Determinants of Enterprise Support Intensity and Key Enterprise Classification: An Empirical Study of Zhaoqing's 'Thousands Enterprises Aiding Thousands Towns

Jyh-Harng Shyng

Department of Landscape Architecture, School of Life Sciences, Zhaoqing University, Zhaoqing, 526061, Guangdong, China

e-mail: hidosing@outlook.com

Abstract. To explore the influencing factors of enterprise support intensity and the impact of key enterprises under the "Thousands of Enterprises Aiding Thousands of Towns" policy, this study examined 170 participating enterprises across 104 towns in Zhaoqing using multiple quantitative methods. Results showed: (1) Enterprise support intensity exhibited high-level aggregation (all dimension means >4.3 on a 5-point scale) with potential outliers; (2) Enterprise resource input (diversified structure, sustainability, etc.) was strongly positively correlated with support intensity ($r=0.665–0.966$, $p<0.001$); (3) Enterprises with 3–4 years of support outperformed those with <2 years in technology introduction and industrial participation ($p<0.05$); (4) Hierarchical clustering identified two enterprise types: "comprehensive support enterprises" (avg. score 4.62) with better industrial driving effects and "specialized support enterprises" (avg. score 4.28). This study enriches rural revitalization theory and provides a quantitative basis for policy optimization and enterprise support strategy formulation.

Keywords: Resource-Based View, Institutional Economics, Spearman Correlation Analysis, One-Way ANOVA, Hierarchical Clustering

1 Introduction

Since Guangdong Province launched the "Thousands of Enterprises Aiding Thou-sands of Towns" initiative in 2020, Zhaoqing City has achieved full coverage of paired assistance between 1,238 enterprises and 104 towns, with a total investment of 3.27 billion yuan and 632 industrial projects implemented (Zhang et al., 2022)[17]. However, practical challenges remain: approximately 35% of enterprises adopt "short-term blood transfusion" support (e.g., one-time fund donations), and only 18% have established long-term industrial cooperation mechanisms (Li et al., 2022)[9]. Meanwhile, mismatches between support directions and rural needs—such as blind investment in traditional agriculture—lead to limited industrial driving effects (e.g., less than 50% survival rate of agricultural projects in Huaiji County) (Gai et al., 2020).

H. Dai et al. (eds.), *Proceedings of the 2025 5th International Conference on Business Administration and Data Science (BADS 2025)*, Advances in Computer Science Research 125,
https://doi.org/10.2991/978-94-6463-980-3_16

2 Literature Review

2.1 Resource-Based View and Enterprise Support Intensity

The resource-based view (Wernerfelt, 1984[15]) holds that enterprises' heterogeneous resources (funds, technology, talents, etc.) are the basis for external assistance. In the "Thousands of Enterprises Aiding Thousands of Towns" context, existing studies have explored the impact of resource input on support intensity: Wang et al. (2022[14]) confirmed that large-scale resource input (e.g., building industrial bases) enhances support scale; Li et al. (2022) [9] pointed out that diversified resources (funds + technology + management) improve support comprehensiveness; Zhang et al. (2022) [17]emphasized that sustainable resource input forms a "resource accumulation - effect amplification" cycle. However, these studies only focus on single resource attributes (scale/structure/sustainability) and lack quantitative analysis of their combined impact on support intensity. This study fills this gap by measuring resource input from five dimensions (scale expansion, diversified structure, economic benefits, technology content, sustainability) and quantifying their correlation with support intensity..

2.2 Institutional Economics and Rural Institutional Environment

Institutional economics (North, 1990) [10] argues that formal institutions (policies, rules) and informal institutions (social trust, culture) reduce transaction costs Pfeffer, J. (1978)[11]. In rural assistance, Xiao et al. (2020) [16] found that tax reductions and land preferences stimulate enterprises' support willingness; Gai et al. (2020) [3] verified that clear land transfer rules improve industrial cooperation efficiency; Gao et al. (2022) [6] noted that high social trust reduces information asymmetry between enterprises and villagers. Nevertheless, existing research rarely discusses how formal and informal institutions synergistically regulate the conversion of enterprise resources into support intensity. This study integrates rural institutional environment as a key variable (measured by infrastructure, policy support, social trust, etc.) to explore its "incentive + guarantee" role in resource conversion.

