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Rural Comprehensive Development as a Moderator of Enterprise-Assisted Industrial Upgrade: Empirical Research on Zhaoqing Using PLS-SEM Model

Jyh-Harng Shyng*
Life Sciences College, Zhaoqing University, Zhaoqing, Guangdong, China

***Corresponding author:** Jyh-Harng Shyng, hidosing@outlook.com

Abstract: Against the background of China's rural revitalization strategy and the implementation of the "Thousand Enterprises Help Thousand Towns" initiative, the input of industrial resources from external enterprises has become an important driving force for rural industrial upgrading, yet the implementation effect of enterprise assistance varies sharply across different towns and villages. Existing literature mostly focuses on the direct promotion effect of enterprise investment while ignoring the heterogeneous absorption capacity brought by differences in rural comprehensive development level. Centered on the "environment-behavior-performance" theoretical framework, this study divides rural comprehensive development into four core dimensions—economic income, social governance, public cultural service, and ecological environment—and constructs a moderated PLS-SEM model to verify its conditional moderating effect on the path from enterprise assistance to industrial performance. Based on 170 valid survey samples from nine counties and districts of Zhaoqing City, empirical results show that rural comprehensive development exerts significant positive moderating influence: the marginal promotion coefficient of enterprise assistance on industrial performance reaches 0.53 in high-level developed rural areas, but drops to 0.21 in low-development villages; infrastructure construction and grassroots governance are the core threshold factors determining the moderating strength. This research supplements the theoretical system of enterprise-assisted rural development and provides differentiated classified policy suggestions for the government to realize precise enterprise-village matching under the "Thousand Enterprises Help Thousand Towns" policy.

Keywords: Rural comprehensive development; Enterprise assistance; Moderating effect; PLS-SEM; Rural industrial upgrading

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1. Introduction

Global rural sustainable development has gradually shifted from a single financial subsidy mode to a market-oriented enterprise-driven development mode [1]. In China's rural revitalization deployment, the provincial "Thousand Enterprises Help Thousand Towns" policy is an important institutional innovation to activate social capital into rural industries. Since 2020, Zhaoqing has realized the pairing of over 1,200 market entities with grassroots towns, with accumulated invested funds exceeding 3.27 billion yuan and more than 586 industrial

landing projects [2]. However, field investigation finds obvious differentiation in project performance: some towns rapidly realize industrial clustering and resident income growth after enterprise access, while lots of villages face idle invested equipment and slow industrial transformation due to weak endogenous bearing capacity [3]. Such practical divergence implies rural comprehensive development forms an important conditional boundary for the transformation efficiency of enterprise assistance resources.

From a theoretical perspective, existing relevant research mainly discusses the unilateral driving influence of enterprises on rural economy from resource dependence, institutional isomorphism, and social network theories [4], but seldom decomposes rural development into multi-dimensional indicators to quantify its moderating function. Few studies combine economic, social, and ecological dimensions into an integrated evaluation system to test the threshold regulation on industrial conversion [5]. Based on the "environment-behavior-performance" analytical framework derived from institutional economics and regional innovation theory, this study takes Zhaoqing's practical data as empirical evidence, adopts PLS-SEM, which fits medium-sized sample research, and systematically inspects the moderating mechanism of rural comprehensive development.

Three core research contributions are highlighted: First, subdivide rural comprehensive development into economic, social, and ecological measurable dimensions and enrich the connotation of the moderating variable in enterprise-village cooperation research. Second, confirm infrastructure and grassroots governance as core threshold factors via a simple slope test. Third, put forward classified matching suggestions for the government to allocate enterprise resources in accordance with differentiated rural development levels, improving the precision of the "Thousand Enterprises Help Thousand Towns" policy.

