Journal of Advanced Academic Research and Studies 高等学术研究期刊
Vol. 2, No.2, February 2025 (pp. 1-27)
http://www.nlbaeai.org/

ISSN 3006-4007 (Print)
ISSN 3006-4015 (Online)

The Influence Mechanism of Partnership on Agri-food Supply Chain Performance

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Received 26 July 2024, Revised 08 November 2024, Accepted 01 February 2025

Abstract

Purpose – This study investigates how strategic partnerships and supply chain collaboration influence the performance of China's agricultural supply chains, addressing challenges such as short-termism, weak collaboration, limited information exchange, and the absence of systematic performance improvement strategies.

Design/Methodology/Approach – Centering on core agricultural enterprises, the research develops a framework linking partnership dimensions (trust, commitment, power, adaptation) and collaboration mechanisms (revenue sharing, information sharing, synchronous decision-making, IT support) to financial and operational outcomes. Empirical analysis explores both direct effects and interaction mechanisms.

Findings – Strong partnerships and robust collaboration significantly enhance performance. Revenue sharing provides the structural foundation, while information sharing and synchronous decision-making are critical operational drivers. IT support strengthens systemic improvements in both areas.

Research Implications – The results offer actionable guidance for policymakers and managers: fostering trust, ensuring fair revenue distribution, and enabling efficient information flows within a systemic collaboration strategy can raise supply chain performance. Such approaches also contribute to rural development, higher farm incomes, and improved food quality and safety in China.

Keywords: partnership; supply chain collaboration; Agricultural supply chain performance; supply chain

JEL Classifications: Q13, L14, M11

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I. Introduction

As the primary industry, agriculture is closely related to people's livelihood. With the improvement of people's living standards and the change of consumption habits, the Agricultural industry has undergone great changes in the past 20 years. At the same time, it is also facing new situations and challenges, such as consumers' personalized and diversified demand for agricultural products, and stricter food quality and safety standards (Saitone and Sexton., 2017; Huggins and Valverde., 2018). At present, the competition between single enterprises has gradually evolved into the whole supply chain (Cooperetal.,1997; Kuhneetal.,2013). Agricultural Supply Chain refers to the functional network in the whole process from production to sales of agricultural products, which composed of farmers, processing enterprises, logistics enterprises, wholesalers and retailers driven by core enterprises. Through information share and close collaboration, members of the supply chain quickly respond to market demand and maximize the overall benefits of the supply chain.

This article believes that starting from supply chain collaboration, exploring the impact mechanism of partner relationships on the performance of agricultural product supply chains is of great value in promoting supply chain management. Through theoretical and empirical analysis, this study clarifies the interaction mechanism between partner relationships, supply chain collaboration, and the performance of agricultural product supply chains. It examines the direct impact paths of overall and dimensional partner relationships on the performance of agricultural product supply chains, as well as the direct impact and mediating role of supply chain collaboration. Based on the empirical analysis, this article proposes strategies to enhance agricultural product supply chain collaboration. The research conclusions of this article have important theoretical significance and practical reference value in promoting the management of agricultural product supply chains in China.

The research objectives of this paper are to explore the influence mechanism of partnership and supply chain collaboration on the Agricultural supply chain performance. Analyze the influence of partnership and supply chain collaboration on Agricultural supply chain performance, clarify the intermediary role of supply chain collaboration between them. Based on the above research, a strategy model for improving Agricultural supply chain performance is proposed from a systemic perspective to promote partnerships, ensure supply chain collaboration, and improve performance. Provide improvement suggestions for implementing supply chain collaboration and improving supply chain performance and provide theoretical support for the government to formulate Agricultural supply chain management policy.

II. Research Design

2.1 Research Model

Based on synergy view, resource-based view, relational view and research status, this article found that based on relationship view and related research, partnership (trust, commitment, power, adaption) as a supply chain Collaboration is an important content. Strengthening partnerships is conducive to promoting supply chain members to establish stable cooperative relationships, obtain relational rents and reduce opportunistic behavior of supply chain members. Ultimately, it is conducive to promoting the improvement of Agricultural supply chain performance.

Based on resource-based view and related research, efficient supply chain collaboration (incentive alignment, information share, and synchronized decision-making) is a unique, difficult-to-imitate capability and a very important strategic resource for agricultural-related enterprises in supply chain management. It can bring competitive advantages to enterprises and help core enterprises make full use of human, financial, information, infrastructure, and other relationship resources among supply chain organizations. It can also promote information share and synchronized decision-making among supply chain members, improve the efficiency of Agricultural supply chain management and bring about performance improvements.

Based on synergy view, relational view, resource-based view, and related research, establishing long-term strategic partnerships among supply chain members and exerting supply chain collaboration can reduce information search costs, transaction negotiation costs, and supervision among Agricultural supply chain members. It can also reduce opportunistic behavior and information asymmetry problems among partners, thereby reducing transaction costs and improving supply chain performance.

Therefore, it is believed that in Agricultural supply chain management, the improvement of partnerships can promote the improvement of supply chain collaboration and promote information share and synchronous decision-making among supply chain members, thereby improving the performance (financial performance, operational performance) of the Agricultural supply chain. Specifically, the establishment of good partnerships among members of the Agricultural supply chain is conducive to promoting supply chain coordination and promoting the close connection among farmers, production enterprises, circulation enterprises, retail enterprises and consumers. It can also promote the smooth distribution of interests between upstream and downstream enterprises in the supply chain, realize information share, and solve the practical problem of being unable to form long-term stable partnerships and efficient cooperation among members of the Agricultural supply chain. This can then reduce transaction costs, improve the performance of the Agricultural supply chain, and solve cooperation problems among members of the Agricultural supply chain.

Based on the above analysis, this article believes that partnerships and supply chain collaboration have three key paths that directly and indirectly affect the performance of Agricultural supply chains The first direct path of influence is through the factors of partnership (trust, commitment, power, adaption). That is, partnership can promote supply chain members to establish trust and commitment relationships, adapt to each other, enhance supply chain stability, reduce transaction costs, give full play to the overall competitive advantage of the supply chain, and improve performance. The second direct influence path is through supply chain collaboration (incentive alignment, information share, synchronous decision-making) factors. That is, establishing an incentive mechanism in supply chain collaboration can promote information share among supply chain members, improve the level of synchronous decision-making, and improve the supply chain performance. The third indirect path of influence is through supply chain collaboration intermediary factors. That is, improving partnerships is conducive to information share and synchronous decision-making. It can reduce delays and distortions in operational information transmission in the supply chain. It can also reduce the influence of the “bullwhip effect" and improve the performance of Agricultural supply chain.

