

# Research on the Brand Spillover Effect and Regional Differences of Geographical Indication Agricultural Products in Shanxi, Shaanxi, and Henan Regions of China under the Background of Rural Revitalization

Zhanlei Xing<sup>1</sup>, Yingying Wang<sup>1,\*</sup>, Xiaoyong He<sup>2</sup>, Lan Ma<sup>3</sup> and Yumin Yin<sup>1</sup>

<sup>1</sup>Shanxi University of Science and Technology, Xi'an, 710021, China;

<sup>2</sup>Shaanxi Intellectual Property Service Center, Xi'an 710021, China;

<sup>3</sup>Xi'an Intellectual Property Protection Center, Xi'an 710021, China.

\* Corresponding Author

## Abstract

**[Purpose]** This study aims to evaluate the role of the brand strategy for geographical indication (GI) agricultural products in rural revitalization, particularly through an empirical analysis of the brand spillover effects of GI agricultural products in Shanxi, Shaanxi, and Henan provinces, thereby providing a scientific basis for agricultural high-quality development and rural revitalization strategy formulation. **[Methodology]** A quantitative analysis approach was employed, involving the collection and analysis of market data on GI agricultural products from the three provinces. This analysis assessed their market performance, brand effects, and their impact on agricultural economics and farmers' incomes. Furthermore, the specific role of regional disparities in shaping the brand spillover effects was explored. **[Results]** The study found that the overall performance of the GI agricultural product markets in the three provinces was positive, with notable brand spillover effects that significantly contributed to the promotion of agricultural economics. However, regional variations in brand development emerged, with cities like Xi'an, Datong, and Zhengzhou exhibiting particularly prominent brand effects, whereas other cities demonstrated less evident brand impacts, indicating a regionalized trend. **[Conclusion]** The study concludes that the brand spillover effects of GI agricultural products are positively correlated with rural revitalization development, serving as a crucial factor in enhancing agricultural competitiveness and promoting farmers' income. It is recommended that, in light of regional disparities, differentiated brand development strategies be adopted, accompanied by strengthened regional cooperation, to fully leverage the brand advantages of GI agricultural products and facilitate the in-depth implementation of rural revitalization strategies.

## Keywords

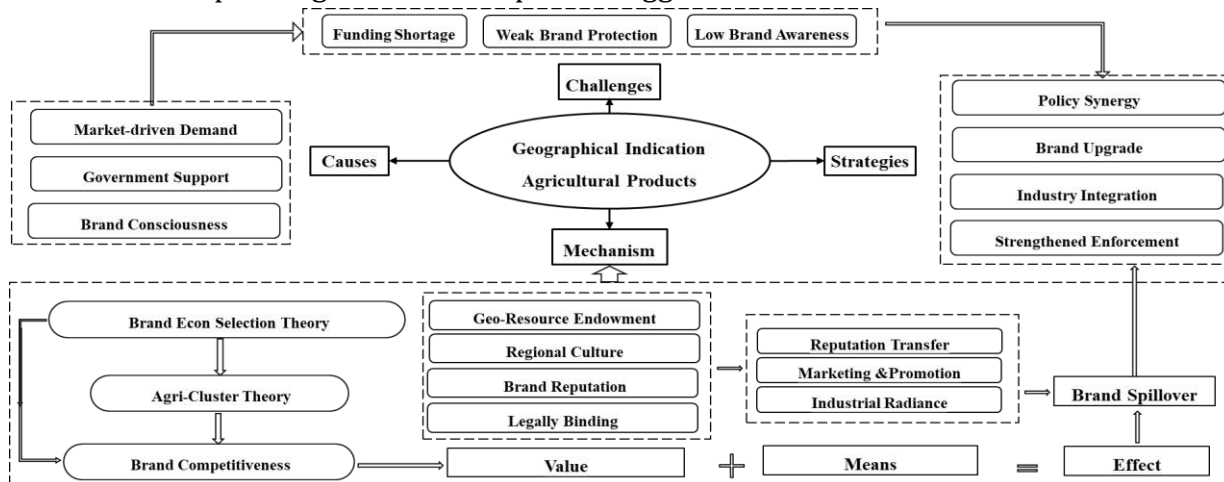
Agricultural Products, Geographical Indication, Brand Enhancement.

## 1. Introduction

The development of rural areas is inseparable from the strong support of the economy. As a special agricultural advantage with regional characteristics, uniqueness and institutional guarantee, the brand spillover effect brought by geographical indications (referred to as : GI) plays an indispensable role in enriching the brand image of regional characteristic products, strengthening the competitive position of agricultural and sideline products in the market, and promoting the growth of regional rural economy. It can not only effectively promote the

prosperity and development of agriculture, drive the steady growth of farmers' income, but also promote the coordinated development of urban and rural areas.

