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The Impact of Multi-Dimensional Vectors on China's Agricultural Products Export: Based on fsQCA

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Abstract: Since 2004, China has been experiencing persistent and significant agricultural trade deficits. The longstanding unfavorable balance has induced a series of problems that require urgent attention. The fundamental approach to narrow the agricultural trade gap is to increase agricultural exports. Based on the cultural, institutional, geographical, and economic theoretical framework and using the fuzzy-set qualitative comparative analysis configurational approach, this study clarifies the configurational paths of the impact of multi-dimensional vectors on China's agricultural exports in recent years. The findings show that (1) the multi-dimensional vectors configuration paths from 2016 to 2020 have certain similarities, and the impact paths are relatively stable; (2) the configuration paths of multi-dimensional vectors are different when comparison involves' China's high-level and non-high-level agricultural exports; (3) all the four vectors simultaneously affect high-level agricultural exports; and the absence of cultural and institutional vectors influence China's non-high-level agricultural exports. Therefore, policymakers should note that one size does not fit all in promoting agricultural exports and that improving the overseas dissemination of a country's culture and its institutional policies can greatly increase agricultural exports.

Keywords: multi-dimensional vectors; agricultural product exports; fsQCA method; CAGE; configuration pathway

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1. Introduction

China is a major agricultural producer and trader. Since its accession to the WTO, China's agricultural trade scale has achieved rapid growth. In 2022, under the dual pressure of Sino-US trade friction and the COVID-19 pandemic, China's agricultural exports still reached USD 98.26 billion, with imports reaching an even higher USD 236.06 billion, resulting in a large trade deficit of USD 137.8 billion (Table 1). The long-term trade deficit reveals that China's agriculture is in a situation of domestic supply-demand imbalance and high external dependence. The difficulty of "going out" is more prominent than that of "coming in" for agricultural products. Despite the overall rapid growth of agricultural exports, the structure of China's agricultural exports is not balanced with its production structure, and the market competitiveness of export agricultural products is weak [1]. The uniqueness of agricultural products makes the influencing factors of agricultural product exports more complex. Countries differ in politics, economy, society, and technology. Therefore, by employing distance factors from the theoretical framework of CAGE (cultural, institutional, geographical, and economic) and using the fuzzy-set qualitative comparative analysis (fsQCA) approach, this study tries to explore the impact of institutional, economic, cultural, and geographical vectors on China's agricultural product exports, which will enriches research on China's agricultural product exports. It is of practical significance for solving the problem of agricultural product exports, optimizing China's agricultural export policy, and further promoting agricultural exports to reduce trade deficits. Table 1 indicates the serious imbalance of agricultural trade in China and the urgent need to promote agricultural exports.

Table 1. Agricultural trade deficit.

Year	Ratio of Agriculture in GDP (%)	Agricultural Products Exported [1]	Agricultural Products Imported [1]	Agricultural Trade Deficit [1]
2015	8.4	70.18	115.94	45.76
2016	8.1	72.61	110.65	38.04
2017	7.5	75.14	124.72	49.58
2018	7.0	79.32	136.71	57.39
2019	7.1	78.57	149.88	71.31
2020	7.7	76.03	170.8	94.77
2021	7.2	84.35	219.82	135.47
2022	7.3	98.26	236.06	137.8

[1] Here, the unit is a billion US dollars. Source of data: Ministry of Agriculture and Rural Affairs of the Peoples' Republic of China and National Bureau of Statistics of the Peoples' Republic of China; http://www.moa.gov.cn; https://data.stats.gov.cn, accessed on 10 March 2023.

Previous literature focusing on the impact of distance factors on agricultural exports usually employs a gravity model [2,3]. However, in most cases, the analysis only contains one or two vectors in the gravity regression [4–7]. In fact, these vectors influence China's agricultural exports simultaneously. "Multi-dimensional vectors" indicate that there are at least three dimensions of vectors. The effects of multiple dimensions, such as politics, economics, and institutions, are examined, and institutional and cultural vectors are found to be the leading factors for the export through gravity model [2]. Based on gravity regression, the impact of three-dimensional vectors of culture, geography, and institutions on China's agricultural product imports and exports is discussed. Regression analysis shows that cultural distance greatly affects China's exports, and the impact of institutional distance and geographical distance is relatively weak [3]. Overall, the previous research indicates that cultural, geographical, and economic distances hinder bilateral trade, and institutional distance exhibits a significant promoting effect on bilateral trade. With the quick development of digital technologies and services, it seems the impacts of these vectors change gradually. Meanwhile, little attention has been paid to the integrated impact of multi-dimensional vectors and the influence pathways.

