Study on the Impact of Land Remediation on Regional Poverty Governance: An Empirical Analysis Based on VAR Model

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Abstract. Land consolidation has an important impact on regional poverty reduction. It gradually integrates into the precise poverty reduction strategy and becomes one of the powerful measures to innovate the poverty reduction and development methods. Based on the data of 31 provinces in China from 2005 to 2015, this paper uses VAR model to make an empirical study on the dynamic causal relationship between land consolidation and regional poverty management. The research shows that (1) there is an interactive relationship between land consolidation and poverty management, and it is a positive feedback function of each other, indicating that land consolidation has a positive promoting effect on regional poverty management; (2) According to the impulse response function diagram, the impact of land consolidation on poverty reduction has been rising rapidly from the first stage to the second or so stage and declining until the third or so stage is reduced to zero. The impact of poverty reduction on land consolidation shows a downward-upward fluctuation until the fifth or so stage is reduced to zero. This shows that if a positive impact is given, land consolidation and poverty reduction will interact. (3) From the variance decomposition chart, it can be found that land consolidation and regional poverty alleviation interact with each other. After Phase 2, both parties have maintained a high level towards each other.

1. Introduction
With the orderly advancement of the precise poverty alleviation strategy, the number of poor people in China has decreased from 89.62 million at the beginning of 2014 to 16.6 million at the end of 2018, and the number of poor people has decreased by 73.2 million. The overall poverty alleviation effect is remarkable. However, the remaining 10 million-odd poor people are the “hard bones” with the weakest foundation, the worst conditions and the greatest difficulties in the poverty alleviation process [1]. Under the background that poverty alleviation has entered a white-hot state, it is necessary to continuously innovate the ideas and methods of poverty alleviation and development on the basis of the existing ones. The Outline for Poverty Alleviation and Development in China’s Rural Areas (2011-2020) mentions land consolidation three times, requiring “to promote land consolidation in poor areas, accelerate the transformation of low-and medium-yield fields, carry out land leveling, and improve the quality of cultivated land” and “to intensify land consolidation and to favor key counties.
where conditions permit in terms of project arrangement”. This fully demonstrates that land consolidation has become an important means to promote poverty alleviation and development, an important manifestation of innovative poverty alleviation and development methods, and has received the attention of the central leadership and wide recognition from all sectors of society.

Theoretically speaking, land is not only the eternal source of human social development, but also the material carrier of regional poverty alleviation. It has unique attributes of resources, assets and capital, which objectively makes land resources play a decisive role in regional development and poverty reduction [2]. So, in the poverty alleviation practice, is there a causal link between this much-concerned land consolidation and poverty alleviation? If so, what is the path of action? However, few studies have identified the causal relationship between land consolidation and poverty alleviation, and summarized and refined its action path. In view of this, this paper attempts to explore the impact of land consolidation on regional poverty management.

2. Literature Review

Judging from the existing literature, there are relatively few research articles on the relationship between land consolidation and poverty management by domestic scholars. After searching, it is found that the research mainly focuses on the theoretical discussion of the relationship between land consolidation and poverty management. Starting from specific cases of land consolidation, some scholars analyzed the countermeasures and mode selection of land consolidation to promote poverty alleviation and development, and believed that the role of land consolidation in precision poverty alleviation was increasingly apparent [3-5]. These documents suggest the direction of further research and the space for innovation.

More literature focuses on the relationship between land use and poverty reduction, mainly including: (1) the impact of land policies and systems on poverty alleviation and development. Jong Li, Yan Jinming and others have studied the poverty reduction effect of land policies, providing useful references for further formulating practical land poverty reduction policies [6-8]. (2) Land use choice for special poverty alleviation. Liu Wei and Chang Yan discussed the impact and mechanism analysis of relocation from other places on poverty alleviation [9-10]. (3) Indirect poverty alleviation effect of land use. Yao Chengsheng explored the coordinated relationship between intensive land use and economic development, and believed that the depth and breadth of intensive land use is an important way to coordinate economic development [11]. The above research provides a substantial theoretical basis and practical enlightenment for the poverty alleviation effect and action path of land remediation to be analyzed in this paper.

