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Effect of Energy Poverty Alleviation on High-Quality Economic Development: An Empirical Study Based on China

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Abstract: High-quality development (HQD) has been listed as the first and foremost task in building a modern socialist country in all respects and also an overarching issue of China's economic and social development in the new era. To achieve economic HQD, a key approach lies in integrating energy development with poverty alleviation and fully leveraging the foundational role of energy infrastructure and supply services in reducing poverty. Using the provincial panel data from 2007 to 2017, this paper analyzes the impact of energy poverty alleviation on economic HQD from multiple dimensions in an empirical way and draws the following conclusions: first, energy poverty alleviation drives the economic growth of China's eastern region and western region, but it cannot effectively promote the synchronous economic growth of the central region, thereby resulting in a greater imbalance in regional development; second, energy poverty alleviation has an effect on reducing the urban–rural income inequality, and such an effect is more significant in the western region; and finally, energy poverty alleviation has a significant effect on promoting economic HQD, and the effect is more significant in the central region and the western region. Furthermore, the transmission mechanism of energy poverty alleviation driving HQD is tested. It is found that energy poverty alleviation can drive HQD by promoting urbanization and technological progress.

Keywords: energy poverty alleviation; economic growth; urban–rural income inequality; China's high-quality development; urbanization; technological progress

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1. Introduction

The 18th National Congress of the Communist Party of China, the CPC Central Committee, and the state council have made unprecedented efforts to advance poverty alleviation with a focus on severely poverty-stricken areas and special vulnerable groups. In return, China has eliminated regional poverty, eradicated extreme poverty, and witnessed the final victory in the fight against extreme poverty. In recent years, the energy industry has implemented targeted poverty alleviation, accelerated the transformation of energy resource advantages into economic and social development advantages, and effectively improved the "self-development" function of poverty-stricken areas and vulnerable groups. However, there are still practical problems in remote areas of China, such as incomplete energy infrastructure, heavy energy burden on low-income households, and some residents being unable to effectively access or consume sufficient modern energy. They are facing long-term, widespread, complex, and diverse energy poverty problems. In addition, the increasing sources of global instability and risk points have led to increasingly prominent energy supply shortages, seriously threatening national energy security. It is urgent to explore and establish a long-term mechanism for energy de-escalation.

The transformation of China's economy from high-speed development to high-quality development is a result of the evolution of China's economic development practice and development theory [1–3]. The Report to the 20th National Congress of the Communist Party of China announced to accelerate the creation of a new development pattern and pursue HQD and highlighted HQD as the first and foremost task in building a modern socialist country in all respects. It should be noted that although both HQD and "quality of economic growth" evaluate economic effectiveness from "quality", "development" has a more extensive and diverse meaning than "growth" [4]. China's energy transformation is based on high-quality development, accelerating the construction of a clean, low-carbon, safe, and efficient new energy system, which can provide strong energy security for high-quality economic development. By taking energy as the best way to poverty alleviation, this paper clarifies the influence mechanism of energy poverty alleviation on China's HQD. It not only provides a different breakthrough point for the study on the current energy construction layout, energy poverty, and other effects, but it also provides a new perspective for the study on the path to economic HQD in the current stage.

In fact, the academic community has conducted extensive discussions and studies on the poverty alleviation effect of infrastructure. Many pieces of literature analyze the poverty reduction effect of infrastructure from different levels such as case, theory, and empirical analysis. We classify the poverty alleviation effects of infrastructure into direct and indirect effects. Most of the literature related to direct poverty alleviation efforts focus on the effect of infrastructure in promoting economic growth, income level, and social welfare. Ref. [5] pioneered depicting the endogenous economic growth brought about by government productive technology expenditure represented by infrastructure, and then scholars began to study the impact of infrastructure on such economic development issues as income growth [1,6], total factor productivity [7], regional economic efficiency [8], labor production efficiency [9], and ecological environment [10] and such social welfare issues as residents' health [11] and family happiness [12]. As public goods or quasi-public goods, infrastructure should shoulder the mission of improving income distribution. If infrastructure aggravates inequality, it loses the nature of public goods. In this sense, the income distribution effect of infrastructure must not be ignored, especially when pursuing HQD. This paper will further refer to the relevant literature on infrastructure promoting income inequality and regard such pieces of literature as evidence indicating the indirect poverty alleviation effect of infrastructure.

Wealth inequality has become a serious problem at the political, economic, and social levels in China [13]. If we shift our focus to the country's urban–rural divide, the "inequality reducing effect" of infrastructure for narrowing China's urban–rural income inequality is certainly one of the most popular research issues. Infrastructure has varying degrees of impact on the income of urban and rural residents. It is also complementary with human capital. Therefore, infrastructure contributes higher return in rich areas, and richer areas will see higher investment in infrastructure, which may lead to income inequality and have a significant effect on urban–rural income distribution. China's urban–rural income inequality is not only an important measure of income inequality but also the primary cause of worsened overall income inequality [14,15]. Based on a study, Ref. [16] found that infrastructure construction such as transportation infrastructure improves urban–rural income equity through human capital and labor transfer effects. Ref. [17] drew the same conclusion. According to the study of Ref. [18], public infrastructure investment affects productivity and income distribution; regardless of the financing method for public infrastructure, the increase in government public investment will exacerbate income inequality in the long term, and the substitution between growth and inequality depends on the level of externalities, the financing policy of public investment, and the span of time. Ref. [19] concluded that the improvement of transportation infrastructure has increased the accessibility between urban and rural areas. However, because of the agglomeration effect in cities, capital and skilled labor from rural areas have gradually moved to urban areas, thus restricting the access of residents who stay in rural areas to social welfare and even making them poorer in this process. This situation is an unfavorable factor for urban–rural income equality. By analyzing the expressway data from the geographic information system (GIS), Ref. [20] found that expressway accessibility helps to reduce urban–rural income inequality in China. By reviewing the urban–rural income distribution effect of infrastructure, Ref. [16] concluded that infrastructure represented by transportation infrastructure can increase the income of urban and rural residents and has a greater effect on increasing the income of rural residents, which helps to transfer rural labor to non-agricultural sectors and increase the marginal labor productivity of the agricultural sector and the income of rural residents.

Although many scholars have discussed the economic effects of public infrastructure, this article believes that there may still be some shortcomings in the existing research. On the one hand, existing research on public infrastructure mostly focuses on transportation infrastructure, with insufficient emphasis on the economic effects of energy infrastructure. On the other hand, existing research on the economic effects of energy infrastructure mainly focuses on aspects such as economic growth and household income and has not yet focused on the quality of economic development and income inequality. This study fills the gaps in existing research from these two aspects.

