INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN ECONOMICS & MANAGEMENT SCIENCES

OPEN ACCESS JOURNAL

Vol 14, Issue 2, (2025) E-ISSN: 2226-3624

Modeling Electricity Demand in Shandong Province

Pick Schen Yip, Xinyou Zhang, Wei Chien Ng*

School of Management, Universiti Sains Malaysia 11800 USM Pulau Pinang, Malaysia

Corresponding Author Email: ngweichien@usm.my

To Link this Article: http://dx.doi.org/10.6007/IJAREMS/v14-i2/25324 DOI:10.6007/IJAREMS/v14-i2/25324

Published Online: 23 May 2025

Abstract

With the ongoing power market reforms in China, the electricity sector has experienced rapid development. As a key commercial and industrial hub, Shandong Province's power market plays a crucial role in local economic and social progress, directly influencing living standards. This study examines the determinants of electricity demand in Shandong Province using a multiple linear regression model. The results indicate that economic growth, electricity efficiency, urban industrialization, and electricity prices significantly affect electricity demand. These findings provide valuable insights for policymakers in Shandong Province to develop more effective electricity strategies, ensuring a balanced supply and demand.

Keywords: Electricity Demand, Population, Economic Growth, Urban Industrialization, Electricity Efficiency, Electricity Prices

Introduction

Electricity is a fundamental resource that support national economies and social development, playing a crucial role in promoting economic growth and enhancing quality of life. Its diverse conversion methods enables both efficient centralized use and precise distribution. Due to its clean, controllable nature, as well as its capacity for large-scale production and long-distance transmission, electricity serves as a key indicator of modernization and the advancement of material and social well-being in a country or region (Belenguer et al., 2023).

Since the early 1980s, China's electricity output has expanded significantly (Xu & Chen, 2006), making China the world's largest power producer (Song et al., 2017). Aligned with China's strategic goal of power system reform (i.e. the *Scheme of the Reform for Power Industry*), the initiative seeks to dismantle the traditional monopoly structure and foster a diversified, efficient power industry through market competition. At its core, the reform aims to establish an open, fair, and standardized power market system, ensuring optimal resource allocation under government supervision. Key objectives include reducing power production costs, refining the electricity pricing mechanism, enhancing national grid interconnectivity, and promoting the sustainable development of the power sector. China has made significant strides in this transition, initially establishing regional power markets and advancing market-

oriented reforms (Zhao & Zhang, 2025). As a result, the evolution of the power market remains a focal point of industry attention.

However, China's power industry has long struggled with an imbalance between supply and demand, experiencing prolonged power shortages in the past, which peaked in 2004 (Song et al., 2017). The rapid advancement of new energy technologies has led to a diversification of power generation methods and a steady increase in power output, generally meeting industrial and residential electricity demands. Despite ongoing efforts, power resource distribution remains uneven, with some regions experiencing surpluses while others face frequent shortages (Sauer et al.,2023). Since 2020, frequent power outages—particularly in Shandong Province—have highlighted the complexity of supply-demand contradictions. As economic and social development progresses and modern life becomes increasingly reliant on electricity, the economic losses resulting from power outages and rationing have shown an upward trend (Song et al., 2017).

The optimal pace of power industry development in alignment with national economic growth remains a pressing issue that requires active exploration (Tang et al.,2023). With hindsight, the study aims to investigate the impact mechanism of regional economic and social development on electricity demand through a multidimensional analysis of regional economy, social development and the power sector, using the Shandong power market as a case study. Our study aims to contribute to the existing literature in two ways. First, the study examines the determinants of electricity demand in Shandong Province. . As the third largest province in China, Shandong accounts for approximately about 10 percent of the country's total energy consumption (Zhang et al., 2018). However, for an extended period, Shandong Province experienced a persistent shortage in electricity supply. Although the expansion of the new energy industry and the diversification of power generation sources have significantly improved electricity output to meet the energy demands of both industrial production and residents' daily lives, regional imbalances in electricity supply persist (Zhou, 2024). Therefore, managing energy consumption is essential to address these regional disparities and mitigate climate change concerns. A thorough understanding of the driving forces behind energy demand is crucial for formulating effective energy control (Zhang et al., 2018).

