Ecological Economics and Management
https://www.sciltp.com/journals/eem

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The Impact of Natural Resource Endowments on Regional Economic Resilience: The Effect of Government Finances and Regional Heterogeneity

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How To Cite: Du, J.; Qi, X.; Han, J. The Impact of Natural Resource Endowments on Regional Economic Resilience: The Effect of Government Finances and Regional Heterogeneity. *Ecological Economics and Management* **2026**, *2*(2), 10. https://doi.org/10.53941/eem.2026.100010

Received: 9 May 2026
Revised: 16 June 2026
Accepted: 23 June 2026
Published: 29 June 2026

Abstract: Economic resilience can help promote a region's economic stability, maintain development, and ensure an advantageous international competitive position. This study constructs an econometric model of 285 Chinese cities using panel data spanning 2003–2020 to analyze the effect of natural resource endowments on regional economic resilience, with government fiscal behavior as a potential mechanism. The results indicate that natural resource endowments contribute to regional economic resilience, but its impact is influenced by regional characteristics and government fiscal behavior. Additionally, among the eastern and western regions, medium-sized cities, and resource-based cities, natural resource endowments significantly influence regional economic resilience. Finally, government fiscal expenditures and revenues have a threshold effect on the correlation between natural resource endowments and a region's economic resilience. The results suggest that government should formulate reasonable policies for natural resource exploitation and development, increase support for small- and medium-sized cities, optimize its fiscal behavior, strengthen regional cooperation, and promote innovative development.

Keywords: natural resource endowment; economic resilience; government finance

1. Introduction

Under modern globalization, the economic resilience of national regions has become a focal academic and policy area [1]. A region's economic resilience is linked not only to the stability and sustainability of the region's development but also to global economic stability [2]. Natural resource endowments refer to the diversity and abundance of mineral deposits, hydraulic resources, agricultural resources, and so on [3,4]. As a populous developing country, China attracts considerable attention in terms of the characteristics and challenges of its regional economic development. The selection of China as a research case is of special significance because of its complex and representative factors resulting from uneven regional development, resource endowments, and economic resilience across regions [5,6]. Examining China's regional economic resilience can provide lessons and inspiration for other developing countries and regions.

Previous research focuses primarily on the relationship between economic growth and natural resource abundance [7,8]. Relatively few studies investigate the effects of an ample supply of natural resources on regional economic resilience. In particular, the existing research contains a notable gap on the impact of regional characteristics and government fiscal behavior on this relationship. The resilience of regional economies does not depend solely on the strength of the economy and flexibility of policies; natural resource endowments also play an important role. The presence and use of natural resources have a major effect on the vitality and adaptability of regional economies [9,10]. Understanding how natural resource endowments relate to economic robustness can

help policymakers assess the potential risks of regional economic promotion [11]. Regional economic resilience plays a crucial role in coping with natural disasters, economic crises, and other uncertainties and provide empirical support for regional disaster preparedness, economic recovery, and sustainable development [12].

In prior studies find that regions with abundant natural resources generally have greater economic resilience because they rely on resources for industrial restructuring and economic growth [13,14]. However, some contrary findings suggest that natural resource endowments do not always increase economic resilience and that overexploitation of resources and environmental problems can have an adverse effect on economic stability [15].

Hence, this study aims to examine this relationship in depth to reveal its intrinsic relationship from a more comprehensive and detailed perspective and provide policymakers with a scientific basis for decision-making. This study offers several contributions. First, this study examines the moderating effect of regional characteristics on the correlation between natural resource endowments and local economic resilience. Specifically, this study examines the eastern, western, and central regions of China, as well as small and medium-sized cities, and cities based on natural resources. The results suggest that local governments need to consider the characteristics of the region when formulating their development strategies to better utilize natural resources to enhance economic resilience. Second, this analysis emphasizes the role of government fiscal behavior. The results indicate a threshold effect of government fiscal expenditure and revenue in this relationship. This finding emphasizes the importance of the government in enhancing the resilience of the urban economy through natural resource endowments. The policy implication is that governments must take appropriate measures in these areas to ensure that natural resource endowments do enhance regional economic resilience. Through these combined analyses, this study offers a comprehensive analysis of the effect of resilience on local economies from various perspectives and suggests targeted recommendations for local governments to formulate relevant policies.

2. Literature Review

Research on the effect of natural resource endowments on the resilience of regional economies has gradually increased in recent years. Previous studies argue that the economic growth of a region is largely determined by the natural resource endowments, with a focus on resource-rich regions [16]. However, as the threats of environmental change and resource scarcity have become more prominent, some new studies address on the complex correlation between natural resource endowments and regional economic resilience and present some interesting insights and findings [17].

On the one hand, some studies suggest natural resource endowments have a positive effect on the resilience of regional economies. Countries with abundant natural resources tend to experience higher economic growth [18,19]. Similarly, economic diversification is more likely to occur in countries rich in natural resources, thereby reducing their overdependence on resources and increasing their economic resilience [20]. Some case studies verify the positive effect of natural resource endowments on the resilience of regional economies. For example, Norway's petroleum resources greatly contributed to the country's economic growth and industrial diversification, which became one of the key factors of the country's economic resilience [21].

On the other hand, some scholars argue that natural resource endowments do not necessarily translate into greater regional economic resilience [22]. Natural resource-rich countries often suffer from a resource curse, which can result in increased economic instability and vulnerability due to overexploitation and dependence on resources [23]. Similarly, while mining resource endowments contribute significantly to economic growth, the economy can become highly sensitive to fluctuations in the international market; therefore, its economic resilience is relatively low [24]. Furthermore, regions with rich natural resource endowments tend to suffer from environmental problems and resource overconsumption, which may negatively affect regional economic resilience in the long run [25].

In addition to the impact of natural resource endowments, some scholars focus on the important influence of government policies on a region's economic resilience. The stability and transparency of political systems are key factors in improving regional economic resilience [26]. The government's preventive measures and emergency response capacity are crucial for improving regional economic resilience [27]. At the policy and management levels, scholars propose strategies and measures to enhance the economic resilience of natural, resource-rich regions. The key to increasing the economic resilience of resource-rich regions is strengthening environmental protection and sustainable development, which can be achieved by supporting the development of a green economy, strengthening environmental governance, and facilitating the application of innovative technologies [28]. In terms of policy formulation, several scholars suggest measures to enhance the economic resilience of natural resource-endowed regions. Investments in infrastructure development, human resource development, and technological innovation and transfer can increase the resilience of the economies of resource-endowed regions [29]. In addition, promoting interregional cooperation and resource sharing can enhance regional economic

resilience [30]. In resource-endowed regions, broader social participation and democratic decision-making processes can enhance regional economic resilience, as they can promote effective management and equitable distribution of resources [31].