To some extent, research from the perspective of multi-dimensional vectors can solve the problem of high trade costs caused by distance factors for agricultural product export. Because agricultural products are prone to decay and are not easy to preserve, research from the perspective of multi-dimensional vectors to some extent, can solve the problem of high trade costs caused by distance factors for agricultural products export. There are still the following two points that need discussing regarding the impact of multi-dimensional vectors on China's agricultural product exports. (1) The research on the "integrated" impact of multi-dimensional vectors needs strengthening, and the framework of CAGE covers all the vectors. (2) It necessitates a combined methodology of fuzzy-set qualitative comparative analysis (QCA) based on configuration analysis with qualitative and quantitative methods, which can clearly explore the impact path, causal and complex relationships of combined distance vectors (independent variables), and outcomes, and the evolution trend of China's agricultural product exports.

2. Materials and Methods

2.1. CAGE Theoretical Framework

The CAGE theory was proposed by Pankaj (2001) [8], including cultural, administrative, geographic, and economic vectors. Cultural distance is reflected by the differences in languages, national characteristics, and religious beliefs. Geographical distance is the actual distance difference, lack of common boundaries, etc. Administrative distance is manifested as government policies and lack of common currency or political structure relationships, etc. Economic distance is the consumer income gap, differences in cost or quality of various resources, etc. Different distances have different impacts on different industry fields. The CAGE framework reflects the bilateral trade characteristics between countries and captures "differences" in bilateral distance measurement at different dimension levels [9].

The four vectors of CAGE, namely geographic distance, economic distance, institutional distance, and cultural distance, have significant impacts on the trade costs of agricultural products, and the importance of distance on bilateral trade has increased over time [5]. Micro-level data also show that geographic barriers to regional trade are great, and the distance effect is large [10]. Scholars have different opinions on the impact of culture on trade. Cultural distance may have negative impacts on bilateral trade [11]. However, the sensitivity to cultural and institutional distance varies among countries [12]. In countries with weaker sensitivity, the impact of cultural distance on international trade is very small [13]. However, cultural distance hinders bilateral trade, and cultural exchanges are conducive to the smooth progress and deepening of cooperation [14]. It is also indicated that cultural distance may have a positive effect on export trade based on the gravity model [15,16]. Therefore, all four vectors influence agricultural exports. However, the gravity model cannot depict the causal relationship between precursor variables and outcome. Second, since the theoretical framework of CAGE combines the four vectors together and this kind of combination is closer to the fact, CAGE theory is employed in the following fsQCA model.

2.2. Research Method

2.2.1. Fuzzy-Set Qualitative Comparative Analysis (fsQCA)

Rihoux and Ragin proposed the fsQCA in 2008 on the basis of Boolean algebra and configurational relationship to analyze the complex causal relationship between the condition configuration and the results of the research sample [17,18]. Compared with multiple regression and structural equation models, fsQCA has the advantage of depicting the propositions that determine the pathways [19] and clarifying the combinations of conditions resulting in the absent, positive, or negative outcomes [19,20]. Because the causal relationship of social phenomena is complex and asymmetric, conventional statistical approaches may not be appropriate [21]. Due to the statistically informed configurational approach, the fsQCA is a highly objective technique that distinguishes it from other analytical packs [18,22]. The premise of QCA is the nonlinear relationship of event causality. QCA combines the characteristics and advantages of qualitative analysis and quantitative analysis [23,24]. Its qualitative aspect comes from the non-fully symmetric event causality that requires theoretical support, and the quantitative aspect is reflected in the analysis of QCA based on set theory and Boolean algebra. At present, fuzzy-set analysis method can at most retain the effective information of the raw data to the greatest extent [25] and at the same time show the complex causality of the independent variables and outcome. In comparison to other methods, this approach is more rigorous and scientific. Therefore, the fuzzy-set qualitative comparative analysis method (fsQCA) is used for this analysis. The core of QCA is able to present the distance configuration that causes the outcome variable to occur and the degree of impact of each vector (core conditions or auxiliary conditions) and provides the equally effective alternative configuration pathways for the same level of agricultural exports, thus helping us to figure out the key influence pathways of multi-dimensional vectors on the agricultural products exports.