In this regard, this paper empirically tests the impact of energy poverty alleviation on economic HQD and tries to achieve innovation in the following aspects: First, for the first time, this paper clarifies the action mechanism of energy poverty and economic HQD and discusses the specific path for direct effect and indirect effect to promote economic HQD. Second, this paper divides economic HQD into three dimensions, including economic growth, urban–rural income inequality, and HQD, hoping to empirically test the different aspects of energy poverty alleviation in driving economic HQD. Moreover, this paper further tests the regional heterogeneity of energy poverty alleviation and stresses that attention should be paid to regional balance and differential policy implementation. Third, this paper explores how energy poverty alleviation promotes economic HQD through urbanization, technological progress, and other specific paths, enriching the path study of economic HQD.

2. China's Energy Poverty and HQD: Characteristic Facts and Mechanism Analysis

2.1. Characteristic Facts of China's Energy Poverty

The World Energy Outlook published by the International Energy Agency (IEA) in 2012 defined energy poverty as the absence of access to electricity, clean fuels, and energy facilities, coupled with a high reliance on traditional fuels. (According to a report published by the IEA, energy poverty indicates a lack of access to affordable electricity or other modern clean energy services and high dependence on traditional fuels. The report China's Regional Energy Poverty Index formulated China's energy assessment index system from four dimensions, including energy service accessibility, energy consumption cleanness, energy management adequacy, and household energy consumption affordability and efficiency.) According to the statistics of the IEA, hundreds of millions of people around the world have no access to the modern energy essential for daily life, and the global COVID-19 pandemic further delayed efforts to tackle energy poverty. Up to now, approximately 2.8 billion people worldwide continue to depend on traditional energy sources, such as coal, charcoal, biomass, crops, and animal manure. According to the relevant statistics, 2.8 million people die from indoor pollution every year, of which 44% are children and 33.6% are women. Energy poverty becomes a prominent issue demanding a prompt solution. China has undergone over three decades of rapid economic growth, resulting in a significant improvement in people′s living standards. China has made significant progress in eliminating energy alleviation. However, it still has a long journey ahead to eliminate energy poverty in all aspects. Energy facilities are taken as an example in this paper. At present, there is a significant regional inequality in China's facilities, with power grid density and natural gas pipeline density as typical ones. (The power grid density and the natural gas pipeline density are measured with the length of power transmission and distribution lines and the length of natural gas pipelines per national land area, respectively). (Grid density formula: Total kilometers of transmission line circuits at the voltage level of

35 kV and above/land area of the province [municipality]; unit: km/km^2.) Three coastal provinces (municipalities), including Shanghai, Tianjin, and Jiangsu, had the highest power grid density in 2019, reaching 1.625, 1.050, and 0.921, respectively. Three inland provinces (autonomous regions), including Qinghai, Xinjiang, and Inner Mongolia, had the lowest power grid density of 0.047, 0.051, and 0.101, respectively. Compared with data from 2004, Qinghai, Inner Mongolia, and Xinjiang achieved the fastest growth in terms of power grid density while Shanghai, Beijing, and Guizhou saw the slowest growth. Three coastal provinces (municipalities), including Shanghai, Tianjin, and Jiangsu, had the highest density of natural gas pipelines, reaching 5.061, 2.491, and 0.833, respectively; three inland provinces, including Qinghai, Gansu, and Xinjiang, had the lowest density of natural gas pipelines, reaching 0.003, 0.008, and 0.009, respectively. Compared with data from 2004, Guizhou, Zhejiang, and Guangxi achieved the fastest growth of natural gas pipeline density while Chongqing, Tianjin, and Beijing experienced the slowest growth.

After 40 years of evolution, China's energy poverty alleviation policy system has been gradually improved, and remarkable achievements have been made in energy poverty alleviation. According to the Report on Achievements of China's Energy Alleviation (2020), China has fully ensured power access for 40 million people without electricity and become the first developing country that guaranteed the power access of all its people. "Three Regions and Three Prefectures" and the three-year action for upgrading the power grid in border villages significantly improved the basic production and living electricity conditions for more than 19 million people in more than 210 national poverty-stricken counties of severely poverty-stricken areas. ("Three Regions" refers to the Tibet Autonomous Region, the Tibetan areas of Qinghai, Sichuan, Gansu, and Yunnan provinces, as well as Hetian, Aksu, Kashi, and Kizilsu Kyrgyz in the south of Xinjiang Autonomous Region. "Three Prefectures" refers to Liangshan prefecture in Sichuan, Nujiang prefecture in Yunnan, and Linxia prefecture in Gansu.) The rural electrification rate reached 18%, rising by 7% compared to that in 2012. The proportion of clean energy to the rural total energy consumption has risen greatly, and the consumption of crop straw and firewood has declined significantly. Farmland pump wells have been fully provided with electricity, reducing agricultural irrigation cost by more than RMB 10 billion. Photovoltaic power stations with a total power of 26.36 million kW have been completed nationwide for poverty alleviation, which bring about RMB 18 billion through power generation every year and benefit the nearby 60,000 poverty-stricken villages and 4.15 million poverty-stricken households. The total investment in major energy projects in poverty-stricken areas have exceeded RMB 2.7 trillion since 2012, effectively promoting local economic development and increasing fiscal revenue. With the transformation from "energy advantage" to "economic advantage", energy poverty alleviation has provided significant support for serving China's economic HQD, achieving the final victory in the fight against poverty and building a well-off society in all aspects. This paper follows the energy poverty index calculated by the existing research [13] to describe the overall development of energy poverty alleviation in China. The index provides material for studying the development of China's energy poverty alleviation and its economic effects. According to the index, China′s energy poverty shows a declining trend. The rapid development of China′s economy has provided a solid economic foundation for the development of clean energy (such as solar and wind energy) and the construction of natural gas infrastructure. The level of clean energy development is relatively high. For example, eastern coastal provinces and southern provinces, such as Shandong, Jiangsu, Zhejiang, Fujian, and Guangdong, have higher clean energy popularization rates and lower energy poverty levels; the economic development level of the northern and western provinces is relatively low, especially with the northern provinces needing a lot of energy for heating in winter, and the cost is high. For example, the energy shortage in Liaoning, Jilin, Heilongjiang, Inner Mongolia, Xinjiang, Qinghai, Gansu, and Ningxia has led to serious energy poverty. Some projects, such as transmission of electricity from the west to the east, transmission of natural gas from the west to the east, and some policies, such as replacement of coal with electricity and natural gas, play an important role in optimizing the allocation of resources, improving the energy structure and alleviating energy poverty.