Several studies present other meaningful insights and findings that deepen the understanding of the correlation between natural resource endowments and regional economic resilience. For example, the impact of natural capital varies according to its type and variety. Regions with diversified natural resource endowments are more resilient in the face of economic crises because they can cope with crisis shocks by adjusting their resource utilization and industrial structure [32]. Compared with regions with different types of resource endowments, hydro-rich regions are more resilient to economic crises because they can reduce their dependence on imported energy, thereby reducing the effect of external shocks on the economy [33]. Other studies examine how natural resource endowments affect local socioeconomic development and quality of life. The development of social services and infrastructure in regions has been found to be significantly influenced by natural resource endowments, which, in turn, positively or negatively affect people's quality of life [34]. For example, oil-rich regions tend to provide better infrastructure and social security, thereby increasing residents' welfare. However, this can also lead to overexploitation of resources and environmental damage, creating a range of social, economic, and environmental problems for the region [35].

Other scholars examine the link between the spatial distribution of natural resource endowments and regional economic resilience [36]. For example, the spatial distribution of natural resource endowments affects the resilience of regional economies. Regions with natural resource endowments concentrated in specific geographic areas face environmental challenges in multiple directions, whereas regions with decentralized resources tend to be more resilient [37]. Other scholars focus on the time dimension of this relationship [38]. Natural resource endowments may positively affect regional economic resilience over time, though overexploitation and dependence may increase economic instability and vulnerability [39]. Therefore, sustained resource management and development strategies are essential to maintain regional economic resilience.

Some research now concentrates on the connection between endowments with natural resources and non-economic factors of regional economic resilience [40]. The culture and history of resource-endowed regions strongly influences regional economic resilience [41]. High levels of culture and education can help foster innovation and creativity, thereby making local economies resilient [42]. In conclusion, the effect of natural resource endowments on the resilience of a regional economy is a comprehensive issue that involves several spatial, temporal, political, social, and environmental aspects [43,44]. An in-depth study of the correlation between natural resource endowments and regional economic resilience can provide governments and policymakers with appropriate policies and measures to promote sustainable development and enhance the resilience of regional economies [45].

This literature review reveals that natural resource endowments may have a beneficial impact on regional economic resilience, though with some negative effects. Therefore, in-depth research is needed on the connection between natural resource endowments and the resilience of regional economies to understand its inner workings and formulate appropriate policies and management measures.

3. Theoretical Analysis and Hypotheses

3.1. Economic Resilience

Economic resilience refers to the ability a country, territory, or organization to maintain stability and respond quickly to external shocks and challenges [46,47]. This concept originated from reflections on economic crises and emphasis on the risk resistance and resilience of economic systems [48]. Globalization is increasing international economic interdependence and the risks and challenges from financial market volatility, natural disasters, trade conflicts, and so on. Economic resilience is thus a key metric for assessing the robustness of an economy and its potential for sustainable development. The evolution of economic resilience is a long-term process that involves various fields and dimensions. First, a diversified economic structure is the foundation of economic resilience [49]. An economically resilient economy usually has a diversified industrial structure and market, such that even if one industry or market is hit, other areas can withstand some of the pressure and mitigate the overall economic shock. Second, supply and demand resilience are important components of economic resilience [50,51]. When an economy faces an external shock, resilience in supply and demand can help to quickly adjust output and prices to changes in market demand, thereby reducing the impact of the shock. A sound financial system, which includes adequate financial liquidity, effective risk-management mechanisms and regulatory systems, and transparent and stable financial markets, is also important for economic resilience [52]. This can provide a stable source of financing to support firms and individuals in coping with shocks. The ability to adapt and innovate is an

important element of economic resilience [53,54]. A resilient economy can adapt to change and act quickly to address new challenges. Innovation is an important part of this process; through scientific, technological, and institutional innovation, economies can adapt better to change and find new sources of growth. Third, social stability is a prerequisite to economic resilience [55]. Social stability, social order, and political stability ensure smooth functioning of the economy and help make it resilient to shocks.

3.2. Natural Resource Endowments and Regional Economic Resilience

Natural resource endowments are the pattern of regions specializing in the production of products in different sectors as a result of differences in the type, quantity, and quality of its natural resources [56]. Strongly linked to regional economic resilience, regions develop economically based on their natural resources.

Natural resource endowments can promote the diversification of the regional economy [57]. Resources vary by region; for example, coastal regions have rich marine resources, whereas inland regions can be rich in coal and mineral resources. Regional economies can develop corresponding industries according to their own natural resource advantages, generate a rational economic structure, reduce dependence on a single industry, and improve their resilience to external shocks. Additionally, natural resource endowments can provide abundant economic growth drivers [58]. For example, regions with abundant hydropower resources could develop hydropower industries to provide clean energy and promote sustainable economic development. The effect of natural resource endowments on regional economic resilience also manifests in the resource compensation capacity [59]. When regions are exposed to external shocks, the presence of natural resources can provide an economic compensatory capacity to improve economic conditions and increase resilience to external shocks through the sale and development of resources.

Several factors also influence the correlation between natural resource endowments and regional economic resilience. The first is the type and value of natural resources. Resources with high value-added and strategic importance (e.g., oil and rare metals) can contribute to regional economic resilience because they are more likely to lead to high incomes and economic growth [60,61]. The second factor is the extent to which natural resources can be exploited. Certain natural resources may have technical or environmental protection limitations that make them less susceptible to large-scale development, limiting their regional economic resilience. The third factor is the substitutability of resources. Certain natural resources can be replaced with alternative resources, whereas other resources cannot. Non-substitutable natural resources have a greater effect on local economic resilience because they provide a unique competitive advantage.