2. Theoretical framework and research hypotheses

2.1. Correlation between enterprise assistance and industrial-driven performance

Enterprise assistance covers five practical dimensions including industrial participation layout, professional talent introduction, special fund input, advanced technology popularization, and long-term cooperative mechanism construction [6]. Such multi-dimensional resource input can effectively remedy rural shortages in industrial foundation, reserve professional practitioners, improve supporting infrastructures, and optimize policy landing environment, so as to continuously expand industrial scale and upgrade industrial benefit [7]. Existing empirical studies have verified the stable positive linkage between diversified enterprise support and local industrial performance [8].

2.2. Theoretical mechanism of moderating effect of rural comprehensive development

Rooted in the "environment-behavior-performance" framework, rural comprehensive development acts as the external environmental carrier of resource transformation [9]. On the economic level, increased resident income and sufficient local labor supply reduce enterprises' additional cost of worker recruitment and training; on the social dimension, improved grassroots governance and perfect public cultural services lower cooperation friction and contract execution cost between enterprises and villagers; on the ecological dimension, fine rural ecological conditions are conducive to developing ecological agriculture and leisure tourism, expanding industrial profit space [10]. All above three paths jointly strengthen the conversion efficiency from enterprise input to industrial output. In contrast, under backward rural development conditions, enterprises have to spend extra capital on basic supporting construction before formal industrial layout, weakening assistance's driving efficiency [11,12]. Accordingly, two hypotheses are proposed:

H1: Rural comprehensive development has a significant positive moderating effect on the path of enterprise

assistance → industrial-driven performance.

H2: The moderating effect is significantly stronger in regions with superior infrastructure and sound grassroots governance.

3. Research design and methodology

3.1. Sample and data source

Field questionnaires were distributed from May to July 2025, covering nine administrative regions of Zhaoqing, including Duanzhou, Gaoyao, Sihui, Huaiji, etc. Stratified random sampling was adopted to select enterprise managers, village cadres, cooperative operators, and ordinary villagers as respondents. 170 valid questionnaires were finally collected with an effective response rate of 95%.

3.2. Variable definition and measurement

All measurement items adopt five-point Likert scale (1 = strongly disagree, 5 = strongly agree):

(1) Independent variable (M, Enterprise Assistance): industrial participation, talent support, capital input, technology introduction, cooperation mechanism;

(2) Dependent variable (Y, Industrial-Driven Performance): industrial foundation, talent reserve, resident participation willingness, infrastructure perfection, policy implementation;

(3) Moderating variable (W, Rural Comprehensive Development): income growth, employment expansion, governance upgrading, cultural service improvement, ecological optimization.

3.3. Reliability and validity test

Table 1 presents reliability and convergent validity outcomes. All Cronbach's alpha and composite reliability values exceed the 0.7 benchmark; AVE values are all above 0.9; and the HTMT index is below 0.85, which proves excellent construct validity of all latent variables.

Table 1. Reliability and convergent validity results

Construct	Cronbach's alpha	Composite reliability	AVE
Enterprise Assistance	0.977	0.982	0.917
Industrial-Driven Performance	0.975	0.980	0.908
Rural Comprehensive Development	0.976	0.981	0.913

4. Empirical test and result analysis

4.1. Baseline direct effect

Enterprise assistance has a significantly positive influence on industrial performance ($\beta = 0.833$, $P < 0.001$), which lays the prerequisite foundation for subsequent moderating effect inspection.

4.2. Moderating effect regression results

After introducing the interaction item W×M into the structural model, regression outcomes are shown in **Table 2**. The coefficient of the interaction term is 0.041 and $P = 0.022 < 0.05$, which means rural comprehensive development has a remarkable positive moderating effect; H1 gets statistical support.

As presented in **Figure 1**, this study constructs a moderated PLS-SEM framework containing the

independent variable (Enterprise Resource Input, X), mediator (Enterprise Assistance Intensity, M), the moderating variable (Rural Comprehensive Development, W), and dependent variable (Industrial Driving Benefit, Y), together with all reflective measurement items of latent constructs.

