

Postprint: Theoretical Analysis and Empirical Study on the Mutual Correlation Effects Between Disaster Risk and Poverty in China

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Abstract

Against the backdrop of frequent global natural disasters and the long-term, uneven distribution of poverty, the nexus between disaster risk and poverty has become a focal point of attention for academia and stakeholders. Based on the fundamental principles of natural disaster risk management and social-ecological resilience assessment, this study systematically elaborates on the mechanisms and driving pathways of disaster-induced poverty and poverty-induced risk, a mutual correlation effect termed as the “entanglement” of disaster risk and poverty. Employing econometric regression analysis methods on panel data from 31 provinces (autonomous regions and municipalities) in China from 2010 to 2019, we verify the existence of a bidirectional reinforcing effect between disaster risk reduction and poverty alleviation at the provincial scale. The results indicate: (1) Higher hazard factor severity, exposure and vulnerability of exposed elements, and complex disaster risk scenarios trigger multiple negative impacts such as casualties, asset damage, and economic losses, ultimately leading to and exacerbating multidimensional poverty across economic, opportunity, capability, and cultural dimensions; the high exposure and low resilience of agricultural livelihoods and household assets among impoverished groups amplify and accumulate disaster risk. (2) In the process of poverty eradication and comprehensive construction of a moderately prosperous society in China, the circular effect of disaster reduction for poverty alleviation and poverty eradication for risk reduction is significant, thereby bringing attribute enhancements to strategies such as rural revitalization and governance modernization. (3) The mechanism of poverty-induced risk is relatively latent and mainly manifests in widespread disaster risk scenarios; ignoring or underestimating it may lead to numerous consequences such as ineffective disaster reduction investments, disciplinary paradigm traps, and unsustainable development. The research findings can provide theoretical basis and empirical evidence for the coordinated development of disaster reduction and poverty alleviation in China, and offer

intellectual support for implementing the “Five-in-One” strategy of economic, political, cultural, social, and ecological civilization construction, achieving the “dual carbon” goals, and addressing global climate change.

Full Text

Theoretical Analysis and Empirical Study of the Nexus of Disaster Risk and Poverty in China

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Abstract: Against the backdrop of frequent global natural disasters and the persistent, uneven spatial distribution of poverty, the nexus between disaster risk and poverty has become a focal concern for academia and stakeholders. Based on the fundamental principles of natural disaster risk management and social-ecological resilience assessment, this paper systematically elaborates on the mechanisms and driving pathways through which disasters induce poverty and poverty generates risk, a bidirectional relationship termed the “fettters” of disaster risk and poverty. Using panel data from 31 Chinese provinces (autonomous regions and municipalities) from 2010 to 2019 and employing econometric regression analysis, this study confirms the existence of mutually reinforcing effects between disaster risk reduction and poverty alleviation at the provincial scale. The results indicate that: (1) High hazard exposure, vulnerability of exposed elements, and complex disaster risk scenarios trigger multiple negative impacts including casualties, asset destruction, and economic losses, ultimately leading to and exacerbating multidimensional poverty across economic, opportunity, capability, and cultural dimensions. The high exposure and low resilience of agricultural livelihoods and household assets among impoverished populations amplify and accumulate disaster risks. (2) In China’s journey toward building a moderately prosperous society and eradicating poverty, the cyclical effects of disaster mitigation for poverty reduction and poverty reduction for risk reduction are significant, bringing attribute bonuses to strategies such as rural revitalization and governance modernization. (3) The poverty-induced risk mechanism is relatively latent and primarily manifests in extensive disaster risk scenarios; ignoring or underestimating it may lead to ineffective disaster mitigation investments, disciplinary paradigm traps, and unsustainable development. The findings provide theoretical foundations and empirical evidence for the coordinated development of disaster mitigation and poverty alleviation in China, and offer intellectual support for implementing the “five-in-one” strategic framework for economic, political, cultural, social, and ecological civilization construction, achieving “dual carbon” goals, and responding to global climate change.

Keywords: disaster risk; poverty; fetters; resilience; extensive disaster risk

1 Theoretical Analysis and Research Hypotheses

The relationship between natural disasters and poverty has long received extensive attention from both natural sciences (geography, disaster science, emergency science and engineering) and social sciences (applied economics, public management, and social governance). Disaster science reflects the poverty-inducing effects of disaster risk through mechanism analysis and impact quantification [1-3], while economics constructs econometric models of disasters and poverty to examine their relationship through hypothesis testing and empirical analysis [4-6]. Geography and sociology estimate disaster-induced poverty effects and post-disaster recovery situations through household tracking surveys [7-9].