Several mechanisms may explain how natural resources provide resilience. The first is the direct role of resources. Natural resources can directly provide raw materials and energy support to the regional economy and promote industrial and economic development [62]. The second factor is the spillover effect of resources. Using and exploiting natural resources drives the growth of related industries, forming industrial clusters, and the regional economic driving effect. The third factor is the resource flow effect [63]. Natural resource endowments not only generate effects through direct development and utilization in the region but also through international trade and resource flows. For example, resource-poor regions can obtain support through imports and international resource exchange, thereby increasing their regional economic resilience.

In summary, prior studies indicate a strong correlation between natural resource endowments and regional economic resilience. The type, quality, and degree of exploitability have varying degrees of impact on regional economic resilience. Natural resource endowments promote the diversified development of the regional economy through the mechanisms of direct resource, spillover, and flow effects; provides economic growth impetus; and enhances regional economic resilience to external shocks. However, natural resource endowments require measures such as resource allocation optimization, strong technological innovation, and international resource cooperation to be effective.

It is worth noting that the aforementioned positive correlation has an institutional basis in the Chinese context. Firstly, the transfer payment mechanism under the tax-sharing system incorporates fiscal revenue from resources into the redistribution channel, effectively curbing the inefficient dissipation of resource rents. Secondly, the extractive industries, mainly composed of state-owned enterprises, possess a certain counter-cyclical stabilizing function, providing a buffer for regional employment and fiscal revenue during external shocks. Thirdly, the local extension of the upstream and downstream industrial chains in the extractive industry promotes regional economic diversification and reduces the reliance on a single resource. These three mechanisms together form a theoretical bridge for transforming resource endowments into economic resilience assets in the urban context of China, which is different from the common “resource curse” transmission logic seen in developing countries. Therefore, this study proposes the following hypothesis:

H1: *Natural resource endowments enhance regional economic resilience.*

3.3. Threshold Effects of Government Fiscal Behavior on Natural Resource Endowments

Government financial behavior is directly linked to regional economic promotion and stability [64]. Changes in general budget revenues and expenditures will directly affect the allocation and utilization of financial resources within a region, which in turn will have far-reaching consequences on the region's economic structure, productivity, and social welfare. Therefore, taking these two variables as threshold variables helps clarify the impact of government financing on regional economic resilience more accurately. When the government fiscal revenue exceeds a certain level, it may trigger positive economic effects and increase regional economic resilience. Fiscal revenues can increase government investment in infrastructure construction and public services and improve regional infrastructure and social welfare levels, thus increasing the competitiveness and adaptability of local economies [65,66]. In the context of globalization, the quality and quantity of infrastructure are crucial for local economic development. Therefore, the government must increase its investment in infrastructure development to improve the regional infrastructure conditions. Second, the government could increase its investment in public services to improve social welfare in the area, increase the human capital and innovation capacity of the region, and enhance its adaptability and risk resistance.

Government revenue falling below a certain level may trigger negative economic effects, thereby reducing regional economic resilience. Low fiscal revenues may lead to the government's inability to adequately meet the public needs of the region, limiting the construction of infrastructure and provision of social services, which, in turn, have implications for the region's economic development and resilience [67]. Restrictions on the government's investment in infrastructure construction will lead to stagnation in the conditions of transportation, energy, and communication infrastructure, directly affecting the region's economic development and resilience. In addition, low fiscal revenues may make the government unable the demand for public services in the region. Public services such as schooling, healthcare, and social security in the region cannot be effectively improved, which also affects how the region develops and becomes resilient.

When government fiscal spending exceeds a certain threshold, it may trigger positive economic effects and increase regional economic resilience. High fiscal spending can promote economic growth, increase employment, and improve social welfare, which in turn increases a region's economic competitiveness and resilience [68]. High fiscal spending stimulates economic growth, especially via investments in science and technology innovation and industrial development. High fiscal expenditure leads to the development of related industries and promotes economic growth and expansion. This increases the productive capacity of the region and improves its resilience and risk tolerance. The government can create more employment opportunities by increasing investments in public and social services. High fiscal spending leads to an increased demand in related industries and promotes an active labor market. This will improve social stability and the income level of residents, and enhance a region's economic resilience.

By investing in education, science and technology innovation, human resource training, and other areas, the government can influence the quality of human resources and the region's capacity for innovation and enhance its competitiveness and sustainable development capacity [69]. However, fiscal expenditure below a certain level, investment in these areas is limited, hampering regional human capital accumulation and the capacity to innovate and reducing regional economic resilience. This is because, when fiscal revenues fall or fiscal pressures increase, the government often needs to reduce investment in these areas, thereby affecting regional human capital accumulation and innovation capacity enhancement. This may lead to problems such as a lack of educational resources, slow scientific and technological innovation, and brain drain, thus reducing regional competitiveness and sustainable development capacity. Therefore, this study proposes the following hypothesis:

H2: *Government fiscal behavior has a threshold effect on natural resource endowments, enhancing urban economic resilience.*

4. Research Design

4.1. Empirical Modeling

This study employs a fixed-effect model for several reasons. First, individual differences often exist between regions, such as the level of education, number of enterprises, and population size. The model should include controls for these individual differences may affect regional economic resilience to accurately judge the correlation between natural resource endowments and the economic robustness of the region. Second, when using ordinary least squares (OLS) regression models, the presence of time-invariant omitted variables can lead to biased estimates. In contrast, a fixed-effects model can eliminate the time-invariant omitted variable bias through

individual fixed effects, thus estimating the effect of resource endowment on regional economic resilience more accurately. Third, in the study of natural resource endowments and economic resilience, the relationship between variables may change over time. The use of fixed-effects modeling can control for different dynamic trends between individuals, making the estimation results more accurate. This is particularly important because the relationship can only be better understood by controlling for individuals' dynamic characteristics. Thus, the measurement results become more reliable, and a greater statistical inference can be drawn between natural resource endowments and economic resilience in the region. The following regression model is constructed as follows:

$$\mathrm{Rec}_{it} = \alpha_0 + \alpha_1 \mathrm{Res}_{it} + \alpha_i \mathrm{Controls}_{it} + \delta_i + \mu_t + \varepsilon_{it}, \quad (1)$$

where Rec_{it} represents regional economic resilience, Res_{it} represents natural resource endowment, $\mathrm{controls}_{it}$ represents multiple control variables that may affect regional economic resilience, μ_t is the time fixed effect, δ_i is the region fixed effect, and ε_{it} is a random error term. A positive coefficient of α_1 indicates that natural resource endowments positively affect urban economic resilience and supports hypothesis H_1.

