



Exploring the relationship between expenditure on power and state finances: an empirical study in Jammu and Kashmir, India

Om Raj Katoch¹

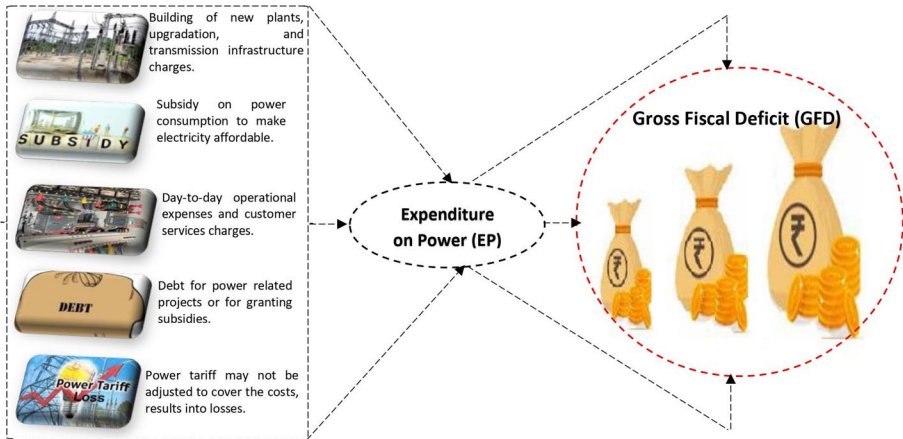
Received: 23 March 2023 / Accepted: 30 July 2023
© The Author(s), under exclusive licence to Springer Nature B.V. 2023

Abstract

Globally, there is a growing momentum toward achieving universal access to clean energy, particularly electricity, as it plays a crucial role in improving the overall quality of life. Addressing the challenge of universal electricity access requires the development of various mechanisms that enable individuals to access electricity at affordable rates while having the freedom to choose their service providers. In many countries, governments are actively involved in enhancing electricity access, but this effort can put strain on state finances, leading to increased fiscal deficits. This paper aims to investigate the relationship between power expenditure and state finances in Jammu and Kashmir, India, in light of the push for improved electricity access. Using data from the RBI Bulletins for the period 1990–91 to 2019–20, the paper employs panel data analysis to investigate the relationship between power expenditure and gross fiscal deficit. Results indicate a positive and significant correlation between expenditure on power and state gross fiscal deficit in Jammu and Kashmir, indicating lower fiscal sustainability with higher power expenditure. For the purpose of reducing the pressure on state finances caused by enormous domestic power subsidies, the study recommended targeted subsidies with a focus on small energy projects utilizing renewable energy sources and energy-saving technologies, as well as incentives and regulations to promote energy conservation.

Extended author information available on the last page of the article

Graphical abstract



Keywords Expenditure on power · Electricity · State finances · Panel data analysis · Jammu and Kashmir

Abbreviations

| | |
|--------|--|
| ACS | Average cost of supply |
| ARR | Average realizable revenue |
| CAGI | Comptroller general of India |
| DISCOM | Distribution companies |
| EP | Expenditure on power |
| FRBM | Fiscal responsibility and budget management |
| GDP | Gross domestic product |
| GFD | Gross fiscal deficit |
| IEA | International energy agency |
| MkWh | Million-kilowatt hour |
| OECD | Organization of economic cooperation and development |
| RBI | Reserve Bank of India |
| UDAY | Udhay DISCOM Assurance Yojana |

1 Introduction

There is increasing global momentum toward providing universal access to clean energy, mainly electricity, and many governments have been engaged in improving access to electricity (Zhang et al., 2019). It touches almost every aspect of our lives—health, wealth, nutrition, clean water, transport, education, business, domesticity, and most importantly, how long we may expect to live (Abbasi et al., 2021a; Lloyd, 2017). Increasing household electricity consumption reflects the improvement in lifestyles and standards of living of the people (Balsalobre-Lorente et al., 2023; Costa-Campi et al., 2019; Niu et al., 2016). Electricity access needs to be made available to everyone for balanced development (Iorember et al., 2022; Katoch et al., 2023; Wang et al., 2023; Yu et al., 2022a). The endeavor to