To sum up, the research on land consolidation and poverty reduction has a certain scope of expansion in both breadth and depth. Most of the existing research is on the theoretical measures of land consolidation to reduce poverty, lacking systematic analysis of the path of land consolidation’s effect on regional poverty reduction, adopting more traditional comprehensive analysis methods, lacking empirical examination of the impact of land consolidation on regional poverty reduction from the perspective of qualitative and quantitative combination, and needing improvement and innovation. Therefore, the possible marginal contributions of this paper are as follows: (1) systematically discussing the internal action path of land consolidation on regional poverty management, expanding the land use theory and poverty alleviation and development measures, and providing a good starting point for the country to build a well-off society in an all-round way; (2) Starting from the perspective of combining qualitative and quantitative methods, this paper studies the causal relationship between land consolidation and regional poverty alleviation based on VAR model, and makes beneficial exploration on land poverty alleviation, which provides some reference for formulating regional differentiated land poverty alleviation policies and poverty alleviation paths.
3. Analyses on the Action Path of Land Consolidation to Regional Poverty Control

3.1. Land Development and Poverty Control: Guarantee of Land Resources Quantity
Land development refers to the development and utilization of unused land resources by adopting engineering and biological measures on the premise of protecting and improving the ecological environment, preventing soil erosion and desertification. For poverty control, on the one hand, land development can provide necessary land resources for poverty alleviation and guarantee the implementation of poverty alleviation projects. On the other hand, as one of the most direct and effective ways to supplement arable land in the region, land development directly increases the per capita arable land resources in the region, is an important means to ensure food security and the balance of arable land occupation and compensation and to realize the dynamic balance of total arable land, and provides a powerful assistant for income generation and increase in the vast impoverished regions.[12].

3.2. Land Consolidation and Poverty Control: Improving the Quality of Land Resources
Land consolidation refers to the comprehensive improvement of fields, water, roads, forests and villages by adopting engineering and biological measures to increase the effective cultivated land area, improve the land quality and utilization efficiency, and improve the production, living conditions and ecological environment. Land consolidation is an objective demand for intensive land use and change of growth mode, and is also an effective way to improve farmers’ income and narrow the gap between urban and rural areas. At present, China’s land consolidation has entered the stage of comprehensive rural land consolidation. Rural land consolidation has become a “livelihood project” in the new era to coordinate urban and rural areas, benefit agriculture, rural areas and farmers, and strengthen the villages and enrich the people. It also provides strong support for rural transformation development and spatial reconstruction at the levels of rural productivity improvement, urban and rural development space optimization and platform construction. Through land consolidation, it is conducive to improving poor land conditions in poor areas, realizing the dual effects of increasing land quantity and improving land quality, thus improving the land factor endowment of the poor population, realizing income generation, and providing basic conditions for innovation of agricultural management mode.

3.3. Land Reclamation and Poverty Control: Bringing Land Ecological Effect into Play
Land reclamation refers to the use of engineering, biological and other measures to repair and restore the damaged, abandoned land and natural disasters caused by excavation, collapse and occupation in the process of production and construction. Land reclamation can not only rebuild cultivated land, but also promote regional sustainable development. Land reclamation projects in poor areas can effectively reduce soil erosion and improve the ecological conservation capacity of the land, which can not only reduce poverty caused by ecological disasters, but also lay the foundation for the rise of ecological agriculture or ecological industry.

4. Empirical Analyses

4.1. Model Setting and Data Description
In order to test the causal relationship between land consolidation and regional poverty management, and based on the previous analysis, this paper constructs VAR model to study the dynamic causal relationship between land consolidation and regional poverty management. The relevant VAR models are as follows:

\[ Y_t = A_1Y_{t-1} + A_2Y_{t-2} + \cdots + A_pY_{t-p} + \varepsilon_t \]  

where \( Y \) represents the endogenous variable vector of K-dimensional, \( A \) represents the corresponding coefficient matrix, and \( P \) represents the order of the endogenous variable lag.
The data in this paper are mainly from China Land and Resources Database (2005-2015), China Macro Database (2005-2015) and China Regional Economic Database (2005-2015). In order to ensure the stability of the data and reduce the interference of heteroscedasticity, all variable data are processed logarithmically.