Further, to explore the possible mechanism by which natural resource endowments enhance regional economic resilience, that is, to verify H_2, this study constructs Model (2) based on Model (1) to test the relationship using a threshold effect model:

$$\mathrm{Rec}_{it} = \beta_0 + \beta_1 \mathrm{Res}_{it} \times \mathrm{I}(\mathrm{Adj}_{it} \le \theta) + \beta_2 \mathrm{Res}_{it} \times \mathrm{I}(\mathrm{Adj}_{it} > \theta) + \alpha_i \mathrm{Controls}_{it} + \delta_i + \mu_t + \varepsilon_{it}. \quad (2)$$

Equation (2) is the single-threshold scenario. For the threshold value and its number, the model is expanded to a multi-threshold scenario according to the econometric test of the sample data. In this model, Adj is the threshold variable and θ is the critical value of the threshold. I(·) is the schematic function with the result of 0 or 1, where the value is 1 when it meets the condition of inequality, and 0 otherwise. According to the aforementioned theoretical analysis, general budget revenue and expenditure were selected as the threshold variables.

4.2. Variables and Data Sources

4.2.1. Explained Variable

The variable explained in this study is regional economic resilience (Rec). At present, there are two main methods for measuring the economic resilience of regions. The first is the economic resilience index, which usually synthesizes several sub-indicators, such as economic growth, employment rate, market competitiveness, and disaster preparedness. The second measure is the city's GDP growth rate. By analyzing a city's GDP growth rate, we can visualize whether the city economy has the capacity to adapt and recover quickly. Second, the strength of a city's economy against external shocks is reflected in its GDP growth rate. If a city can maintain a high GDP growth rate despite challenges, it indicates strong economic adaptability and resilience. In addition, a stable GDP growth rate can indicate the city's ability to resist risk and quickly recover from external shocks. Therefore, this study adopts the regional GDP growth rate as local economic resilience [70]:

$$\mathrm{Rec}_{it} = \frac{\Delta G_i - \Delta G_n}{\Delta G_n} \quad (3)$$

$$\Delta G_i = \frac{G_{it} - G_{i,t-1}}{G_{i,t-1}} \quad (4)$$

$$\Delta G_n = \frac{G_{nt} - G_{n,t-1}}{G_{n,t-1}} \quad (5)$$

where Rec_{it} denotes the economic resilience of region i in year t; ΔG_i denotes the change in regional GDP of city i in year t relative to year t − 1, and ΔG_n denotes the variance in national GDP in year t relative to year t − 1 derived from the growth rate of national GDP; G_{it} and $G_{i,t-1}$ are the GDPs of city i in year t and year t − 1; G_{nt} and $G_{n,t-1}$ are the national GDP in year t and year t − 1.

It is particularly important to note that the relative GDP growth rate indicator employed in this study reflects the economic resilience concept from two perspectives: Firstly, in years of systemic shocks (such as the 2008 financial crisis and the 2020 pandemic), this indicator directly quantifies the differentiated resilience and recovery capabilities of cities compared to the national overall situation; Secondly, during non-shock periods, a consistently high relative growth rate reflects the inherent stability and adaptive adjustment capabilities of the urban economic structure, which aligns with [46] "evolutionary resilience" framework's emphasis on the system's sustained adaptability. This measurement approach is consistent with that of [70] and has been widely adopted in relevant domestic and foreign literature [12].

4.2.2. Core Explanatory Variables

This study uses the share of employment in extractive industries in the total employment in the secondary industry (Res) as a measure of natural resource endowments, which can intuitively capture an economy's dependence on natural resources. Extractive industries usually rely directly on natural resources, and the share of their employment in the total employment in secondary industries can reflect the importance and contribution of natural resources in the economy. A higher proportion implies that the region is endowed with natural resources, and plays a greater role in supporting the economy. The efficiency and scale of regional resource utilization can be assessed by analyzing the share of resources employed by extractive industries. A low share of employment in extractive industries may indicate underutilized resources and development potential, or that the region is poor in natural resources.

Under the constraint of data availability, objective stock indicators that directly measure regional resource endowments (such as mineral reserves, resource abundance index) are difficult to obtain at the city level, and there are issues such as inconsistent statistical standards. The employment share of the extractive industry, as a proxy variable for resource endowments, has an economic logic as follows: A city maintaining a high proportion of employment in the extractive industry usually requires that the local area has resource reserves that can be scaled up for exploitation. This reflects the objective shaping effect of resource endowments on the economic structure. This measurement approach is consistent with the practices of [9,16], other literature, and is considered to be able to balance the information of both resource stock and development intensity.

4.2.3. Threshold Variables

This study chooses general budget revenue (Inc) and general budget expenditure (Exp) as threshold variables for government fiscal behavior as these are important indicators of the national or local economy. These two indicators cover many aspects of economic activities, including taxes, government expenditures, and investments, and provide comprehensive economic information. General budget revenues and expenditures are an important part of the government's financial statistics, and their data are usually collected, organized, and released by relevant government agencies with a high degree of reliability, openness, and transparency.

4.2.4. Control Variables

The control variables mainly include road passenger transportation (RPT), using the natural logarithm of regional road passenger transportation; education level (Edu), as the natural log of primary plus lower secondary enrollments; health care level (Hos), as the natural logarithm of the number of hospitals; population density (Pop), as the natural logarithm of the number of total population/area; industrial structure (VSG), as the ratio of tertiary sector GDP to secondary sector GDP; Unemployment (Une), as the natural logarithm of the number of registered unemployed persons in cities and towns at the end of the year; Productivity (Pro), as the natural logarithm of the average number of employees on the job; and Enterprise Size (Cor), as the natural logarithm of the number of industrial enterprises above the scale. Descriptive statistics of the main variables are shown in Table 1.

Table 1. Descriptive statistics of the main variables.

