

A Study on the Interaction between Environmental Constraints, Economic Development, and Educational Resource Allocation: A Case Study of Rural Gansu

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Abstract: Rural areas in Gansu Province have long been constrained by multiple factors, including harsh natural conditions, weak economic foundation, and scarce educational resources, resulting in a complex interaction between environment, economy, and education. This study uses rural areas in Gansu as a case study, employing questionnaire surveys and semi-structured in-depth interviews to explore the constraints of environmental factors on economic development, the impact of economic development on the distribution of educational resources, and the short- and long-term feedback effects of education on household economics. The study found that: First, the survey and interviews suggest an urban-rural gap in educational resources in rural Gansu, including reported teacher shortages and underutilized facilities in the interviewed cases; second, families face significant pressure from education expenditures, and the vulnerability of agricultural income exacerbates the economic burden; third, although families generally have a strong willingness to invest in education, the short-term returns to household economics are weak, leading some families into the paradox of "education-induced poverty"; fourth, the positive feedback effect of education on the economy has not yet been fully realized, and there is a structural imbalance between input and return. Under environmental constraints, educational development in underdeveloped areas cannot solely rely on household investment but requires a coordinated approach involving environmental governance, economic diversification, and the allocation of educational resources. This study provides empirical support for understanding the mechanisms behind educational poverty in underdeveloped areas and offers recommendations for policy formulation.

Keywords: environmental constraints; economic development; allocation of educational resources; the paradox of education-induced poverty; rural Gansu

1. Introduction

Located in the northwest inland of China, Gansu Province has a complex terrain and harsh natural conditions. Drought, low rainfall, infertile land, and water scarcity have long constrained its economic development. This limited economic development further impacts educational investment and quality, creating a dual dilemma between regional development and improving population quality. Based on long-term participation in rural education support work in Gansu, it was observed that the aforementioned environmental problems in rural Gansu limit the diversification of local economic industries. On the one hand, this makes it impossible for some families to afford their children's education; on the other hand, the limited local educational resources significantly reduce the equalization of educational opportunities for local youth.

The academic community has paid widespread attention to the relationship between the environment, economy, and education. This research has been conducted from both empirical and theoretical perspectives. It has explored the relationship between economic growth, educational investment, and human capital under environmental constraints, and offered relevant suggestions regarding the current situation in my country, where economic development still relies heavily on extensive growth models based on capital and labor inputs, the relatively low contribution of human capital to economic growth, and the urgent need for further reforms in the education system to achieve a transformation in the economic development model.

This paper takes rural Gansu Province as a case study, combining theories such as the education

paradox and social capital to explore the constraints of natural environmental factors on economic development, as well as the intrinsic relationship between economic development and the distribution of educational resources. Through in-depth interviews with local families, it further explores the relationship among the 'environment-economy-education' system. It also provides policy references and pathways for environmental governance, economic development, and educational improvement in underdeveloped regions.

2. Literature Review

Based on existing literature, research on the relationship between environment, economy, and education mainly revolves around the following aspects.

2.1 The constraint mechanism of environmental constraints on regional economic development

Natural environmental conditions are a fundamental constraint on economic development. Especially in areas with greater environmental constraints, the fragility of the ecological environment directly restricts the diversification of industrial structure and sustainable development. For example, He Wenju's empirical study based on Hunan Province found that under resource and environmental constraints, economic growth still highly depends on extensive input of capital and labor, while the contribution rate of human capital is low, reflecting the difficulty of economic transformation under environmental pressure^[1]. Similarly, in the study of ethnic poverty-stricken areas, Zhang Xuemin et al. pointed out that the harsh natural conditions make it difficult for local areas to form a competitive industrial system, which in turn affects the economic returns of education investment and forms a situation of "input-return asymmetry"^[2]. These studies together show that environmental constraints not only directly restrict the expansion of economic scale, but also indirectly weaken the endogenous driving force of regional development by affecting industrial structure and employment opportunities. The above studies provide a research perspective for understanding economic development under environmental constraints and lay a solid foundation for the study of the relationship between ecological environment and economic development in rural Gansu, the research object of this paper.