Based on the above discussion, this article proposes an overall research framework to explain partnership (trust, commitment, rights, adaption), supply chain collaboration (incentive alignment, information share, synchronized decision-making) and Agricultural supply chain performance (financial performance, operational performance). The primary and secondary variables are closely related and influence each other. Among them, supply chain collaboration can have a direct impact on the performance of Agricultural supply chain. Partnerships can have direct and indirect impacts on Agricultural supply chain performance. Supply chain collaboration plays a key mediating path role in the relationship between partnerships and Agricultural supply chain performance. It also constructs a research model for studying the impact mechanism of partnership on Agricultural supply chain performance. As shown in Figure 1, this article studies four basic hypothesis paths (interaction paths among three first-level constructs). The three first-level constructs are partnership, supply chain collaboration and Agricultural supply chain performance. The 10 secondary constructs include 4 dimensions of partnership (trust, commitment, power and adaption), 3 dimensions of supply chain collaboration (incentive alignment, information share, and synchronized decision-making) and 2 dimensions of Agricultural supply chain performance (financial performance and operational performance). These further studies the impact of first-level variables partnership and supply chain collaboration on Agricultural supply chain performance from a holistic perspective. These impacts include the impact of partnerships on supply chain performance, the impact of supply chain collaboration on supply chain performance, the impact of partnerships on supply chain collaboration, and the mediating role played by supply chain collaboration. Focus on analyzing the hypothesis paths H1, H2, H3, and H4 to solve the practical problem of "how partnerships and supply chain collaboration jointly affect the performance of Agricultural supply chain”. The specific research model is as follows:

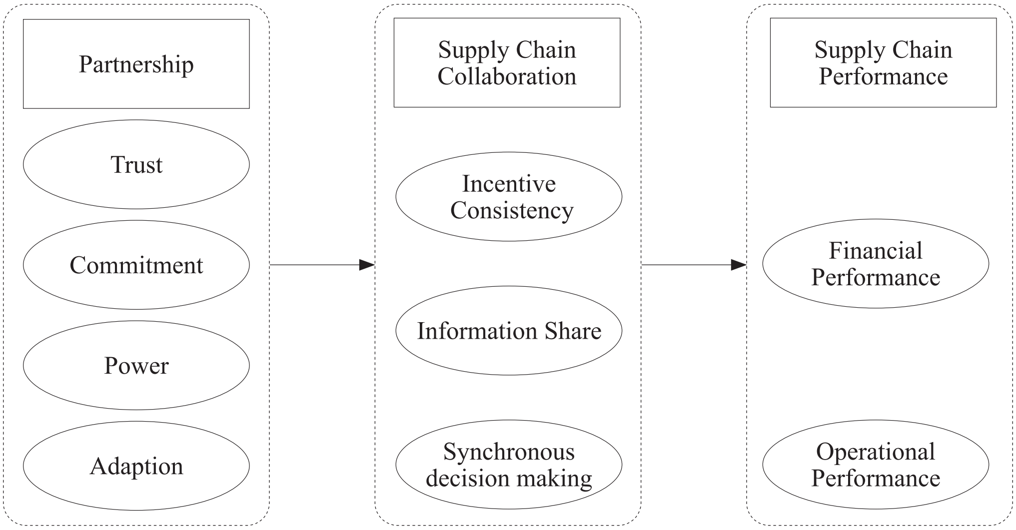

Figure 1.Research model

2.2 Research Hypothesis

2.2.1 The Impact of Partnerships on Supply Chain Collaboration

Based on the existing research foundation, this article initially clarifies the interaction between partnerships and supply chain collaboration, as well as its impact on Agricultural supply chain performance. On this basis, we comprehensively construct the concept of partnership (trust, commitment, power, adaption) and supply chain collaboration (incentive consistency, information share, synchronous decision-making) jointly affecting the performance (financial performance and operational performance) of the Agricultural supply chain. model, and hypotheses are proposed based on the relationship among factors in the model.

(1) Partnership and Agricultural supply chain performance

The improvement of supply chain collaboration can bring competitive advantages to supply chain members and improve the performance of the entire supply chain (Bahinipati and Deshmukh., 2012; Barkataki and Zeineddine., 2015). According to the Resource based view, performance differences among enterprises are determined by the number of strategic resources. When enterprises possess and can effectively integrate scarce strategic resources, enterprises can obtain sustained competitive advantages in market competition (Caoe et al., 2010). According to the Resource based view, relational assets are also a kind of strategic resources of enterprises, which have the characteristics of value, scarcity, and difficulty in complexity, and can bring competitive advantage to enterprises (Barney.,1991). For example, in supply chain collaboration, the resources and skills among enterprises can complement each other, supply chain members do not need to have all the superior resources, and some of their own resource capacity is insufficient, which can be made up through the cooperation among supply chain enterprises. In addition, the cooperation among supply chain enterprises can also make enterprises in the chain focus on their core business, so as to improve their specific skills, achieve economies of scale, and further improve supply chain performance (Barratt and Oliveira., 2001; Fawcettetal., 2015). Therefore, supply chain collaboration can complement the superior resources among enterprises, and produce economies of scale, which will ultimately promote the improvement of supply chain performance.

Therefore, this article puts forward the following hypothesis.

H1: Partnership has a positive impact on supply chain collaboration.

H1-1 Trust has a positive impact on incentive alignment.

H1-2 Trust has a positive impact on information sharing.

H1-3 Trust has a positive impact on synchronous decision-making.

H1-4 Commitment has a positive impact on motivation.

H1-5 Commitment has a positive impact on information sharing.

H1-6 Commitment has a positive impact on synchronous decision-making.

H1-7 Power has a positive impact on motivation.

H1-8 Power has a positive impact on information sharing.

H1-9 Power has a positive impact on synchronous decision-making.

H1-10 Adaption has a positive impact on motivation alignment.
H1-11 Adaption has a positive impact on information sharing.
H1-12 Adaption has a positive impact on synchronous decision-making.

2.2.2 Supply Chain Collaboration on Supply Chain Performance

Synchronous decision-making can affect the performance of the entire supply chain. Synchronous decision-making in supply chain collaboration can have a positive impact on financial performance such as corporate sales growth, sales profit margin, return on investment (ROI), and return on investment growth rate (Caoe et al., 2010; Adams et al., 2014). Synchronous decision-making can also positively affect operational performance, including reducing stockouts, ordering costs, improving inventory turnover rates, on-time delivery rates, etc. (Wiengartenetal., 2013; Li., 2012). Synchronous decision-making can affect market performance, sales growth, market share, market development, product development and customer development (Biome et al., 2014). Therefore, supply chain members make joint decisions based on information share, which may result in increased inventory turnover, on-time delivery, improved supply chain response speed, and reduced procurement costs, ultimately improving the overall performance of the supply chain. This article puts forward the following hypotheses based on the above analysis.
H2: Supply chain collaboration has a positive impact on Agricultural supply chain performance.
H2-1: Incentive consistency has a positive impact on financial performance.
H2-2: Incentive consistency has a positive impact on operational performance.
H2-3: Information share has a positive impact on financial performance.
H2-4: Information share has a positive impact on operational performance.
H2-5 Synchronous decision-making has a positive impact on financial performance.