2.3 Enterprise Support Intensity and Industrial Driving Effects

Existing studies have identified heterogeneous driving effects of support dimensions: Cai et al. (2020) [1] and Tong et al. (2024) [13] confirmed that technology and talent input promote rural industrial upgrading; Hong et al. (2020) and Wang et al. (2022) [14] pointed out that industrial chain integration enhances market competitiveness; Zhang et al. (2022) [17] emphasized that single fund support has limited long-term effects. Additionally, Li et al. (2022) [9] found that long-term support accumulates resources for sustainable driving, while González-Cantú et al. (2025) [5] noted that advanced manufacturing enterprises have stronger driving effects than traditional agricultural enterprises. Holmes (2006) [7] emphasized that corporate social responsibility plays a key role in promoting multifunctional rural development, which provides a theoretical reference for enterprises to participate in rural assistance beyond economic benefits. However, these studies lack systematic comparisons of heterogeneous effects (e.g., between different support durations or enterprise types) and mechanism analysis. This study addresses this by using one-way ANOVA and hierarchical clustering to quantify the impact of support duration and enterprise type on industrial driving effects.

2.4 Literature Review Summary

Existing research provides a theoretical basis for this study but has three limitations: (1) Fragmented theoretical framework: Most studies focus on single factors (enterprise resources/policy support) and ignore the synergistic effect of rural institutional environment on resource conversion; (2) Single research method: Few studies integrate correlation analysis, clustering, and other tools to reveal complex causal mechanisms; (3) Limited application of quantitative methods: PLS-SEM is rarely used in "Thousands of Enterprises Aiding Thousands of Towns" research, making it difficult to verify regulatory relationships between variables. To fill these gaps, this study constructs a multi-dimensional analytical framework of "enterprise resource input - rural institutional environment - enterprise support intensity - industrial driving effect" and uses mixed methods for in-depth analysis.

3 Research Design

- Variable Definition

All observation items of the variables are designed with reference to mature scales in existing studies and adjusted according to the actual situation of Zhaoqing's "Thousands of Enterprises Aiding Thousands of Towns" policy. A pre-survey was conducted with 30 samples, and 2 items with factor loadings less than 0.7 were deleted to ensure the validity of the scale. The final scale includes 11 items for enterprise support intensity, 12 items for enterprise resource input, 10 items for rural institutional environment, and all use a 5-point Likert scale (1=strongly disagree, 5=strongly agree). Based on previous studies (Wang et al., 2022; Du et al., 2023) and Zhaoqing's prac-tice, variables are defined as follows Table 1.

Table 1. Definition and Measurement of Variables

Variable Category	Variable Name	Definition & Measurement	
Dependent Variable	Enterprise Support Intensity (M)	Measured by 5 dimensions (11 items, 5-point Likert scale): - M1: Fund support - M2: Technology introduction	- M3: Talent support - M4: Cooperation mechanism - M5: Industrial participation
Independent Variables	Enterprise Resource Input (X)	5 dimensions: - X1: Scale expansion - X2: Diversified structure	- X3: Economic benefits - X4: Technology content - X5: Sustainability

	Rural Institutional Environment (Y)	5 dimensions: - Y1: Infrastructure improvement - Y2: Talent function	- Y3: Policy support - Y4: Industrial foundation - Y5: Participation willingness
Control Variable	Support Duration	Grouped into 4 categories: - 1: 1 year or less - 2: 1-2 years	- 3: 2-3 years - 4: 3-4 years

4 Data Source

Data were collected via stratified random sampling from May to July 2025, covering 170 enterprises in 9 districts of Zhaoqing (e.g., Sihui City, Gaoyao District). The sampling framework was designed based on the Krejcie-Morgan formula: under a 95% confidence level, 170 samples meet the inference needs for 1,945 supported enterprises in Zhaoqing (2023 statistics) with a sampling error of 0.08%. The effective recovery rate was 95% (180 questionnaires distributed, 170 valid).

5 Analytical Methods

Empirical data were collected through field surveys of 58 local town and rural PPP projects in Guangdong Province as of 2024-2025. The sample includes water ecological restoration, environmental remediation, and wetland park projects, ensuring sectoral relevance and representativeness. Analytical Methods and Purposes shown in (Table 2). Descriptive Statistics, Spearman Correlation Analysis, One-way ANOVA (Welch's correction), Hierarchical Clustering (Ward's method).