2.2 The interaction between economic development level and allocation of educational resources

Economic development provides the material basis for education, while education feeds back into economic growth through the accumulation of human capital. This two-way relationship has been explained in many articles. Wu Yiyi systematically discussed the interdependence between higher education and economic development, emphasizing that economic development determines the scale and structure of education investment, while education promotes the improvement of economic quality and efficiency through talent cultivation and technological innovation^[3]. Yue Changjun's empirical research based on inter-provincial data shows that the difference in economic development level between regions directly leads to the uneven allocation of education resources, and factors such as per capita GDP and local fiscal revenue are significantly positively correlated with education funding^[4]. However, in ethnic minority poverty-stricken areas, this ideal two-way promotion mechanism is often difficult to achieve. Yue Changjun's research shows that from the perspective of improving the efficiency of resource allocation to promote economic development, there are two aspects of measures: First, by improving efficiency, the educational reform measures such as the adjustment of school layout should be coordinated with the economic development and urbanization level^[4]. Second, conditions should be created for the flow of labor in order to improve the market efficiency of production factors and accelerate the urbanization process, which is conducive to both economic development and improving the efficiency of education resource use. It is evident that there is a two-way interactive relationship between the level of economic development and the allocation of educational resources, which provides valuable insights for studying the relationship between economic development and the allocation of educational resources in rural areas of Gansu.

2.3 The problem of uneven distribution of educational resources and fairness of educational opportunities

The problem of uneven regional allocation of educational resources has been further exacerbated by the differences in economic development levels. Lin Yong pointed out that fair allocation of educational resources is the key to achieving a positive interaction between the two by constructing an evaluation

model of coordinated development of education and economic growth. However, in practice, the gap between regional education funding and teacher allocation continues to widen [5]. Luo Haifeng analyzed the relationship between economic development and higher education from a three-dimensional perspective, emphasizing that under the background of reform of the higher education management system, the regional development of higher education should be in line with the needs of local economy, otherwise it will easily lead to misallocation and waste of educational resources [6]. For rural areas, the scarcity of educational resources is not only reflected in insufficient funding, but also in the marginalization of educational quality, teacher strength and curriculum. Chen Bin reviewed the changes in understanding the relationship between higher education and economic growth from a historical perspective, pointing out that in the early stage of economic development, educational resources tend to be tilted towards cities and developed areas, and educational opportunities in rural areas are systematically squeezed [7]. In addition, empirical studies by Yang Jun et al. on educational inequality and economic growth in China have found that educational inequality significantly hinders economic growth. In economically underdeveloped regions, the benefits of educational investment often cannot be accumulated locally due to the outflow of human capital, forming a vicious cycle of "educational investment - talent loss - economic stagnation" [8]. The discussions on the uneven distribution of educational resources and the equality of educational opportunities in the above studies are enlightening for the research in this paper.

Although numerous studies have been conducted on these three aspects, providing a foundation for this paper, in the long term, education is important for economic development because it may improve employability and income, thereby contributing to long-term development. In the short term, however, the "education-induced poverty" paradox exists in underdeveloped rural areas—high education costs and insufficient short-term returns may exacerbate poverty and hinder economic development. However, existing research on the relationship between economic and educational development under environmental constraints rarely utilizes the "education-induced poverty" paradox theory. Therefore, based on the aforementioned research, this paper elaborates and analyzes the "education-induced poverty" paradox theory, hoping to provide valuable research for the study of the relationship between economic and educational development in underdeveloped regions under environmental constraints.