Natural disasters' role in creating or exacerbating poverty is evident [10-12], with long-term and deep poverty even occurring in regions affected by low-severity, high-frequency extensive disasters [13-15]. However, research on how impoverished populations generate and accumulate disaster risk remains scarce. The United Nations Office for Disaster Risk Reduction (UNDRR) states in its explanation of the "disaster risk-poverty nexus" that poverty and daily risk conditions constitute the foundation of natural disaster risk [16]. Globally, 85% of disaster-affected populations live in low Human Development Index countries, which account for 99% of disaster-related deaths [17]. Since 1990, among countries with relatively high economic losses (direct economic losses as a percentage of GDP), lower-middle-income countries have accounted for over 50% [18]. At the regional scale, disaster losses in impoverished areas are disproportionately higher than in other regions. For instance, urban disaster losses often concentrate in informal settlements characterized by poor housing conditions, inadequate infrastructure, and insufficient emergency services. Comparing urban marginality indices with numbers of destroyed houses across Latin American cities reveals that cities with higher marginality indices (such as rural areas and small towns), representing 20% of the total, account for over 50% of damaged houses [19].

Overall, domestic and international scholars preliminarily acknowledge the intercorrelation between disaster risk and poverty, but insufficiently analyze the mutual driving mechanisms (especially poverty-induced risk) and lack empirical cases at different spatial scales. This paper focuses on disaster risk elements including hazard factors, exposure of affected elements, and disaster resilience (encompassing vulnerability and recovery capacity). It systematically analyzes how disasters drive poverty across different dimensions while clarifying the basic pathways through which impoverished populations generate and accumulate disaster risk. This bidirectional interaction is characterized as the "fetters" of disaster risk and poverty. Based on panel data from 31 Chinese provinces (autonomous regions and municipalities) from 2010 to 2019, this study conducts

empirical testing to provide reference ideas for disaster risk traceability, visual assessment of disaster impacts, and disaster risk reduction (DRR).

1.1 Driving Path of Disaster-Induced Poverty The pathways through which natural disasters trigger poverty primarily include hazard factor-induced poverty, exposure element-induced poverty, and disaster risk-induced poverty (Figure 1). Hazard factor-induced poverty manifests as severe casualties, asset destruction, and economic losses caused by major natural disasters. These direct, explicit impacts induce multidimensional poverty phenomena, including inability to pay for minimum living expenses such as food, housing, healthcare, education, energy, and transportation; lack of health, education, and other services; political and economic weakness and isolation; gender discrimination and social exclusion; illiteracy; poor sanitation conditions; and high livelihood vulnerability.

Disaster risk-induced poverty represents hidden poverty phenomena driven by different risk scenarios (with significantly different occurrence probabilities and systemic impacts). Among these, low-frequency, high-loss intensive disasters (such as catastrophes) cause poverty by blocking economic and social development through fatalities and asset destruction. High-frequency, low-loss extensive disasters (such as regular rainstorm flooding [20], hail, and agricultural drought) are major culprits of asset damage and economic losses. Their continuously accumulated indirect impacts (health deterioration, welfare damage, disaster-induced migration, etc.) generate long-term and deep poverty, hindering poverty alleviation performance. The Global Assessment Report on Disaster Risk Reduction (GAR 2015) statistics on historical disaster data from 195 countries and regions worldwide show that disaster events causing fewer than 20 deaths or destroying fewer than 500 houses account for 86.21% of records; although major disasters remain the primary cause of fatalities (86.21%) and house destruction (84.09%), the damage to houses (46.26%) and economic losses (55.41%) caused by medium and small disasters cannot be ignored [21].

1.2 Driving Path of Poverty-Induced Risk Poverty's driving effect on disaster risk mainly manifests as the uneven increase of absolute risk (fatalities) and relative risk (loss proportion), and the continuous accumulation of extensive risk (which has not yet received attention). For example, since 1980, approximately 85% of earthquake deaths globally have concentrated in low- and middle-income countries; although over 70% of absolute economic losses have occurred in OECD countries and other high-income nations, over 85% of relative economic losses (direct economic losses as a percentage of GDP) have concentrated in lower-middle-income countries [22]. From a probabilistic loss estimation perspective, while the absolute value of Average Annual Loss (AAL) concentrates in large high-income economies, the AAL as a proportion of annual capital investment primarily concentrates in lower-middle-income countries, particularly small island developing states. Additionally, comparing AAL as a proportion of capital stock and social expenditure reveals similar patterns [23].