2.3 Data Collection and Methods

2.3.1 Data Collection

This article takes managers who are familiar with supply chain operations in core enterprises of the Agricultural supply chain as the research objects. Specific research objects include. enterprise senior managers (general manager, deputy general manager, etc.), middle managers (supply chain managers, purchasing managers, sales managers, product operation managers, etc.) and grassroots managers. When answering the questionnaire, core enterprise managers are required to conduct a five-level assessment of the overall situation of their supply chain to ensure the quality of the research data. In order to ensure that the research sample is representative and quantitatively valid, this study combines online and offline methods to survey core enterprises in the Agricultural supply chain in major domestic provinces, and each agricultural-related enterprise is only allowed to fill in one questionnaire. The selection of research objects and approaches refer to previous research (Edwards et al., 2014; Uddin., 2017; Lee and Ha., 2018).

2.3.2 Research Methods

The mathematical model of structural equation is represented by a system of linear equations, which includes a structural model and a measurement model. The structural model reflects the relationship among latent variables, and the measurement model represents the relationship among latent variables and observed variables. The latent variables are defined by the observed variables through the measurement model.

The structural equation mathematical model is as follows.

Measurement equation: $x=\lambda_x\xi+\delta$, $y=\lambda_y+\varepsilon$

Structural equation: $\eta=\Gamma\xi+\zeta$

x is a q*l vector composed of q exogenous indicators, and ξ is a q*l vector composed of n exogenous latent variables. λ_x is the q*n factor loading matrix of x on η, and δ is the q*l vector composed of q measurement errors. y is a p*l vector composed of p endogenous indicators, η is a p*l vector composed of m endogenous latent variables, λ_y is the p * m factor loading matrix of y on ξ , and ε is the p*l vector composed of p measurement errors. B is the m*m coefficient matrix of endogenous latent variables, Γ is the m*n coefficient matrix of the influence of exogenous variables on endogenous variables, and ξ is m* l Residual vector.

When applying structural equation model for empirical analysis, it is generally divided into two stages. model development stage and estimation and evaluation stage. In the model development stage, the process of theory development, model setting, and identification is to go through, with the purpose of constructing a hypothetical model that can be identified based on the theory. The estimation and evaluation stage involves processes such as sampling, parameter estimation, model fitting, and modification, with the goal of measuring and estimating a theoretical model with a relatively reasonable explanation.

Mplus, AMOS and LISREL are commonly used analysis software for structural equation model. The three operating interfaces are different, but the model settings, analysis and results are the same. Structural equation model is a confirmatory method that requires theoretical support. The hypothesis model needs to be constructed under the guidance of theory, and the model needs to be revised based on the rationality of the theory. Based on the structural equation model method, this study sets up a total of 37 observed variables (measurement items). The first-level latent variables are partnership, supply chain collaboration and Agricultural supply chain performance. The second-level latent variables are 4 categories of partnership (trust, commitment, power and adaption), supply chain collaboration is divided into three dimensions (incentive consistency, information share, synchronous decision-making) and Agricultural supply chain performance is divided into two dimensions (financial performance and operational performance). Utilizing the structural equation model method, Chapter 4 of this article conducts a detailed empirical analysis of the influence relationship between the above first level and second-level latent variables through different decomposition models and main models.

Moderation model. Moderator variables are used to explain whether a relationship changes under different conditions. The effect of moderator variables is to delineate constraints and scope for existing theories. We enrich the original theory by studying the changes in variable relationships under different conditions and the reasons behind them, making the theory's explanation of variable relationships more refined.

III. Results and Analysis

3.1 Demographic Descriptive Statistics

Basic statistical description of initial items. A total of 204 valid samples were obtained in this research. The general statistical description of the sample is shown in Table 1. Through basic statistical analysis, it can be seen that the gender ratio in the sample is 110 males, accounting for 53.92%, and 94 females, accounting for 46.08%. Age distribution. 45 people under 30 years old, accounting for 22.06%; 89 people between 31 and 40 years old, accounting for 43.63%; 57 people between 41 and 50 years old, accounting for 27.94%; 13 people over 51 years old, accounting for 6.73%. The age distribution of the samples is mainly concentrated between 30 and 50 years old, accounting for 71.57%.

Education level. 16 people have high school or below and technical secondary school, accounting for 7.84%, 33 people have college degree, accounting for 16.18%, 77 people have bachelor's degree, accounting for 37.75%, and 78 people have master's degree or above, accounting for 38.24%. The educational level of the research objects in the sample is relatively high, and most of them are undergraduates and postgraduates, accounting for 75.99%. The above reasons are mainly related to the initial selection of research objects. This article studies the condition of Agricultural supply chain collaboration. The research objects are corporate managers. Usually, the management level of enterprises is relatively high, and the cultural level of the sample is consistent with that of the research objects.

The positions of the research objects in the interviewed companies are all management, which is basically consistent with the expected research objects. Among the research objects of this article, 79.9% of the survey subjects are senior managers and middle managers, and 20.1% are junior managers. Business managers in the Agricultural supply chain can better understand the supply chain operations of their own companies. For the working years of the survey samples in the unit, 15.2% of the survey samples were less than one year, 32.35% in 2-5 years, 32.35% in 5-10 years, 22.06% in 5-10 years, 30.39% in 10 years or more, and 84.8% of the research objects worked in enterprises for more than 2 years. It indicates that the research objects have a certain degree of understanding of the enterprise's management.

Table 1. Demographic Analysis Results (N=204)

Name	Options	Frequency	Percentage (%)
Gender	male	110	53.92
	female	94	46.08
Age	Below 30	45	22.06
	31-40	89	43.63
	41-50	57	27.94
	51-60	12	5.88
	above 60	1	0.49
Education level	High school or below	7	3.43
	Technical secondary school	9	4.41
	Junior college	33	16.18
	Undergraduate	77	37.75
	Graduate or above	78	38.24
Duties	Senior managers	96	47.06
	Middle managers	67	32.84
	First line managers	41	20.1
Enterprise nature	State-owned enterprises	91	44.61
	Collective enterprise	13	6.37
	Private enterprise	93	45.59
	Sino-foreign joint venture	7	3.43
Enterprise scale	Less than 100 people	72	35.29
	100-300 people	36	17.65
	More than 300 people	96	47.06
Working years	Less than 1 year	31	15.20
	2-5 years	66	32.35
	5-10 years	45	22.06
	More than 10 years	62	30.39

In terms of enterprise scale, small enterprises n=72, accounting for 35.29%, medium enterprises n=36, accounting for 17.65%, and large enterprises n=96, accounting for 47.06%. The sample's enterprise nature included 93 private enterprises at most; 91 state-owned enterprises; collective enterprises and joint ventures accounted for 9.8%. The sample sources are distributed in 31 provinces, autonomous regions, and municipalities across the country. Through the above basic statistical descriptive analysis, this article can see that the sample is certain representative.