Variable Type	Name	N	Obs.	Mean	SD	Min	Max
Explained variable	Regional economic resilience	Rec	5114	0.272	1.154	−10.210	48.440
Explanatory variable	Natural resource endowment	Res	4849	0.106	0.283	−0.001	9.104
Control variables	Educational level	Edu	5116	5.260	0.818	2.485	8.265
	Medical level	Hos	5115	3.926	0.833	0.000	7.479
	Road passenger traffic	RPT	5086	8.346	1.027	2.197	12.570
	Industrial structure	VSG	5130	0.943	0.530	0.094	5.348
	Population density	Pop	5130	5.727	0.916	1.548	7.923
	Number of unemployed persons	Une	5094	9.781	0.826	6.653	19.090
	Productivity levels	Pro	5112	3.362	2.963	−0.073	18.660
	Enterprise size	Cor	5114	5.448	1.323	1.099	9.824
Threshold variables	General budget income	Inc	5130	164.9	427.6	1.340	7165
	General budget expenditure	Exp	5130	285.1	527.6	3.310	8352

4.2.5. Data Sources

Considering the lack of sample data or different statistical calibers used in Hong Kong, Macao, and Taiwan, this study analyzes data on 285 municipal units in China. Raw data on regional economic resilience, natural resource endowment, and government finance were obtained from the 2003–2020 China Statistical Yearbooks, China Urban Statistical Yearbooks, and China Population and Employment Statistical Yearbooks. Additionally, individual missing values in the data were computed using linear interpolation.

5. Empirical Analysis

5.1. Benchmark Regression

The results in Table 2 show that natural resource endowments significantly affect the resilience of a regional economy, when no control variables are included and the only individual cases are fixed (Column (1)). Second, the effect of natural resource endowments on the resilience of a regional economy is meaningful at the 1% level after including the control variables and fixing only the individual case (Column (2)). The inclusion of these controls provides more accurate estimates the effect of natural resource endowments on regional economic resilience, which makes this finding more convincing. Finally, the effect of natural resource endowments on regional economic resilience remains within the 1% level of significance after adding the control variables and fixing the individual and year cases in Column (3) of Table 2, which strengthens the findings. Furthermore, the baseline regression revealed that the coefficient of the industrial structure variable VSG was significantly negative. This result seems to contradict the conventional perception that a service-led economy is conducive to enhancing economic resilience. In fact, it reflects the unique situation of urban industrial evolution in China: at present, the increase in the proportion of the tertiary industry in most cities is not due to the internal growth of high-end productive services, but rather to a considerable extent due to the "passive de-industrialization" caused by the relative decline of manufacturing. The expansion of the service sector dominated by low-end non-tradable services not only fails to form effective technological innovation and employment absorption effects, but may also exacerbate the fragility of the economic structure, thereby having a negative impact on regional economic resilience. This finding suggests that future policy-making should focus on promoting the quality upgrade of the service sector rather than simply expanding its quantity. Hence, Hypothesis H1 is supported.

Table 2. Benchmark regression.

Variables	(1) Rec	(2) Rec	(3) Rec
Res	0.255 ***	0.217 ***	0.210 ***
	(4.14)	(4.77)	(5.74)
Edu		0.073	−0.003
		(0.59)	(−0.02)
Hos		0.036	0.022
		(0.88)	(0.60)
RPT		0.102 ***	0.024
		(2.88)	(0.89)
VSG		−0.296 ***	−0.138 *
		(−4.70)	(−1.80)
Pop		−0.173	−0.190
		(−1.34)	(−1.36)
Une		0.026	0.033
		(0.62)	(0.83)
Pro		0.008	0.132 **
		(0.57)	(1.97)
Cor		0.038	0.101 *
		(0.79)	(1.67)
Year	No	No	Yes
Id	Yes	Yes	Yes
_cons	0.256 ***	−0.344	0.117
	(39.28)	(−0.37)	(0.14)
N	4845	4778	4778
R2	0.002	0.012	0.028

Note: t statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.2. Robustness Tests

5.2.1. Alternative Explained Variables

To further validate the main findings, this study replaces the explained variable (Recit = ΔGi/ΔGn), and re-runs the empirical analysis. The results in Column (1) of Table 3 indicates that even using an alternative explained variable, the results still indicate a significant effect of natural resource endowments on regional economic resilience, further validating the main findings.

Table 3. Robustness test.

Variables	(1) Rec	(2) Rec	(3) Rec	(4) Rec	(5) L. Rec	(6) Rec
Res	0.210 ***		0.169 ***		0.136 ***	0.208 ***
	(5.74)		(5.68)		(7.62)	(5.85)
ress		0.030 *				
		(1.78)				
L. Res				0.094 ***		
				(2.73)		
Edu	−0.003	0.059	0.080	0.024	−0.004	0.001
	(−0.02)	(0.23)	(0.38)	(0.14)	(−0.03)	(0.01)
Hos	0.022	0.031	0.080 *	0.024	0.013	0.024
	(0.60)	(0.74)	(1.90)	(0.58)	(0.35)	(0.64)
RPT	0.024	0.021	0.062 **	0.022	−0.001	0.026
	(0.89)	(0.70)	(2.10)	(0.78)	(−0.03)	(0.94)
VSG	−0.138 *	−0.119	−0.046	−0.136	−0.166 **	−0.144 *
	(−1.80)	(−1.40)	(−0.57)	(−1.63)	(−2.49)	(−1.79)
Pop	−0.190	−0.235	0.007	−0.251	−0.101	−0.195
	(−1.36)	(−1.35)	(0.04)	(−1.50)	(−1.22)	(−1.37)
Une	0.033	0.026	0.041	0.033	0.024	0.035
	(0.83)	(0.54)	(0.99)	(0.80)	(0.89)	(0.88)
Pro	0.132 **	0.135*	0.370 ***	0.126 *	0.080 *	0.131 *
	(1.97)	(1.67)	(3.80)	(1.69)	(1.92)	(1.95)
Cor	0.101 *	0.081	0.298 ***	0.105	0.231 ***	0.107 *
	(1.67)	(1.23)	(3.90)	(1.53)	(5.53)	(1.71)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Id	Yes	Yes	Yes	Yes	Yes	Yes
_cons	1.117	0.204	−3.680 ***	0.458	−0.576	0.070
	(1.37)	(0.19)	(−2.62)	(0.45)	(−1.04)	(0.08)
N	4778	3987	4493	4490	4493	4707
R2	0.028	0.022	0.044	0.028	0.037	0.028

Note: t statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.2.2. Alternative Explanatory Variables

To ensure that the research findings were robust, we replaced the indicators for the core explanatory variables in the model. Among them, the measure of natural resource endowments in the core explanatory variables is replaced by the share of extractive industry employment in the number of employees in the secondary industry with the number of employees in the extractive industry (ress) to avoid the "diluting" effect of the total number of employees on the results. These changes can improve the accuracy and reliability of the main results. Column (2) of Table 3 shows that the effect of natural resource endowments on regional economic resilience remains significant.