Second, the study seeks to offer targeted strategic recommendations for both power supply companies and policymakers to optimize and advance the Shandong power market. Accurate forecasting of future electricity demand through analyzing its driving forces enables policymakers to proactively adjust power generation capacity and grid load, optimize resource allocation, and ensure a stable electricity supply. Additionally, it provides valuable insights to policymakers to facilitates rational planning for investments in power generation infrastructure, lowers operating costs, promotes the integration of renewable energy sources, and supports the development of smart grids. Furthermore, understanding electricity demand forecasting helps to better balance supply and demand, enables more efficient dispatch of wind and photovoltaic power generation, reduces reliance on standby capacity, and contributes to lowering carbon emissions. The remaining sections of the study are as follows. Section 2 presents literature review. Data and methodology are discussed in Section 3. It is followed by findings discussions and Section 5 concludes.

Literature Review

Energy consumption serves as a fundamental indicator of economic development (Han et al., 2022). Electricity, as the primary energy source, in which its demand is driven by population growth, industrialization, and urbanization (Azam et al., 2021). According to International Energy Agency (2019), annual electricity demand growth in developing economies is four times higher than in developed ones, with China being the largest consumer. Electricity demand forecasting, which involves analyzing historical consumption patterns alongside economic and social trends, is essential for effective energy management and infrastructure planning. Accurate forecasts enable power producers to optimize capacity planning, minimize energy waste, and enhance the stability and reliability of the power system, benefiting utilities, policymakers, and related industries.

Population Size and Electricity Demand

Population growth is a key driver of rising electricity demand. As the world's most populous country with a rapidly expanding economy, China presents a vast consumer market and numerous business opportunities (Dai et al., 2022). With a growing population, society's reliance on electricity intensifies across all sectors. In industrial and commercial domains, population expansion translates into larger-scale production and services, leading to increased electricity consumption (Alexander-Haw & Schleich, 2024). Empirical studies consistently confirm the significant positive relationship between population growth and electricity demand (see, among others, Zaman et al., 2012; Alawin et al., 2016; He et al., 2020). This underscores the need for policymakers to anticipate and address future electricity demand surges driven by rapid population growth. Urbanization further accelerates this trend, as the concentration of people in cities fuels residential, commercial, and industrial electricity demand. Simultaneously, industrialization amplifies energy consumption, sustaining an upward trajectory in electricity demand. Additionally, demographic shifts play a crucial role—aging populations exhibit greater reliance on electrical equipment, while younger generations drive electricity consumption through widespread use of electronic devices and household appliances (Li et al.,2024). Based on these discussions, we derive hypothesis 1 as follows,

Hypothesis 1 (H1): Population size has a significant positive impact on electricity demand in Shandong Province.

Economic Growth and Electricity Demand

Since the economic reforms in 1978, China has experienced economic growth, emerging as the world's second-largest economy after the United States. This expansion has been accompanied by a surge in electricity consumption, making China the largest electricity producer (Mahmood et al., 2022). The growth-electricity nexus has been tested empirically (e.g., Altinay & Karagol, 2005; Gurgul & Lach, 2012; Zhang et al., 2017; Tiwari et al., 2021), with the positive impact of economic growth on electricity consumption explained by the conservation hypothesis or growth-led electricity hypothesis (Apergis & Payne, 2009; Mahmood et al., 2022). In modern economies, industry remains the primary driver of electricity consumption. As economic expansion continues, dependence on electricity intensifies (Zhou & Lin, 2025). Urbanization has further amplified this trend, with increasing urban populations driving higher residential electricity demand. From basic lighting to smart home technologies, electricity has become fundamental to modern life. Additionally, rising

living standards have diversified electricity consumption, as higher purchasing power has increased the adoption of high-end electrical appliances and intelligent home systems.