3. Questionnaire survey

3.1 Basic Information of the Sample

To better understand the level of concern and personal experiences regarding environmental, economic, and educational issues in different regions of Gansu, this survey distributed questionnaires to the population in Gansu, and a total of 118 valid questionnaires were collected. The features of the sample were as follows: the proportion of women (61.0%) was relatively higher than that of men (39.0%); most of the respondents had a college-level or higher education background, accounting for 83.0%; and the occupational distribution was relatively even, with a large number of professional and technical staff, as well as heads of enterprises and institutions. In short, most of the respondents had a relatively high educational level and various occupations; thus, the results of the study are likely to be generalisable.

3.2 Urban-Rural Gap in the Allocation of Educational Resources

As shown in Figure 1, there exists an imbalance of educational resources between rural and urban areas in Gansu Province. 76% of respondents perceived the gap in educational resources between urban and rural areas as significant, with 36% considering it extremely large, and only 4% believing resource allocation is balanced. This indicates that respondents perceive educational resource equity as a prominent issue in the region, with a clear trend that high-quality teachers and teaching equipment are concentrated in urban areas, while the basic conditions for rural education development remain relatively weak.

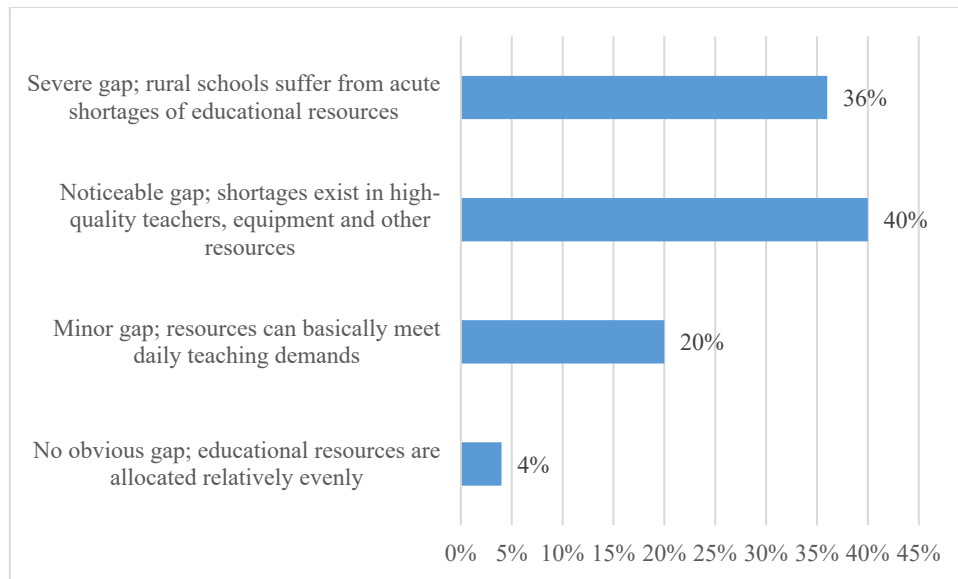


Figure 1 Distribution of perceived economic pressure from household education expenditure in rural Gansu

3.3 The Economic Pressure Dimension of Family Education Expenses

As shown in Figure 2, the survey shows that families generally bear a heavy burden in terms of education expenditure. 39% of families reported facing significant or extreme financial pressure, with 14% struggling to afford their children's tuition. The above data suggest that limited household economic capacity may constrain educational funding; thus, economic limitations are now a serious external factor hindering the progress of education.