Table 2. Overview of Analytical Methods and Purposes

Analytical Method	Purpose
Descriptive Statistics	Characterize variable distribution (mean, SD, CV, skewness, kurtosis) and identify outliers
Spearman Correlation Analysis	Test linear relationships between influencing factors and support intensity (for non-normal data)[2]
One-way ANOVA (Welch's correction)	Examine heterogeneous effects of support duration on support intensity dimensions
Hierarchical Clustering (Ward's method)	Classify key enterprises and verify clustering validity (Silhouette Coefficient, DBI, CH)

6 Empirical Results

6.1 Descriptive Statistics of Support Intensity

As shown in Table 3, all dimensions of enterprise support intensity have high average values (4.365-4.482), indicating overall strong support willingness. However, all variables have coefficients of variation (CV) exceeding 0.15, suggesting potential outliers (e.g., M2: CV=0.203; M5: CV=0.187). Skewness values (-1.182 to -1.758) and kurtosis values (0.628 to 3.451) indicate slight left-skewness, consistent with the concentration of high-score samples (SPSSPRO, 2021)[12].

Table 3. Descriptive Statistics of Key Variables

Variable	Sample Size	Mean	SD	Min	Max	CV	Skewness	Kurtosis
Fund Support (M1)	170	4.435	0.883	1	5	0.199	-1.497	1.743
Technology Introduction (M2)	170	4.447	0.904	1	5	0.203	-1.690	2.573
Talent Support (M3)	170	4.459	0.864	1	5	0.194	-1.486	1.442
Cooperation Mechanism (M4)	170	4.482	0.837	1	5	0.187	-1.597	2.005
Industrial Participation (M5)	170	4.482	0.837	1	5	0.187	-1.658	2.599
Scale Expansion (X1)	170	4.412	0.833	1	5	0.189	-1.334	1.304
Diversified Structure (X2)	170	4.388	0.878	1	5	0.200	-1.430	1.741
Economic Benefits (X3)	170	4.365	0.902	1	5	0.207	-1.377	1.448
Technology Content (X4)	170	4.376	0.870	1	5	0.199	-1.251	0.873
Sustainability (X5)	170	4.388	0.858	1	5	0.195	-1.297	1.090
Infrastructure Improvement (Y1)	170	4.429	0.855	1	5	0.193	-1.758	3.451
Talent Function (Y2)	170	4.406	0.832	1	5	0.189	-1.318	1.278
Policy Support (Y3)	170	4.376	0.890	1	5	0.203	-1.276	1.077
Industrial Foundation (Y4)	170	4.371	0.869	1	5	0.199	-1.182	0.628
Participation Willingness (Y5)	170	4.400	0.838	1	5	0.191	-1.295	1.158
Support Duration	170	2.265	1.149	1	4	0.507	0.271	-1.380

Note: CV = Coefficient of Variation; SD = Standard Deviation.

The distribution characteristics of key variables can be further observed through histograms and boxplots. Taking technology introduction (M2) as an example, the histogram shows that the data is concentrated in the high-score range (4-5 points), and the boxplot indicates no extreme outliers beyond the inner limit, confirming that the potential outliers identified by the coefficient of variation are reasonable due to the actual differences in enterprise support capabilities (see Appendix for detailed charts).

6.2 Influencing Factors of Support Intensity (Spearman Correlation)

This result aligns with the resource-based view: long-term support enables enterprises to accumulate rural-specific assets (technology, talents, social capital), forming a "resource accumulation - effect amplification" cycle. Short-term support, by contrast, hinders in-depth rural cooperation, limiting impacts on technology introduction and industrial integration. The large income improvement effect (Partial η^2=0.114) indicates long-term support effectively fosters sustainable industrial models, ensuring stable villagers' income growth.The high correlation between technology introduction and talent support (r=0.966) reflects their synergy: advanced technology requires professional talents for operation, while talent training enhances rural technology absorption, creating a mutually reinforcing mechanism. The significant policy-fund support correlation (r=0.715) confirms formal institutions' incentive role: government tax reductions and subsidies lower enterprises' capital costs, stimulating their financial support willingness. Table 4 shows that enterprise resource input is significantly positively correlated with support intensity:

Table 4. Spearman Correlation Coefficients (Key Pairs).

Variable	M1	M2	M3	M4	M5
Diversified Structure (X2)	0.724***	0.746***	0.748***	0.696***	0.733***
Sustainability (X5)	0.724***	0.706***	0.732***	0.706***	0.728***
Policy Support (Y3)	0.715***	0.731***	0.723***	0.698***	0.684***
Social Trust (Y5)	0.720***	0.664***	0.684***	0.672***	0.689***
Technology Introduction (M2)	0.900***	1.000***	0.966***	0.931***	0.912***

Note: ***p<0.001.