The rapid growth of the service industry and advancements in information technology have further fueled electricity demand, particularly in data centers and communication infrastructure. Moreover, infrastructure development—including transportation, healthcare, and education—relies on stable and reliable power supply, reinforcing the critical role of electricity in economic development (Jiang et al., 2024). Based on these discussions, we propose Hypothesis 2 as follows,

Hypothesis 2 (H2): Economic growth has a significant positive impact on electricity demand in Shandong Province.

Urban Industrialization and Electricity Demand

The rapid industrialization of many developing countries has significantly intensified carbon dioxide emissions due to rising electricity consumption (Shahbaz et al., 2014). Industrialization influences energy consumption through several mechanisms. First, the expansion of manufacturing and heavy industries necessitates extensive mechanical equipment and production facilities, leading to high energy consumption (Sahoo & Sethi, 2020). Second, while technological advancements associated with industrialization enhance production efficiency, the overall expansion of industrial activities and diversified energy demands contribute to increased electricity usage (Liu J et al., 2024). Third, industrial growth raises labor income, stimulating demand for durable goods and further driving energy consumption (Shahbaz & Lean, 2012). Fourth, industrialization fosters the development of ancillary industries, such as construction and transportation, both of which heavily depend on electricity (Zhao et al., 2023). Although advancements in energy efficiency and green technology can mitigate some of these pressures, industrialization remains a primary driver of electricity demand. Accordingly, we propose the following hypothesis,

Hypothesis 3 (H3): Urban industrialization has a significant positive impact on electricity demand in Shandong Province.

Electric Efficiency and Electricity Demand

In many advanced economies, the growth in electricity demand has slowed due to increasing efforts to improve energy efficiency. Nevertheless, electricity demand continues to rise rapidly in many developing countries. According to the International Energy Agency (2022), the industrial and residential sectors account for the largest shares of energy consumption in China—approximately 49% and 16%, respectively—with electricity being the primary energy source. Lin and Zhu (2020) emphasize that enhancing electricity efficiency is a key strategy for energy conservation.

However, the existing literature presents mixed evidence. While some studies support the view that improved electricity efficiency reduces consumption (e.g., Ayres et al., 2007), others argue that it may lead to increased energy use due to rebound effects (e.g., Moezzi, 2000). Several mechanisms explain how improved efficiency can lead to lower electricity consumption. First, energy-efficient equipment delivers the same functionality while consuming less electricity. Second, the adoption of energy-saving technologies in industry enhances production efficiency and reduces waste. Third, smart grids and energy management systems minimize unnecessary power usage through real-time monitoring and

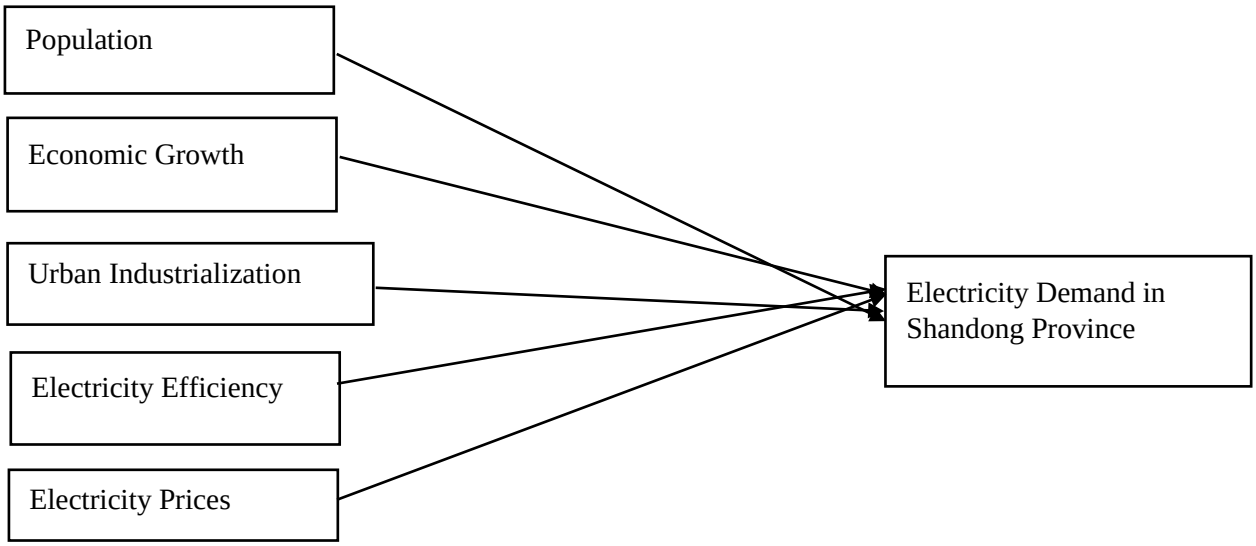
optimization (Klemeš et al., 2019). Additionally, in the construction sector, green buildings and energy-efficient designs reduce electricity needs through better insulation and intelligent control systems. Improving electricity efficiency can thus reduce consumption under equivalent demand and output, easing the load on power grids and lowering energy costs. Based on these discussions, we propose the following fourth hypothesis:
Hypothesis 4 (H4): Electricity efficiency has a significant adverse impact on electricity demand in Shandong Province.