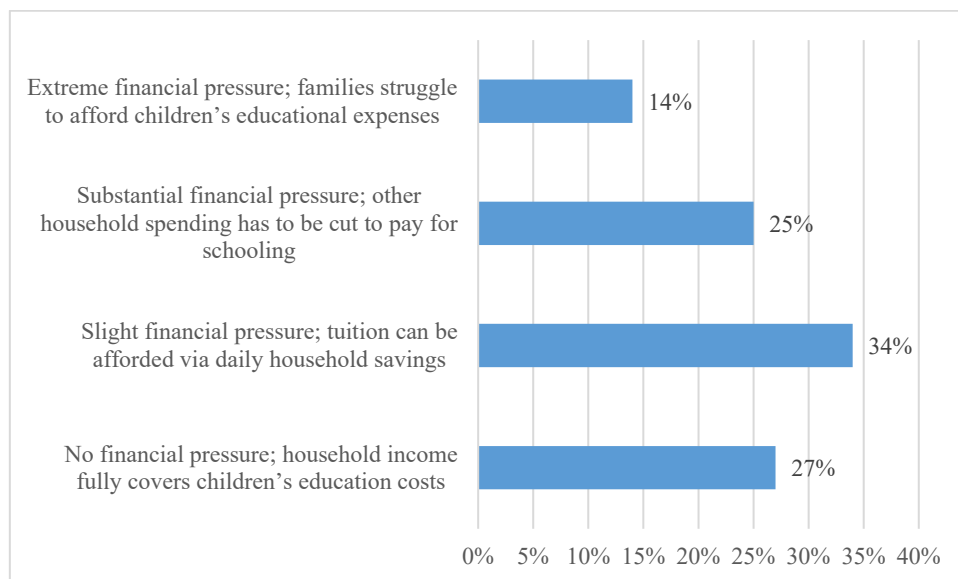


Figure 2 Perceived urban-rural gap in the allocation of educational resources

3.4 Dimension of Willingness to Invest in Education

As shown in Figure 3, despite the economic pressure, families have been making substantial investments in their children's education; 82% of the families said they would fully support their children's pursuit of higher education, and only 6% were willing to forgo their children's education due to money problems. Therefore, education remains one of the main intended areas of family investment in the local community.

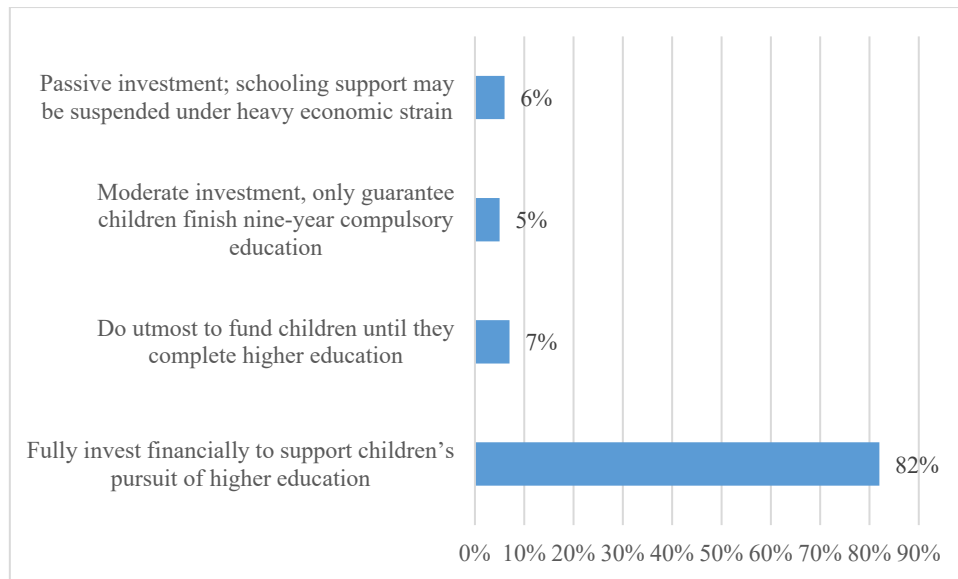


Figure 3 Household willingness to invest in children's higher education

3.5 The Feedback Effect of Education on the Economy

As shown in Figure 4, on the other hand, some people believe that education has a significant or extremely positive effect on personal growth and family finances; 40% are quite positive, but 19% believe that the effect of education is average or weak, and education has offered little help to improve their families' economic conditions. This difference is a result of regional disparities in the effect of education. Although most families are aware of the good economic effect of education, some families still have a conservative view of the expected return on investment in education or even dismiss it. Therefore, there are different views among the public on the beneficial economic effects of education.