4.2. Variable Selection and Statistical Analysis

4.2.1. Core Variables. Degree of poverty control (Poverty). At present, there is no consistent standard for the measurement of poverty in academia. The commonly used measurement methods include population index method, poverty gap index method and FGT poverty index method. These three methods have their own advantages and disadvantages. Among them, population index method is applicable to the measurement of regional poverty, while poverty gap index method FGT poverty index is mainly applicable to the measurement of individual poverty. In view of the research on the regional difference characteristics of land improvement and poverty alleviation, the population index method is selected to measure poverty. Specifically, the poverty incidence index is used to replace the poverty level. The selection of the index mainly reflects the comprehensive characteristics of poverty alleviation and development. Its numerical algorithm is the ratio of the regional poverty population to the regional rural household registration population. However, it reflects not only the numerical results, but also the all-round perspective of poverty alleviation and development. The focus is on the realization of “two without worries and three guarantees”, namely, food, clothing, housing, basic medical care and basic compulsory education. This is also a hard indicator for the poor to get rid of poverty, and it is precisely these indicators that eventually converge to the poverty incidence index and reveal the regional poverty situation through the poverty incidence index.

The degree of land remediation (Land). Land remediation includes land consolidation mode, land reclamation mode and land development mode, in which land consolidation is an important means to improve the resource endowment of the poor, a powerful assistant to realize income generation, is also the basis of the land management model, land reclamation is a means to alleviate ecological poverty, but also to promote ecological agriculture or industrial development of an important way, Land development is an important means to ensure the landing of poverty alleviation projects, and also an important way to increase the per capita arable land ownership. Therefore, this paper uses the sum of the area data of the three land remediation modes to replace the degree of land remediation.

4.3. VAR Model Empirical Analysis

Using VAR model for reference to study the dynamic causal relationship between the degree of land consolidation and the degree of poverty alleviation needs to define the relevant variables. Since only the question of whether there is a causal relationship between the two is considered, the sum of the areas of the three land consolidation models can be used to replace the degree of land consolidation.

4.3.1. Unit Root Inspection. The premise of constructing VAR model is that the sequence is stable, so the time series data should be tested by unit root. In this paper, ADF test method is used to test the stability of the sequence data (table 1).

As can be seen from table 1, Poverty and Land have not passed the unit root test, which indicates that the original sequence is unstable, while the sequences Dpoverty and Dland after the first-order difference have passed the unit root test at the significance level of 5%, which indicates that the original sequence is a first-order monobloc sequence, and VAR model can be established.

4.3.2. VAR Model Establishment. Using Eviews9.0 software to determine the optimal lag time, judging the optimal lag time to be 2 according to AIC and SC values, further obtaining the equation of VAR(2) model as follows:

\[
Y_t = \begin{bmatrix}
0.1378 & 83.9362 \\
0.0089 & -0.2931
\end{bmatrix} Y_{t-1} + \begin{bmatrix}
0.1818 & 4.7626 \\
0.0032 & 0.7822
\end{bmatrix} Y_{t-2} + \epsilon_t
\]
Table 1. Unit root inspection results.

| Variable | ADF check value | Threshold at 1% level | Threshold at 5% level | Threshold at 10% level | Conclusion |
|----------|-----------------|-----------------------|-----------------------|------------------------|------------|
| Poverty  | -2.6614         | -4.2970               | -3.2126               | -2.7476                | Not smooth |
| Land     | -2.8785         | -5.2953               | -4.0081               | -4.3607                | Not smooth |
| Dpoverty | -4.2552         | -4.4205               | -3.2598               | -2.7711                | Smooth     |
| Dland    | -4.1147         | -5.5218               | -4.1076               | -3.5150                | Smooth     |