Electricity Prices and Electricity Demand

Undeniably, electricity price is a critical determinant of electricity demand (Yang et al., 2018). As electricity markets become more liberalized, consumers are increasingly exposed to price volatility and may adjust their consumption patterns to minimize costs (Kirschen et al., 2000). When electricity prices rise, the associated increase in usage costs incentivizes households and businesses to curtail non-essential electricity consumption, thereby reducing overall demand. Conversely, lower prices tend to stimulate higher consumption. Based on this relationship, we formulate the fifth hypothesis as follows:
Hypothesis 5 (H5): Electricity prices have a significant adverse impact on electricity demand in Shandong Province.

Conceptual Framework of the Study

Figure 1 presents the conceptual framework of the study, which aims to examine the determinants of electricity demand in Shandong Province. The dependent variable is electricity demand, while the independent variables include population, economic growth, urban industrialization, electricity efficiency, and electricity prices.



Data and Methodology

Our study examines data from 2013 to 2023, sourced from the Shandong Statistical Yearbook compiled by the Shandong Provincial Bureau of Statistics. The dependent variable-electricity demand —electricity demand—is measured by the annual electricity consumption in Shandong Province. For the independent variable, population is measured by the total number of permanent residents in the Shandong Province and is logarithmically transformed to normalize the scale. Economic growth is proxied by provincial GDP, reflecting the overall

economic output and development level. Urban industrialization is captured by the proportion of industrial added value in GDP, manufacturing output value, and indicators of technological innovation, illustrating the province's transition from an agricultural to an industrial economy. Electricity efficiency is measured by the ratio of GDP to industrial electricity consumption, indicating the economic output generated per unit of electricity consumed; higher values suggest greater efficiency and economic benefits. Electricity price refers to the average electricity price in Shandong Province, influenced by production and transmission costs, policy interventions, and the province's energy structure. Electricity consumption and provincial GDP are divided by 100 to ensure consistency in the scale of the estimated coefficients.

This study employs multiple linear regression analysis to examine the factors influencing electricity demand in Shandong Province. The ordinary least square (OLS) model is specified as follows,

$$D_t = \alpha_t + \beta_{1t} logPop_t + \beta_{2t} GDP_t + \beta_{3t} Ind_t + \beta_{4t} Eff_t + \beta_{5t} P_t \quad (1)$$

Where D denotes the electricity demand, Pop is the provincial population, GDP represents economic growth, Ind is urban industrialization, Eff is the electricity efficiency, and P is the electricity price. α is the constant term, β_1, β_2,…, β_5 are the coefficients of the respective independent variables.

