. Columns (1) and (2) of Table 6 report the regression results for the sample of processing trade and general trade firms. The results show that a decline in TPU effectively boosts the exports of general trade agricultural firms, whereas the effect on the exports of processing trade agricultural firms is not significant. This study argues that firms engaged in processing trade mainly use raw materials of agricultural products provided by a foreign party for production, and then process them before exporting them to the corresponding country [37]. This type of trade is more concerned with the local labor cost advantage of the exporting country than the tariffs. As long as firms can make a profit, they will continue to seek sub-processing; therefore, they are less affected by changes in external TPU. Agricultural firms mostly engage in general trade by taking advantage of local factor prices and choose to enter export markets when TPU is reduced and firms have higher expectations of future returns.

Table 6. Heterogeneous analysis—business trading methods.

	(1)	(2)
	General Trade	**Processing Trade**
$TPU1_{j01} \times POST_{t02}$	1.281 ***	−1.255
	(0.424)	(0.772)
Controls	Yes	Yes
N	26,282	4928
R^2	0.0038	0.0036

Note: standard errors in parentheses; *** $p < 0.01$.

5.1.2. Export Destination Countries

The regression results are shown in columns (1) and (2) of Table 7, which indicate that a decline in TPU significantly boosts the exports of agricultural firms whose export destination are developing countries (The developed countries classified in this study are: the United Kingdom, Ireland, France, the Netherlands, Belgium, Luxembourg, Germany, Austria, Switzerland, Norway, Iceland, Denmark, Sweden, Finland, Italy, Spain, Portugal, Greece, Slovenia, the Czech Republic, Slovakia, Malta, Cyprus, the United States, Canada, Australia, New Zealand, Japan, Singapore, South Korea, and Israel, and the rest are developing countries). Handley and Limão [14] found that a decline in tariff uncertainty is accompanied by a reduction in the price of China's exports to the United States. A similar conclusion was reached by Feng et al. [15], who argue that a reduction in tariff uncertainty has a strong correlation with the price of exported products (i.e., the greater the reduction in uncertainty is, the lower the export price is), and new market entrants have a clear advantage in export prices: they are more willing to export as they expect higher future returns. The agricultural products exported by Chinese companies are highly sought after in developing countries because of their low added value and small profit margins. Such agricultural exporters do not add as much value to their products as those exporting to developed countries, and are therefore more reluctant to take on the risks associated with changes in TPU; they are only willing to export when TPU declines.

Table 7. Heterogeneous analysis—export destination countries.

	(1)	(2)
	Developing Countries	**Developed Countries**
$TPU1_{j01} \times POST_{t02}$	2.099 ***	0.678
	(0.841)	(0.705)
Controls	Yes	Yes
N	11,040	20,193
R^2	0.0038	0.0031

Note: standard errors in parentheses; *** $p < 0.01$.

5.1.3. Business Ownership

Considering that Chinese exporters have different ownership and their economic behavior may differ, this study divides the samples into domestic enterprises, SOE and non-SOEs; FIEs, Hong Kong-, Macau-, and Taiwan-funded enterprises and other FIEs. The authors test whether the regression results are significantly different. Columns (1)–(6) of Table 8 report the regression results. The decline in TPU significantly enhances the exports of non-SOEs and Hong Kong-, Macau-, and Taiwan-funded enterprises, whereas there is no significant effect on the exports of SOEs and other FIEs. This may be because non-SOEs must take more risks when making export decisions since they do not have public property rights, and therefore, the decline in TPU increases their expectations of future earnings, effectively boosting the exports of non-SOEs. Other FIEs are mostly established in China under foreign direct investment, in view of the price advantage of Chinese agricultural products and the demographic dividend, with the aim of profiting from the price gap, so they may not be sensitive to changes in TPU.

Table 8. Heterogeneous analysis—business ownership.

	(1)	(2)	(3)	(4)	(5)	(6)
	Domestic Firms	**SOEs**	**Non-SOEs**	**FIEs**	**Hong Kong, Macau, and Taiwan-Funded Enterprises**	**Other FIEs**
$TPU1_{j01} \times POST_{t02}$	1.259	−1.886	2.581 **	0.968	2.467 *	0.117
	(1.033)	(2.565)	(1.220)	(0.719)	(1.485)	(0.840)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	14,983	428	14,555	16,250	5551	10,699
R^2	0.0012	0.0007	0.0015	0.0052	0.0055	0.0050

Note: standard errors in parentheses; ** $p < 0.05$; * $p < 0.1$.

5.2. Analysis of Mechanisms

The decline in TPU has facilitated the expansion of firms' access to finance, as evidenced by the shift from a single domestic financial market to a combination of domestic and international financial markets [8] (The main international financing sources are WFP and IFAD aids in international agricultural loans). This is important for easing the difficulties of firms in obtaining loans and promoting their exports.