2.2. Theoretical Mechanism of Energy Poverty Alleviation and HQD

Poverty alleviation is the key to China's strategic goal of building a well-off society in all aspects, and the importance of infrastructure in national economic and social development is self-evident. As complex areas featuring resource and energy enrichment, ecological fragility, and economic poverty, poverty-stricken areas have never been beyond the extensive development model, and their economic growth is also subject to the economic environment, while being supported and guaranteed by environmental factors [21–23]. The impact of energy poverty alleviation on HQD is mainly reflected in the fact that the development of energy infrastructure not only drives consumption, employment, and income growth but also serves as a key factor in determining the location selection and production factors of enterprises. According to the neoclassical theoretical model of economic growth, increased investment in infrastructure can bring about capital accumulation and directly drive economic growth. Moreover, infrastructure is a bridge connecting all sustainable development goals and also the key to achieve industrial sustainability, building efficient cities and alleviating poverty. See Figure 1 for the corresponding mechanism analysis process.

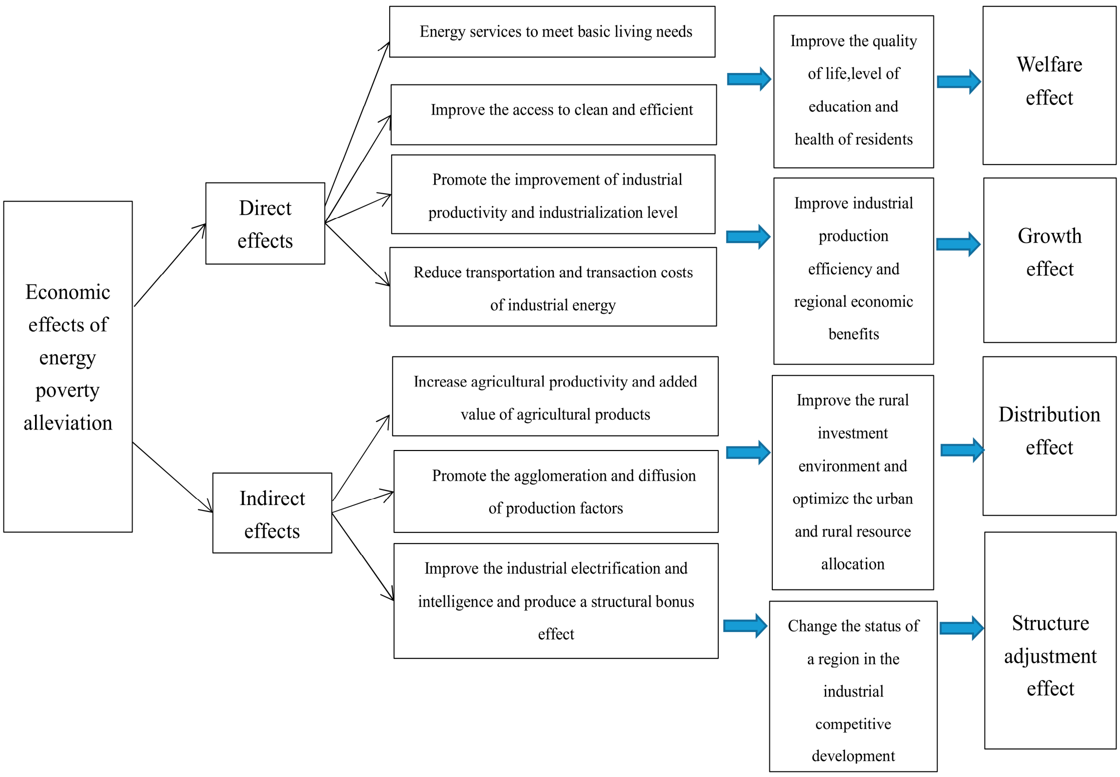

Figure 1. Conceptual framework of energy poverty alleviation affecting HQD.

2.2.1. Direct Effect: Welfare and Growth Effects of Energy Poverty Alleviation

In general, the most direct impact of energy poverty alleviation on HQD is the income growth effect and social welfare effect. Plenty of previous pieces of literature have analyzed the effect of infrastructure on increasing income and improving social welfare from different levels, such as cases, theoretical models, and empirical estimations. First of all, energy poverty alleviation can significantly improve social welfare. On the one hand, the improvement of residents' energy access conditions is a significant sign of energy poverty alleviation because the basic needs of people for energy in daily life can be met, the living energy demand can be guaranteed, the tense situation of energy supply is alleviated temporarily, the level of energy consumption is improved greatly, and residents have access to electricity and high-quality electricity in a high efficiency and can afford electricity at the same time. Therefore, the resident's life quality is improved significantly, thus promoting the welfare level of the whole society. On the other hand, the households in poverty-stricken areas are often unable to obtain clean and efficient energy to meet their basic living needs due to the limited affordability and energy accessibility, thus suffering from energy poverty. Low-efficiency combustions will produce indoor air pollution, which will seriously affect the health of residents. At the same time, residents spend too much time looking for fuel and reduce the time for education and other recreational activities, which will lead to a decline in social status and damage to family welfare. Energy poverty alleviation can significantly mitigate the adverse effects of poverty on social welfare. In addition, energy poverty alleviation has a significant economic growth effect. On the one hand, energy alleviation is the "booster" of industrial productivity, which helps to raise the industrialization level of poverty-stricken areas. The improvement of energy access conditions in the poverty-stricken areas can significantly reduce the transportation cost of electricity, natural gas, and other industrial energy and greatly lessen the consumption of energy for industrial equipment operation and product manufacturing. Therefore, industrial users will face lower transaction costs. On the other hand, the improvement of energy facilities, such as the increased coverage of power grids and natural gas pipelines, can empower the development of characteristic industries in poverty-stricken areas, enhance the driving force of regional independent development, and bring the comparative advantages of these areas into play. These things considered, they are enabled to develop and utilize reliable and clean energy resources to promote their own economic development and bring about direct economic benefits.

2.2.2. Direct Effect: Distribution and Structure Adjustment Effects of Energy Poverty Alleviation

In addition to its direct income growth and social welfare effects, energy poverty alleviation can also affect economic HQD by adjusting income distribution and industrial structure. First of all, energy poverty alleviation drives economic HQD by adjusting urban–rural income distribution. Energy poverty has become an important type of new poverty in China's rural areas, which is mainly reflected in the significant inequality between urban and rural energy use, relatively weak rural energy infrastructure, and serious environmental pollution. At present, the main types of energy poverty alleviation include distributed photovoltaic energy, hydropower, and biomass energy.