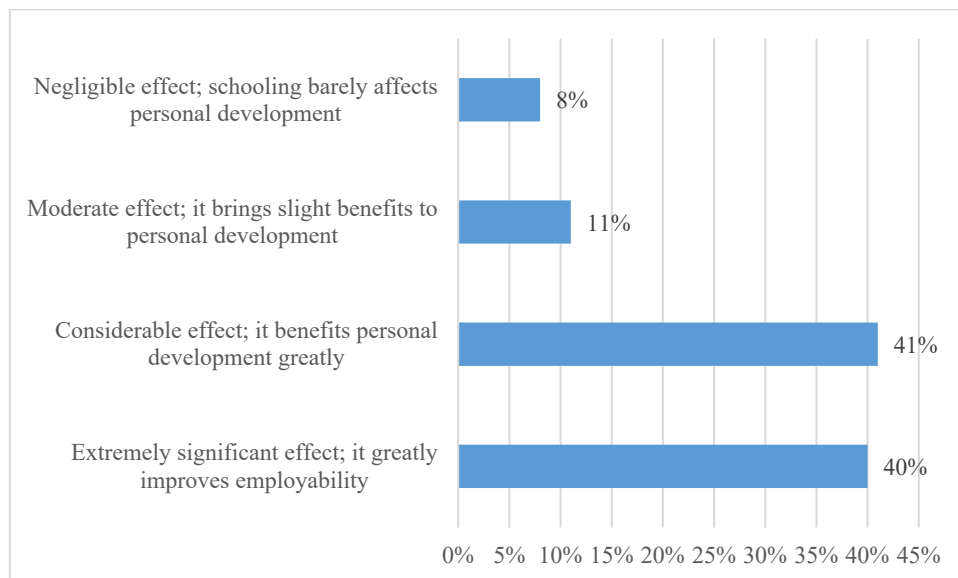


Figure 4 Perceived feedback effect of education on household economy

3.6 Dimensions of Representation of Educational Paradoxes

As shown in Figure 5, a survey in Gansu Province found that 53% of people believed in an "education paradox": more money was being invested in education, but the economic burden was relatively large; at the same time, the actual returns did not meet expectations, and 25% agreed entirely. In total, 47% expressed some level of disagreement, including 38% who disagreed to some extent and 9% who strongly disagreed. The above data suggest a potential mismatch between educational investment and perceived returns in the local context, as well as the lack of a positive feedback loop between education and family

finances.