- **Correlation between enterprise resource input and support intensity:**

Diversified structure (X2) has the strongest correlation with technology introduction (M2, r=0.746, p<0.001) and talent support (M3, r=0.748, p<0.001), confirming that multi-resource input enhances technical assistance (Li et al., 2022)[9]. Sustainability (X5) correlates highly with industrial participation (M5, r=0.728, p<0.001), indicating long-term planning strengthens industrial integration (Zhang et al., 2022)[17].

- **Correlation between rural institutional environment and support intensity:**

Policy support (Y3) correlates highly with fund support (M1, r=0.715, p<0.001) and technology introduction (M2, r=0.731, p<0.001), verifying that policy incentives can stimulate enterprise investment willingness. Participation willingness (Y5, reflecting social trust) has a moderate correlation with all support intensity dimensions (r=0.664-0.689, p<0.001), indicating that high rural social trust reduces cooperation transaction costs (North, 1990)[10].

- **Correlation between support intensity dimensions:**

Technology introduction (M2) and talent support (M3) show the strongest inter-correlation (r=0.966, p<0.001), indicating significant synergy between technical and human resource input. Cooperation mechanism (M4) and industrial participation (M5) also have a high correlation (r=0.943, p<0.001), suggesting that sound cooperation mechanisms promote in-depth industrial integration.

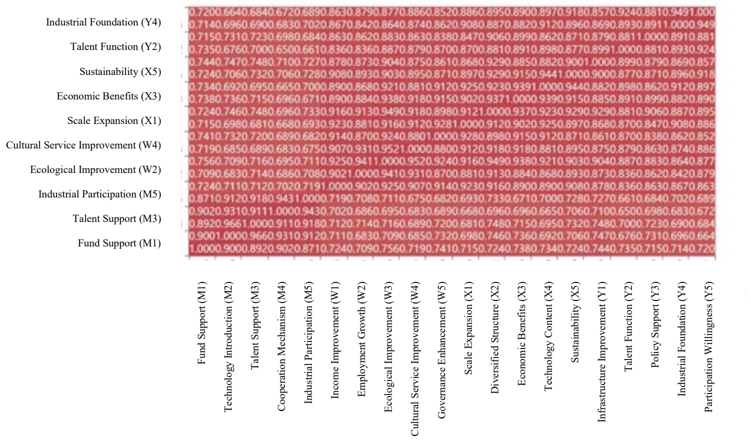

Fig. 1. Spearman Correlation Heatmap of Key Variables

The correlation heatmap more intuitively shows the overall correlation pattern between variables. Fig. 1 clearly reflects the correlation intensity between key variables. Technology Introduction (M2) and Talent Support (M3) show the strongest correlation ($r=0.966$), confirming the synergistic effect between technical input and talent training—advanced technology requires professional talents for promotion, while talent reserves enhance rural technology absorption. Diversified Structure (X2) has high correlations with M2 ($r=0.746$) and M3 ($r=0.748$), indicating that multi-resource input (funds + technology + management) effectively improves the depth of technical and talent support.

The dark red color in the heatmap indicates a strong positive correlation, which is consistent with the statistical results in Table 5. Heterogeneous Effects of Support Duration (One-Way ANOVA).

Table 5. ANOVA Results by Support Duration

Variable	1 Year or Less (Mean±SD)	1-2 Years (Mean±SD)	2-3 Years (Mean±SD)	3-4 Years (Mean±SD)	F	p	Partial η^2
M1	4.197±0.928	4.297±0.968	4.684±0.809	4.735±0.618	4.343	0.006***	0.073
M2	4.197±0.928	4.297±1.051	4.763±0.751	4.706±0.676	4.663	0.004***	0.078
M5	4.213±0.897	4.459±0.836	4.737±0.760	4.706±0.676	4.333	0.006***	0.073

Note: ***$p<0.001$; SD = Standard Deviation.

As shown in Table 5, support duration significantly affects all dimensions of support intensity ($p<0.05$):

6.2.1 Mean comparison

Enterprises with 3-4 years of support have the highest scores in technology introduction (M2: 4.706) and industrial participation (M5: 4.706), which are 12.1%-13.5% higher than those with 1 year or less (M2: 4.197; M5: 4.213). Enterprises with 2-3 years of support also perform well, with average scores in most dimensions higher than those with 1-2 years of support.

6.2.2 Variance homogeneity and normality test

The Shapiro-Wilk test shows that all variables do not meet the normal distribution ($p<0.001$), but their kurtosis absolute values are less than 10 and skewness absolute values are less than 3, which can be considered basically consistent with the normal distribution. The variance homogeneity test shows that all variables do not meet the variance homogeneity ($p<0.05$), so Welch's correction is used for one-way ANOVA, and the results are still significant ($p<0.05$).