To test whether the easing of financing constraints is the mechanism at play in the decline in TPU promoting firms' exports, we draw on Hovakimian [38] and Guariglia et al. [39] to measure the financing constraints (fincons):

$$fincons = \frac{(cashflow/totalasset)_{it}}{\sum_{t=1}^{N}(cashflow/totalasset)_{it}} \cdot e_{it} - \frac{1}{N} \cdot e_{it} \quad (3)$$

where cashflow is the cash flow, and totalasset is the total assets of the firms, N represents the number of observations of the firms, and t is the observation period.

First, a mediating effect model is constructed as shown in Equations (4)–(6) to test whether the corporate financing constraint has a mediating effect, while the Bootstrap method is used to test the results as shown in Table 9:

$$value = c \cdot TPU + \delta_1 \cdot X + \varepsilon_1 \tag{4}$$

$$fincons = a \cdot TPU + \delta_2 \cdot X + \varepsilon_2 \tag{5}$$

$$value = c' \cdot TPU + b \cdot fincons + \delta_3 \cdot X + \varepsilon_3 \tag{6}$$

Table 9. Intermediary effects test.

Direct intermediary effect	−0.007
	(0.009)
Indirect intermediary effects	0.301 **
	(0.149)
Controls	Yes
Reps	500
N	31,178

Note: standard errors in parentheses; ** $p < 0.05$.

Second, the regression model shown in Equation (7) is constructed to further test whether corporate financing constraints are the mechanism through which declining TPU affects the agricultural firm exports:

$$\begin{aligned} value_{ijt} = \alpha_i + \beta_1 \cdot TPU_{j01} \times POST_{t02} \times fincons_{ijt} + \beta_2 \cdot TPU_{j01} \times POST_{t02} \\ +\beta_3 \cdot TPU_{j01} \times fincons_{ijt} + \beta_4 \cdot POST_{t02} \times fincons_{ijt} + \gamma X_{ijt} + \delta_t + \gamma_j + \varepsilon_{ijt} \end{aligned} \tag{7}$$

Table 10 reports the regression results for Model (7). The coefficient of cross term $TPU_{j01} \times POST_{t02} \times fincons_{ijt}$ is significantly positive, indicating that financing constraints are an important reason for the decline in *TPU*, affecting agricultural firms' exports. The possible explanations for this are that the reduced *TPU* broadens exporters' access to finance, expanding from a single domestic finance to an international financial market finance; in addition, exporters have a better image and are more favored by financial institutions. The facilitation of corporate finance is crucial to accelerate the capital circulation of firms and to promote their export growth.

Table 10. Mechanism test.

$TPU_{j01} \times POST_{t02}$	2.384 ***
	(0.924)
$TPU_{j01} \times POST_{t02} \times fincons_{ijt}$	1.442 *
	(0.838)
Controls	Yes
N	31,178
R^2	0.0032

Note: standard errors in parentheses; *** $p < 0.01$; * $p < 0.1$.

6. Conclusions and Policy Suggestions

This study examines the effect of TPU on Chinese firms' agricultural exports using a DID approach in a quasi-natural experiment based on China's accession to the WTO. We find that, first, a decline in TPU significantly increases the export trade volume of Chinese agricultural firms, and this effect remains valid after a series of validity and robustness tests. Second, regarding heterogeneity, in terms of the business trading method, the decline in TPU significantly boosts firms engaged in general trade; in terms of export destinations,

the decline in TPU significantly boosts the firms whose export destinations are developing countries, but not the firms whose export destinations are developed countries. In terms of firms' ownership, the decline in TPU has a more significant effect on the non-SOEs and Hong Kong-, Macao-, and Taiwan-funded enterprises. Third, reduced TPU promotes the exports of Chinese agricultural firms by easing the firms' financing constraints.

In today's complex external environment of deepening TPU, the findings of this study have important policy implications for stabilizing foreign trade. First, in an increasingly complex international environment in which trade frictions continue to escalate, the impact of COVID-19 is far-reaching, and the global economy continues to decline due to huge challenges, governments should actively engage in consultation with trading partner countries, deepen bilateral and multilateral collaboration, actively sign free trade agreements, and strive to resolve trade disputes to create a stable and healthy foreign trade environment and minimize or even eliminate the TPU faced by enterprises. Second, enterprises should establish the development concept of "quality advantage", and in the process of participating in export trade, they should actively learn how to use advanced foreign technology, improve the quality of exported agricultural products, increase the competitiveness of their export products, increase the profitability of enterprises through the product markup rate, eliminate the financing constraints of export enterprises, and strengthen the effect of the decline in TPU promoting agricultural exports through the channels.

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