3.2 Descriptive Analysis of Variables

In this study, we will use adopts method to analyze the data in accordance with the standard principles of structural equation model analysis. The maximum likelihood estimation method in the structural equation model based on the covariance matrix of variables to evaluate the relationship between the measured variables. The maximum likelihood estimation method requires that the measured variable obey the multivariate normal distribution, and the so-called multivariate normal distribution mainly refers to the distance between the peak value of the measured variable and the deviation value and zero. When both kurtosis and skewness are within 0, the measured variable follows an ideal normal distribution. However, in the analysis of practical problems, due to errors and other reasons, the collected data cannot reach the ideal state. Academics believe that the skewness and kurtosis of data can show whether the data sample obeys the normal distribution, in general, when the absolute values of kurtosis and skewness are less than 3, it means that the observed variables are basically in normal distribution, The analysis results of this study are shown in Table 4-2.

It can be seen from Table 2 that from the analysis of maximum value, minimum value, average value and standard deviation, the mean value of each variable is between 3.603 and 4.144, of which the variable with the minimum average value is " incentive consistency " and the variable with the maximum average value is " commitment ". Kline believes that the absolute values of skewness and kurtosis of the data are less than 3 and 10 respectively, indicating that the data conforms to the model to a certain extent. The results in the above table show that the absolute value of skewness is less than 3 and the absolute value of kurtosis is less than 10, indicating that each problem meets the conditions. Therefore, the data of this questionnaire can be directly used for subsequent statistical analysis.

Table 2. Descriptive Statistics of Variables

Project	N	Minimum value	Maximum value	Average value	Standard deviation	Kurtosis	Skewness
Trust	204	1.00	5.00	3.691	0.883	-1.406	1.671
Commitment	204	1.00	5.00	4.144	0.823	-0.852	0.987
Power	204	1.00	5.00	3.686	0.914	-1.681	1.234
Adaption	204	1.00	5.00	3.710	0.961	-0.860	2.412
Information share	204	1.00	5.00	3.920	0.769	-1.271	1.314
Synchronous decision-making	204	1.00	5.00	3.800	0.841	-0.673	0.365
Incentive Consistency	204	1.00	5.00	3.603	0.976	-1.251	0.654
Financial Performance	204	1.00	5.00	3.820	0.780	1.314	1.451
Operational Performance	204	1.00	5.00	3.903	0.728	-0.977	0.931

3.3 Reliability and Validity Analysis

3.3.1 Reliability Test

Reliability refers to the consistency, stability, and reliability of measurement data. Generally, internal consistency is used to express the reliability of the test. The higher the reliability coefficient is, the more consistent, stable, and reliable the test results are. This study uses multiple questions to measure, so Cronbach alpha is used as an indicator to test the reliability of the questionnaire. Generally speaking, when the Cronbach alpha value of the scale designed by the questionnaire is lower than 0.7, it means that the internal consistency of the variables of the scale is poor, and the scale needs to be re compiled; When the Cronbach alpha value of the equivalence table is higher than 0.7, it means that the internal consistency of several variables constructed by the scale is good; If the Cronbach alpha value of the scale is higher than 0.9, it means that the internal consistency of the variables designed by the scale is excellent.

Table 3. Reliability Analysis

Variables	Name	CITC	The alpha coefficient of the deleted item	Cronbach alpha coefficient
Trust	T1	0.883	0.729	0.893
	T2	0.905	0.883	
	T3	0.924	0.791	
	T4	0.884	0.896	
Commitment	C1	0.823	0.920	0.932
	C2	0.799	0.912	
	C3	0.801	0.887	
Power	P1	0.914	0.807	0.789
	P2	1.021	0.476	
	P3	0.849	0.703	
Adaption	A1	0.961	0.733	0.917
	A2	0.947	0.767	
	A3	0.910	0.795	
	A4	1.008	0.894	
Information share	IS1	0.769	0.916	0.936
	IS2	0.787	0.959	
	IS3	0.847	0.869	
	IS4	0.841	0.444	
Synchronous decision-making	DS1	0.800	0.808	0.907
	DS2	0.955	0.858	
	DS3	0.909	0.856	
	DS4	0.976	0.856	
Incentive consistency	IA1	0.970	0.783	0.880
	IA2	0.962	0.802	
	IA3	0.799	0.799	
	IA4	0.780	0.829	
Financial performance	FP1	0.776	0.848	0.938
	FP2	0.761	0.900	
	PF3	0.771	0.905	
	FP4	0.728	0.905	
Operational performance	OP1	0.749	0.821	0.897
	OP2	0.772	0.844	
	OP3	0.777	0.864	
	OP4	0.769	0.793	

Reliability analysis is used to test the consistency and stability of the results. Before model validation, the reliability of the study variables needs to be analyzed. Variable composition reliability can reflect the consistency of variable indicator content. In the study, the internal consistency was estimated and tested through Cronbach’s a coefficient. Generally, it is appropriate that the reliability Cronbach's a coefficient is greater than 0.7. the Cronbach's a coefficient of all variables in this article are greater than 0.7. The results indicate that the internal consistency of the research variables is good.

In addition, this study uses the Correction Item Total Correlation (CITC) to measure the reliability of a single problem item. In the study, when the following two conditions are met, one problem item shall be deleted: (1) The overall correlation coefficient CITC of one problem item is less than 0.4; (2) The Cronbach alpha coefficient of the scale is greater than the value of the Cronbach alpha coefficient of the corresponding dimension after the problem item is excluded. The specific reliability analysis results are shown in Table 3

It can be seen from the results in the table that the Cronbach alpha coefficient value corresponding to the Trust variable is 0.893, the Cronbach alpha coefficient corresponding to the Commitment variable is 0.932, the Cronbach alpha coefficient corresponding to the Power variable is 0.789, the Cronbach alpha coefficient corresponding to the Adaption variable is 0.917, the Cronbach alpha coefficient corresponding to the Information Share variable is 0.936, and the Cronbach alpha coefficient corresponding to the Synchronous Decision-making variable is 0.907, The Cronbach alpha coefficient value corresponding to the Incentive Consistency variable is 0.880, the Cronbach alpha coefficient value corresponding to the Financial Performance variable is 0.938, the Cronbach alpha coefficient value corresponding to the Operational Performance variable is 0.938.

We can see from the table that the Cronbach alpha coefficient values of each variable are greater than 0.7, which means that the internal consistency of several variables constructed by the scale is good. At the same time, the CITC value of each scale and Cronbach alpha value of deleted items meet the research requirements, indicating that the stability of each variable in the questionnaire of this study is high, and the reliability of each variable basically passes the test.