Poverty drives risk through agricultural livelihoods, populations (farmers, low-income groups, urban informal settlement residents), and assets with high exposure and low resilience (Figure 2). Specifically, low-income groups in rural and urban areas often inhabit disaster-prone, environmentally harsh zones. For example, poor farmers' land often has lower productivity and weaker disaster resistance, while housing in suburban marginal areas faces higher geological disaster risks. From a disaster resilience perspective, first, due to limited access to land, technology, credit, and other productive assets, rural poor households in isolated or remote areas largely depend on rain-fed agriculture for livelihoods, making them highly vulnerable to seasonal climate variations. Even in regions where intensive disasters (such as catastrophic floods, tornadoes, and droughts) rarely occur, poor families frequently suffer from extensive disasters (such as rainstorms, flash floods, and hail) due to crop failures and damage. Second, market trade barriers, backward economic policies, and lack of infrastructure investment increase the vulnerability of agricultural livelihoods to varying degrees, reducing their recovery capacity and adaptability and amplifying the magnitude of disaster risk. Meanwhile, speculative fluctuations in global agricultural prices triggered by economic globalization exacerbate the vulnerability of smallholder markets. Finally, poor households often work in small and medium-sized enterprises and informal businesses (such as small farms) with limited and single-structured assets, weak resistance and recovery capacity when facing disaster impacts. For instance, informal enterprises in disaster-affected areas may go bankrupt due to disasters, damaging the supply chains of small companies that cooperate with them, thereby exacerbating potential risks for impoverished populations.

1.3 The “Fetters” of Disaster Risk and Poverty Through analysis of the driving mechanisms of disaster-induced poverty and poverty-induced risk, it is evident that a theoretical mutual correlation exists between disaster risk and poverty. Other scholars have referred to this as the disaster risk-poverty nexus [24], the disaster-poverty cycle (disaster \rightarrow poverty \rightarrow greater vulnerability \rightarrow more severe disaster) [25], or the cyclic disaster-poverty effect (vicious cycle of “disaster-induced poverty” and “poverty-return due to disaster”) [26]. This paper characterizes it as the “fetters” of disaster risk and poverty. Under the background of global climate change, disasters generate risk through hazard factor exposure, vulnerability of affected elements, and resilience, triggering casualties, asset destruction, and economic losses that lead to or exacerbate poverty levels. Meanwhile, against the backdrop of economic globalization and rapid urbanization, the high exposure and low resilience of agricultural livelihoods and assets among impoverished populations amplify and accumulate risk. This mutual correlation and binding effect may lead to deep, long-term poverty and, to some extent, induce the transformation of extensive risk into intensive risk (Figure 3). Accordingly, this paper proposes: - **Hypothesis 1:** Disaster risk exacerbates poverty levels. - **Hypothesis 2:** Poverty triggers and accumulates disaster risk.

2 Sample Selection and Data Sources

2.1 Sample Selection and Data Sources Existing literature indicates that disaster-induced poverty is significant at micro scales (household, city, intra-provincial regions) [27-30], while poverty-induced risk lacks empirical support. Considering that the disaster risk-poverty “fettters” may emerge in lower-middle-income countries and during critical poverty alleviation periods, and based on the continuity of historical disaster information, this study selects 31 Chinese provinces (autonomous regions and municipalities), excluding Hong Kong, Macao, and Taiwan, as research samples to demonstrate the intercorrelation effects between disaster risk and poverty at the provincial scale. Following national statistical standards, these are divided into eastern, central, and western regions. The eastern region includes 11 provinces (municipalities): Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. The central region includes 8 provinces: Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan. The western region includes 12 provinces (autonomous regions and municipalities): Sichuan, Chongqing, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Guangxi, and Inner Mongolia. The research time series spans 2010-2019. After supplementing and correcting missing data, 310 sample groups were selected for panel data processing. Historical disaster data and related indicators were sourced from the National Bureau of Statistics, while poverty data came from the *China Rural Poverty Monitoring Report*.