They are employed to enhance the marginal labor productivity of the agricultural sector and increase the income of rural residents by improving agricultural production efficiency, advancing the construction of modern agriculture, increasing the added value of agricultural products, and accelerating the transfer of rural labor to non-agricultural sectors. Meanwhile, the poverty alleviation using photovoltaic energy can improve the ecological environment in rural areas, utilize the local cheap small hydropower and biomass energy, promote the development of related industries in rural areas, and increase the income of local farmers. Considering this, the improvement of energy infrastructure has the function of regulating the agglomeration of production factors. It also helps improve the basic conditions of industrial agglomeration areas, boost the regional capacity for absorbing relocated industries, reduce the operating costs for enterprises in the agglomeration area, and support the formation and growth of industrial clusters. By improving the investment environment, promoting the optimal allocation resources, increasing job opportunities for residents, and raising the employment and salary levels of poverty-stricken areas, the poverty-stricken areas can benefit from the process of economic development, thus reducing the urban–rural income inequality. From the perspective of industrial spatial layout, energy poverty alleviation accelerates economic HQD by promoting industrial restructuring. In particular, the upgrading of industrial structure is an important path to China's economic HQD as the process of industrialization featuring the rapid development of heavy and chemical industries is coming to an end. Significant efforts are still needed to unlock the potential of energy efficiency in China's traditional industries. Fossil energy makes up a large part of the energy structure, and the proportion of coal consumption is still more than 50%, resulting in a lower energy utilization efficiency. Energy poverty alleviation can improve the electrification and intelligence level of different industries, effectively raise the production efficiency of various production sectors, and result in a strong structural bonus effect through the construction of energy infrastructure and the popularization of clean energy, so as to promote the upgrading of industrial structure and accelerate the economic HQD.

3. Modeling of Energy Poverty Alleviation and China's HQD

3.1. Empirical Modeling

This paper analyzes the relationship between energy poverty alleviation and HQD from the three aspects of regional economic growth, urban–rural income distribution, and HQD and discusses the regional heterogeneity of the economic growth effect and urban–rural income distribution effect caused by energy poverty alleviation and the impact of energy poverty alleviation on HQD. This article uses panel data estimation because panel data, which cover multiple individuals across different time points, have the main advantage of being able to analyze individual and temporal effects, as well as their interactions, effectively increasing the validity of the estimation results. Considering the differences in the characteristics of different provinces, this paper analyzes the impact of energy poverty alleviation on economic growth using a two-way fixed effects model. The regression model is as follows:

$$\text{Growth}_{i,t} = \beta_0 + \beta_1 \text{EP}_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_t + e_{i,t} \quad (1)$$

where the subscripts i and t refer to the province and year, respectively. The dependent variable Growth is the first-order difference (also the logarithmic growth rate) of the natural logarithm of actual GDP per capita to measure economic growth. The independent variable EP follows the energy poverty index calculated by existing research [13] as a proxy variable, and the author predicts that the estimated value of the coefficient β1 is less than zero, indicating that energy poverty is negatively correlated with economic HQD. This paper controls other factors (X) that affect economic HQD in the regression equation. Specifically, this paper uses the government scale (Gov) to control the degree of local government intervention in the regression equation, and government fiscal expenditure has a significant impact on the optimal allocation of resources in each region. In addition, this paper uses the ratio of regional government fiscal expenditure to regional GDP to measure government expenditure, the total import and export after being divided by GDP to control the opening to the outside world (Open), the financial development (FD) indicator to control the contribution of financial development to economic growth, and the ratio of loan balance to GDP to measure the financial development. The construction of transportation infrastructure (Infra) is added to control the impact of infrastructure on economic growth, and this variable is measured by the ratio of total length of highways and railways to area. Energy structure (Stru) is added, which is expressed as the proportion of clean energy production to total energy production. The advancement of industrialization and the change in institutional environment are also significant factors affecting economic growth, so the degrees of industrialization (Indus) and institutional environment (Inti) are included as control variables in the regression model. The model controls province fixed effects (μI) and year fixed effects (εI), which are used to capture the individual heterogeneity of provinces and the common economic growth trend of the country, respectively; ei,t is a random error term. See Table 1 for the definition of each variable.

Table 1. Variable definitions and descriptive statistics.

Variable	Description	Measure	Mean Value	Standard Deviation	Sample Size
lnHqd	HQD	Logarithmic value of HQD index	1.714	0.146	319
lnGrowth	Economic growth level	Logarithmic value of actual GDP per capita	10.221	0.580	319
Inequality	Urban–rural income inequality	Per capita disposable income of urban residents Ratio to per capita net income of rural residents	2.827	0.531	319
lnEP	Energy poverty	Logarithmic value of energy poverty index	−0.821	0.306	319
Gov	Government scale	Proportion of government expenditure in GDP	0.242	0.112	319
Open	Opening to the outside world	Proportion of import and export in GDP	0.303	0.366	319
FD	Financial development	Ratio of bank load balance to GDP	1.201	0.431	319
Infra	Infrastructure	Ratio of total length highways and railways to area	0.868	0.565	319
Indus	Degree of industrialization	Proportion of industrial added value in GDP	0.391	0.075	319
Stru	Energy structure	Proportion of clean energy production in total energy production	0.212	0.226	319
lnInsti	Institutional environment	Logarithmic value of marketization index	1.814	0.316	319

China is now in the crucial stage of HQD. The imbalance of urban and rural development and insufficient rural development are some of the most prominent structural social contradictions. Efforts of reducing the urban–rural income inequality and patterns of urban–rural integrated development are becoming the significant implications and playing a crucial role in China's HQD. In order to analyze the impact of energy poverty alleviation on the urban–rural income inequality, this paper refers to the methods of Ref. [24] and designs the following empirical model:

$$\text{Inequality}_{i,t} = \beta_0 + \beta_1 \text{EP}_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} + e_{i,t} \quad (2)$$

where $\text{Inequality}_{i,t}$ is the ratio of urban and rural income in the tth year of the province i and is also defined as the ratio of per capita disposable income of urban residents to per capita net income of rural residents. The core explanatory variable of the regression equation is the energy poverty alleviation index EP, which is measured in the same way mentioned above. The other control variable X is consistent with those in Formula (1). The author predicts that the ratio of per capita net income of urban households to disposable income of rural residents should be greater in the areas with higher energy poverty. It means that the estimated value of the coefficient β1 as the energy poverty index in Formula (2) should be greater than zero.

China's economy has shifted from economic growth to HQD. China's HQD index is used to measure the economic HQD level of each province. This paper refers to the China's HQD index system and the corresponding calculation results of Ref. [25] as the proxy indicator measuring the economic HQD level of each province (municipality directly under the central government). The author predicts that the EP coefficient β1 is less than zero, indicating that energy poverty is negatively correlated with the growth of economic HQD index.