At present, there are few studies on the brand spillover effect of GI agricultural products, and the empirical research on regional GI agricultural products is particularly lacking. In order to clarify the differentiation status of GI agricultural products in Shanxi, Shaanxi and Henan Provinces of China and promote the sustainable development of the regional economy of the Yellow River Golden Triangle, this paper takes the GI agricultural products in Shanxi, Shaanxi and Henan Provinces as the research object. Based on the perspective of brand economics, this paper systematically constructs the theoretical framework of brand formation mechanism-effect-cause-dilemma-promotion strategy of GI agricultural products in Shanxi, Shaanxi and Henan Provinces by using the theory of brand economic choice cost paradigm, agricultural cluster theory and brand competitiveness theory , see Figure 1. By collecting and studying the panel data of various cities, this paper analyzes the brand spillover effect of GI agricultural products, further discusses its regional differences and explores the causes of the gap. Put forward corresponding brand development suggestions.



**Figure 1:** Theoretical Framework of the Formation Mechanism, Effects, Causes, Dilemmas, and Enhancement Strategies for GI Agricultural Product Brands

## 2. Literature review and research hypothesis

### 2.1. The impact of the development of geographical indication agricultural products on economic development and farmers' income

As a unique resource, geographical indication agricultural products significantly promote regional economy and farmers' income. The research shows that its brand value spillover effect has a positive effect on agricultural economic growth and farmers' income increase[1], and showed price advantage[2]. Empirical analysis shows that GI agricultural products such as Weixian radish have a positive impact on regional development, farmers' income increase and industrial prosperity[3]. A sound intellectual property protection system enhances agricultural economic growth[4], and farmers' income is positively correlated with the number of landmarks[5]. Although the effect of increasing income decreases with the increase of quantity[6], the degree of industrial agglomeration still shows an advantage[7]. Case studies in Jiangxi Province also confirmed the important role of GI agricultural products in poverty reduction and income increase[8]. In addition, geographical indication agricultural products promote international trade[9], which is crucial to farmers' poverty alleviation and economic development[10]. In short, geographical indication agricultural products drive positive returns with unique value, promote industrialization development, and inject new vitality into farmers' income increase and regional economic and social comprehensive development[11]. These

studies further show that geographical indication agricultural products, as a unique resource, not only open the door for farmers to increase their income, but also inject a steady stream of new vitality into the overall development of regional economy and society. Based on this, the following hypothesis 1 is proposed:

**H1: The development of GI agricultural products has a significant positive impact on agricultural economic development and farmers' income increase.**

## **2.2. Regional differences in brand spillover benefits of geographical indications agricultural products**

Regression analysis reveals that the number of geographical indications is significantly related to the total output value of agriculture, forestry, animal husbandry and fishery, and the benefits vary from region to region[12]. The study of Anhui Province shows that geographical indication agricultural products narrow the income gap between urban and rural areas, and the impact has regional differences[13]. It not only promotes the increase of local farmers' income, but also has a spatial driving effect on the surrounding areas, reflecting a multi-dimensional impact[14]. The case of Guangxi uses the spillover effect model to show that the GI agricultural products have a significant impact on the total agricultural output value and help policy formulation[15]. The pattern of 'small agglomeration and large dispersion' of GI agricultural products in China has deepened the understanding of their geographical distribution and market influence[16]. In summary, the spillover benefits of geographical indication agricultural product brands are significant and regional, reflecting the combined effects of regional culture, economy and natural environment.

The government is at the core of the development of GI agricultural products, and uses non-exclusive characteristics to improve product quality and structure through financial support for agriculture, science and technology demonstration and modern agricultural park projects. Agricultural industrialization subsidies ensure brand application, market expansion and sustainable development[14]. These measures contribute to the spillover benefits of regional differentiated brands and promote the characteristic development of GI agricultural products. Based on this, the following hypothesis 2 is proposed:

**H2: The spillover effect of geographical indications agricultural products brand has regional differences.**

## **3. Data source, method selection and model setting**

### **3.1. Date source**

In view of the availability of data, the research samples are selected from three provinces: Shanxi Province, Shaanxi Province and Henan Province. Before 2008, the number of geographical indication agricultural products in Shanxi, Shaanxi and Henan provinces of China showed a relatively stable trend, with a small change. At the same time, due to historical reasons and the limitations of statistical work, there are some deficiencies and inconsistencies in the relevant statistical data, which to some extent affects the accurate analysis and judgment of the changes in the number of agricultural products with geographical indications. Therefore, in order to ensure the unity and integrity of the data, the data of geographical indication agricultural products are obtained by the National Geographic Indications Information Query Network of Agricultural Products, and the data are sorted out in combination with the 'China Statistical Yearbook' (2012-2021). Based on 2020, this paper collects and collates the data of geographical indication agricultural products through China's State Administration of Quality Supervision, Inspection and Quarantine, the former State Administration for Industry and Commerce and the Ministry of Agriculture and Rural Affairs, traces the application year of each geographical indication agricultural product in detail, and accurately counts the number year

by year. In addition, this paper strictly screens the list of geographical indications selected by the three departments, excludes duplication of names, and ensures that the data is accurate. In terms of map drawing, the basic geographic information data of each province in 2020 are used.

### 3.2. Method description

Based on the time series data of Shanxi, Shaanxi and Henan in China, this paper constructs a joint regression model to explore the relationship between rural economic benefits and geographical indications. From the provincial perspective, the spillover effect of geographical indication brands is analyzed, the differences between different cities are quantified, and the variable coefficient model is used to refine the effect distribution. In view of the characteristics of panel data, it is necessary to deal with the challenges of time series correlation and cross-sectional heteroscedasticity to avoid OLS estimation errors. Therefore, this paper uses the GLS method and Eviews12 to ensure that the model estimation is accurate and reliable, so as to scientifically evaluate the actual impact of geographical indications on the rural economy.

### 3.3. Variable selection and model setting

This paper takes the number of GI agricultural products, the total power of agricultural machinery, the number of agricultural workers, the area of cultivated land of crops and other factors as the key explanatory variables, and takes the gross agricultural product and farmers' income as the explanatory variables to construct the geographical indication brand spillover effect model. Using Stata17 measure, the specific measurement model is as follows:

$$\ln TP = \beta_0 + a_1 \ln(\text{geoindi}) + a_2 \ln(\text{labor}) + a_3 \ln(\text{power}) + a_4 \ln(\text{land}) + \mu \quad (1)$$

$$\ln FPI = \beta_0 + a_1 \ln(\text{geoindi}) + a_2 \ln(\text{labor}) + a_3 \ln(\text{power}) + a_4 \ln(\text{land}) + \mu \quad (2)$$

In the formula, TP represents the gross agricultural product, FPI represents the per capita disposable income of farmers,  $a_i$  is the coefficient,  $\ln$  is the logarithm,  $\beta_0$  is a constant term, and  $\mu$  is a random term. In the formula, *geoindi*, *labor*, *power*, and *land* represent the number of GI agricultural products, the number of agricultural workers, the total power of agricultural machinery, and the geography of crop cultivated land area, respectively. Based on the above model, the geographical indications of agricultural products in Shanxi, Shaanxi and Henan provinces are empirically tested, and their spillover effects on rural economic development and farmers' income are deeply explored.

## 4. Empirical research and analysis

### 4.1. Descriptive statistical analysis of cross-sectional data

The agricultural economic development benefit index adopts the total agricultural output value of each province and city and the per capita disposable income of farmers. Other control variables include *geoindi*, *labor*, *power* and *land*, see Table 1.

**Table 1:** Descriptive Statistics of Variables for Shanxi, Shaanxi and Henan Province

Province	Shanxi (Sample Size: 110)				Shaanxi (Sample Size: 100)				Henan (Sample Size: 180)			
	Mean	S.D	Min	Max	Mean	S.D	Min	Max	Mean	S.D	Min	Max
TP	13.31	0.75	11.43	14.80	4.99	0.72	2.98	5.99	5.27	0.78	2.94	6.59
FPI	9.28	0.31	8.60	9.89	9.22	0.25	8.60	9.76	9.44	0.31	8.73	10.20
Labor	14.05	0.59	12.85	15.42	4.96	0.63	3.24	5.82	5.15	0.92	1.55	7.92
Power	5.12	0.68	3.53	6.56	5.25	0.72	3.48	6.38	6.15	0.74	4.28	7.29
Land	12.38	0.72	10.88	13.41	5.57	0.61	4.08	6.59	6.39	0.87	3.90	7.61
Geoindi	2.17	0.70	0.69	3.43	1.86	0.75	0.00	3.18	1.35	0.83	0.00	3.26

Note: ① S.D, Min, and Max represent Standard deviation, Minimum, and Maximum, respectively;  
 ② Data are from the 'China Statistical Yearbook' over the years

### 4.2. Analysis of geographical indications brand spillover effect

The generalized least squares (GLS) method is used to estimate the model. In order to ensure the accuracy of the estimation results, cross-section weights are selected as the weighting method to deal with the possible heteroscedasticity in the data, so as to obtain more robust and reliable estimation results.