2.2 Variable Definition and Measurement **Disaster Risk Measurement.** Disaster risk metrics include occurrence probability and impact intensity, where disaster impacts are further divided into direct and indirect effects. Disaster occurrence probability has a significant relationship with its intensity (return period) and prediction timeframe [31]. For example, a 100-year flood has a 1% probability of occurrence within one year. In risk estimation without considering scenario differences, probability can be ignored or indirectly reflected by disaster frequency. Disaster impacts include casualties (deaths, injuries, missing persons, affected individuals), asset destruction (house damage, crop losses, infrastructure damage), and economic losses (direct and indirect economic losses). Referencing previous research [32-34] and considering the study area’s actual conditions, direct economic losses and agricultural disaster-affected area were selected to represent disaster risk. These were made dimensionless (using range method) and weighted equally to obtain the disaster risk index (R).

Poverty Measurement. Poverty involves multiple dimensions including economic welfare levels, individual capabilities, and social exclusion [35]. Measurement approaches are divided into absolute poverty and relative poverty. The former distinguishes poor from non-poor (wealthy) by establishing a poverty line, while the latter measures poverty proportion, degree, and depth through multiple indicators. This paper uses poverty incidence—the proportion of population below the poverty line—to represent poverty [36], defined as the poverty

index (Pov). During 2010-2019, poverty incidence in all provinces (autonomous regions and municipalities) showed a gradual decreasing trend, representing the critical period for implementing the “building a moderately prosperous society in all respects” and “poverty eradication” strategies proposed at the 18th National Congress of the Communist Party of China.

Control Variables. The World Bank identifies causes of poverty including lack of income and basic living assets, weak national and social governance capacity, and lack of resilience to disasters. China’s five categories of poverty causes are illness, disaster, education, weak labor capacity, and other reasons. This paper selects rural household per capita healthcare consumption expenditure (H), rural household per capita education and entertainment consumption expenditure (E), and rural per capita disposable income (I) as control variables for the poverty index, and rural per capita disposable income (I) and rural per capita consumption expenditure (C) as control variables for the disaster risk index. Here, H, E, and I reflect poverty effects due to illness, education, and other causes, while I and C determine households’ resistance and recovery capacity when facing natural disasters, influencing disaster risk magnitude. Variables H, E, I, and C were made dimensionless (range method). Variable definitions and measurements are shown in Table 1.

3 Model Selection and Empirical Results

3.1 Model Selection When using panel data for regression analysis, it is necessary to consider whether to select a fixed effects model, random effects model, or pooled OLS model. First, an F-test determines whether to use a pooled OLS or fixed effects model. F-test results show: for the disaster-induced poverty model, $F(3, 276) = 14.12$ with $p = 0.0000$; for the poverty-induced risk model, $F(3, 276) = 24.67$ with $p = 0.0000$, both rejecting the null hypothesis. Second, the Hausman test further confirms whether to use a fixed effects or random effects model. Since the random effects model treats individual effects as part of the disturbance term, it requires that explanatory variables be uncorrelated with individual effects—a condition not required by the fixed effects model. The Hausman test results show: for the disaster-induced poverty model, $\chi^2(3) = 14.74$ with $\text{Prob} > \chi^2 = 0.0000$; for the poverty-induced risk model, $\chi^2(3) = 18.23$ with $\text{Prob} > \chi^2 = 0.0000$, thus both reject the null hypothesis and establish fixed effects models. This paper uses Stata15 software to conduct fixed effects model analysis.

The constructed models are:

Model 1 (Disaster-Induced Poverty):

$$Pov_{it} = \alpha_i + \beta_1 R_{it} + \beta_2 H_{it} + \beta_3 E_{it} + \beta_4 I_{it} + \varepsilon_{it}$$

Model 2 (Poverty-Induced Risk):

$$R_{it} = \alpha_i + \beta_1 Pov_{it} + \beta_2 I_{it} + \beta_3 C_{it} + \varepsilon_{it}$$

Where:

- Pov_{it} is the poverty index (poverty incidence)
- R_{it} is the disaster risk index
- H_{it} is rural household per capita healthcare consumption expenditure
- E_{it} is rural household per capita education and entertainment consumption expenditure
- I_{it} is rural per capita disposable income
- C_{it} is rural per capita consumption expenditure
- β represents coefficients
- α_i is the constant term reflecting cross-sectional individual characteristics
- ε_{it} represents the residual term
- i denotes province (autonomous region or municipality)
- t denotes year

3.2 Descriptive Statistics The disaster risk index has a mean of 0.31, standard deviation of 0.27, maximum of 1.00 (Sichuan Province in 2013), and minimum of 0.00 (Tianjin in 2010). Other samples with values greater than 0.90 include Inner Mongolia Autonomous Region (2018), Heilongjiang Province (2013), and Yunnan Province (2013), reflecting high disaster risk levels in these provinces. The poverty index has a mean of 8.02%, median of 5.30%, maximum of 49.20% (Tibet Autonomous Region in 2010), and minimum of 0.00% (multiple provinces in 2019). Provinces with poverty incidence exceeding 20% include Guizhou, Yunnan, Gansu, Tibet, and Xinjiang during certain periods—these are key areas for China's poverty alleviation efforts. Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang, and Guangdong show poverty incidence below 1.00%, reflecting easier poverty eradication in economically developed regions. Standard deviations of all control variables are less than 0.30, indicating small data fluctuations and high stability, making regression analysis results reliable (Table 2).