This paper designs the following empirical model:

$$Hqd_{i,t} = \beta_0 + \beta_1 EP_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} + e_{i,t} \quad (3)$$

3.2. Data Specifications and Statistical Descriptions

With reference to the energy poverty alleviation index of Ref. [13], this paper empirically tests the effect of energy poverty alleviation on economic HQD. China's HQD index is used to measure the economic HQD level of each province. This paper refers to China's HQD index system and the corresponding calculation results of Ref. [25] as the proxy indicator measuring the regional economic HQD level. The remaining data, such as actual GDP per capita, GDP, urban–rural income inequality, government expenditure, total import and export, bank load balance, total length of highways and railways, and industrial added value, are collected from China's Statistical Yearbook of different years. The marketization index is the "Marketization index of China's regions". In particular, the National Bureau of Statistics of China conducted urban and rural integrated surveys on the household income and expenditure and living conditions since 2013 and adjusted the statistical criteria of disposable income of urban residents and rural per capita net income of rural residents. As a result, the data before 2013 and the data after 2013 are subject to different statistical criteria. This paper obtains the data before 2013 after calculations using the comparable statistical criteria of urban and rural integrated surveys on the income and expenditure and living conditions by the National Bureau of Statistics of China. The processing ensures the consistency of statistical criteria for the indicator data. (Since 2013, the National Bureau of Statistics of China has conducted urban and rural integrated surveys on the household income and expenditure and living conditions and published detailed data on the per capita disposable income of urban residents and the per capita disposable income of rural residents. Based on the data from open sources prior to 2013, it is not feasible to further break down wage and salary income within the per capita disposable income of urban residents and the per capita net income of rural households. Consequently, this paper uses the per capita disposable income of urban residents and the per capita net income of rural households as approximate substitutes.)

4. Empirical Result Analysis of Energy Poverty Alleviation and China's HQD

4.1. Energy Poverty Alleviation and Economic Growth

Table 2 reports the empirical results about the impact of energy poverty alleviation on economic growth. As shown in Column (1), the EP coefficient is statistically significant at the level of 1%, indicating that energy poverty alleviation has a significant promotive effect on economic growth and coinciding with the conclusion of the theoretical analysis. In the test of control variables, opening to the outside world contributes to economic growth, which also passes the significance test in the region-based test, and improved infrastructure construction can better promote economic development. This conclusion is also confirmed in the region-based test and accords with realistic empirical judgments. The empirical analysis of financial development's impact on economic growth has only achieved significance in the regression results for the entire country and the eastern region. This situation may arise from the higher degree of financial development in the eastern region compared with China's central region and western region. Financial development plays a greater role in promoting economic development. Government expenditure and economic development show a positive correlation. As an important means of government resource allocation, the government's practice of increasing fiscal expenditure to promote economic growth has achieved remarkable results. The optimization of energy structure plays a more significant role in promoting economic growth in the western region because it is a region rich in resources in China. Further effective development of clean energy in the western region can help economic development according to local actual conditions. The impact of the institutional environment and the degree of industrialization on regional economic development are less pronounced, indicating that the optimization of the institutional environment and a higher degree of industrialization are powerful means to promote economic growth, but they may not be effective within a specific time frame.

Table 2. Energy poverty alleviation and economic growth.

Dependent Variable	(1)	(2)	(3)	(4)
	Growth	Growth	Growth	Growth
Region	Nationwide	Eastern Region	Central Region	Western Region
EP	−0.631 *** (0.128)	−0.428 *** (0.082)	−0.241 (0.165)	−0.890 *** (0.109)
Gov	2.595 ** (0.772)	2.816 *** (0.340)	1.299 *** (0.171)	0.925 * (0.286)
Open	0.428 *** (0.171)	0.137 * (0.066)	1.372 * (0.705)	1.223 *** (0.226)
FD	0.417 ** (0.137)	0.162 ** (0.057)	0.167 (0.236)	0.126 (0.083)
Infra	0.122 * (0.052)	0.298 *** (0.033)	0.931 ** (0.265)	1.318 * (0.651)
Indus	−0.021 (0.630)	0.298 (0.381)	−0.503 (0.401)	0.024 (0.033)
Stru	0.725 ** (0.206)	0.007 (0.099)	0.003 (0.002)	0.316 ** (0.109)
Insti	0.049 ** (0.016)	0.010 (0.025)	0.013 (0.015)	0.002 (0.022)
Constant	7.938 *** (0.331)	8.998 *** (0.133)	10.788 *** (0.527)	7.902 *** (0.328)
Fixed Effects	Yes	Yes	Yes	Yes
Observations	319	110	99	110
R^2	0.801	0.939	0.935	0.874

Note: Standard errors are reported in parentheses; ***, **, and * indicate that the regression coefficients are significant at the statistical levels of 1%, 5%, and 10%, respectively; and the same rule applies to the following tables.

According to the statistical results, the areas with higher energy poverty are still concentrated in the northern and western provinces, and the eastern coastal and southern provinces have lower energy poverty levels; although, the overall level of energy poverty in China shows a downward trend. The significant regional imbalance of energy poverty will inevitably lead to regional differences in the effect of energy poverty alleviation on economic growth. In order to demonstrate whether the impact of energy poverty alleviation on economic growth varies across regions, Columns (2)–(4) of Table 2 estimate the model results using three subsamples of eastern, central, and western regions, respectively. In Columns (2) and (4), the EP coefficients are statistically significant at the levels of 1% and 10%, respectively, while the EP coefficient in Column (3) is not significant. It can be seen that although energy poverty alleviation can drive the growth of the eastern and western regions, it cannot effectively promote the synchronous economic growth of the central region and aggravate the imbalance of development between regions. From the regression coefficient, we can see that the impact of energy poverty alleviation on high-quality economic development in the western region is greater than that in the eastern region, which effectively promotes the economic development of the less-developed regions in the west.

4.2. Energy Poverty Alleviation and Urban–Rural Income Inequality

Income distribution is a crucial factor that hinders balanced economic growth and impacts social harmony and stability. The optimization of income distribution can provide inexhaustible drives for HQD. The imbalance of economic growth reflects income distribution in the spatial dimension, while urban–rural income inequality reflects the wealth inequality between urban and rural residents in the same province. In this paper, the urban–rural income inequality (Inequality) is used as an indicator to measure the equality of income distribution in the province, the impact of energy poverty alleviation on income distribution is analyzed, and the results are shown in Table 3. In Column (1) of Table 3, the regression coefficient of energy poverty (EP) has a positive effect on urban–rural income distribution at the significance level of 10%, indicating that the exacerbation of energy poverty will increase the income inequality between urban and rural areas. Columns (2)–(4) of Table 3 estimate the impact of energy poverty on the urban–rural income inequality using the three subsamples of the eastern, central, and western regions, respectively. In Column (4), the energy poverty coefficient is significant at the statistical level of 1% but not significant in the eastern and central regions, indicating that the mitigating effect of energy poverty alleviation on urban–rural income inequality is mostly distributed in the western region. It should be emphasized that this article found that energy poverty alleviation has no impact on the economic growth and urban–rural income gap in the central region, which is related to the decline in industrialization level, relatively low urbanization level, insufficient infrastructure investment, and delayed policy implementation in the central region.