5.2.3. Excluding the COVID-19 Pandemic Sample Years

The COVID-19 pandemic that broke out at the end of 2019 could have affected a city's economic resilience. This study therefore excluded the sample in 2020 and retained only the data from 2003 to 2019 for the regression analysis. This better reflects the economic development of a city before a major crisis. The results in Column (3) of Table 3 indicate that natural resource endowments still affect regional economic resilience.

5.2.4. Lagged Explanatory and Explained Variables

After lagging both the explanatory (L.Res) and interpreted variables (L.Rec) by one period, the results in Columns (4) and (5) of Table 3, indicate that natural resource endowments is positively associated with economic resilience in the region, thus enhancing the socioeconomic system's ability to adapt to external shocks.

5.2.5. Excluding Outlier Municipalities

Given that the four municipalities of Beijing, Tianjin, Shanghai, and Chongqing have special characteristics in terms of economic policies and development levels that are similar to those at the provincial level, they were excluded from the sample to mitigate the effects of statistical differences. This approach allows for a more accurate assessment of the correlation between endowments with natural resources and other variables, leading to a deeper understanding of how natural resources influence economic development and social change. The results in Column (6) of Table 3 remain positive and significant.

5.3. Heterogeneity Analysis

5.3.1. Regional Heterogeneity

The heterogeneity analysis in Columns (1)–(3) of Table 4 indicate that the effect of natural resource endowments on a region's economic resilience is positive and meaningful in the eastern and western regions, and insignificant in the central region. Abundant resources in the East and West help these areas deal with outside shocks and risks and enhance their economic resilience. In the central area, natural resources are not the main driver of economic resilience; other factors, such as industrial structure and policy support, may be more important. The central region has abundant agricultural resources but relatively low density of mineral resources. The economic driving effect of its resource endowment structure is weaker than that of the eastern and western regions. More importantly, the central region has long been in a policy-ground of "central depression", with weaker industrial policy support than the east and weaker infrastructure for resource development than the west. This has led to the double suppression of the industrial chain driving effect of resource endowment [27]. At the same time, the proportion of small cities in the central region is high, and the agglomeration capacity of central cities is insufficient, which hinders the development of the resource-industry-resilience transmission chain. In the East and West, governments can utilize abundant natural resources to promote economic resilience. However, in the central region, the government should focus on industrial restructuring to enhance the region's economic resilience.

5.3.2. Urban Scale

This study finds varying effects based on the size of the city, as show in Columns (4) and (5) in Table 4. The effect of natural resource endowments on regional economic resilience is positive and meaningful for small and medium cities, while the effect is insignificant for large cities. In small- and medium-sized cities, abundant natural resources can effectively enhance regional economic resilience and help cities cope with external shocks and risks. However, natural resources are not a major factor in large cities' regional economic resilience. Large cities exhibit a stronger "agglomeration economies" effect–diversified industrial structure, high-density knowledge spillover networks, and strong technological innovation capabilities, making human capital, scientific and technological innovation, and the deepening of the service sector the main sources of economic resilience [49]. Under this structural feature, resource endowments merely serve as one of many sources of resilience, and their marginal contribution tends to be statistically insignificant. Moreover, large cities are more sensitive to external demands, and their economic resilience depends more on their position in the global value chain and their ability to cope with financial risks rather than local resource stocks. For small and medium-sized cities, governments can fully utilize local natural resources to promote economic resilience.

5.3.3. Resource Endowment Heterogeneity

In response to resource endowment heterogeneity, the effect of natural resource endowments on local economies' resilience was explored for non-resource- and resource-based cities, and the results in Columns (6) and (7) of Table 4 indicate variability. Among non-resource-based cities, the effect of natural resource endowments on local economies' resilience is positive and meaningful but only passes the 10% significance level. By contrast, the effect of natural resource endowments on local economies' resilience is more significant among resource-based cities. In non-resource cities, natural resource endowments enhance economic resilience, which can help them cope with external risks and challenges. In resource-based cities, natural resource endowments have a more meaningful effect on the resilience of local economies, which can be effective in promoting the sustainable development of the urban economy.

Table 4. Heterogeneity analysis.

Variables	(1) East	(2) Central Region	(3) Western Region	(4) Large Cities	(5) Small/Medium-Sized Cities	(6) Non-Resource-Based Cities	(7) Resource-Based Cities
Res	0.846 ***	0.216	0.123 ***	0.618	0.206 ***	0.732 *	0.176 ***
	(2.75)	(0.73)	(5.88)	(0.36)	(5.96)	(1.77)	(6.93)
Edu	0.426	−0.386 *	0.032	0.215	−0.005	0.053	−0.122
	(1.28)	(−1.92)	(0.47)	(1.68)	(−0.03)	(0.21)	(−1.50)
Hos	0.068	−0.029	0.038	−0.026	0.026	0.044	−0.025
	(0.86)	(−0.52)	(1.23)	(−0.29)	(0.68)	(0.90)	(−0.52)
RPT	−0.020	0.245 ***	−0.044	−0.132 *	0.032	0.032	0.019
	(−0.40)	(4.24)	(−1.28)	(−1.84)	(1.14)	(0.78)	(0.57)
VSG	0.040	−0.104	−0.356 ***	−0.030	−0.147 *	0.021	−0.377 ***
	(0.34)	(−1.00)	(−3.12)	(−0.21)	(−1.77)	(0.20)	(−3.90)
Pop	−0.678 ***	0.018	0.095	−0.097	−0.175	−0.199	−0.207
	(−2.70)	(0.05)	(0.80)	(−0.70)	(−1.16)	(−1.03)	(−0.99)
Une	0.083	−0.029	0.010	−0.112 *	0.040	0.055	0.006
	(1.36)	(−0.44)	(0.20)	(−2.00)	(0.96)	(0.94)	(0.12)
Pro	0.013	0.339 **	−0.017	−0.080	0.144 **	0.045	0.257 **
	(0.15)	(2.05)	(−0.33)	(−0.62)	(2.07)	(0.55)	(2.41)
Cor	0.347 ***	0.139 *	−0.151 *	0.101	0.109 *	0.126 *	0.088
	(3.44)	(1.72)	(−1.87)	(0.68)	(1.71)	(1.69)	(1.00)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Id	Yes	Yes	Yes	Yes	Yes	Yes	Yes
_cons	−0.751	−0.681	0.623	1.805	−0.141	−0.582	1.300
	(−0.48)	(−0.35)	(0.79)	(1.53)	(−0.16)	(−0.54)	(1.19)
N	1923	1826	1029	228	4550	2908	1870
R2	0.054	0.098	0.160	0.210	0.028	0.024	0.102