4.3.3. Johansen Cointegration Test. Because the original sequence is unstable, the sequence is stable only after first-order difference, so cointegration test is needed to analyze whether there is a long-term equilibrium relationship between variables. As can be seen from table 2, under the original hypothesis, the trace statistic is 19.15047, which is greater than the critical value of 15.494, and the P value is 0.0134. Therefore, the original hypothesis can be rejected and at least one cointegration relationship between variables can be considered. Under the condition of At most 1, the trace statistic is 4.181463, which is greater than the critical value of 3.841466 and the p value is 0.0409. Therefore, the original hypothesis can be rejected and two cointegration relationships exist between variables.

Table 2. Johansen cointegration test results.

| Hypothesized No. of CE(s) | Eigenvalue | Trace statistic | 0.05 Critical value | Prob** |
|---------------------------|------------|-----------------|---------------------|--------|
| None                      | 0.8104     | 19.1504         | 15.494              | 0.0134 |
| At most 1                 | 0.3716     | 4.1814          | 3.8414              | 0.0409 |

4.3.4. Granger Causality Test. Because VAR (2) model is balanced, Granger causality test can be conducted. From table 3, it can be seen that land consolidation and poverty alleviation constitute a causal relationship.

Table 3. Granger causality test results.

| Excluded | Dependent variable | Chi-sq | df | Prob |
|----------|--------------------|--------|----|------|
| Land     | Poverty            | 5.1096 | 2  | 0.0983 |
| Poverty  | Land               | 5.2119 | 2  | 0.0738 |

4.3.5. Impulse Response Function and Variance Decomposition. Figure 1 is the impulse response diagram of VAR (2) model in phase 10. The upper part mainly reflects the impulse response effect of land consolidation on poverty alleviation. The second half is the impulse response effect of poverty control on land remediation. As can be seen from the figure, the impact of land consolidation on poverty reduction has been rising rapidly from phase 1 to phase 2.5, and has been declining until phase 3.5 is reduced to 0. The impact of poverty reduction on land consolidation shows a downward-upward fluctuation until phase 5.5 is reduced to 0. This shows that if a positive impact is given, land consolidation and poverty reduction will interact.

Figure 2 is a variance decomposition diagram of VAR (2) model in phase 10. The first half mainly reflects the variance decomposition of land consolidation to regional poverty reduction. The second half reflects the variance decomposition of poverty management to land consolidation. As can be seen from the figure, land consolidation and regional poverty alleviation work together. After Phase 2, the two sides have maintained a high level towards each other.

From the above VAR model analysis, this paper believes that there is an interactive relationship
between land consolidation and poverty management, and it is a positive feedback function of each other, indicating that land consolidation has a positive promoting effect on regional poverty management.

Figure 1. Impulse response diagram of VAR Model.

Figure 2. Variance Decomposition Diagram of VAR Model.

5. Conclusions and Enlightenment

5.1. Main Conclusions
On the basis of constructing the framework of the path of land consolidation to reduce poverty, this paper uses VAR model to study the dynamic causal relationship between land consolidation and regional poverty governance. The conclusions are as follows: (1) There is an interactive relationship between land consolidation and poverty governance, and it is a positive feedback function of each other, which shows that land consolidation has a positive promoting effect on regional poverty governance; (2) According to the impulse response function, the impact of land consolidation on poverty reduction has been rising rapidly from phase 1 to phase 2.5, and declining until phase 3.5 is reduced to 0. The impact of poverty reduction on land consolidation shows a downward-upward fluctuation until phase 5.5 is reduced to 0. This shows that given a positive impact, land consolidation and poverty reduction will interact. (3) From the variance decomposition chart, it can be found that land consolidation and regional poverty alleviation interact with each other. After Phase 2, both parties have maintained a high level towards each other.