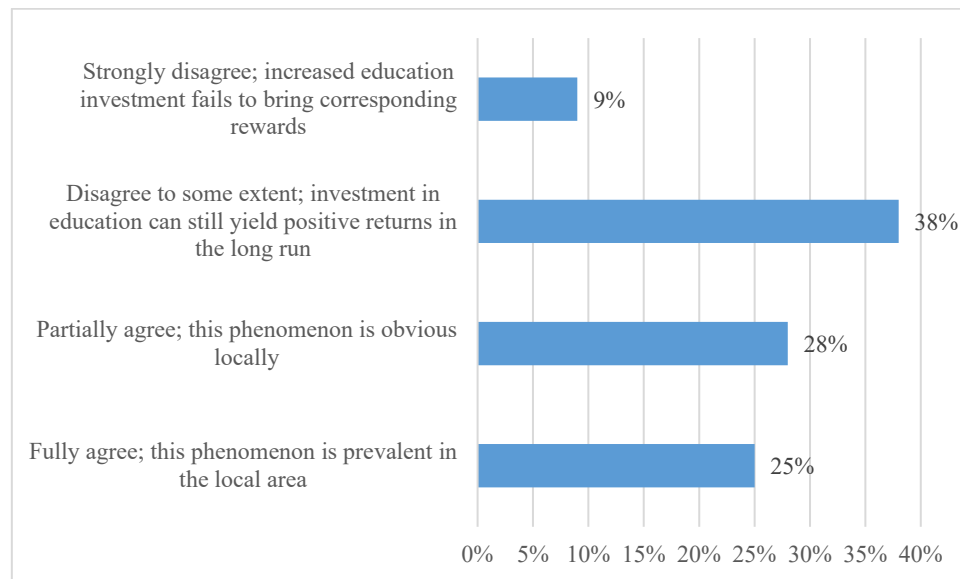


Figure 5 Recognition of the "education-induced poverty" paradox among respondents

3.7 Summary

In short, the connection among environment, economy and education in Gansu Province has the following characteristics: weak educational resources, a heavy financial burden on families for education, inconsistent evaluations of the actual impact of education on family finances, and a widespread mismatch between inputs and outputs. Based on the above analysis, under environmental constraints, the level of economic development restricts the amount of funds available for education, and the impact of educational investment on economic growth also varies from place to place.

4. On-site interview findings

Given that the environment, economy, and education are closely related at the provincial level in Gansu, this paper intends to explore the mechanism of interaction among these three factors more precisely and understand how local families in rural Gansu experience educational investment, economic pressure, perception of resources, expected returns, etc. A semi-structured in-depth interview method was employed, selecting three typical families from rural Gansu as interviewees. Interviews were conducted across six core dimensions: urban-rural disparity in educational resources, family pressure regarding educational expenditure, willingness and expectations of educational investment, perceived educational returns, experiences of educational paradoxes, and policy and resource demands. All interviews were conducted with the consent of the respondents, and the interview content, after being organized and de-anonymized, is analyzed as follows.

4.1 Interviewees and Interview Design

This field interview selected three parents of students from rural Gansu as interviewees. All the interviewed families have long lived in rural areas of Gansu and rely on agriculture as their main source of income. The characteristics of the sample families reflect certain common experiences of rural families in Gansu.

The interviews were conducted based on a pre-set outline and were conducted in a one-on-one face-to-face format. The interview content focused on the rural families' direct feelings about educational resources, economic burden, educational value and real-life dilemmas, and focused on capturing the real manifestations of the education-induced poverty paradox in the local area.

4.2 Core Content and Analysis of the Interviews

4.2.1 Uneven distribution of educational resources: Significant urban-rural disparities, underutilized infrastructure, and a severe shortage of teachers

The respondents unanimously agreed that there is a significant and difficult-to-bridge gap in educational resources between rural and urban schools, with the core issue being the matching of teachers and facilities.

Hardware facilities are "built but not used": Some schools are equipped with functional classrooms such as guzheng rooms and music rooms according to policy, but there are no professional teachers to teach them, and the equipment is idle for a long time and cannot serve a teaching function.

There is a severe shortage of teachers: rural schools generally have the phenomenon of "one teacher teaching multiple subjects and one person holding multiple positions". The number of teachers is small and their professional abilities are limited. Courses can only be carried out based on textbooks and lack innovation and expansion.

Low college entrance rates lead to a shrinking student body: Rural schools have small student populations and weak teaching quality, and respondents reported that the proportion of students entering high school and university was lower than that of urban schools. This leads many families to prefer sending their children to study in urban areas, exacerbating the uneven distribution of educational resources .

4.2.2 Household education expenditure under pressure: Heavy burden, the vulnerability of agriculture exacerbates economic pressure

The average annual education expenditure of the surveyed families is concentrated between 2,300 and 3,000 yuan. Although they are in the nine-year compulsory education stage, the hidden expenses such as textbook fees, living expenses, transportation fees, and clothing fees still constitute a large burden. Moreover, due to the constraints of the local natural environment, their economic resilience is extremely weak.