2.2.2. Dependent Variables

Based on the total export amount of HS01-24 class agricultural products (The HS codes are as follows: Chapter 01 (Live animals), Chapter 02 (Meat and edible offal), Chapter 03 (Fish, etc.), Chapter 04 (Eggs, etc.), Chapter 05 (Other animal products), Chapter 06 (Plants, etc.), Chapter 07 (Edible vegetables, etc.), Chapter 08 (Edible fruits), Chapter 09 (Coffee, etc.), Chapter 10 (Cereals), Chapter 11 (Mill industry products), Chapter 12 (Nuts, etc.), Chapter 13 (Gums, etc.), Chapter 14 (Plaiting materials), Chapter 15 (Animal and vegetable fats and oils, etc.), Chapter 16 (Meat products, etc.), Chapter 17 (Sugars and sugar confectionery), Chapter 18 (Cocoa products, etc.), Chapter 19 (Cereal flours, etc.), Chapter 20 (Vegetables, etc.), Chapter 21 (Miscellaneous food), Chapter 22 (Beverages, etc.), Chapter 23 (Food industry residues), Chapter 24 (Tobacco, etc.)). (hereinafter referred to

as 24-class agricultural products) of various countries from 2002 to 2020 and considering statistics accessibility and validity, we select China and 63 countries with an export volume of above products over one billion as the sample countries (India, New Zealand, Australia, Denmark, Ukraine, Ireland, Switzerland, Romania, Colombia, Belarus, Uruguay, Pakistan, Uganda, Luxembourg, United States, Brazil, Germany, France, Canada, Spain, Belgium, Indonesia, Thailand, Poland, Russia, Argentina, United Kingdom, Vietnam, New Zealand, Malaysia, Chile, Turkey, Sweden, Singapore, South Korea, Norway, Ecuador, South Africa, Japan, Czech Republic, Hungary, Peru, Portugal, Greece, Lithuania, Philippines, Morocco, Bulgaria, Latvia, Costa Rica, Serbia, Slovakia, Croatia, Slovenia, Ethiopia, Estonia, Iceland, Dominican Republic, Israel, Jordan, El Salvador, Nigeria, and Zimbabwe). According to the sample size formula:

$$n = N/(1 + Ne^2) \quad (1)$$

where n refers to the sample size and N represents overall size. e indicates the permissible error. Due to the number of China's agricultural trade partners and non-zero trade volume, the overall size is 170. The possible error shall be no more than 0.1. Therefore, the sample size shall be 62.96. Thus, we have 63 countries as the sample.

Second, data from 2016 to 2020 are chosen for fuzzy-sets qualitative comparative analysis, with the aim of clarifying the changes in conditional configurations that cause dependent variables to occur over time. The dependent variable data are all sourced from Trademap.org. Using China's agricultural product export volume to sample countries as an indicator to measure agricultural export level and taking the characteristics of qualitative comparative analysis and calibration results into consideration, China's agricultural product export level is divided into two asymmetry outcome variables, namely high-level agricultural exports (EX) and non-high-level agricultural exports (~EX).

2.2.3. Independent (Precursor) Variables

1. Geographical Distance (DS)

Existing research generally believes that a country's geographical distance from its trading partners affects bilateral trade [26–30]. Countries with neighboring geographical locations have more advantages and potentials for cooperation, and geographical vector has a significant inhibitory effect on bilateral trade [31]. Countries from close geographical locations not only enjoy convenience and cost-saving in transportation but also have similar product demand and supply due to similar social and economic cultures and industrial structures [29]. According to the previous research [26–31], the geographical distance between the capitals of countries is used as the measure of geographical distance, and the data employed are from the CEPII database.

2. Cultural Distance (CD)

Cultural distance is sometimes included in institutional distance. When cultural distance is considered in bilateral trade, the larger cultural distance is usually associated with reduced trade volume [16,32]. However, the relationship between cultural distance and bilateral trade is nonlinear, and there is a threshold. Only when the cultural distances surpass the threshold does international trade decrease [4]—all types of institutional distances are detrimental to import and export trade between countries. Due to the importance of agriculture in a country, institutional distance is a factor more important than cultural distance affecting agriculture and raw material bilateral trade [33]. Because of the differences in national institutional environment and cultural background, single index measurement is one-sided. Therefore, multidimensional distance indices are employed to measure the impacts on trade [2]. Usually, bilateral trade shows greater sensitivity to institutional distance than cultural distance, especially with regard to agricultural products [2,7]. Hofstede's six-dimensional theory of culture includes power distance, individualism/collectivism, masculinity/femininity, indulgence/restraint, uncertainty avoidance, and long-term/short-

term orientation. Based on this theory, The KSI index is proposed by Kogut and Singh (1988) [34] to measure cultural distance. The calculation formula is as follows:

$$CD_j = \left\{ \sum_{i=1}^{6} \left[(C_{ij} - C_{iCH})^2 / V_i \right] / 6 \right\} \quad (2)$$

where C_{ij} is the cultural distance value of dimension i of the sample country, CD_j is the cultural distance value of sample country i and China, C_{iCH} is the cultural distance value of dimension i of China, and V_i is the variance of the cultural distance of dimension i. Usually, with frequent mutual visits and dialogues, the cultural distance seems to be gradually weakened. Therefore, the number of years of diplomatic relations between China and each sample country is added to the equation to show the change in cultural distance over time [35]. Then, the formula is rewritten as:

$$CD_j = \left\{ \sum_{i=1}^{6} \left[(C_{ij} - C_{iCH})^2 / V_i \right] / 6 \right\} + \left(1 / T_j \right) \quad (3)$$

where T_j represents the number of years of diplomatic relations between China and country j and $1/T_j$ represents that the cultural distance between China and country j decreases with the increase of bilateral exchanges.