**Table 2:** The regression analysis results of GI agricultural products in Shanxi, Shaanxi and Henan on TP and FPI respectively.

Variable	TP			FPI		
	Shanxi(I)	Shaanxi(II)	Henan(III)	Shanxi(IV)	Shaanxi(V)	Henan(VI)
Geindi	0.431***	0.202***	0.140***	0.287***	0.180***	0.087***
Labor	0.115**	0.281***	-0.195***	-0.127**	-0.327***	-0.086***
Power	0.223**	0.676***	0.029*	0.089**	0.472***	-0.340***
Land	0.306**	0.137*	0.009*	0.266***	0.269***	1.194***
_cons	5.844***	0.469***	10.151***	14.201***	9.560***	9.560***
R2	0.7336	0.8524	0.9758	0.7270	0.8485	0.8371

Note: \*\*\*, \*\*, \* represent the significance level of 1%, 5% and 10% respectively.

The regression results with TP and FPI as dependent variables are shown in table 2. The weighted least squares method was used for regression. The adjusted absolute coefficients were all above 0.90, and the goodness of fit was good. The overall P value of the equation was less than 0.05, and the model had strong explanatory power. According to the regression results of the model, it shows that GI have a significant role in promoting regional agricultural economic development and farmers' income.

### 4.3. Regional differences of geographical indications brand spillover effect

This study uses the variable coefficient model to calculate the regression coefficient of geographical indications in Shanxi, Shaanxi and Henan, and explores the regional differences in brand spillover effects. By comparing and analyzing the regression coefficients of different cities, the degree of spillover effect of GI brands in different regions and its influencing factors can be revealed. The measurement results are as follows, see Table 3.

**Table 3:** Regional Differences in the Spillover Effects of Geographical Indication Branding in Shanxi Province

variable	TP(VII)	FPI(VIII)
Labor	0.0881	-0.1205
Power	0.2368	0.0736
Land	0.275	0.2654
Geindi	Taiyuan City	-0.0571
	Datong City	0.0854
	Yangquan City	0.3163
	Changzhi City	0.0573
	Jincheng City	0.0422
	Shuozhou City	0.0644
	Jinzhong City	0.0355
	Yuncheng City	0.0095
	Xinzhou City	0.0275
	Linfen City	0.0396
	Luliang City	0.0587

Note: Due to the limited space, only the measurement results of Shanxi Province are displayed.

In Shanxi Province, the measurement results with TP and FPI as dependent variables are shown in Table 3, Model VII and Model VIII, respectively. From the in-depth analysis of the city level, the coefficient of geographical indication shows a trend of positive and negative, which directly reflects the non-equilibrium characteristics of the spillover effect of geographical indication brands in different cities. Taking Taiyuan City as an example, its geographical indication coefficient in Model VII is  $-0.0571$ , while in Model VIII it jumps to  $0.0948$ , which shows that the geographical indications of Taiyuan City have a significant positive effect on the total agricultural output value, but the pulling effect on the per capita disposable income of farmers has not yet been highlighted. This is mainly due to the fact that Taiyuan's economy is dominated by energy and heavy chemical industry, the proportion of agriculture is relatively low, and the number and types of geographical indication agricultural products are relatively limited.

The situation in Shaanxi Province is similarly complex. The coefficient of geographical indications fluctuates among cities, especially in Xianyang City. The geographical indications are negative in both models, which is contrary to expectations and exposes Xianyang City. There are deficiencies in the mining of brand spillover effects of geographical indication agricultural products. Despite the large number of geographical indications, the industrialization development is lagging behind and has not been effectively transformed into economic advantages. Henan Province shows a more consistent positive brand spillover effect, and the coefficients of geographical indications in most areas are positive, indicating that the development and utilization of geographical indications are more sufficient. However, the negative coefficient of Jiaozuo City and Xuchang City in the total agricultural output value model is compared with the positive coefficient in the farmers' income model, suggesting that there is still room for improvement in the deep excavation of the brand value of geographical indications and the wide spread of economic spillover effects in these two places, which needs further exploration and practice.