Single and fragile source of income: Families rely mainly on agricultural income, which is greatly affected by severe weather such as drought and frost, and there may even be situations where there is no harvest at all, resulting in extremely poor income stability.

Special families face extremely heavy burdens: Some of the surveyed families have family members with disabilities or serious illnesses, which puts them under double pressure from medical and educational expenses, making their economic situation even worse.

4.2.3 Strong Willingness to Invest in Education: They are highly concerned about their education and view further education as their " a major pathway out of poverty"

Although the families were facing financial difficulties, they were all willing to invest in the education of their children and hoped that their children would be able to get higher education.

The main expectation was consistent across families: they generally hope that their children can attend university and live away from their hometowns; they believe that higher education is a major pathway out of poverty and to change their lives.

Their commitment is unwavering: even if it means incurring debt and cutting back on living expenses, they will fully support their children in completing their studies and refuse to terminate their education due to financial difficulties.

Clear value perception: viewing knowledge as a key resource for changing the destiny of families and individuals, and recognizing the long-term value of education.

4.2.4 Significant Long-Term Returns on Education: No Short-Term Benefits, but Long-Term Expectations

The surveyed families had a weak perception of the short-term, tangible returns of education, but maintained a firm expectation for long-term developmental returns, exhibiting the characteristic of "no short-term benefits, but a focus on the future in the long term."

No practical help in the short term: Children cannot share housework or farm work while they are in school, and education expenses exacerbate the family's financial strain, so it has no direct effect on improving the family's current economic situation.

Long-term value recognition: Although there is no return in the short term, they firmly believe that education can improve children's employability, improve their future lives, and break the intergenerational transmission of poverty.

4.2.5 Strong Experiential Impact of the Educational Paradox: Imbalance Between Input and Return, Significant "Education-Driven Poverty" Phenomenon

The interviewed families' accounts suggest the existence of an educational paradox in the selected rural cases in Gansu: increased investment in education leads to a heavy economic burden on families, with insufficient short-term returns, resulting in a reality where "the more you invest, the more financially strapped you become."

The sense of the problem is clear: most respondents agreed that "the more one invests in education, the tighter one's life becomes now, and the actual return is lower than expected."

Expenditure is negatively correlated with living standards; education expenditure directly leads to a lower standard of living for the family. Due to living expenses such as rent, medical fees and education costs, the family's finances are stretched.

Reluctant persistence: Although faced with the short-term problem of "impoverishment due to education", families are still willing to invest, resulting in a contradictory situation of "forced investment and difficult support".

4.2.6 Clear Demands for Educational Development: Core Focus on Teachers, Expecting Targeted Policy Support

The families who were surveyed generally agreed on the demands for the development of local education, and the main reason was a lack of teachers; they also hoped for more specific economic and policy support.

At present, the government needs to strengthen the development of rural teaching staff in rural schools and tackle problems such as a shortage of teachers, low professional qualifications, and missing courses.

Supporting Measures: We hope to improve the implementation of policies such as education subsidies and renovation subsidies for old buildings to reduce the economic and housing pressure on families.

4.3 Interview Summary

The field interview shows a clear chain of events in the rural area of Gansu: severe weather conditions, such as drought and frost, reduce agricultural income; the family economy becomes fragile; this economic weakness directly increases the burden of education expenses; resource scarcity, including teacher shortages and underutilised facilities, impairs the quality of education; although the family deeply values education and expends considerable funds on it, the lack of prompt economic returns results in a paradox of "education leading to poverty", and finally forms a vicious circle of environmental constraints on the economy, economic constraints on education, and an inability of education to provide immediate economic support. Meanwhile, the interviewed families' demands for improving rural teacher numbers and implementing supportive public policies provide a realistic basis for proposing targeted countermeasures.