3. Institutional (or administrative) Distance (ZD)

A good trade policy and institutional system is the driver for long-term and sustained economic growth [36,37]. At present, there is no unified standard for measuring institutional distance across international research. The relationship between institutions and trade was first proposed by Belloc (2006) [6]. Institutional differences are important determinants of trade flows. The quality of a country's institutions is positively correlated with bilateral trade activities, and institutional differences are negatively correlated with bilateral trade volume [38,39]. Institutional distance can be divided into economic institutions, political institutions, and legal institutions in measuring their impacts on trade [40]. Smaller institutional distances between countries may have export creation effects, while medium and large institutional distances between countries show short-term inhibitory effects and long-term promotion effects. Institutional distance seems to be the greatest obstacle in trade in previous studies [2]. The WGI index's six dimensions published by the World Bank are used to calculate institutional distance, including voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. The formula is as follows:

$$ZD_j = 1/6 \sum_{i=1}^{6} \left| (I_{ij} - I_{iCN}) / (maxI_{ij} - minI_{ij}) \right| \quad (4)$$

where ZD_j is the institutional distance value of sample country j and China, I_{ij} is the institutional distance value of dimension i of the sample country. I_{iCN} is the institutional distance value of dimension i of China, and $maxI_{ij}$ and $minI_{ij}$ are the maximum and minimum values of the institutional distance value of dimension i of the sample country, respectively.

4. Economic Distance (ED)

"Economic Distance" is introduced to measure the degree of market openness and trade facilitation between countries and its relationship with bilateral trade costs [41]. It can be specifically divided into formal and informal trade barriers. Formal trade barriers include restrictive trade policies such as tariffs and non-tariffs, while informal trade barriers contain geographic transportation costs [27], exchange rate risks [42], communication barriers [43], cultural differences [44], and other costs such as time, information, and regulation [45]. Previous studies show that the smaller the economic distance between countries, the higher the level of trade convenience between countries [36]. In most studies, the gap in GDP is used to show the economic distance [29,36,46]. In addition, the combination of economic alienation, cross-border management differences, technology gap,

and geographical distance may be used to represent the economic vector. The different economic scales and economic differences between countries will have an impact on trade between the two countries. The difference in per capita GDP between the sample country and China is used to represent the economic distance between countries. The formula is as follows:

$$ED_{tj} = \ln\left|\overline{Y_{tj}} - \overline{Y_{tCN}}\right| \quad (5)$$

where ED_{tj} represents the economic distance between the sample country and China in year t, $\overline{Y_{tj}}$ represents the per capita GDP of sample country j in year t, and Y_{tCN} represents the per capita GDP of China in year t.

2.3. Data Adaptability Analysis

2.3.1. Panel Data Analysis

Variables and data sources are listed in Table 2. In order to reduce the absolute value of the data and make the analysis reliable, we take the logarithm of raw data of China's agricultural exports, geographical distance, and economic distance. Table 3 lists the summary statistics of the raw data.

Table 2. Variables and data sources.

Variables	Instructions	Units	Type of Data	Data Source
EX	China's agricultural exports to each sample country	Billion USD	Continuous	TradeMap.org
DS	Straight-line distances from 63 capitals to Beijing	Km	Continuous	CEPII France database
CD	The improved Kogut index based on Hofstede's six cultural dimensions		Discrete	Hofstede
ZD	WGI index		Discrete	World Bank database
ED	GDP gap between China and sample countries	USD	Continuous	World Bank database

Table 3. Summary statistics of variables.

Variables	Obs	Mean	Median	Std	Min	Max
EX	1197	11.122	11.11	2.395	0	16.11
DS	1197	8.941	8.940	0.534	6.860	9.870
ED	1197	8.922	8.910	1.517	2.530	11.62
ZD	1197	0.340	0.330	0.180	0.020	0.720
CD	1197	2.202	1.820	1.204	0.420	5.460

According to the applicable conditions of the fsQCA, we first analyze whether the single distance variable has a significant impact on China's agricultural exports based on panel data from 2002 to 2020. Only distance variables that have a significant impact can be used as precursor variables for the qualitative comparative analysis. When no control variables are added, the results of the univariable regression are shown in Table 4.