Findings and Discussions

The results of diagnostic tests are presented in Table 1. The Jarque-Bera test confirms the normality of residuals with a p-value of 0.8144, while the Breusch-Pagan test indicates no heteroskedasticity at 5% significant level with a p-value of 0.0976. The Ramsey RESET test checks the model specification and rejects the null hypothesis of model misspecification with a p-value of 0.1442. finally, the Breusch-Godfrey test suggests no significant autocorrelation with a p-value of 0.2205. The diagnostic results confirm the validity of our model by satisfying the key OLS assumptions.

Table 1
Diagnostic Test

	p-value
Jarque-Bera	0.8144
Breusch-Pagan	0.0976
Ramsey RESET	0.1442
Breusch-Godfrey	0.2205

Our OLS results are reported in Table 2. The model yields an R^2 of 0.999, indicating that 99.9% of the variation in electricity demand is explained by the independent variables. Among them, only population demonstrates an insignificant impact, with a coefficient of 0.931. Although population growth generally contributes to higher residential electricity consumption, this segment represents a relatively minor share of total electricity demand. The findings suggest that electricity demand is more closely linked to economic activity and industrial structure than to population size alone. Economically advanced areas with smaller populations tend to exhibit higher electricity consumption due to electricity-intensive industrial, commercial, and service activities. Conversely, densely populated regions with

limited economic activity tend to consume less electricity. Therefore, electricity demand is more influenced by per capita economic activity intensity, technological advancement, and industrial composition than by the sheer size of the population.

Our findings consistent with those of Apergis and Payne (2009) and Mahmood et al. (2022), indicating that economic growth has a significantly positive impact on electric demand in Shandong Province, with a coefficient of 0.099. GDP captures the expansion of economic activities that are inherently electricity-intensive. As Shandong Province continues to undergo rapid industrialization and urbanization, electricity plays a critical role in supporting manufacturing processes and infrastructure development. Moreover, rising income levels and the pace of urbanization have fueled consumer demand for electricity-intensive goods and services, thereby further contributing to the growth in electricity consumption.

Table 2
OLS Regression Results for the Determinants of Electricity Demand

Independent Variables	**Coefficient**
Population	0.931
Economic Growth	0.099***
Industrialization	1.107**
Electricity Efficiency	-4.766***
Electricity Prices	-36.937**
Constant	213.044
R-squared	0.999
F-statistic	1105.360***
Observations	11

Notes: *,**,*** denotes 10%, 5%, and 1% significance level.

The findings also support Hypothesis 3, indicating a statistically significant and positive relationship between urban industrialization and electricity demand in Shandong Province. This suggests that higher levels of industrialization are associated with an expansion in the production scale of energy-intensive industries. In particular, sectors such as metallurgy and chemicals, which are central to the region's industrial base, require substantial electricity inputs for their operations. Moreover, industrialization is often accompanied by accelerated infrastructure development and urbanization, further increasing electricity demand across industrial, commercial, and residential sectors. Additionally, the advancement of high value-added product processing and the widespread adoption of precision equipment have further contributed to the rise in overall electricity consumption.

Furthermore, our findings indicate that electricity efficiency exerts a significant negative impact on electricity consumption in Shandong Province. This inverse relationship reflects the combined effects of technological advancement, economic incentives, and behavioral adaptations. Enhanced electricity efficiency implies that less electricity is required to fulfill a given level of demand, thereby curbing overall consumption. Technological innovations and process optimizations effectively reduce energy waste and lower electricity costs, incentivizing both enterprises and households to adopt energy-saving technologies and modify consumption behaviors. Additionally, improvements in electricity efficiency facilitate

more rational resource allocation, encouraging policy and market shifts toward green technologies and low-energy-intensive industries, thus further limiting the growth of electricity demand.

The findings also align with the law of demand, which posits an inverse relationship between price and quantity demanded—indicating that lower electricity prices lead to higher electricity demand. From the consumer perspective, rising electricity prices elevate usage costs, discouraging non-essential consumption and encouraging a shift toward energy-efficient practices or alternative energy sources. For producers, higher electricity prices raise operational costs, compelling firms to reduce electricity usage through technological upgrades, process optimization, or energy substitution. Moreover, elevated prices signal resource scarcity, prompting broader societal responses in the form of improved electricity efficiency, demand-side management, and supportive policy interventions.