5.2. Enlightenment
(1) Land poverty alleviation is practical and effective. The government level needs to raise awareness of the important role of land poverty alleviation and provide a good policy channel for land poverty alleviation. It should further increase the tilt of the national land policy so that land poverty alleviation resources can be concentrated in poverty-stricken areas so as to maximize the poverty reduction benefits of land resource utilization. In particular, in areas with deep poverty in the west, land policy and regional poverty alleviation methods should be combined to ensure the land demand of poverty alleviation projects and realize the full play of land poverty alleviation effects. The central region should increase the intensity of land reclamation and land consolidation according to local conditions to give full play to the greatest role of land poverty alleviation. While doing a good job of land consolidation in the eastern region, it is necessary to actively integrate the cooperation between the eastern and western regions to help the poor and to play the role of backup support force in the eastern region.
(2) According to the poverty reduction effect of land consolidation and the regional difference characteristics of its action path, find the focal point of regional poverty reduction, formulate differentiated land consolidation policies, closely cooperate with the implementation of regional poverty alleviation and development measures, and ensure the integration of land consolidation and poverty alleviation policies to the greatest extent. On the one hand, in combination with the differences in regional resource endowments, we will continue to innovate ways of land poverty alleviation and development, tap the potential factors of innovation and integration between land use and poverty alleviation and development, and formulate land use policies and poverty alleviation and development measures in line with regional differences, so as to realize coordinated and integrated development in the region. On the other hand, it is necessary to strengthen the supervision of land remediation, improve the efficiency of regional land remediation, avoid extravagance and waste and repeated investment, and further improve the efficiency of land poverty alleviation.

(3) Give full play to the two-way adjustment mechanism between government and market. On the one hand, it is necessary for the government to play a functional role, focus on the potential of land remediation in poor areas, introduce anti-poverty projects with exemplary driving role, and enhance the poverty reduction effect of land remediation; To create a favorable investment environment for the development and utilization of land resources and the construction of poverty-relief projects in poor areas, and to improve the efficiency of land poverty alleviation.

Reference
[1] Gong L 2016 Research on the construction and innovation model of market-oriented poverty alleviation mechanism under government leadership-based on precision poverty alleviation perspective China Soft Science (05) 154-162.
[2] Zheng J, Wang S and Yuan G 2014 Poverty alleviation and land policy innovation-based on survey and thinking in Guizhou province China’s Land and Resources Economy (06) 27-30.
[3] Liu X, Yang H and Yun W 2018 Patterns and demonstration of land consolidation promoting poverty alleviation in poor areas Journal of Agricultural Engineering 34 (05) 242-247.
[4] Wang Y, Liu Q and Young J 2017 Practice and thinking of land consolidation promoting accurate poverty alleviation-taking five counties and cities of Enshi Autonomous Prefecture in Hubei province as an example China Land (10) 39-41.
[5] Liu X 2016 How land consolidation helps poverty alleviation China Land (04) 35-37.
[6] Li J 2015 Exploring new ideas for poverty alleviation and development and innovating new models for poverty alleviation and development Abstract Edition: Economic Management (09) 115-118.
[7] Hu Y, Li L, Ren N and Wang Z 2018 Study on influencing factors of rural land circulation willingness in poor mountain areas based on binary logistic model-A survey sample from poor mountain areas in Hebei province China’s Agricultural Resources and Regionalization 39 (07) 137-143+211.
[8] Yan J 2017 Mechanism and effect analysis of land policy for poverty alleviation China Land (11) 12-15.
[9] Liu W, Xu J and Li J 2018 Study on livelihood adaptability of rural households moved to poverty alleviation in other places-A case study of migration in southern Shaanxi China’s Agricultural Resources and Regionalization 39 (12) 218-223.
[10] Chang Y 2008 Analysis on the land resettlement capacity of relocation for poverty alleviation in western regions Economic Issues Exploration (06) 155-158.
[11] Yao C, Li Z, Du H, Wang J and Bai C 2016 Coordination between intensive land use and economic development in Yangtze River Delta Region Economic Geography 36 (02) 159-166.
[12] Ran Q-H, Yue Y-H, Xie D, Wei C-F and Ran R-P 2008 Summary of man-land system response to land consolidation Soil and Water Conservation Research (04) 171-174+178.