6.2.3 Effect size analysis

Partial η^2 ranges from 0.057 to 0.114, and Cohen's f ranges from 0.246 to 0.358, both indicating medium-level differences. Among them, income improvement (W1) has the largest effect size (Partial η^2=0.114, Cohen's f=0.358), indicating that support duration has the most significant impact on income improvement.

The comparison chart of one-way ANOVA shows the trend of mean scores of each support intensity dimension across different support duration groups, clearly reflecting the increasing trend of support intensity with the extension of support duration (see Appendix for the comparison chart).

6.3 Classification and Impact Evaluation of Key Enterprises: Hierarchical Clustering)

Using hierarchical clustering (Ward's method) based on the 5 dimensions of enterprise support intensity, 170 enterprises are classified into two types of key enterprises, and the clustering validity is verified by multiple indicators:

6.4 Cluster characteristics

6.4.1 Comprehensive support enterprises (n=78)

High scores in all dimensions of support intensity, with an average score of 4.62. Among them, technology introduction (M2=4.75) and industrial participation (M5=4.72) are the core advantages. These enterprises are mainly distributed in advanced manufacturing fields such as new energy vehicles and metal processing. They drive rural industrial upgrading by extending the industrial chain and introducing advanced technologies, and have a significant synergistic effect between multiple support dimensions (Gan, Y., Zhang, A. L., & Li, G.,2023)[4] (González-Cantú et al., 2025)[5].

6.4.2 Specialized support enterprises (n=92)

Focus on single-dimensional input, with relatively high scores in fund support (M1=4.51) and talent support (M3=4.48), but low scores in technology introduction (M2=4.25) and industrial participation (M5=4.23). Most of these enterprises are related to traditional agriculture, such as characteristic agricultural product processing enterprises. Their support methods are relatively single, and the industrial driving effect is 7.5% lower than that of comprehensive support enterprises (average score 4.28 vs. 4.62).

6.5 Clustering validity evaluation

The Silhouette Coefficient of the clustering result is 0.693 (greater than 0.5), indicating that the similarity within the cluster is high and the difference between clusters is significant; the DBI is 0.21 (less than 1), indicating good separation between clusters; the CH index is 17.735 (a higher value), indicating good cohesion within the cluster (Jain & Dubes, 1988)[8].

The clustering scatter plot based on principal component analysis shows that the two types of enterprises are clearly separated in the space formed by the first two principal components (PC1 explains 84.191% of the variance), further verifying the effectiveness of the clustering result.

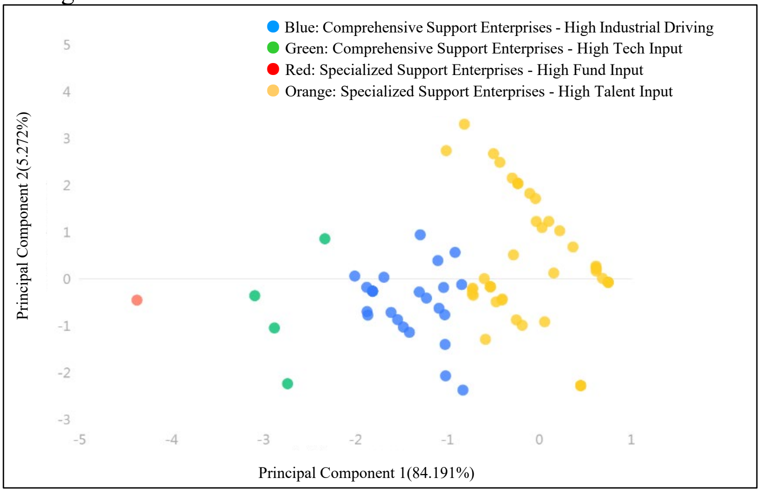

Fig. 2. Hierarchical Clustering Scatter Plot of Enterprises

Fig. 2 shows clear separation between the two enterprise types in the principal component space. Comprehensive Support Enterprises (blue scatter) are concentrated in the high PC1 region, mainly due to their high scores in Technology Introduction (M2) and Industrial Participation (M5). Specialized Support Enterprises (red scatter) are distributed in the low PC1 region, with advantages in Fund Support (M1) and Talent Support (M3) but insufficient industrial integration. This clustering result is consistent with the validity evaluation indicators (Silhouette Coefficient=0.693, DBI=0.21), confirming its rationality.