3.3.2 Exploratory Factor Analysis

Validity means that measuring tools and means can accurately measure the accuracy of the tested object. The higher the validity, the more the measurement results can reflect the real characteristics of the tested object. There are generally three types of validity: structural validity, content validity and dimensional validity. Among them, structural validity is the most commonly used indicator, which refers to the degree to which the measuring tool measures a theoretical concept or trait. This paper will use exploratory factor analysis to test the structural validity of the questionnaire data. Homoscedasticity is derived from the fact that the independent and dependent variables come from the same participants. In order to address the characteristics of the research problem, the approach used in previous studies is borrowed, and the Harman single-factor test is employed to verify whether there is homoscedasticity in the variables and samples used in the study. Before we formally conduct factor analysis, we first need to conduct KMO test and Bartlett's spherical test to determine whether the indicators of the variables we select meet the conditions for factor analysis. Kaiser's measurement shows that, in general, when KMO is greater than 0.7, it can be considered as meeting the conditions for factor analysis.

Secondly, considering the relationship between the indicators, this study uses the principal component analysis proposed by Hotelling (1933) to extract the common factors of the original indicators to test their validity. It is generally believed that if the eigenvalue is less than 1, the interpretation of the principal component is not as strong as the average interpretation of the direct introduction of the original variable. Therefore, the inclusion criterion of eigenvalue greater than 1 can generally be used. If the cumulative variance of all public factor explanations with eigenvalues greater than 1 is greater than 60%, the questionnaire data is considered to have good construct validity.

Finally, the maximum variance rotation method is used for orthogonal rotation to obtain the rotation component matrix containing the loading value of each item factor, which is used to identify and name common factors. If the factor load of an item in the rotated component matrix on the corresponding common factor is greater than 0.5, and no item has a factor load greater than 0.4 on two or more common factors, it is the most ideal situation. Otherwise, it is necessary to consider deleting the corresponding item.

The results of exploratory factor analysis on the questionnaire data are shown in Table 4. This article conducted a one-factor test on all variables in the study (partner relationship, supply chain coordination, agricultural product supply chain performance), as shown in Table 3. The KMO value is 0.939. It was found that there are 9 factors with eigenvalues greater than 1, and the first factor only explains 16.596% of the variance of all measurement indicators. Since there is no common factor that explains most of the variance of all measurement indicators, we can consider that there is homogeneity of variance, and it does not pose a serious problem to the study.

Table 4. Results of Exploratory Factor Analysis

Scale	Dimensionality	Title	Factor loading	Eigen value	Cumulative variance explained	Barth sphericity significan	KMO
Partnership	Trust	T1	0.729	3.691	16.596%	0.000	0.939
		T2	0.883				
		T3	0.791				
		T4	0.896				
	Commitment	C1	0.920	4.144			
		C2	0.912				
		C3	0.887				
	Power	P1	0.807	3.686			
		P2	0.476				
		P3	0.703				
	Adaption	A1	0.733	7.710			
		A2	0.810				
		A3	0.882				
		A4	0.882				
Supply chain collaboration	Information Share	IS1	0.916	3.920	16.596%	0.000	0.939
		IS2	0.959				
		IS3	0.869				
	Synchronous decision-making	DS1	0.444	3.800			
		DS2	0.808				
		DS3	0.858				
		DS4	0.856				
	Incentive consistency	IA1	0.856	3.603			
		IA2	0.783				
		IA3	0.802				
		IA4	0.799				
Supply chain performance	Financial performance	FP1	0.848	3.820	16.596%	0.000	0.939
		FP2	0.900				
		PF3	0.905				
		FP4	0.905				
	Operational performance	OP1	0.821	3.820			
		OP2	0.844				
		OP3	0.864				
		OP4	0.793				

3.3.3 Confirmatory Factor Analysis

In this study, AMOS 23.0 software was used to conduct confirmatory factor analysis (CFA) on the variables involved in the Partnership Scale, the Supply chain collaboration Scale, the supply chain performance Scale, and composite reliability (CR) and mean square error extraction (AVE) were used to determine the convergence validity of each variable dimension. Convergence validity analysis is mainly used to test the positive correlation between different indicators of the same variable. The specific method is to examine the standardized factor compliance coefficient of each indicator on its corresponding variable. When most of the factor loads are greater than 0.5 and reach statistically significant or very significant levels, it indicates that there is a high convergence validity.

The specific approach is to first test the model fitting of the validation factor analysis scale. The data collected from the questionnaire are imported into AMOS23.0 software, and the model fitting parameters obtained by applying the maximum likelihood method are shown in Table 5.

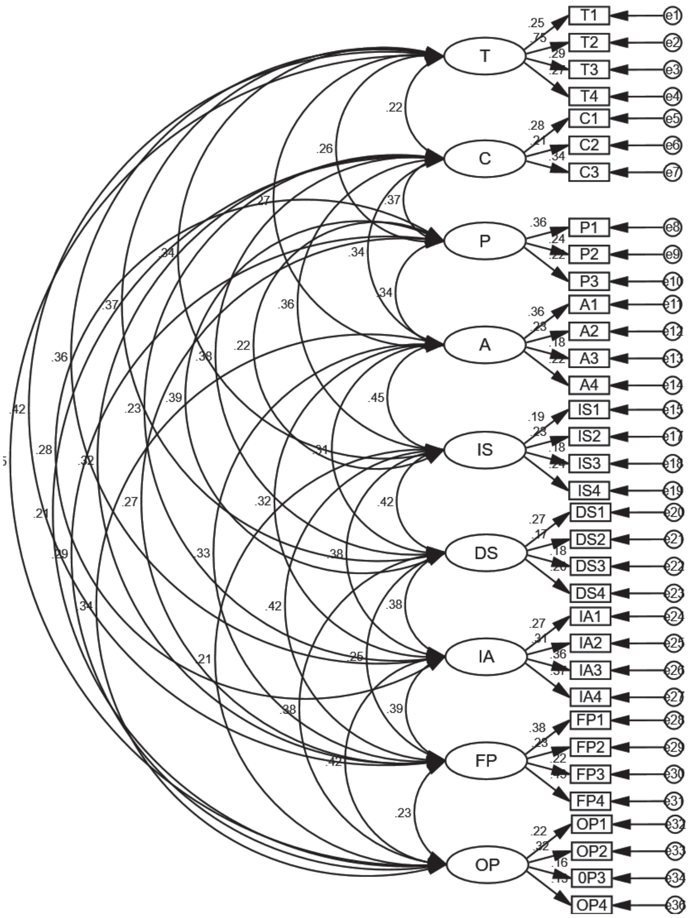

Figure 2. Confirmatory Factor Analysis Model Diagram

Table 5. Fit Indices of Measurement and Structural Model

Model Fitting	CMIN	DF	x²/df	CFI	TLI	GFI	SRMR	RMSEA
Fitting results	1252.615	606	2.067	0.910	0.901	0.925	0.068	0.072
Recommended Value			<3	>0.9	>0.9	>0.9	>0.9	<0.08

According to the results in Table 5 above, the displayed values of each fitting parameter in the validation factor analysis are CMIN=1252.615, DF=606, x²/df =2.067 and 1.4 < 3, TLI=0.901, CFI=0.910, GFI=0.925 and all are greater than 0.9, RMSEA=0.025 and < 0.08, which indicates that the validation factor analysis fit of the model in this study is good, and the Partnership, Supply chain collaboration, supply chain performance Scale, which indicates that the validation factor analysis fit of the model in this study is good.