Table 3. Energy poverty alleviation and urban–rural income inequality.

Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	Inequality	**Inequality**	**Inequality**	**Inequality**
Region	Nationwide	Eastern Region	Central Region	Western Region
EP	0.315 * (0.132)	0.185 (0.148)	0.032 (0.071)	0.236 *** (0.049)
Gov	−2.487 *** (0.564)	−1.618 * (0.694)	−1.332 *(0.399)	−0.476 *** (0.127)
Open	−0.778 ** (0.263)	0.098 (0.137)	−1.233 ** (0.287)	−0.703 *** (0.142)
FD	−0.266 * (0.125)	−0.438 *** (0121)	−0.047 (0.061)	−0.062 (0.046)
Infra	−0.122 * (0.064)	−0.025 (0.053)	−0.382 *** (0.059)	−0.013 (0.022)
Indus	−0.349 (0.898)	−1.695 * (0.779)	−0.108 (0.176)	−0.490 * (0.358)
Stru	−0.626 (0.465)	0.321 * (0.157)	0.079 (0.055)	−0.825 (0.052)
Insti	−0.074 * (0.029)	0.006 (0.037)	−0.017 * (0.006)	−0.013 (0.014)
Constant	5.099 *** (0.538)	3.954 *** (0.229)	1.939 (0.088)	1.831 *** (0.171)
Fixed Effects	Yes	Yes	Yes	Yes
Observations	319	110	99	110
R^2	0.584	0.592	0.824	0.736

4.3. Energy Poverty Alleviation and HQD

Enhancing the quality and efficiency of economic development and advancing high-quality development (HQD) are two key components of China's economic transformation. The paper further analyzes the impact of energy poverty alleviation on economic HQD. In Column (1) of Table 4, the regression coefficient of energy poverty on HQD is statistically significant at the level of 5%. This result shows that energy poverty alleviation can effectively promote economic HQD. Columns (2)–(4) of Table 4 estimate the impact of energy poverty alleviation on the economic HQD using the three subsamples of the eastern, central, and western regions, respectively. In Columns (3) and (4), the regression coefficient of energy poverty is significant at the statistical level of 1% but not significant in the eastern region, indicating that the effect of energy poverty alleviation on promoting economic HQD is mostly distributed in the central and western regions. From the coefficient of energy poverty alleviation on high-quality economic development, we can further see that the impact of energy poverty alleviation on the western region is greater than that of the central region, and the driving effect on the western less-developed region is more intense.

Table 4. Energy poverty alleviation and HQD.

Dependent Variable	(1)	(2)	(3)	(4)
	Hqd	**Hqd**	**Hqd**	**Hqd**
Region	Nationwide	Eastern Region	Central Region	Western Region
EP	−0.157 ** (0.044)	−0.020 (0.056)	−0.171 ** (0.046)	−0.187 ** (0.071)
Gov	0.308 (0.193)	0.772 * (0.346)	0.282 (0.163)	0.050 (0.117)
Open	0.063 (0.061)	0.039 (0.056)	0.123 (0.173)	0.252 * (0.139)
FD	0.155 * (0.059)	0.120 * (0.424)	0.114 * (0.043)	0.228 *** (0.040)
Infra	0.028 * (0.011)	−0.324 * (0.101)	0.369 ** (0.081)	0.020 (0.017)
Indus	0.276 (0.194)	1.187 *** (0.328)	0.543 * (0.215)	1.090 ** (0.415)
Stru	0.155 * (0.078)	0.229 * (0.092)	−0.010 (0.094)	0.018 (0.075)
Insti	0.009 * (0.005)	0.001 (0.005)	0.007 (0.06)	0.010 (0.012)
Constant	1.075 *** (0.124)	1.345 *** (0.219)	0.887 *** (0.130)	0.678 *** (0.151)
Fixed Effects	Yes	Yes	Yes	Yes
Observations	319	110	99	110
R^2	0.540	0.661	0.838	0.720

4.4. Exploration of the Transmission Mechanism

Energy poverty alleviation can significantly promote economic growth in the eastern region and have an impact on the urban–rural income inequality and HQD index in the central and western regions. What is the underlying transmission mechanism? In other words, what is the transmission mechanism of energy poverty alleviation affecting China's economic HQD? This paper explores the transmission mechanism of energy poverty alleviation affecting economic HQD from the perspectives of urbanization and technological progress.

Energy poverty alleviation can affect China's economic HQD through the process of urbanization. On the one hand, urbanization promotes investment in urban construction through urban functional transformation and infrastructure construction; while, urban industry and tertiary industry promote investment in economic industries through development. The rural population that transferred to cities needs to solve the problems of housing, employment, medical care, and children's education, thus advancing the development of urban social services. Economic growth and social stability are promoted in multiple dimensions, and the economic HQD is driven ultimately. On the other hand, energy poverty alleviation boosts labor transfer, increases the marginal labor productivity of the agricultural sectors, raises the income of rural residents, reduces the urban–rural income inequality, and effectively promotes the process of urbanization. In order to validate this mechanism, this paper selects the proportion of urban population to the total population as the proxy variable of urbanization. Table 5 reports the corresponding empirical regression results. In Column (3), the coefficient of the urbanization variable on high-quality economic growth is significantly positive, indicating that urbanization promotes HQD. It is noticeable that the process of urbanization is usually accompanied by the agglomeration of industrialization, which may adversely affect the construction of energy infrastructure. In order to alleviate this endogenous problem, Column (7) selects the lagged order of energy poverty index to review the impact on urbanization. The empirical results reveal a significant negative correlation between energy poverty and the urbanization process, suggesting that alleviating energy poverty can effectively advance urban development. With regard to the effect of energy poverty alleviation on promoting the urbanization process, the central and western regions are better than the eastern region, coinciding with the fact that the central and western regions obtain more benefits from energy poverty alleviation.

Considering this, another important mechanism for energy poverty alleviation affecting China's economic HQD is the impact on technological progress. On the one hand, whether in the traditional neoclassical economic model or in the endogenous growth model, technological progress is the primary factor in eliminating the tension between scarce natural resources and long-term economic growth. Therefore, technological progress is one of the key drivers in promoting economic HQD. On the other hand, energy is known as important infrastructure, and energy poverty alleviation can affect the technological progress through the paths of industrial structure adjustment, trade, investment, and R&D [26]. This paper takes the total factor productivity widely used in the relevant literature as the proxy variable of human capital, so as to empirically test the technological progress mechanism of energy poverty alleviation affecting the HQD of China's economy. Table 6 shows that the transmission mechanism of technological progress can be effectively validated. It is clear that technological progress improves the level of HQD while energy poverty alleviation significantly promotes technological progress. Technological progress has always been an important direction for the development of the energy industry, especially the development of new energy technology. It can strengthen the transformation and application of scientific research results, the energy technology, and its related industries into a new growth point to drive industrial upgrading, and new energy technology introduced to the countryside can also extend the new energy industry chain to the countryside, driving rural economic development.