Note: t statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.4. Threshold Effects

Based on the theoretical analysis, there may be a nonlinear correlation between natural resource endowments, government financing, and economic resilience; that is, the positive effect of natural resource endowments on regional economic resilience may change based on the government's financing behaviors. Therefore, the number of thresholds was first tested in accordance with the model setup described in the previous section. To conduct this test, this study adopted the bootstrap method and drew samples 300 times. Threshold tests were conducted a different number of times during each sampling process. Table 5 presents the results. General budget revenue has a triple-threshold effect, whereas general budget expenditure has a double-threshold effect.

Table 5. Threshold effect model results.

Threshold Variable	Model	F-Value	*p*-Value	Threshold Value	95% Confidence Interval
Inc	Single threshold	9.16	0.000	18.670	[12.850, 19.710]
	Double threshold	5.25	0.030	72.020	[29.770, 124.275]
	Triple threshold	8.24	0.023	73.830	[72.020, 76.130]
Exp	Single threshold	9.48	0.000	62.820	[41.705, 65.930]
	Double threshold	5.87	0.007	152.951	[148.652, 156.548]
	Triple threshold	1.71	0.617	458.123	[441.730, 473.374]

From Model (1) in Table 6 with general budget revenue as the threshold variable, the three thresholds are 18.67, 72.02, and 73.83, respectively. When the threshold variable is below 72.02, the effect of natural resources on regional economic resilience was significant. When the threshold variable is above 72.02, the effect of natural resource endowments on regional economic resilience is no longer significant. This result reveals a threshold effect of natural resource endowments on local economies' resilience when general budget revenue is the threshold variable. As the value of natural resources increases, the spillover effect of regional economic resilience exhibits a significantly positive and nonlinear feature of a decreasing marginal effect.

During the period of low fiscal scale, local governments prioritize the provision of basic public services and have limited investment in resource development. The effect of resource endowment on enhancing economic resilience is constrained by infrastructure bottlenecks, and the estimated coefficient is relatively high (reflecting the relative marginal value of each unit of resource endowment under scarce fiscal support). In the stage of medium fiscal scale, the "developmental government" prioritizes the investment of fiscal surpluses in infrastructure and

the extension of resource industrial chains, enabling the activation of the transmission chain between resource endowment and resilience. The coefficient is significantly positive. When the fiscal scale exceeds the second critical value, fiscal redundancy may trigger government rent-seeking behavior or inefficient expenditure expansion (such as repetitive construction), and a highly fiscalized resource development model may strengthen industrial path dependence, thereby weakening or even negating the net positive effect of resource endowment on resilience, which is consistent with the finding in the empirical results that the coefficient tends to be insignificant.

Table 6. Threshold effect model regression results.

(1) General Budget Income		(2) General Budget Expenditure	
Explanatory Variable	**Estimated Coefficient**	**Explanatory Variable**	**Estimated Coefficient**
Inc ≤ 18.67	0.739 ***	Exp ≤ 62.82	0.723 ***
	(0.133)		(0.174)
18.67 < Inc ≤ 72.02	0.210 ***	62.82 < Exp ≤ 152.951	0.249 ***
	(0.034)		(0.048)
72.02 < Inc ≤ 73.83	3.315	Exp > 152.951	0.0660
	(2.855)		(0.066)
Inc > 73.83	−0.273		
	(0.210)		
Controls	Yes	Controls	Yes
Year	Yes	Year	Yes
Id	Yes	Id	Yes
Constant	−0.453	Constant	−0.475
	(0.915)		(0.912)
Observations	4778	Observations	4778
Number of cityid	285	Number of cityid	285
R-squared	0.019	R−squared	0.018

Note: t statistics in parentheses; *** $p < 0.01$.

In Model (2), with general budget expenditure as the threshold variable, the two thresholds were 62.82 and 152.951. When the threshold variable is below 152.951, the effect of natural resource endowments on the resilience of local economies is meaningful. Above the threshold of 152.951, the effect of natural resource endowments on regional economic resilience is no longer significant. When the general budget expenditure is less than the second threshold, the promotion effect of natural resources on local economic resilience is enhanced, and the positive and marginal effect of resources endowed by nature is still nonlinear and increasing. This result indicates that the effect of natural resources on local economies' resilience is not only influenced by their own level, but also by the moderating influence of the government's fiscal behavior, which is reflected in the positive interaction between general budget revenues and general budget expenditures. This finding suggests that governments need to consider the threshold effect when formulating policies and rationally utilizing and allocating natural resources to improve the resilience of local economies. Thus, H_2 is supported.

6. Discussion

First, the main analysis and robustness tests confirm that natural resource endowments increase the resilience of local economies, which has several explanations. Natural resource endowments can provide basic resources such as energy and raw materials to support the development and growth of the regional economy while driving the development of related industrial chains, promoting employment, and increasing income. In addition, regions with natural resource endowments can promote diversification of the regional economy through the development of service industries, such as tourism. This positive effect has multifaceted consequences for local economies. First, the growth and development of the regional economy provides more employment opportunities and income sources for residents, thereby improving their living standards. Second, the development of the regional economy can attract more investment and talent and promote modernization of the region. Finally, regional economic growth can drive economic development in adjacent regions, resulting in a stronger economic driving effect.