7 Discussion and Policy Recommendations

7.1 Research Conclusions

Based on the comprehensive analysis of empirical data, this study draws the following core conclusions:

- Enterprise resource input is the core driving factor of support intensity

Enterprise resource input (diversified structure, sustainability, technology content, etc.) has a significant positive impact on support intensity, among which the diversified resource structure and sustainability have the most prominent role. This confirms the resource-based view that heterogeneous resources are the basis for enterprises to carry out effective assistance. Enterprises with multi-type resources and long-term planning can better meet the diverse needs of rural industrial development and form in-depth cooperation with rural areas.

- Rural institutional environment plays a "double enhancement" role

Rural institutional environment (formal institutions such as policy support and infrastructure, and informal institutions such as social trust) not only directly affects enterprises' support willingness but also regulates the conversion effect of enterprise resource input. Perfect policy support reduces enterprise assistance costs, good infrastructure provides a foundation for industrial cooperation, and high social trust improves cooperation efficiency. The synergistic effect of resources and institutions is the key to improving the effectiveness of the "Thousands of Enterprises Aiding Thousands of Towns" policy.

- Support duration and enterprise type lead to significant heterogeneous effects

Long-term support (3-4 years) is significantly better than short-term support in terms of technology introduction and industrial participation, because long-term cooperation can accumulate technology, talents, and market resources to form a sustainable driving mechanism. Comprehensive support enterprises (advanced manufacturing) have a more significant industrial driving effect than specialized support enterprises (traditional agriculture), reflecting the impact of industrial characteristics (technology intensity, industrial chain length) on support efficiency.

- There is a strong synergistic effect between support dimensions

Technology introduction and talent support, cooperation mechanism and industrial participation are highly correlated, indicating that enterprise support should adopt a multi-dimensional integrated strategy. Single fund support or symbolic technical assistance is difficult to achieve the goal of industrial revitalization. Only by integrating multiple support methods can we maximize the driving effect on rural industries.

7.2 Policy Recommendations

Based on the research conclusions, this study puts forward targeted policy recommendations for the government, enterprises, and rural areas to optimize the "Thousands of Enterprises Aiding Thousands of Towns" policy:

7.2.1 Government level: Construct a "resource-institution" synergy-oriented policy system.

- Differentiated Incentive Policies

Offer long-term (≥3 years) and comprehensive support enterprises preferential treatments like 50% corporate income tax reduction for 3-5 years and land discounts. Establish a "Special Fund for Rural Industrial Technology Upgrading" to subsidize up to 50% of technical input (max. 1 million yuan per project) for advanced technology introduction. Link policy support to outcomes via a "support effect evaluation system" to prioritize high-impact enterprises.

Tailor support by enterprise type: back advanced manufacturers' rural industrial chain extension (e.g., land for new energy vehicle parts factories) and train traditional agricultural enterprises to shift from single fund support to integrated technology-management assistance. Adapt to regional conditions: enhance infrastructure in weak industrial areas (e.g., Huaiji County) and build clusters in strong ones (e.g., Sihui City).

- Optimize Rural Institutional Environment

Simplify collective construction land approval for enterprise-rural projects by 50% and clarify land transfer rights with supporting policies. Foster trust through "enterprise-village activities" and a township-led dispute mediation mechanism to resolve conflicts promptly.

- Precise Matching Platform

Construct a "rural demand-enterprise supply" platform, collect rural technical gaps and resource advantages, and build an enterprise resource database. Conduct targeted docking, such as introducing auto parts enterprises to Sihui and High-tech Zone, and linking agricultural processors with Huaiji and Guangning Counties.

7.2.2 Enterprise level: Adopt a "precision + long-term" support strategy.

- Optimize the resource input structure

Combine their own advantages with rural resource endowments to carry out targeted support: Advanced manufacturing enterprises can extend the industrial chain to rural areas and build supporting production bases; technology-based enterprises can focus on technical assistance and talent training to improve the technical level of rural industries; avoid blind investment in fields inconsistent with their own advantages. Adopt a multi-dimensional resource combination model of "technology + funds + management" to avoid single fund input and enhance the sustainability of support effects.

- Integrate rural support into the long-term development strategy

Formulate a 3-5 year rural support plan, clarify annual input goals and key tasks (such as driving rural industrial output value growth by 30% within 3 years); establish a "dynamic evaluation mechanism for assistance projects", conduct quarterly evaluations of project progress and effects, and adjust input directions and intensity according to the evaluation results; strengthen the inheritance of support projects to ensure the continuity of support effects.