Table 5. Energy poverty alleviation and HQD: urbanization mechanism.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Impact of Urbanization on HQD						Impact of Energy Poverty Alleviation on Urbanization			
							Nationwide	Eastern Region	Central Region	Western Region
	Growth	Inequality	Hqd	Growth	Inequality	Hqd	Urban	Urban	Urban	Urban
L.EP							−0.071 *** (0.023)	0.025 (0.028)	−0.074 *** (0.016)	−0.068 *** (0.005)
Urban	2.629 *** (0.168)	−1.572 *** (0.140)	1.011 *** (0.191)							
L.Urban				2.435 *** (0.183)	−2.696 *** (0.368)	0.545 *** (0.094)				
Control variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	319	319	319	290	290	290	319	100	90	100
R^2	0.921	0.705	0.569	0.919	0.744	0.561	0.746	0.648	0.960	0.922

Table 6. Energy poverty alleviation and HQD: technological progress mechanism.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Impact of Technological Progress on HQD						Impact of Energy Poverty Alleviation on Technological Progress			
							Nationwide	Eastern Region	Central Region	Western Region
	Growth	Inequality	Hqd	Growth	Inequality	Hqd	Urban	Urban	Urban	Urban
L.EP										
Technological progress	0.186 ** (0.074)	−0.058 ** (0.028)	0.114 * (0.056)				0.425 * (0.205)	0.538 (0.489)	0.251 * (0.141)	0.112 *** (0.019)
L. Technological progress				0.202 ** (0.079)	0.070 ** (0.028)	0.017 * (0.009)				
Control variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6. *Cont.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Impact of Technological Progress on HQD						Impact of Energy Poverty Alleviation on Technological Progress			
							Nationwide	Eastern Region	Central Region	Western Region
	Growth	Inequality	Hqd	Growth	Inequality	Hqd	Urban	Urban	Urban	Urban
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	319	319	319	270	270	270	270	100	90	100
R^2	0.861	0.891	0.765	0.846	0.945	0.075	0.051	0.638	0.876	0.891

4.5. Robustness Test

This paper performs robustness tests in the following areas. First of all, efforts are made to change different information sets and only control fixed effects or add other control variables. The regression results aligning with the benchmark model are obtained. Then, power grid density is included on the basis of benchmark indicators, the benchmark model is estimated again, and the consistent conclusion is obtained. This paper substitutes China's economic HQD mechanism with HQD index, tests the relationship between energy poverty and economic HQD again, and obtains the empirical results, which do not change the main conclusions of this paper. In consideration of the possible endogeneity of energy poverty and HQD, the three models are re-estimated using system GMM, yielding the same regression results as the benchmark model.

5. Conclusions and Policy Recommendations

Energy industry is crucial to China's stability and people's well-being. Unlike previous poverty alleviation efforts that depended on external support (likened to blood transfusion), energy poverty alleviation makes the most of the unique advantage in enhancing the "self-motivation" ability of poverty-stricken areas by improving the energy infrastructure, reasonably developing and utilizing the energy resources in poverty-stricken areas, and implementing photovoltaic energy poverty alleviation and other methods for targeted poverty alleviation to increase the income of poverty-stricken households. In the process of this study, economic HQD is first divided into three dimensions, including economic growth, urban–rural income inequality, and HQD, to discuss the mechanisms of energy poverty alleviation affecting economic HQD. Then, panel data and the econometric model are constructed to gradually test the effect of energy poverty alleviation on the different dimensions of economic HQD. The main conclusions are as follows: First, energy poverty alleviation not only promotes economic HQD directly by boosting economic growth and increasing social welfare but also drives economic HQD indirectly by reducing urban–rural income inequality and adjusting the industrial structure. Second, reducing the degree of energy poverty can effectively promote economic growth and reduce urban–rural income inequality as an important way to improve economic HQD. The effect of energy poverty alleviation on promoting economic growth is more significant in the eastern and western regions, the effect on income distribution is more significant in the western region, and the effect on enhancing high-quality economic development (HQD) is more pronounced in the central and western regions, indicating that energy poverty alleviation operates under varying economic conditions while pursuing different objectives. Third, this paper explores and finds that on the one hand, energy poverty alleviation promotes the process of urbanization by improving urban infrastructure construction and accelerating the transfer of rural labor, which effectively promotes China's HQD. On the other hand, energy poverty alleviation affects technological progress through the paths of industrial structure adjustment, trade, investment, and R&D, thus, effectively promoting economic HQD. This paper has supplemented the gap in the research on the impact of energy infrastructure on high-quality economic development, but there are still many problems such as the bias of empirical data and the need to deepen the mechanism research, for example, the fixed effect ignores the spatial effect of the sample. In the future, with the gradual improvement of relevant data, relevant research should also pay attention to the micro mechanism of energy infrastructure effects.

Based on the above conclusions, the policy implications of this paper cover the following aspects. First of all, it is recommended to accelerate the construction of energy infrastructure, such as power grids and natural gas pipelines, and improve the clean and efficient household energy for the residents in poverty-stricken areas. In particular, the central and western regions, where energy resources are most concentrated, should continue the role of energy structure in supporting poverty alleviation, the role of energy development in increasing the income of people in poverty-stricken areas, and the role of energy resource development in promoting the regional HQD. Specifically, efforts should be made to formulate effective targeted energy poverty alleviation plans, accelerate the transformation of energy poverty alleviation models, allocate more resources to severely poverty-stricken areas, enhance the self-development capacity of poverty-stricken areas, upgrade and renovate the power grid in poverty-stricken areas, include the construction of energy infrastructure in the scope of special fund support, and more effectively leverage the role of national special funds in expanding energy coverage, while continuously driving effective investment and guiding social capital to build new energy charging infrastructure. Considering these things, this paper concludes that the effect of energy poverty alleviation on economic growth, urban–rural income inequality, and HQD varies across regions, which is related to the stage of economic development and the popularization of energy infrastructure in each region. Accordingly, this paper suggests that the focus of energy infrastructure construction in the eastern, central, and western regions should be different in the future. Regional differences should be taken into account, and governments should differentiate their policies according to local facility conditions to reduce energy poverty. The energy infrastructure in the eastern region has a higher popularization rate, and policies should focus on reducing production and use costs and improving the hardware quality of energy infrastructure. The central and western regions are areas where energy resources are concentrated in China. Therefore, they should adhere to both quantity and quality. In particular, the HQD effect of the western region has not been fully utilized. More investment should be allocated and more energy infrastructure should be built for poverty-stricken villages and households. Whether it is the eastern region or the central and western regions, the energy infrastructure that has been built should be maintained, and the damage of the infrastructure should be checked regularly to improve the reliability and efficiency of the energy infrastructure.