Table 4. Univariable regression results on panel data.

Export	Coef.	Std. Err.	t	P > |t|
CD	−0.520	0.053	−9.82	0.000
_cons	12.268	0.133	92.26	0.000
ED	0.166	0.044	3.76	0.000
_cons	9.640	0.399	24.14	0.000
DS	−1.843	0.112	−16.43	0.000
_cons	27.601	1.005	27.47	0.000
ZD	0.956	0.369	2.59	0.010
_cons	10.797	0.142	76.16	0.000

The results show that all distance variables have significant impacts on China's agricultural export volume. Among them, geographical distance and cultural distance have negative impacts on China's agricultural exports, indicating that the larger the geographical distance and cultural distance, the lower the export volume of China's agricultural products. Economic and institutional vectors have positive impacts on China's agricultural exports, indicating that the gap in economic and institutional distance between countries has complementary effects and promotes China's agricultural exports. Therefore, it can be determined that economic, institutional, cultural, and geographical vectors can all be included in the fsQCA analysis as precursor variables.

Proper data shall be selected after the four precursor variables are set. However, according to the feature of the fsQCA approach, the raw numerical data have to be transformed to set membership scores based on a certain number of qualitative anchors, namely, calibration, which is a fundamental operation in the fsQCA.

2.3.2. Calibration of Original Data

The methodological feature of the fsQCA is to create "propositions" that determine the membership in configurations [38]. The configuration analysis is conducted through set-theoretic analysis. In fact, the fsQCA uses set theory to conceptualize causal attributes and dependent variables to analyze the relationship between the two. First, we select the calibration criteria based on theoretical and practical knowledge. Second, we calibrate the degree of membership between attributes or casual conditions and outcome variables. Third, we analyze the sufficiency or necessity of conditions or combinations of conditions for the outcome to reveal complex causal relationships. Based on the above panel data analysis and previous research, we use the fuzzy-sets direct calibration method to assign continuous variables between 0 and 1 to the original data of the outcome variable and the conditional variables, representing the different degrees of membership of the two sets. This assignment process is called calibration. Based on the direct calibration method, there are three membership thresholds in the course of calibration: full membership (1), crossover point (0.5), and full non-membership (0). The membership thresholds of the original data are determined by the ratios of 0.95, 0.5, and 0.05, and the conditional variables and result variables are calibrated as the degree of membership.

According to the calibration of the outcome variables, we determine whether China's agricultural product export level to each sample country belongs to the set of high-level agricultural exports or non-high-level agricultural exports or is in between the two.

In line with the research method of Han et al. (2023) [47], positive values are assigned to economic distance and institutional distance, which have positive impacts on agricultural exports, and reverse values are assigned to cultural distance and geographical distance, which have negative effects on agricultural exports. In addition, to avoid automatically identifying and removing sample countries with a calibration result of 0.5 by the fsQCA software (version 4.1), it is necessary to add or subtract 0.001 from the calibration results. In this paper, the preliminary calibration results are treated as "+0.001".

Table 5 shows that original data of the dependent variable with a value greater than or equal to 15.299 belongs to the set of high-level agricultural exports, while original data with a value no more than 8.8 belongs to the set of non-high-level agricultural exports. As to cultural distance, original data no more than 0.602 pertains to the set of the existence of cultural distance (CD), while data greater than 4.263 falls under the set of the absence of cultural distance (~CD). As for economic distance, original data no less than 10.942 indicates that it is part of the set of the existence of economic distance (ED), while data less than 7.385 is in the set of the absence of economic distance (~ED). In terms of geographical distance, the original data less than or equal to 7.97 falls in the set of the existence of geographical distance (DS), while data greater than 9.736 belongs to the set of the absence of geographical distance (~DS). As far as institutional distance is concerned, original data greater than or equal to 0.583 is in the set of the existence of institutional distance (ZD), while data less than 0.109 pertains to the set of the absence of institutional distance (~ZD).

Table 5. Raw data anchor points for the calibration of fuzzy-set membership—2020.

Fuzzy-Set Variables	Full Membership	Crossover Point	Full Non-Membership
Export	15.229	11.672	8.800
CD	0.602	1.818	4.263
ED	10.942	9.059	7.385
DS	7.970	8.942	9.736
ZD	0.583	0.311	0.109

According to the raw data of exports and the calibration in Table 6 and raw data anchor points in Table 5, of all the 63 sample countries, China's agricultural product exports to the four countries inclusive of the United States, Chile, Hungary, and Lithuania are full membership of high-level exports. China's exports to India, Ireland, Belarus, and Luxembourg are full membership of non-high-level agricultural product exports. The other 55 sample countries are in the crossover points.