- Strengthen cooperation with multiple subjects

Establish a tripartite cooperation mechanism with local governments and village collectives, clarify the rights, responsibilities, and interests of all parties through formal agreements; cooperate with universities and research institutes to jointly develop technical solutions suitable for rural industries, and improve the adaptability of technical assistance; integrate rural industries into their own industrial chains to form a win-win pattern of "enterprise development + rural revitalization".

7.2.3 Rural level: Enhance the "acceptance + feedback" capacity.

- Improve the infrastructure and talent support system

Invest in industrial supporting infrastructure such as cold chain logistics warehouses, e-commerce live broadcast rooms, and industrial roads through multiple channels (village collective self-financing, government subsidies, enterprise donations) to reduce enterprise support costs; cooperate with enterprises to carry out "order-based skill training" to cultivate local technical backbones in e-commerce operation, intelligent agricultural machinery operation, and industrial management; encourage migrant workers to return to their hometowns to start businesses by providing rent subsidies and loan interest discounts.

- Strengthen demand expression and feedback

Establish a "village-enterprise communication mechanism", hold monthly joint meetings to timely feedback rural industrial needs and opinions on assistance projects to enterprises; sort out local resource advantages (characteristic agriculture, ecological resources, cultural resources) and clarify development positioning to provide a basis for enterprises to formulate precise support strategies; establish a "support effect feedback system" to evaluate the implementation effect of assistance projects from the perspective of villagers and put forward improvement suggestions.

- Cultivate endogenous development capabilities

Give full play to the role of village collectives and cooperatives, integrate scattered land and labor resources, and reduce the transaction costs of enterprise cooperation;

guide villagers to participate in the whole process of assistance projects (planning, implementation, supervision) to enhance their sense of ownership and participation; explore the "enterprise + cooperative + farmer" interest connection mechanism to ensure that villagers can share the benefits of industrial development and enhance their enthusiasm for participation.

8 Conclusion

This study aimed to empirically explore the determinants of enterprise support intensity and classify key enterprise types under Guangdong Province's "Thousands of Enterprises Aiding Thousands of Towns" policy, using 170 participating enterprises across 104 towns in Zhaoqing as the research sample. By integrating multiple quantitative methods—including descriptive statistics, Spearman correlation analysis, one-way ANOVA, and hierarchical clustering—it addressed gaps in existing research regarding fragmented theoretical frameworks and limited quantitative analysis of synergistic effects.

As summarized in Table 6, the core findings of this study not only verify the theoretical applicability of the resource-based view and institutional economics in rural revitalization but also provide targeted practical implications for all stakeholders.

The core findings of this study can be summarized as follows. First, enterprise resource input emerged as the primary driver of support intensity: diversified resource structures (funds + technology + management) and sustainable input exhibited strong positive correlations with technology introduction ($r=0.746$, $p<0.001$) and industrial participation ($r=0.728$, $p<0.001$), respectively. Second, the rural institutional environment played a "dual enhancement" role: formal institutions (e.g., policy support, $r=0.715$ with fund support) reduced enterprise assistance costs, while informal institutions (e.g., social trust, $r=0.664$–0.689 across support dimensions) improved cooperation efficiency. Third, support duration and enterprise type induced significant heterogeneous effects: enterprises with 3–4 years of support outperformed shorter-term counterparts in technology introduction and industrial participation (12.1%–13.5% higher scores), and "comprehensive support enterprises" (avg. score 4.62, mainly advanced manufacturing) demonstrated 7.5% stronger industrial driving effects than "specialized support enterprises" (avg. score 4.28, mainly traditional agriculture). Fourth, synergies between support dimensions were evident, particularly between technology introduction and talent support ($r=0.966$) and between cooperation mechanisms and industrial participation ($r=0.943$).

Theoretically, this study enriches rural revitalization research by verifying the applicability of the resource-based view in enterprise external assistance—confirming that heterogeneous resources (rather than single attributes) determine support effectiveness. It also extends institutional economics by revealing how formal and informal institutions synergistically regulate resource conversion, filling gaps in prior studies that focused on isolated institutional factors.

Practically, the findings provide actionable guidance for stakeholders: governments can design differentiated incentives (e.g., 50% corporate income tax reductions for long-term comprehensive supporters) and build “demand-supply” matching platforms; enterprises should adopt long-term (3–5 year) multi-dimensional support strategies aligned with rural endowments; rural areas can enhance infrastructure and feedback mechanisms to improve support acceptance.

This study has limitations, including reliance on 2025 cross-sectional data (which limits dynamic analysis) and a Zhaoqing-focused sample (which may reduce regional representativeness). Future research could use 3–5 year panel data to track long-term support evolution and expand samples to the broader Pearl River Delta or other provinces for multi-regional comparisons, while integrating digital economy factors to further refine support efficiency analysis.