Table 2. Moderating effect estimation results

Path	Coefficient	Std. error	*t*-value	*P*-value	Conclusion
M → Y	0.833	0.041	20.350	0.000	Significant
W×M → Y	0.041	0.015	2.737	0.022	Significant

4.3. Simple slope test for moderating heterogeneity

To further verify H2, this study divides rural development into high-level (+1SD) and low-level (-1SD) groups for simple slope analysis:

(1) High rural development group: M→Y coefficient = 0.53, $P < 0.001$.

(2) Low rural development group: M→Y coefficient =0.21, $P < 0.05$.

The obvious coefficient gap confirms that villages with complete infrastructure and standardized governance gain much higher conversion efficiency from enterprise resources, H2 is verified.

As shown in **Figure 2**, the three fitting lines represent high (mean+1SD), average (mean), and low (mean-1SD) rural comprehensive development levels respectively. The green line (high RCD) has the steepest slope, verifying that high rural development significantly strengthens the positive influence of enterprise resource input on industrial-driven performance.

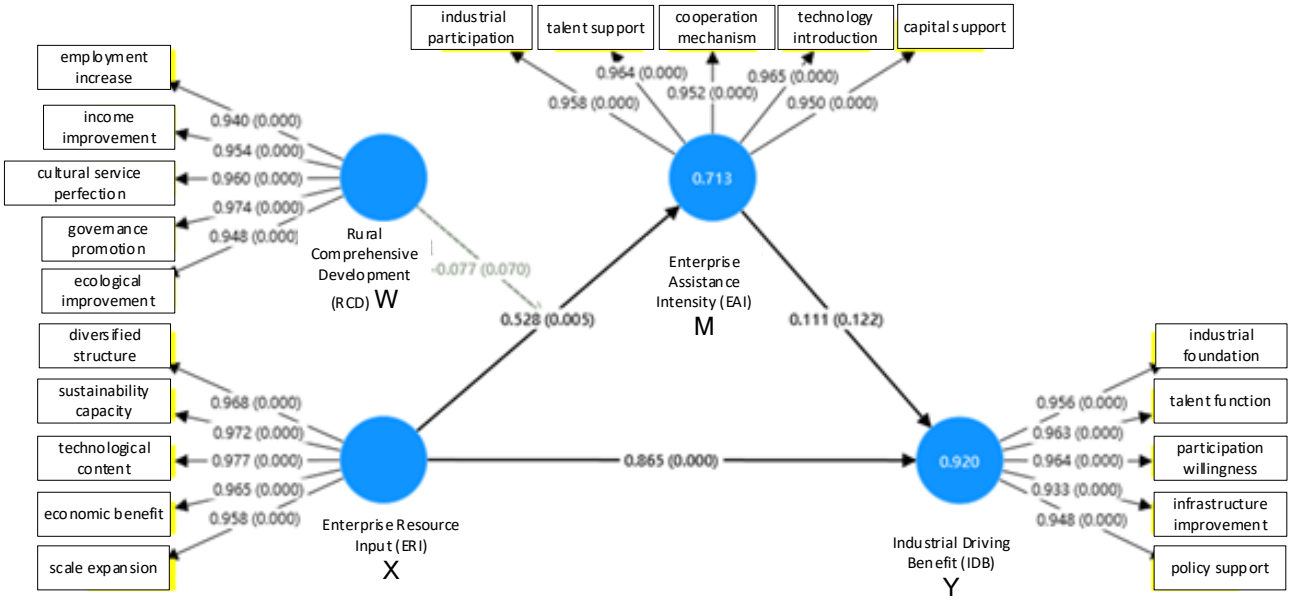

Figure 1. Structural PLS-SEM research framework with moderating path of rural comprehensive development