Table 6. Convergent Validity Results

Variables	Title item	Estimate	S.E.	C.R.	Standardized factor loadings	CR	AVE
Trust	T1	1.000			0.729	0.900	0.633
	T2	0.761	0.065	17.325	0.883		
	T3	0.986	0.070	16.385	0.791		
	T4	0.052	0.071	20.236	0.896		
Commitment	C1	1.000			0.920	0.869	0.577
	C2	0.733	0.074	21.421	0.912		
	C3	0.954	0.076	20.311	0.887		
Power	P1	1.000			0.807	0.963	0.625
	P2	1.379	0.154	24.325	0.476		
	P3	0.956	0.157	26.310	0.703		
Adaption	A1	1.000			0.810	0.951	0.554
	A2	1.036	0.136	23.425	0.882		
	A3	0.698	0.128	22.321	0.882		
	A4	1.012	0.154	25.120	0.860		
Information share	IS1	1.000			0.916	0.951	0.522
	IS2	0.728	0.036	18.321	0.959		
	IS3	1.087	0.036	19.542	0.869		
	IS4	1.087	0.032	20.102	0.444		

Variables	Title item	Estimate	S.E.	C.R.	Standardized factor loadings	CR	AVE
Synchronous decision-making	DS1	1.000			0.808	0.925	0.621
	DS2	0.930	0.036	23.210	0.858		
	DS3	1.061	0.032	22.615	0.856		
	DS4	0.739	0.036	24.123	0.856		
Incentive consistency	IA1	1.000			0.783	0.867	0.675
	IA2	1.061	0.088	23.014	0.802		
	IA3	1.059	0.060	22.310	0.799		
	IA4	0.730	0.053	22.241	0.829		
Financial performance	FP1	1.000			0.938	0.843	0.545
	FP2	0.986	0.072	23.120	0.848		
	PF3	0.733	0.094	26.125	0.900		
	FP4	0.954	0.088	24.155	0.905		
Operational performance	OP1	1.000			0.905	0.845	0.546
	OP2	1.036	0.053	19.321	0.821		
	OP3	0.698	0.068	18.324	0.844		
	OP4	1.012	0.072	20.615	0.864		

It can be seen from Table 6 that in the factor analysis model verified in this paper, the standardization factor of each measurement value conforms to 0.645~0.903, which is greater than 0.50, and the corresponding significant p values are less than 0.05, indicating that the influence between each potential variable and the observed variable is significant. At the same time, the AVE value extracted from the mean variance is between 0.503 and 0.776, which is greater than 0.5, and the CR value of the joint reliability is between 0.765 and 0.933, which is greater than 0.7, indicating that the convergence validity of the variables in this study is good.

3.4 Correlation Analysis

In this study, Pearson correlation analysis is used to examine the significance and direction of linear correlation between two pairs of variables. Pearson correlation coefficient measures linear correlation. Therefore, when we use Pearson correlation analysis, we generally use correlation coefficient r to describe the degree of linear correlation between variables. If the value of correlation coefficient r is less than 0, it indicates that the correlation between the two variables is negative. If the value of correlation coefficient r is greater than 0, it indicates that the correlation between the two variables is positive. The greater the absolute value of correlation coefficient, the stronger the correlation; The closer the correlation coefficient is to 1 or - 1, the stronger the correlation is. The closer the correlation coefficient is to 0, the weaker the correlation is.

When the AVE square value of the latent variable is greater than the correlation coefficient between the variable and other variables, it indicates that the variables have good discrimination. As shown in Table 4-7, the correlation coefficients between the variables in this study are less than the square root value of AVE of each potential variable, which can be used to judge that the discriminant validity of each potential variable is good. For the results obtained in this study, the marks "* *”,"* * *"or "*" in the upper right corner of the corresponding data refer to the significance levels of 1% and 5% in turn. If there is no such mark, it means that no significance test has been conducted, and each variable has no specific relationship.

Table 7. Pearson Correlation with AVE Square Root Values

	T	C	P	A	IS	DS	IA	FP	OP
T	0.802								
C	0.269**	0.720							
P	0.450**	0.595**	0.801						
A	0.576**	0.246**	0.208**	0.685					
IS	0.614**	0.236**	0.214**	0.308**	0.671				
DS	0.223**	0.221**	0.020**	0.192**	257**	0.784			
IA	0.254**	0.345**	0.344**	0.255**	0.647**	0.597**	0.792		
FP	0.208**	0.214**	0.236**	0.246**	0.260**	0.054**	0.597***	0.793	
OP	0.171*	0.185*	0.209**	0.270***	0.223***	0.354**	0.067*	0.061**	0.693

Notes: 1. Refers to Table 3-1

* refers to $p<0.05$; ** refers to $p<0.01$; *** refers to $p<0.001$

The correlation coefficient analysis results in Table 7 show that Trust is significantly and positively correlated with Information share ($r=0.614$, $p<0.01$), Synchronous decision-making ($r=0.223$, $p<0.01$), and Incentive consistency ($r=0.254$, $p<0.01$) of Supply Chain Collaboration; Commitment was positively correlated with Information share ($r=0.236$, $p<0.01$), Synchronous decision-making ($r=0.221$, $p<0.01$), and Incentive consistency ($r=0.345$, $p<0.01$); Power ($r=0.344$, $p < 0.01$), Information share ($r=0.308$, $p < 0.01$), Synchronous decision-making ($r=192$, $p < 0.01$), Incentive consistency ($r=0.255$, $p < 0.01$), and Financial performance ($r=0.260$, $p < 0.01$) were positively correlated with Supply Chain Performance, Operational performance ($r=0.223$, $p < 0.01$), Incentive consistency ($r=0.597$, $p < 0.01$), Adaption ($r=0.308$, $p < 0.01$), Financial performance ($r=0.260$, $p < 0.01$), Synchronous decision-making (0.354, $p < 0.01$) were positively correlated with behavioral identity.