Conclusion and Implications

Electricity demand forecasting remains a critical concern for economists, consumers, firms, and policymakers. In China, the power sector has long grappled with supply–demand imbalances, with severe shortages peaking in 2004 (Song et al., 2017). Since 2020, recurring power outages—particularly in Shandong Province—have underscored the ongoing complexity of these contradictions. This study investigates the determinants of electricity demand in Shandong Province. The results indicate that all selected explanatory variables significantly influence electricity consumption, except population. Economic growth and urban industrialization exert a positive effect on electricity demand, whereas electricity efficiency and prices are negatively associated with it. These findings offer valuable insights for policymakers seeking to enhance energy efficiency and promote low-carbon transitions. They contribute to the theoretical foundation for developing a clean, efficient, and sustainable energy system, while also supporting the coordinated advancement of energy security and socio-economic development.

References

Alawin, M., Al-Hamdi, M., & Alomeri, M. (2016). Determinants of electricity demand in Jordan. *Indian Journal of Science and Technology*, *9*(15).

Alexander-Haw, A., & Schleich, J. (2024). Low carbon footprint-A consequence of free will or of poverty? The impact of sufficiency orientation and deprivation on individual carbon footprints. *Energy Policy*, *195*, 114367.

Altinay, G., & Karagol, E. (2005). Electricity consumption and economic growth: evidence from Turkey. *Energy economics*, *27*(6), 849-856.

Apergis, N., & Payne, J. E. (2009). Energy consumption and economic growth in Central America: evidence from a panel cointegration and error correction model. *Energy economics*, *31*(2), 211-216.

Ayres, R. U., Turton, H., & Casten, T. (2007). Energy efficiency, sustainability and economic growth. *Energy*, *32*(5), 634-648.

Azam, A., Rafiq, M., Shafique, M., Zhang, H., Ateeq, M., & Yuan, J. (2021). Analyzing the relationship between economic growth and electricity consumption from renewable and non-renewable sources: Fresh evidence from newly industrialized countries. *Sustainable Energy Technologies and Assessments*, *44*, 100991.

Belenguer, E., Segarra-Tamarit, J., Pérez, E., & Vidal-Albalate, R. (2025). Short-term electricity price forecasting through demand and renewable generation prediction. *Mathematics and Computers in Simulation*, *229*, 350-361.

Dai, K., Shen, S., & Cheng, C. (2022). Evaluation and analysis of the projected population of China. *Scientific Reports*, *12*(1), 3644.

Gurgul, H., & Lach, Ł. (2012). The electricity consumption versus economic growth of the Polish economy. *Energy economics*, *34*(2), 500-510.

Han, J., Zeeshan, M., Ullah, I., Rehman, A., & Afridi, F. E. A. (2022). Trade openness and urbanization impact on renewable and non-renewable energy consumption in China. *Environmental Science and Pollution Research*, *29*(27), 41653-41668.

He, Y., Wang, M., Guang, F., & Zhao, W. (2020). Research on the method of electricity demand analysis and forecasting: The case of China. *Electric Power Systems Research*, *187*, 106408.

International Energy Agency. (2019). *World Energy Outlook 2019*. https://www.iea.org/reports/world-energy-outlook-2019 (accessed on 16 November 2019).

International Energy Agency. (2022). *Efficiency and demand* [Data set]. https://www.iea.org/countries/china/efficiency-demand

Jiang, H. D., Liang, Q. M., Yao, Y. F., & Liu, L. C. (2024). Incentive policies to realize large-scale deployment of CCS in China's power sector and its economy-wide impacts. *Structural Change and Economic Dynamics*, *71*, 1-14.

Kirschen, D. S., Strbac, G., Cumperayot, P., & Paiva Mendes, D. (2000). Factoring the elasticity of demand in electricity prices. *IEEE Transactions on Power Systems*, *15*(2), 612-617.