3.3 Regression Analysis In the regression analysis process, control variables (H, E, I) and the dependent variable (Pov) were first entered to form Model 1. Next, the independent variable (R), control variables (H, E, I), and dependent variable (Pov) were entered to form Model 2 for Hypothesis 1 verification. Then, control variables (I, C) and dependent variable (R) were entered to form Model 3. Finally, the independent variable (Pov), control variables (I, C), and dependent variable (R) were entered to form Model 4 for Hypothesis 2 verification. Regression results are shown in Table 3.

In Model 2, the regression coefficient of independent variable R is 0.234 ($P < 0.01$), indicating that natural disaster risk has a significant positive driving effect on poverty. That is, the larger the crop disaster-affected area and direct economic losses caused by disasters, the higher the poverty incidence, thus verifying Hypothesis 1. In Model 4, the regression coefficient of independent variable Pov is 0.412 ($P < 0.01$), indicating that poverty has a significant positive amplifying effect on disaster risk. That is, areas with higher poverty incidence experience

greater disaster impacts and risks, verifying Hypothesis 2.

To further explore the spatiotemporal differences in Hypotheses 1 and 2, time series and spatial cross-sectional regression analyses were conducted on the panel data, with results shown in Table 4. Shandong and Gansu provinces show significant disaster-induced poverty effects ($P < 0.01$), while Heilongjiang and Tibet also show some significant effects ($P < 0.05$). Hainan shows no significant effect. Gansu's regression coefficient is significantly larger than Shandong's, indicating that disaster risk fluctuations in Gansu cause larger absolute changes in poverty incidence. Hebei shows a negative coefficient ($P = 0.106$), presenting a conclusion contrary to Hypothesis 1. Regarding poverty-induced risk, Heilongjiang, Shandong, and Gansu show poverty incidence significantly affecting regional disaster risk levels, while Tianjin and Zhejiang show significant negative relationships between poverty incidence and disaster risk index. That is, as poverty incidence decreases, disaster risk levels increase—obviously, rapid increases in exposure of population, economic, and social assets are important factors driving disaster risk growth in these regions. Shandong and Gansu exhibit the disaster risk-poverty “fettters,” and comparing trends in crop disaster-affected area and poverty incidence in both provinces further confirms this (Figure 4).

[Figure 4: see original paper]

4 Discussion

This study demonstrates three main viewpoints: (1) From a logical reasoning perspective, disaster risk and poverty exhibit a “fetter” relationship, manifested as a “disaster-induced poverty” effect driven by hazard factor exposure, resilience of affected elements, and risk scenario differences, and a “poverty-induced risk” effect amplified by the high exposure and low resilience of livelihoods and assets among impoverished populations. (2) From an empirical testing perspective, against the backdrop of building a moderately prosperous society and implementing poverty eradication strategies, China from 2010-2019 exhibited significant “disaster mitigation for poverty reduction” effects brought by rapid investment in disaster prevention and mitigation, as well as “poverty reduction for risk reduction” effects achieved through regional holistic poverty eradication. (3) The causal relationship between disaster risk and poverty (closed-loop or cyclic relationship) is not a “natural phenomenon” but a historical function of the mainstream economic-social paradigm, influenced by inequality, disordered urbanization, and poor governance. This socially constructed and driven multi-dimensional, multi-level causal cycle will offset global DRR efforts and even generate intensive disaster risks [37]. This challenge is no longer latent or weak and should not be long ignored or underestimated. The dilemma and predicament that “modern social development inevitably leads to disaster risk-poverty fettters” requires interdisciplinary research and innovative thinking to resolve.