3.5 Structural Equation Model Test

According to the above theories and research results, in the structural equation model of partnership and supply chain collaboration, there are seven potential variables. The four variables of partnership are trust, commitment, power, and Adaption; the three variables of the supply chain collaboration are information share, synchronous decision-making, and incentive consistency. There are two variables of supply chain performance: financial performance and operational performance. There are 40 observation variables corresponding to 7 potential variables. Among them, partnership is an independent variable, supply chain collaboration is an intermediary variable, and supply chain performance is a dependent variable. In this study, the data collected from the questionnaire is imported into AMOS23.0 software, and the maximum likelihood method is applied to establish the path relationship structure diagram between the potential variables and indicators in the research model. The model fitting parameters obtained are shown in the following figure.

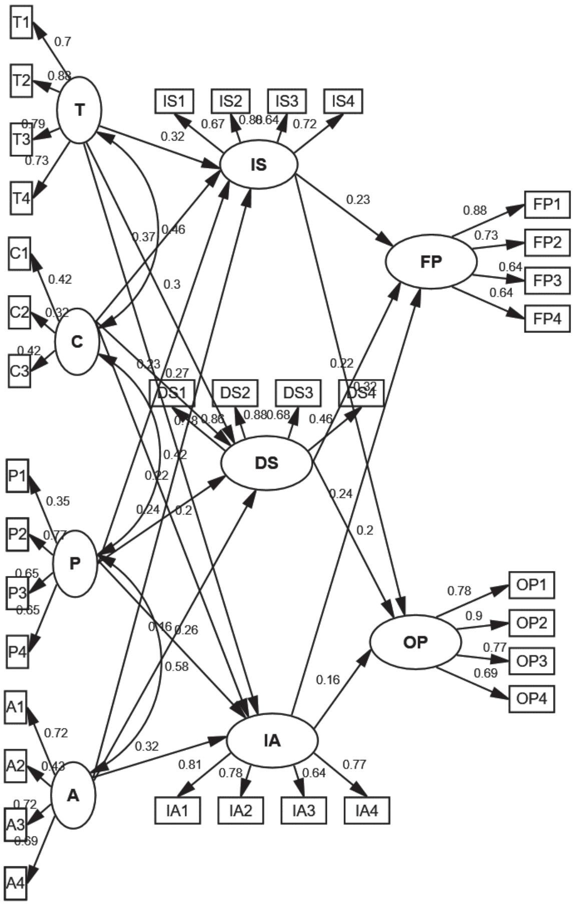

Figure 3. Structural Equation Model Result Diagram

Note: Refers to Table 3-1

Each potential variable in SEM is measured by multiple measurement items. If all potential variables with multiple indicators are sed for structural equation analysis, the mathematical and physical operations of the structural equation may be too complex, and the estimated parameters are too many, which will lead to the reduction of the fitting degree of the model. It can be seen from the previous analysis results that the confirmatory factor analysis results of each variable show that the construction validity has reached an acceptable standard, so it is reasonable to replace multiple indicators with a single indicator. In the application of structural equation model in recent years, many scholars have adopted some alternative methods to avoid the problem of unstable model estimation caused by too few samples or too many measurement items. Considering that there are many measurement items in this study, it is not enough to include all indicators in the analysis. In order to ensure the degree of freedom, the method of replacing multiple measurement indicators with a single measurement indicator is also selected in this study, and the common factor score of the measurement items is used as an explicit variable for structural equation analysis.

3.6 Path Coefficient Analysis

Before the analysis of path coefficient analysis, we first analyze the fitting of the model.

Table 8 Model Fitting for The Validated Factor Analysis

Model Fitting	CMIN	DF	x^2/df	CFI	TLI	GFI	NFI	IFI	RFI	RMSEA
Fitting results	1242.615	140	2.265	0.953	0.942	0.910	0.919	0.956	0.912	0.042
Recommended Value			<3	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	<0.08

The fitting results in Table 8 show that the ratio x^2/df of the chi square value to the degree of freedom of the model is 2.265which is less than 3 and is a good fitting degree. The RMSEA value of the model is 0.042, which is less than 0.08, indicating that the model has a good fit; NFI, RFI, IFI, TLI, CFI, GFI are all greater than 0.9, indicating that the model has a good fit. Therefore, in general, it can be considered that the fitting degree of structural equation model is acceptable.

In order to deeply understand the path relationship between variables and verify the research hypothesis, this study further analyzes the model path. After the above analysis of fitting indicators proves the validity of the structural equation model, it shows that the relationship between potential variables in the model and the actual sample has a high degree of fit. Therefore, this study uses AMOS23.0 software to test the hypothesis relationship in the research model. See Table 9 for the specific hypothesis test result.

Table 9. Structural Equation Model Path Coefficient Test

Paths	Relationship path between variables			Estimated value	S.E.	C.R.	Standardized path coefficient	Results
H1-1	T	→	IS	0.334	0.069	5.453	0.208**	Accepted
H1-2	T	→	DS	0.351	0.074	6.377	0.214**	Accepted
H1-3	T	→	IA	0.375	0.076	5.918	0.236***	Accepted
H1-4	C	→	IS	0.284	0.064	3.920	0.258**	Accepted
H1-5	C	→	DS	0.307	0.068	5.789	0.246**	Accepted
H1-6	C	→	IA	0.333	0.069	4.176	0.171***	Accepted
H1-7	P	→	IS	0.359	0.075	2.955	0.185**	Accepted
H1-8	P	→	DS	0.368	0.076	2.858	0.209***	Accepted
H1-9	P	→	IA	0.387	0.065	8.914	0.187**	Accepted
H1-10	A	→	IS	0.327	0.069	8.203	0.270***	Accepted
H1-11	A	→	DS	0.455	0.128	5.037	0.223**	Accepted
H1-12	A	→	IA	0.715	0.154	6.722	0.221**	Accepted
H2-1	IS	→	FP	0.747	0.157	5.913	0.238**	Accepted
H2-2	IS	→	OP	0.459	0.111	6.823	0.220**	Accepted
H2-3	DS	→	FP	0.395	0.136	2.592	0.192***	Accepted
H2-4	DS	→	OP	0.527	0.069	3.701	0.223**	Accepted
H2-5	IA	→	FP	0.334	0.074	3.098	0.693*	Accepted
H2-6	IA	→	OP	0.351	0.076	5.453	0.693*	Accepted

Notes: 1. Refers to Table 3-1

* refers to p<0.05; ** refers to p<0.01; *** refers to p<0.001.