Klemeš, J. J., Varbanov, P. S., Walmsley, T. G., & Foley, A. (2019). Process integration and circular economy for renewable and sustainable energy systems. *Renewable and Sustainable Energy Reviews*, *116*, 109435.

Li, S., Ji, L., Wang, Y., Zhou, X., Wang, X., Jiang, S., & Sun, Q. (2024). Can China's carbon generalized system of preferences reduce urban residents' carbon emissions? Evidence from a quasi-natural experiment. *Journal of Environmental Management*, *362*, 121222.

Lin, B., & Zhu, J. (2020). Chinese electricity demand and electricity consumption efficiency: Do the structural changes matter? *Applied Energy*, *262*, 114505.

Mahmood, H., Wen, J., Zakaria, M., & Khalid, S. (2022). Linking electricity demand and economic growth in China: evidence from wavelet analysis. *Environmental Science and Pollution Research*, *29*(26), 39473-39485.

Moezzi, M. (2000). Decoupling Energy Efficiency from Energy Consumption. *Energy & Environment*, *11*(5), 521-537.

Sauer, J. M. T., Kirchherr, J., Plummer-Braeckman, J., & Anadón, L. D. (2024). Multilevel actor networks in China's growing fossil-fuel based role in the global electricity sector. *Environmental Research Letters*, *19*(11), 114037.

Shahbaz, M., Uddin, G. S., Rehman, I. U., & Imran, K. (2014). Industrialization, electricity consumption and CO2 emissions in Bangladesh. *Renewable and sustainable energy reviews*, *31*, 575-586.

Song, M. L., Song, H., Zhao, J. J., & Wang, J. L. (2017). Power supply, coal price, and economic growth in China. *Energy Systems*, *8*, 727-746.

Tang, Z., Liu, Y., Zhang, L., Gu, H., & Liao, Y. (2023). Natural resources, cleaner electricity production and economic performance. *Resources Policy*, *86*, 104271.

Tiwari, A. K., Eapen, L. M., & Nair, S. R. (2021). Electricity consumption and economic growth at the state and sectoral level in India: Evidence using heterogeneous panel data methods. *Energy Economics*, *94*, 105064.

Xu, S., & Chen, W. (2006). The reform of electricity power sector in the PR of China. *Energy policy*, *34*(16), 2455-2465.

Yang, C., Meng, C., & Zhou, K. (2018). Residential electricity pricing in China: The context of price-based demand response. *Renewable and Sustainable Energy Reviews*, *81*, 2870-2878.

Zaman, K., Khan, M. M., Ahmad, M., & Rustam, R. (2012). Determinants of electricity consumption function in Pakistan: Old wine in a new bottle. *Energy policy*, *50*, 623-634.

Zhang, Y., Liu, C., Li, K., & Zhou, Y. (2018). Strategy on China's regional coal consumption control: A case study of Shandong province. *Energy Policy*, *112*, 316-327.

Zhang, C., Zhou, K., Yang, S., & Shao, Z. (2017). On electricity consumption and economic growth in China. *Renewable and Sustainable Energy Reviews*, *76*, 353-368.

Zhao, X., Zhang, J., Zhang, C., & Hu, J. (2023). Decoupling analysis and forecast of economic growth from electricity consumption in the Yangtze River Delta region, China. *Environmental Science and Pollution Research*, *30*(57), 120422-120460.

Zhao, Y., & Zhang, N. (2025). Energy Trade Access and Market Monopoly: Evidence from China's Power Sector. *World Development*, *185*, 106797.

Zhou, Y. (2024). Low-carbon urban–rural modern energy systems with energy resilience under climate change and extreme events in China—A state-of-the-art review. *Energy and Buildings*, 114661.

Zhou, Y., & Lin, B. (2025). The energy-saving effect of green fiscal policy: Empirical evidence from China's comprehensive demonstration cities of energy conservation and emission reduction fiscal policy. *Applied Energy*, *378*, 124784.