With the current integrated development of urban and rural areas, it is recommended to guide migrant workers to return to their hometowns and start their own businesses through the construction of energy infrastructure, bring urban resources and technologies to the rural economy, implement rural clean energy construction and other projects, and give full play to the catalytic role of the urban economy. Meanwhile, efforts should be made to improve the deep integration of rural modern energy systems and rural ecological construction and strengthen the pattern of empowering the energy sector with digital intelligence, raising the level of digital energy governance and driving the high-quality rural economic development. Differentiated energy infrastructure systems should be sequentially and pertinently extended in the areas under different levels of economic development. Furthermore, attention should be paid to the improvement of the institutional environment, which will help to achieve China's balanced economic growth, reduce urban–rural income inequality, and promote China's economic HQD. In particular, the central region should pay more attention to the construction of energy infrastructure. On the one hand, we should actively respond to the global trend of energy change and promote the development of the energy industry in the direction of green and low-carbon practices through industrial transformation, technological innovation, and international cooperation. On the other hand, we should rely on resource advantages, continue to strengthen regional cooperation in infrastructure, jointly carry out key core technology research, improve the digital transformation of energy infrastructure, and inject more impetus into the sustainable development of the energy industry.

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References

1. Fan, S.; Zhang, X.; Robinson, S. Structural change and economic growth in China. *Rev. Dev. Econ.* **2003**, *7*, 360–377. [CrossRef]
2. Chen, S.; Jefferson, G.H.; Zhang, J. Structural change, productivity growth and industrial transformation in China. *China Econ. Rev.* **2011**, *22*, 133–150. [CrossRef]
3. Cai, F.; Wang, M. Growth and structural changes in employment in transition China. *J. Comp. Econ.* **2010**, *38*, 71–81. [CrossRef]
4. Jiang, L.; Zuo, Q.; Ma, J.; Zhang, Z. Evaluation and prediction of the level of high-quality development: A case study of the Yellow River Basin, China. *Ecol. Indic.* **2021**, *129*, 107994. [CrossRef]
5. Barro, R. Government Spending in a Simple Model of Endogenous Growth. *J. Political Econ.* **1990**, *98*, 103–125. [CrossRef]
6. Jacoby, H.G. Access to markets and the benefits of rural roads: A nonparametric approach. *Econ. J.* **2001**, *110*, 713–737.
7. Aschauer, D.A. Is Public Expenditure Productive? *J. Monet. Econ.* **1989**, *23*, 177–200. [CrossRef]
8. Donaldson, D.; Hornbeck, R. Railroads and American Economic Growth: A "Market Access" Approach. *Q. J. Econ.* **2016**, *131*, 799–858. [CrossRef]
9. Fan, S.; Zhang, V. Infrastructure and Regional Economic Development in Rural China. *China Econ. Rev.* **2004**, *15*, 203–214. [CrossRef]
10. Luo, Z.; Wan, G.; Wang, C.; Zhang, X. Urban Pollution and Road Infrastructure: A Case Study of China. *China. Econ. Rev.* **2017**, *49*, 171–183. [CrossRef]
11. Jalan, J.; Ravallion, M. Does Piped Water Reduce Diarrhea for Children in Rural India? *J. Econ.* **2003**, *112*, 153–173. [CrossRef]
12. Awaworyi Churchill, S.; Smyth, R. Transport poverty and subjective wellbeing. *Transp. Res. Part A Policy Pract.* **2019**, *124*, 40–54. [CrossRef]
13. Zhao, J.; Jiang, Q.; Dong, X.; Dong, K. Assessing energy poverty and its effect on CO_2 emissions: The case of China. *Energy Econ.* **2021**, *97*, 105191. [CrossRef]
14. Yang, T. Urban-biased Policies and Rising Income Inequality in China. *Am. Econ. Rev.* **1999**, *89*, 306–310. [CrossRef]
15. Gustafsson, B.; Shi, L. The anatomy of rising earnings inequality in urban China. *J. Comp. Econ.* **2001**, *29*, 118–135. [CrossRef]
16. Banerjee, A.; Duflo, E.; Qian, N. On the road: Access to transportation infrastructure and economic growth in China. *J. Dev. Econ.* **2020**, *145*, 102442. [CrossRef]
17. Dercon, S. Risk,Poverty and Vulnerability in Africa. *J. Afr. Econ.* **2005**, *14*, 483–488. [CrossRef]
18. Chatterjee, S.; Turnovsky, S.J. Infrastructure and inequality. *Eur. Econ. Rev.* **2012**, *56*, 1730–1745. [CrossRef]
19. Sadhukhan, S.; Banerjee, U.K.; Maitra, B. Rationality of fare increment for improvement of transfer facilities at metro stations: An experience in Kolkata. *Transp. Policy* **2017**, *58*, 31–38. [CrossRef]
20. Liu, C.; Wu, Q.; Liu, Q. Transportation Infrastructure, Market Accessibility, and Enterprise Productivity: A Perspective Based on Competition and Resource Allocation. *China Econ. Res.* **2020**, *55*, 140–158. (In Chinese)
21. Hu, Y.; Guo, D.; Wang, M.; Zhang, X.; Wang, S. The relationship between energy consumption and economic growth: Evidence from China's industrial sectors. *Energies* **2015**, *8*, 9392–9406. [CrossRef]
22. Cicea, C.; Ciocoiu, C.N.; Marinescu, C. Exploring the Research Regarding Energy–Economic Growth Relationship. *Energies* **2021**, *14*, 2661. [CrossRef]
23. Oliveira, H.; Moutinho, V. Renewable energy, economic growth and economic development nexus: A bibliometric analysis. *Energies* **2021**, *14*, 4578. [CrossRef]
24. Lin, Y.; Chen, B. Development Strategy, Industrial Structure, and Income Distribution. *Econ. (Q.)* **2013**, *12*, 1109–1140. [CrossRef]
25. Nie, C.F.; Jian, X.H. Measurement of China's high-quality development and analysis and comparison of inter provincial status quo. *Quant. Econ. Technol. Econ. Res.* **2020**, *37*, 26–47.
26. Wang, C.; Wan, G.; Yang, D. Income Inequality in the people's Republic of China: Trends, Determinants, Proposed Remedies. *J. Econ. Surv.* **2014**, *28*, 686–708. [CrossRef]