Comparing with previous research, viewpoint (1) aligns with theoretical analyses by Gordy [16] and Wen Guang and Gong Qianwen [1-2, 9]. Disaster-induced

poverty at micro scales (household, city, intra-provincial region) has been confirmed [27-30], and this paper verifies it at the meso scale (domestic provincial level). Viewpoint (2) confirms poverty-induced risk phenomena and evidence documented in literature [16, 21-23] within China's provincial scope. Existing research lacks macro-scale empirical verification of the mutual influence mechanism between disaster risk and poverty across countries. The authors attempted empirical testing using panel data from 30 lower-middle-income countries with complete historical disaster records but did not pass significance tests, indicating that the relationship shows strong scale and regional sensitivity at the national/global level, or that driving mechanisms differ from meso and micro scales—representing a future research challenge.

Further analyzing eastern, central, and western differences (Table 4), the eastern region shows statistically significant disaster mitigation for poverty reduction effects. That is, against the national poverty eradication backdrop, high-quality economic foundations and urban development continuously drive and support regional, urban, and household resistance (absorptive capacity), recovery capacity, and adaptive adjustment capacity when facing natural disasters. Despite increased quantity and value of exposed elements, risk reduction brought by enhanced disaster resilience remains significant, leading to performance bonuses of 率先脱贫 (poverty incidence of 0.40% by end of 2019). The central region shows statistically significant poverty reduction for risk reduction effects. That is, holistic poverty eradication projects implemented in central and western regions have greatly reduced poverty incidence (from 14.05% to 2.50%), thereby containing and slowing the trend of increasing natural disaster risk fluctuations to some extent. The western region, influenced by natural and historical factors, did not show intercorrelation between disaster risk and poverty during the study period. Temporally, 2013 showed more significant disaster-induced poverty effects ($P < 0.05$), while 2018 showed significant poverty-induced risk effects ($P < 0.05$). Overall, except for Shandong and Gansu provinces, provincial heterogeneity of the disaster risk-poverty “fetters” is not obvious, while the eastern and central regions show some regional heterogeneity.

Based on these viewpoints, we argue that: (1) Continuously advancing multi-dimensional DRR strategies (national, urban, community) and implementing high-quality social and economic construction and development will comprehensively consolidate poverty alleviation achievements and effectively prevent poverty relapse. In the causal relationship where economic and social development achieves comprehensive poverty eradication and avoids rebound, the role of DRR should be fully leveraged and regulated. (2) In the context of global climate change, economic globalization, and China's critical period of high-quality urbanization, governments and DRR stakeholders (such as enterprises and capital owners) at all levels should provide more political attention and financial investment, streamlining administration and delegating power in regional joint control and community autonomy to enable innovation and practice in disaster mitigation and social governance strategies that suit local conditions. (3) In years when major natural disasters rarely occur, attention should be paid to

the asset erosion and livelihood impacts of thousands of extensive disasters on populations that have escaped poverty. Policies preventing relapse into poverty should be considered alongside improving public health and welfare, blocking epidemic and infectious disease transmission, and limiting unsustainable economic and social development, achieving benign interaction between good governance and ecological protection in the DRR process.

5 Conclusion

In the process of tracing disaster risk origins, this study identifies poverty and inequality as important drivers of extensive risk [38], thereby demonstrating the relationship between disaster risk and poverty. This research systematically identifies the driving pathways of disaster-induced poverty and poverty-induced risk, using econometric “hypothesis testing” methods to confirm the existence of disaster risk-poverty “fettters” at China’s provincial level. The study concludes that: (1) The bidirectional driving of disaster risk and poverty is an inevitable outcome of frequent natural disasters and free market economic operation. Recognizing and curbing this closed-loop effect will bring multiple socioeconomic benefits such as welfare growth, resilience dividends, and risk mutual assistance, while also helping to harness and tame capital to serve rather than dominate the people. (2) China’s poverty eradication strategies, including ecological poverty alleviation, targeted poverty alleviation, and sustained poverty reduction, have eliminated absolute poverty while enhancing grassroots governance capacity and amplifying the effectiveness of community autonomy, embodying people-centered and democracy-led thinking. (3) In regions where relative poverty repeatedly emerges, the positive role of disaster risk management in preventing poverty relapse should be emphasized, integrating DRR measures (such as land planning, disaster insurance, and climate migration) into poverty governance practices to loosen the “fettters” of disaster risk and poverty.

This study expands the theoretical framework of disaster risk attribution and management to some extent, helping different regions establish long-term mechanisms for addressing relative poverty [39], and providing intellectual support and decision-making references for achieving rural revitalization, modernizing national governance systems and capabilities, and building a moderately prosperous society in all respects.

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Note: Figure translations are in progress. See original paper for figures.

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