Table 6. High-level and non-high-level agricultural exports.

Classification	Country	Ex (Raw Data)	Calibration (0~1)
High-level agricultural exports	United States	15.4982	0.961
	Chile	15.4644	0.961
	Hungary	15.2344	0.951
	Lithuania	15.8835	0.971
Non-high-level agricultural exports	India	8.798	0.051
	Ireland	7.68754	0.021
	Belarus	6.02345	0.001
	Luxembourg	6.22456	0.001

3. Results

3.1. Necessity Analysis

According to the necessary conditions of the fsQCA, when the consistency of the necessity analysis result of a single variable is greater than 0.9, the precursor variable is a necessary condition for the dependent variable and becomes a core condition affecting the occurrence of the dependent variable in subsequent analyses. Table 7 shows that the consistency of each antecedent variable is less than 0.9. Therefore, it is not true that any single precursor variable is a necessary condition. The occurrence of the dependent variable depends on the complex combination of antecedent conditions, which is consistent with subsequent research on configurations.

Table 7. Necessity analysis of single independent variable.

Variables	Dependent Variable: EX		Dependent Variable: ~EX	
	Consistency	Coverage	Consistency	Coverage
CD	0.689	0.700	0.574	0.592
~CD [1]	0.599	0.581	0.709	0.698
ED	0.700	0.666	0.620	0.599
~ED	0.578	0.600	0.655	0.689
DS	0.684	0.732	0.566	0.615
~DS	0.640	0.592	0.753	0.708
ZD	0.618	0.648	0.596	0.635
~ZD	0.652	0.614	0.670	0.640

[1] ~ represents the logic "not" or the absence of a variable in the fsQCA.

3.2. Configuration Analysis

The Truth Table Algorithm of the fsQCA is used for truth value analysis. According to the sample volume consistency analysis, the threshold is set at 0.8, and the frequency is

set at 1. The results can be complex solutions, parsimonious solutions, and intermediate solutions. As both the universality of complex solutions and the revelation of parsimonious solutions are poor, the intermediate solution is selected for interpretation, and the interpretation of the parsimonious solution is used for backup. The precursor variables that appear in both the intermediate solution and the parsimonious solution are recorded as core conditions, and the rest are auxiliary conditions.

A comparison of the distance configurations affecting agricultural product exports in 2016 and 2017 (Table 8) shows that the degree of influence, coverage, and consistency of the overall solution of the non-high-level agricultural product export path do not change. The configuration path of high-level agricultural product exports has changed, but the structure is similar. In 2016, there was only one configuration path affecting high-level agricultural product exports: M1 (**CD *ED *~DS *~ZD**). In this way, cultural distance and economic distance, the absence of geographical distance, and institutional distance work together as core conditions affecting high-level agricultural product exports, with a consistency of 0.84 and a coverage of 0.28. In 2017, there were two paths affecting high-level agricultural product exports: M1 (**CD *~ED *DS *~ZD**) and M2 (**CD *ED *~DS *ZD**)—in M1, cultural distance, geographical distance, the absence of economic distance, and the absence of institutional distance act as the core conditions. In M2, cultural, economic, and institutional vectors, together with the absence of geographical distance, play a role as core conditions.

Table 8. Configuration of agricultural product export level in 2016–2017.

Variables	2016		2017	
	~EX [1]	**EX** [2]	**~EX**	**EX**
M1	**~CD *~ZD**	**CD *ED *~DS *~ZD**	**~CD *~ZD**	**CD *~ED *DS *~ZD**
M2	~CD *~ED		~CD *~ED	**CD *ED *~DS *ZD**
M3	**~ED** *DS ***ZD**		**~ED** *DS ***ZD**	
Overall solution coverage	0.58	0.28	0.58	0.49
Overall solution consistency	0.85	0.84	0.85	0.80

~ represents the absence of the following variable, and * stands for logic "and". ~ does not mean that the variable does not affect agricultural product exports, but means "the absence of the variable" as a variable affects agricultural product exports, reflecting the non-symmetry of the fsQCA. EX: high level of agricultural exports; ~EX: non-high level of agricultural exports. Bold words refer to the core conditions.

Table 9 shows the distance configuration paths affecting agricultural product exports in 2018 and 2019, where the coverage of the overall solution is above 0.5, and the overall solution consistency is above 0.79. The consistency is around 0.8, indicating that each pathway is effective and the fsQCA results are scientifically reliable.

Table 9. Configuration of agricultural product export level in 2018–2019.