Second, the heterogeneity analysis indicates that natural resource endowments in the East and West have a meaningful positive effect on regional economic resilience, whereas this effect in the central region is not significant. This finding suggests a difference between natural resource endowments and economic resilience across regions, with the East and West being more likely to benefit from the enhancing effect of natural resource endowment. This variability is due to the different types of endowments of natural resources and levels of economic development between regions. The East and West are richer in natural resource reserves than the central region. For example, the eastern region is close to the sea and thus has rich marine resources, while the western region has more mineral, oil, and gas resources, and the central region's natural resources are mainly agricultural

and water resources. Therefore, the East and West are more likely to benefit from the enhancing effect of natural resources on economic resilience. The eastern region has a higher level of economic development and marketization relative to the central regions. Enterprises and industries in these regions are more concentrated with larger firms and greater innovation capacities. Consequently, it is easier for these regions to utilize their natural resource endowments to drive the growth of related industrial chains and economic growth.

Third, city size affects the correlation between natural resources and regional economic resilience. Natural resource endowments in small- and medium-sized cities have a substantial beneficial effect on regional economic resilience, whereas that in large cities does not. Small- and medium-sized cities may be more dependent on natural resources for their development, whereas large cities are more resilient in terms of economic diversification. This is because small and medium-sized cities tend to be more dependent on particular natural resources in their economic structures, such as agriculture and minerals. The natural resource endowments of these cities can, therefore, contribute more positively to their economic development. Large cities tend to have relatively diverse economies, relying not only on natural resources but also on a variety of areas such as services, manufacturing, and finance. Although large cities are also affected by natural resource endowment, their economic resilience depends more on other factors, such as human resources and scientific and technological innovation. Higher-level local governments should increase their support for small and medium-sized cities to promote sustainable development. For example, they can use tax incentives and infrastructure construction to attract and support business investment and thereby strengthen regional cooperation. Additionally, regions still have complementarities and dependencies. Therefore, local governments should strengthen regional cooperation and actively pursue resource sharing and technology exchange to promote coordinated regional development.

This study also finds that the heterogeneity of resource endowment affects regional economic resilience. In non-resource-based cities, natural resource endowments positively impact the resilience of regional economies. The effect of natural resources on the resilience of regional economies was more significant in resource-based cities. This suggests that resource-based cities are more likely to have greater economic resilience by fully utilizing natural resources. Cities with and without resources may also differ in the relationship between natural resources and economic resilience. As non-resource-based cities depend more on the development of other industries, natural resource endowments positively affect their economic resilience. In resource-based cities, the effect of natural resources on local economic resilience is more significant because their economic development is more directly constrained by the utilization of natural resources. In resource-rich areas, development should be restricted to prevent excessive depletion and pollution. For areas with scarce resources, this potential should be tapped to promote economic development.

From a dynamic perspective of the resource life cycle, the findings of this paper have significant implications for intertemporal policies. For cities in the period of abundant resources, when their fiscal revenues and expenditures are within the optimal range identified in this study, local governments should actively convert the resource tax surpluses into diversified industries and human capital investment, forming a systematic “transition reserve”. This forward-looking fiscal strategy can effectively smooth the sharp decline in resilience when resources enter the depletion stage, avoiding the “resource depletion–resilience collapse” predicament that some resource-based cities in Northeast China have already experienced. In other words, the fiscal behavior threshold effect revealed in this paper not only has policy implications in the cross-sectional sense, but also constitutes a dynamic transformation incentive mechanism across the resource life cycle.

Finally, the study also finds that government fiscal behavior has a threshold effect on natural resource endowment, enhancing urban economic resilience. This includes general fiscal expenditures and general fiscal revenues. Hence, governments must adopt appropriate measures related to fiscal expenditure and revenue to ensure that natural resource endowments can fully enhance the local economy’s resilience. This is mainly because urban economic development relies heavily on the government. Through fiscal expenditure and revenue, the government can regulate the direction and speed of urban economic development as well as support or restrict the development and utilization of natural resources. Insufficient government fiscal expenditures or unstable revenues may lead to inadequate development and utilization of resources, thereby affecting the resilience of the urban economy. Specifically, government fiscal spending directly affects urban economic resilience. Government investment in the development of natural resources and environmental protection can contribute to the sustainable development of the urban economy and increase its resilience. Additionally, unstable government revenue may hinder the government’s provision public services and the construction of infrastructure, thereby limiting the development and resilience of urban economies. Local governments must optimize their revenue and expenditure structures and rationally allocate financial resources to ensure that natural resource endowments do enhance the resilience of the local economy.

This study shows that, although natural resource endowments have a beneficial effect on local economies' resilience, its role in economic growth is gradually weakening. Local governments should promote innovative development, strengthen technological and scientific innovation, introduce talent, boost cities' and regions' competitiveness, and aim to realize sustainable development. Technological progress and innovation should improve resource utilization efficiency and development capacity, reduce dependence on resources, and improve regional economic resilience. In addition, governments at higher levels should strengthen international cooperation and the exchange of resources, leverage international trade and resource flows, and make the regional economy more resilient to external shocks through resource complementarity and cooperation with other regions.

In terms of limitations, this study employs a broad, non-specific definition of natural resource endowment, which could include water, land, and forest, resources. Future research can further analyze the impact mechanisms and paths of each type of natural resource on a city's economic resilience. By comparing the impacts of different types of natural resources, it is possible to gain a better understanding of how natural resource endowments affect urban economic resilience. In addition, future research could consider natural resource endowment, government financial behavior, and other factors (such as urban demographics, industrial structure, and technological innovation) to analyze their combined impact on urban economic resilience. By establishing a comprehensive model, the interactions between different factors can be better revealed, thereby providing systematic and comprehensive guidance for enhancing urban economic resilience.

Author Contributions

Conceptualization, J.D. and J.H.; methodology, J.D. and J.H.; software, J.H. and X.Q.; writing—original draft preparation, J.D. and J.H.; writing—review and editing, J.D. and X.Q.; visualization, X.Q.; project administration, J.D.; funding acquisition, J.D. All authors have read and agreed to the published version of the manuscript.

Funding

This research was funded by the Philosophy and Social Sciences Planning Project of Anhui Province grant number AHSKQ2022D022.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data used in this study are derived from publicly available databases, and detailed sources are described in the manuscript. Further data are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

No AI tools were utilized for this paper.

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