5. Policy Recommendations

Based on the empirical analysis and field interviews on the interaction between environment, economy, and education in rural Gansu, this paper proposes systematic countermeasures from three levels: environmental governance, economic development, and education optimization. These countermeasures address real-world problems such as strong natural environmental constraints, weak economic foundation, uneven distribution of educational resources, heavy family educational burdens, weak educational feedback effect, and the prominent paradox of "education leading to poverty." They provide a path reference for solving the development dilemma of underdeveloped rural areas.

5.1 Environmental aspect: Improve the ecological foundation and reduce development constraints

(1) Promote ecological restoration and drought relief projects

In response to problems such as drought, frost, and infertile land in rural Gansu, we will accelerate

the implementation of ecological projects such as small watershed management, sloping farmland transformation, and shelterbelt construction, promote water-saving agriculture, mulching to conserve moisture, and drought-resistant crop varieties, reduce the impact of natural disasters on agricultural production, and stabilize the basic income sources of families.

(2) Optimize basic conditions for rural production and living

Improve rural infrastructure such as roads, water conservancy, electricity, and communications to solve problems such as inconvenient transportation for students to and from school and backward agricultural production conditions, thereby alleviating the dual constraints of the environment on the economy and education from the source.

5.2 Economic Level: Cultivating Income Channels and Enhancing Support Capabilities

(1) Develop distinctive and suitable industries to broaden income channels

Based on local resources, "local governments should develop environmentally friendly industries such as traditional Chinese medicine, specialty breeding, rural tourism, and primary processing of agricultural products, promote industrial diversification, change the fragile income structure that relies solely on traditional agriculture, and enhance families' ability to pay for education.

(2) Strengthen employment assistance and skills training

Provide practical skills training for rural laborers, promote a combination of local employment and orderly migrant work, increase the proportion of non-agricultural income in households, and reduce the risk of interruption of education investment due to income instability.

(3) Accurately implement policies to benefit farmers and provide relief.

Accelerate the implementation of policies such as subsidies for dilapidated housing renovation, medical assistance, and basic living allowances, with a focus on helping families facing special difficulties such as those with serious illnesses, disabilities, or those affected by disasters, to alleviate the pressure of dual expenditures on education and healthcare.

5.3 Education: Balancing resource allocation and addressing rural shortcomings

(1) Prioritize addressing the shortage of teachers in rural areas

Expand the scale of the special post program and the rural teacher support program, improve the treatment, subsidies, and preferential treatment in professional title evaluation and appointment for rural teachers, and retain excellent teachers. The government should promote the rotation and exchange of teachers between urban and rural areas and implement the "county-managed, school-employed" system to facilitate the flow of high-quality teachers to rural areas and address the issues of "one teacher teaching multiple subjects" and "mismatched majors." It should also ensure that there are enough teachers for shortage subjects such as music, art, and information technology, and make full use of functional classrooms and hardware equipment.

(2) Optimize the layout and conditions of rural schools

Rural teaching sites should be preserved scientifically, and the living and dining conditions of boarding schools should be improved to reduce students' commuting costs; teaching equipment should be updated in sync to promote resource sharing between urban and rural schools and narrow the gap in hardware and curriculum.

(3) Improve the quality of education and its localization adaptability

Increase vocational education, labor education, and practical skills courses, taking into account both further education and employment, so that education is more in line with the development needs of rural students and the actual return on investment in education is improved.

6. Conclusions and Future Research Directions

This study has several limitations. First, the questionnaire sample (N=118) over-represents individuals with higher education (83.0%), which may not fully capture the views of less-educated rural populations. Second, the qualitative analysis is based on only three family interviews, limiting the

generalizability of the findings. Third, the cross-sectional design prevents examination of long-term dynamics in the environment-economy-education relationship. Future research should expand the sample size with more representative sampling, adopt longitudinal designs to track the long-term returns of educational investment, and conduct comparative studies across different regions or ecological zones to further validate and extend the findings of this paper.

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