Variables	2018		2019	
	~EX	**EX**	**~EX**	**EX**
M1	**~CD *~ZD**	**CD *~ED *DS *~ZD**	**~CD *~ZD**	**CD *ED *~DS**
M2	**~CD *~ED**	**CD *ED *~DS *ZD**	~CD *~ED	**CD *~ED *DS *~ZD**
M3			**~ED** *DS ***ZD**	
Overall solution coverage	0.54	0.50	0.59	0.52
Overall solution consistency	0.85	0.80	0.84	0.79

~ represents the absence of the following variable, and * stands for logic "and".

For high-level agricultural product exports, there are two pathways in both 2018 and 2019, which are basically the same. Specifically, path M2 (**CD *~ED *DS *~ZD**) in 2019 is exactly the same as path M1 (**CD *~ED *DS *~ZD**) in 2018, and M1 in 2019 (**CD *ED *~DS**) is based on path M2 in 2018 (**CD *ED *~DS *ZD**), reducing the core condition of institutional distance, which indicates that the influence of institutional distance on high-level

agricultural trade is gradually weakening from 2018 to 2019. For non-high-level agricultural product exports, there is one more path M3 (**~ED** *DS ***ZD**) in 2019 than in 2018, and the impact extent of variables in path M2 (~CD *~ED) changed over time. In 2018, the absence of cultural and economic distance play as core conditions; in 2019, they play as auxiliary conditions, and their influence gradually declines as time goes by.

Table 10 indicates that the distance factors affecting China's agricultural product export constitute four pathways, and the consistency of each pathway reaches more than 0.75. The overall solution consistency is higher than the minimum level of 0.7, indicating that each pathway has good statistical significance and that the results of the fsQCA are scientifically reliable.

Table 10. Configuration of agricultural product export level in 2020.

Non-High-Level Agricultural Exports		RC	UC	C	High-Level Agricultural Exports		RC	UC	C
M1	**~CD *~ED**	0.44	0.05	0.78	M1	**CD *~ED *~DS *~ZD**	0.36	0.36	0.81
M2	~CD ***~DS *~ZD**	0.40	0.01	0.77					
M3	CD ***ED *DS *~ZD**	0.28	0.08	0.82					
Solution coverage			0.55		Solution coverage			0.36	
Solution consistency			0.77		Solution consistency			0.81	
Path M1: Bulgaria, Luxembourg, India, Turkey, Vietnam, Uganda, Sweden, Jordan, Latvia, Estonia, Switzerland, Norway, Hungary, Pakistan					Path M1: Netherlands, Costa Rica				
Path M2: Bulgaria, Uganda, Sweden, India, Turkey, Nigeria, Belarus, Norway, Hungary									
Path M3: El Salvador									

RC refers to raw coverage, UC is the unique coverage, and C is the consistency. ~ represents the absence of the following variable, and * stands for logic "and".

There are three pathways for the non-high level of influence on agricultural product exports, and the overall consistency reaches 0.77, and the coverage is 0.55. Path M1 (**~CD *~ED**) indicates that the absence of cultural and economic vectors as the core conditions jointly affect the export of non-high-level agricultural products. This pathway does not have auxiliary conditions, and the consistency is 0.78. The raw coverage reaches 0.44. The sample countries covered by this pathway include Bulgaria, Luxembourg, India, Turkey, Vietnam, Uganda, Sweden, Jordan, Latvia, Estonia, Switzerland, Norway, Hungary, and Pakistan. Path M2 (~CD ***~DS *~ZD**) shows that the absence of geographical and institutional vectors works as core conditions, and the absence of cultural distance as auxiliary conditions jointly affect the export of non-high-level agricultural products, with a consistency of 0.77 and the raw coverage of 0.40. The sample countries covered by this path include Bulgaria, Uganda, Sweden, India, Turkey, Nigeria, Belarus, Norway, and Hungary. Path M3 (CD ***ED *DS *~ZD**) involves all four vectors, but the influence extent is different. Economic and geographical vectors and the absence of institutional distance together work as core conditions, and only cultural distance plays a role as auxiliary conditions affecting the export of non-high-level agricultural products. The consistency of this path is as high as 0.82, and the raw coverage is 0.28. The sample country covered is El Salvador. There are overlapping parts in the sample countries of the M1 and M2 configuration paths, indicating that for the overlapping sample countries, both configuration pathways have their impact.

There is only one path, M1 (**CD *~ED *~DS *~ZD**), that affects the export of high-level agricultural products. This pathway has four distance factors that play roles as core conditions: cultural distance and the absence of economic, geographical, and institutional vectors. The consistency is 0.81, and the coverage is 0.36. The countries covered by this path include the Netherlands and Costa Rica.