#### **4.4. Reasons for regional differences in brand spillover effects of geographical indication agricultural products**

##### **Regional differences in the basic conditions required for the protection and development of geographical indications.**

The protection and development of geographical indications is based on the promotion of economic development, agricultural modernization and farmers' open thinking to enhance brand effect. Xi'an, Yan'an and other places are leading the economy, and the brand spillover is significant. Ankang in southern Shaanxi has limited economic effects of geographical indications due to its weak economy, conservative farmers, insufficient awareness of geographical indications, and heavy sales and light brands. Therefore, it is necessary to strengthen economic development and enhance farmers' education and brand awareness to promote the protection and development of geographical indications.

##### **Regional gap in the number of special marks for geographical indication products**

The core of geographical indication brand effect and economic benefit is widely used in 'special signs'. The number of uses determines the brand potential and influence. Taking Shaanxi Apple as an example, high usage rate increases brand awareness and market power. Henan Lingbao Apple is lack of brand value due to weak use. Therefore, the promotion of special signs is very important to enhance the brand effect and economic benefits of geographical indications.

##### **Regional differences in the number of special logos used in geographical indication products**

Geographical indications need market operation strategy to highlight the brand. The successful operation of Xi'an, Zhengzhou and other places has achieved remarkable results, while the promotion in some areas is weak. Government guidance and efficient market operation are the key. The high proportion of processed products in Shaanxi promotes the economy, and the

primary products in Shanxi and Henan are the main limited benefits. Therefore, the government-led, social forces to participate, flexible management to enhance the geographical indication brand.

## 5. Research conclusions and prospects

### 5.1. Conclusions of the study

Based on the relevant data released by China's State Administration for Quality Supervision and Inspection, State Administration for Industry and Commerce and the Ministry of Agriculture and Rural Affairs, this paper deeply analyzes the brand spillover effect and regional differences of geographical indication agricultural products in Shanxi, Shaanxi and Henan provinces. The study found that the market of GI agricultural products in the three provinces performed well, and the brand spillover was significant, but it was affected by geographical and economic differences, showing the characteristics of regional development. Xi'an, Datong, Zhengzhou and other GIs have significantly promoted agricultural economy and farmers' income, while the effects of other cities are not obvious, and resource protection and development need to be strengthened. To enhance the brand effect, it is necessary to take targeted measures according to local conditions to promote the rational use of resources. On the whole, the brand spillover of GI agricultural products is positively correlated with rural revitalization.

### 5.2. Research implications and suggestions

Shanxi, Shaanxi and Henan as China's major agricultural provinces, the development of geographical indications of agricultural products is of great significance. As a unique product, geographical indication protection products have attracted more and more attention in the world. Geographical indication products have brand effect, high popularity and reputation, and play an important role in promoting the adjustment of agricultural industrial structure and increasing farmers' income. Therefore, it is necessary to accelerate the brand development of GI agricultural products. The specific measures are as follows:

#### **Guided by Policy Synergy to Strengthen Regional Cooperation**

Through policy coordination and regional cooperation, the three provinces of Shanxi, Shaanxi and Henan should promote the coordinated development of GI agricultural products. To formulate regional coordination policies, consider the differences between the three provinces, and promote the development of characteristic GI agricultural products; establish a GI agricultural product protection mechanism, joint registration, management, protection of uniqueness and quality; promote resource sharing, cooperative research and development, promotion, construction of industrial parks, enhance overall competitiveness, and promote brand development.

#### **Upgrading Brand Promotion to Enhance Market Recognition**

Increase brand publicity and enhance the awareness and trust of GI agricultural products. Establish a unified publicity strategy, integrate resources, and enhance brand awareness; organize promotion activities, on-site display and exchange to attract consumers; strengthen brand culture construction, excavate connotation, inherit spirit, enhance cultural value and market influence.

#### **Deepening and Expanding Industrial Chains with Diversified Financing Channels**

Deepen the GI agricultural products processing industry chain, broaden the financing channels. Promote the research and development of deep processing technology and enhance the added value; optimize the business environment, simplify approval, reduce taxes and fees, and strengthen supervision; establish a diversified financing system, encourage financial institutions to support, guide the entry of social capital, raise funds through credit, equity, bonds, etc., and support the sustainable development of enterprises.

## Strengthening Supervisory Enforcement to Protect Brand Rights and Interests

Strengthen supervision and law enforcement, ensure the quality of GI agricultural products, and maintain brand and market order. Improve the regulatory system, develop strict standards to ensure quality and safety; strengthen law enforcement, crack down on infringement, and maintain brand reputation; establish a reward and punishment mechanism, recognize contributors, severely punish violators, and form an effective deterrent.

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