8.1 Limitations

This study has limitations that need to be addressed in future research:

(1)Data timeliness: The 2025 cross-sectional data only reflects the static state of enterprise support intensity. Future research should use 3-5 years of panel data to track the long-term evolution of support intensity and its driving factors. For example, by collecting annual data of 50 typical enterprises in Zhaoqing, we can analyze how resource input and institutional environment dynamically affect support effects and identify key turning points in support duration (e.g., whether the 3rd year is a critical period for improving industrial driving effects).

(2)Regional representativeness: The Zhaoqing-limited sample may lead to regional biases. Future research should expand to the entire Pearl River Delta (e.g., Guangzhou, Shenzhen) and other provinces (e.g., Sichuan, Hunan) for multi-regional comparisons. This can verify whether the "resource-institution synergy" mechanism is applicable in different rural development contexts (e.g., economically developed vs. underdeveloped areas) and summarize region-specific support models.

(3)Variable comprehensiveness: Digital economy factors (e.g., rural e-commerce, intelligent agriculture) are excluded from variable measurement. Future studies should integrate these factors to explore how digital technology enhances support efficiency—for example, analyzing whether enterprises’ digital resource input (e.g., building e-commerce platforms for rural products) strengthens the correlation between technology introduction and industrial participation.

(4)Research scope expansion: This study focuses on industrial driving effects, while ignoring spillover effects of enterprise support on rural social governance (e.g., villagers’ participation in public affairs) and ecology (e.g., green production promotion). Future research should adopt a multi-dimensional evaluation framework to comprehensively measure support effects.

8.2 Future Research

Practical application exploration: To bridge the gap between research and practice, future studies should: (1) Develop a "support tool kit" for different enterprise types—for example, providing technical training modules for traditional agricultural enterprises to shift from single fund support to "technology + management" integrated support; (2)

Conduct pilot applications of the tool kit in 10-15 towns in Zhaoqing, track its implementation effect, and optimize it based on feedback; (3) Summarize replicable experience (e.g., how to match enterprises' digital resources with rural e-commerce needs) and promote it through policy briefings or enterprise workshops.

Table 6. Summary of Core Findings, Theoretical Significance and Practical Implications

Core Findings	Theoretical Significance	Practical Implications
Enterprise resource input (diversified structure, sustainability) is the core driver of support intensity ($r=0.665–0.966$, $p<0.001$)	Verifies the applicability of the resource-based view in rural revitalization, enriches the theoretical explanation of enterprises' external assistance behavior	Enterprises should optimize resource input structure: advanced manufacturing enterprises extend industrial chains to rural areas; technology-based enterprises focus on technical training; avoid single fund input
Rural institutional environment (policy support, social trust) plays a "double enhancement" role—reducing enterprise assistance costs and improving resource conversion efficiency	Expands the application of institutional economics in urban-rural cooperation, reveals the synergistic mechanism between resources and institutions	Government: Simplify land approval for enterprise-rural projects by 50%; organize "enterprise-village communication activities" to enhance social trust; establish a dispute mediation mechanism
Long-term support (3–4 years) outperforms short-term support in technology introduction and industrial participation ($p<0.05$), with the most significant impact on income improvement (Partial $\eta^2=0.114$)	Supplements empirical evidence on the relationship between support duration and effects, improves the theory of sustainable rural industrial development	Enterprises: Formulate 3-5 year rural support plans, establish quarterly project evaluation mechanisms; Government: Provide 50% corporate income tax reduction for enterprises with ≥3 years of support
Comprehensive support enterprises (avg. score 4.62) have 7.5% stronger industrial driving effects than specialized support enterprises (avg. score 4.28)	Clarifies the heterogeneous impact of enterprise types on rural industrial upgrading, provides theoretical basis for classified policy-making	Government: Support advanced manufacturing enterprises to build rural supporting production bases; train traditional agricultural enterprises to strengthen industrial participation; build a "rural demand-enterprise supply" matching platform
Technology introduction and talent support ($r=0.966$), cooperation mechanism and industrial participation ($r=0.943$) show strong synergies	Reveals the interdependence between support dimensions, improves the theory of multi-dimensional integrated support	Enterprises: Adopt "technology + talent + cooperation mechanism" integrated support; avoid symbolic technical assistance or single fund input

Acknowledgments

Supported by the Scientific Research Fund of Zhaoqing Philosophy and Social Science Planning Project, Approval (No. 25ZD-04)

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