Table 10 shows the configuration pathways whereby the combination of all four vectors affects the exports of high-level agricultural products and non-high-level agricultural products. There are three pathways affecting non-high-level exports, with only one influencing high-level exports. The absence of cultural and economic distance is the core

condition to improve the non-high exports of China to those countries included in path M1 (Bulgaria, Luxembourg, India, Turkey, Vietnam, Uganda, Sweden, Jordan, Latvia, Estonia, Switzerland, Norway, Hungary, and Pakistan). This is also the case with paths M2 and M3. Cultural distance, together with the absence of the other three vectors, is the core condition for promoting the high-level agricultural exports of China to the Netherlands and Costa Rica.

The above analysis depicts the key distance factors influencing China's agricultural exports. For different trading partners, the configuration pathways are not the same. The different core conditions of configuration pathways imply that the distance factors have different impacts (core or auxiliary) on the agricultural product exports of sample countries. Therefore, the combination of economic, cultural, geographical, and institutional vectors should be fully considered, and the matching proposal shall be suggested based on the exact configuration pathways.

4. Discussion

Based on the CAGE theoretical framework and employing the fsQCA approach, a configurational comparative analysis of the impact of multi-dimensional vectors on China's high-level and non-high-level agricultural product exports is conducted, and the findings are as follows.

First, the overall impact of multi-dimensional vectors on the level of China's agricultural exports remained stable from 2016 to 2020, and the evolution trend was not significant. For non-high-level agricultural exports, there are two configurations of causal conditions (paths) that lead to the same outcome. First is the absence of both cultural and institutional distance, two vectors that are the core conditions in the configuration. This finding is consistent with the findings of Xing et al. (2023) [2], but the research method is totally different. This shows that the findings are reliable. Second, is the absence of both cultural and economic distance, which played as core conditions only in 2018 and 2020. For high-level agricultural exports, cultural distance [12,48,49] and the absence of economic and institutional distance [33,50,51] are the core conditions in the configuration in most years. The impacts of these vectors are changing over time. However, for different levels of agricultural exports, including high-level and non-high-level agricultural exports, there is no significant change in the configuration pathway in the research period.

Second the configuration pathways differ as to how multi-dimensional vectors affect the exports of high-level and non-high-level agricultural exports. This new discovery is quite important, and different policies may have better effects on different exports. All four vectors simultaneously play the role of core conditions in high-level agricultural exports, and in any configuration pathway, cultural distance and the absence of institutional distance are core conditions to promote the exports. This is different from the previous findings [2,48] because this research first figures out the causal relations between the four vectors and outcomes. Second, it divides the exports into high-level and non-high-level groups. Moreover, this research provides equally effective alternative configuration pathways. This is attributed to the use of the fsQCA [22]. In terms of non-high-level agricultural exports, only the absence of cultural distance and mostly the absence of institutional distance are the core conditions to increase exports, and other vectors do not have a significant impact.

Third, for different trading partners, the configuration pathways may be different in different years. Compared to previous research, this is new because the commonly used gravity model cannot work out the configuration pathways. Except for 2018, there were three paths of influence. The configuration from 2016 to 2019 was consistent, but the impact of cultural and economic distance was weakening. Due to the impact of the COVID-19 pandemic, the configuration of the 2020 path was more complex than before, with the absence of cultural distance as the core condition, except for El Salvador.

However, due to the combination of qualitative and quantitative analysis, this study cannot precisely measure the influence of the multi-dimensional vectors on the exports

through the panel data. The combination of the fsQCA and gravity model may be employed for further discussion.

5. Conclusions

This study uses the fsQCA method to reveal the coordination and causal complexity between four vectors and the level of agricultural exports. The method is a supplement to the previous regression model in analyzing agricultural exports, for it reveals the causal and complex configuration effects of multi-dimensional vectors on high-level and non-high-level agricultural exports. In addition, this study discovers the asymmetrical association in different configuration pathways. For the same level of agricultural exports, this study provides equally effective alternative configuration pathways. Last, the impact on agricultural exports or trade is not determined by a single or standalone precursor but by the combinations of those independent variables.

The study implies that cultural and institutional distance is more important than geographical and economic vectors in agricultural exports in the integrated precursor variables. Therefore, to increase China's non-high-level agricultural exports, the overseas dissemination of its culture is crucial. For example, policies may be formulated to support the exports of TV plays and films, translation and overseas dissemination of books and online novels, etc. Enhancing the strength of cultural dissemination overseas can greatly increase non-high-level agricultural exports. To increase high-level agricultural exports, it is essential to maintain a country's unique cultural characteristics and introduce its national policies to the world. However, policymakers should note that one size does not fit all. For different trading partners, the export-promoting proposal may not be the same. For one trading partner, sometimes we can find two or more equally effective pathways to the same outcome in affecting agricultural exports. Thus, trade policies shall be different for different countries.

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