According to the path analysis results in Table 4-9, first of all, from the perspective of the hypothesis of two variables of partnership on supply chain collaboration, Trust has a significant positive effect on information share (β=0.208, p<0.001), so H1-1 is assumed to be supported; Trust has a significant positive impact on synchronous decision-making (β=0.214, p<0.001), so it is assumed that H1-2 is supported; Trust has a significant positive impact on Incentive consistency (β=0.236, p<0.001), so it is assumed that H1-3 is supported; Commitment has a significant positive impact on Information share (β=0.258, p<0.001), so it is assumed that H1-4 is supported; Commitment has a significant positive impact on synchronous decision-making (β=0.246, p<0.001), assuming H1-5 is supported. Commitment has a significant positive impact on incentive consistency (β=0.171, p<0.001), so H1-6 is assumed to be supported; Power has a significant positive impact on information share(β=0.185, p<0.001), so it is assumed that H1-7 is supported; Power has a significant positive impact on synchronous decision-making (β=0.209, p<0.001), so it is assumed that H1-8 is supported; Power has a significant positive impact on incentive consistency(β=0.187,p<0.01), so it is assumed that H1-9 is supported; Adaption has a significant positive impact on information share (β=0.270, p<0.01), so the hypothesis H1-10 is supported. Adaption has a significant positive impact on synchronous decision-making (β=0.223, p<0.01), so the hypothesis H1-11 is supported. Adaption has a significant positive impact on incentive consistency (β=0.221, p<0.01), so the hypothesis H1-12 is supported.

From the perspective of supply chain collaboration assumption of supply chain performance, Information share has a significant positive impact on financial performance(β= 0.238, p<0.001), so suppose H2-1 is supported; Information share has a significant positive impact on operational performance (β= 0.220, p<0.001), so H2-2 is assumed to be supported; Synchronous decision-making has a significant positive impact on financial performance (β= 0.192, p<0.001), so it is assumed that H2-3 is supported; Synchronous decision-making has a significant positive impact on operational performance (β=0.223, p<0.001), so suppose H2-4 is supported; Incentive consistency has a significant positive impact on financial performance (β= 0.693, p<0.001), so H2-5 is assumed to be supported. Incentive consistency has a significant positive impact on operational performance (β=0.693, p<0.001), assuming H2-6 is supported; Through path coefficient analysis, we can conclude that hypothesis 1 and hypothesis 2 of this study are valid.

This article analyzes the main effect of partnership on supply chain performance. The empirical results show that partnership has a very significant impact on supply chain performance in Agricultural supply chains. The impact mechanism of partnership on performance is divided into two parts. direct impact and indirect impact through the intermediary effect of the supply chain collaboration part. Among them, the direct impact is that supply chain members establish a trust mechanism through cooperation, improve adaptability through equipment investment, and establish long-term cooperation with mutual commitment. Through efficient collaborative relationships, inventory costs are reduced, flexibility is increased, and profits are increased. The indirect impact is that through partnership among supply chain enterprises, the supply chain collaborative operation level of members is improved, thereby further improving the performance of the entire Agricultural supply chain.

Based on the research results, the following hypothesis are drawn

Table 10. Summary of Hypothesis Test Result

Number	Research hypothesis	Results
H1	Partnership has a significant positive impact on supply chain collaboration.	
H1-1	Trust has a positive impact on incentive alignment.	Accepted
H1-2	Trust has a positive impact on information sharing.	Accepted
H1-3	Trust has a positive impact on synchronous decision-making.	Accepted
H1-4	Commitment has a positive impact on motivation.	Accepted
H1-5	Commitment has a positive impact on information sharing.	Accepted
H1-6	Commitment has a positive impact on synchronous decision-making.	Accepted
H1-7	Power has a positive impact on motivation.	Accepted
H1-8	Power has a positive impact on information sharing.	Accepted
H1-9	Power has a positive impact on synchronous decision-making.	Accepted
H1-10	Adaption has a positive impact on motivation alignment.	Accepted
H1-11	Adaption has a positive impact on information sharing.	Accepted
H1-12	Adaption has a positive impact on synchronous decision-making.	Accepted
H2	Supply chain collaboration has a significant positive impact on Agricultural supply chain performance.	Accepted
H2-1	Incentive consistency has a positive impact on financial performance.	Accepted
H2-2	Incentive consistency has a positive impact on operational performance.	Accepted
H2-3	Information share has a positive impact on financial performance.	Accepted
H2-4	Information share has a positive impact on operational performance.	Accepted
H2-5	Synchronous decision-making has a positive impact on financial performance.	Accepted
H2-6	Synchronous decision-making has a positive impact on operational performance.	Accepted

IV. Conclusion

The coordinated development of Agricultural supply chains is of great significance to increasing farmers' income, balancing the supply and demand of agricultural food, and realizing agricultural industrialization and informatization. Based on resource-based view and relational view, this article analyzes the practical problems existing in the cooperation of members of my country's Agricultural supply chain, designs scales to collect data from core agricultural enterprises, and applies structural equation model to empirically analyze the impact of partnership and supply chain collaboration on Agricultural supply chain performance. influence mechanism. On this basis, a performance improvement strategy model of the Agricultural supply chain was constructed, and performance improvement strategies were proposed based on the model elements. This article reaches the following research conclusions through analysis.

Trust, commitment, power and adaption in partnership have a positive impact on agricultural food supply chain performance (financial performance, operational performance). The hypothesis that firms size has a positive moderating effect between partnership and agricultural food supply chain performance (financial performance, operational performance) does not hold. However, there is a negative moderating effect on the relationship between trust and agricultural food supply chain performance compared with medium and large enterprises, that is, trust is more important in small enterprises. In the relationship between power and agricultural food supply chain performance, there is a moderating effect when comparing medium-sized enterprises with small and large enterprises, that is, power is more important in medium-sized enterprises. The moderating effect of enterprise size on the relationship between adaption and commitment and agricultural food supply chain performance is not significant.

Incentive consistency has a significant positive impact on agricultural food supply chain performance (financial performance, operational performance). Incentive consistency has a significant direct impact on information share and synchronous decision-making, information share has a direct impact on synchronous decision-making, and information share and synchronous decision-making have a direct impact on supply chain performance (financial performance, operational performance). Information share and synchronous decision-making have a partial mediating effect between incentive consistency and supply chain performance (financial performance, operational performance). Information share and synchronous decision-making continuously mediate the relationship between incentive consistency and supply chain performance (financial performance, operational performance).

Partnership has a significant positive impact on the performance of Agricultural supply chain, and its total effect is divided into two parts. direct effect and indirect effect. Supply chain collaboration has a partial mediating effect between partnership and supply chain performance. Partnership has a significant positive impact on supply chain collaboration. Supply chain collaboration has a significant positive impact on agricultural food supply chain performance. The positive moderating effect of enterprise size on partnership, supply chain collaboration and agricultural food supply chain performance is not significant.

Agricultural food supply chain performance improvement strategy model, with supply chain collaboration as the core, ensures the improvement of supply chain performance from a systemic perspective. This model aims to improve the performance of the agricultural food supply chain (financial performance, operational performance), and the influencing factors are divided into three categories. partnership (trust, commitment, power, adaption), supply chain collaboration (incentive consistency, information share, synchronous decision-making), and information technology. According to the characteristics of the model elements, the performance improvement strategy includes partnership guarantee mechanism, revenue share mechanism and information share incentive mechanism.

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