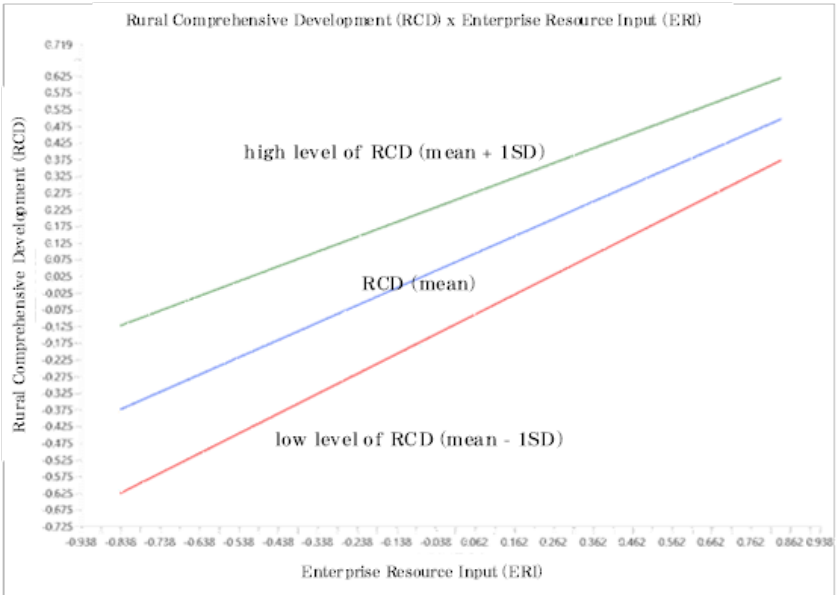

Figure 2. Difference in enterprise assistance's marginal effect under high, medium, and low rural development levels

5. Mechanism discussion and policy implications

5.1. Core research findings

1. Rural comprehensive development is an essential environmental amplifier for enterprise-assisted industrial upgrading; better economic, social, and ecological conditions can significantly improve the conversion rate of enterprise input into real industrial benefits [7].

2. Infrastructure perfection and grassroots governance standardization are two pivotal threshold indicators of moderating intensity, which directly decide the absorption capacity of rural areas to external industrial resources [13].

3. Under poor rural endowment, blind introduction of large-scale industrial investment easily causes resource waste and a low project utilization rate [14].

5.2. Theoretical contributions

This study expands the "environment-behavior-performance" theoretical framework in the field of enterprise helping rural construction, quantifies the multi-dimensional moderating value of rural comprehensive development, and supplements empirical evidence for moderated PLS-SEM application in rural revitalization policy assessment [15]. Meanwhile, it optimizes the indicator measurement system of rural comprehensive development, providing reference for subsequent related empirical research.

5.3. Targeted practical suggestions

1. Differentiated resource allocation: For high-development towns (Sihui, Dawang, etc.), prioritize introducing advanced manufacturing and green energy projects to release industrial dividend; for underdeveloped mountainous counties (Fengkai, Guang, etc.), first invest in road, water conservancy, and grassroots governance construction before attracting enterprise projects.

2. Classification enterprise matching: Guide manufacturing enterprises to cluster in developed towns with sound supporting conditions; encourage characteristic agriculture and ecological tourism enterprises to lay out mountainous villages matching local ecology.

3. Long-term construction of rural comprehensive capacity: Take cultural service and ecological protection as regular government work, continuously lift rural endogenous bearing capacity to amplify follow-up enterprise assistance efficiency.

6. Conclusion

Rural comprehensive development presents a statistically significant positive moderating effect on the linkage between enterprise assistance and industrial-driven performance. The promotion effect of enterprise input on local industry rises remarkably along with the improvement of rural economic income, social governance and ecological environment, and infrastructure plus grassroots governance constitute core threshold constraints of such regulation. Under the implementation of "Thousand Enterprises Help Thousand Towns" policy, government departments should abandon the unified investment promotion mode, implement classified enterprise-village matching according to regional development gaps, prioritize infrastructure and governance input in backward villages to lift rural absorption capacity, so as to maximize the industrial driving effect of social capital investment and realize high-quality rural revitalization.

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Disclosure statement

The author declares no conflict of interest.

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