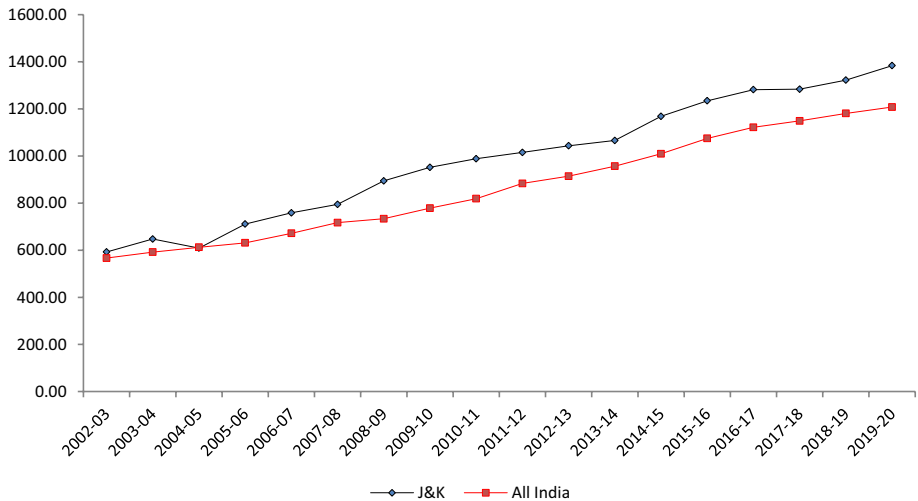


Fig. 1 Per capita consumption of electricity in all India and in Jammu and Kashmir in kWh. *Source:* RBI bulletins, 2020–21

achieve universal electricity access requires the establishment of mechanisms that guarantee access provided by service providers, decrease connection expenses through tariff design or integrated subsidies in payment plans, and diversify the pool of suppliers, enabling users to select from various service providers offering different quality levels. (Cook, 2011). Initial increases in production will cause an increase in energy consumption, which does not affect the economic growth rate in the short run, but in the long run it has a beneficial effect (Shah et al., 2023a; Topolewski, 2021). It plays a vital role in human welfare as all important economic activities of development are dependent on the use of energy (Adebayo, Samour, et al., 2023a).

The abolition of energy poverty would have significant economic effects, not only in terms of its direct effects on health, but also in terms of its indirect effects on household budgeting (Katoch et al., 2022a, 2022b; Kose, 2019). An adequately heated domestic dwelling will improve its inhabitants' mental and physical health, thereby reducing mortality and morbidity (Abbas et al., 2023a; Costa-Campi et al., 2019). Among the major factors affecting electricity consumption were per capita income (Musango, 2014; Niu et al., 2016), the price of electrical appliances, the variety of appliances, and the size of households (Niu et al., 2016). For electrification to be effective, it requires not just economic, educational, and infrastructure development, but also the private sector's involvement, governments' commitments, and the reduction of poverty (Zhang et al., 2019; Zhuang et al., 2022).

India is the third largest producer of electricity in the world (Bernard Looney, 2021). Reports from India's Ministry of Power (Ministry of Power, 2020) indicate that the gross electricity generated by utilities in FY 2019–20 amounted to 1383.50 TWh, and the country's overall electricity generation (utilities and non-utilities) reached 1598 TWh. Per capita gross electricity consumption of FY 2019 at all-India level and in Jammu and Kashmir was 1208 kWh and 1384 kWh, respectively, which indicates a continuing trend of steady growth from FY 2002–02 to 2019–20, Fig. 1. According to the analysis, the per capita electricity consumption/demand in Jammu and Kashmir is higher than the national

average, meaning every effort has been made in this union territory to provide access to electricity to its citizens.

Electricity power is a secondary energy resource obtained from the conversion of the primary energy resources such as fossil fuels (*natural gas oil, coal*) and wind energy. Coal has been the fuel mostly used in electricity generation, the share of nuclear power and natural gas in electricity generation has increased in recent years, while the use of oil in electricity generation has declined since the late 1970s due to sharp increases in oil prices (IEA, 2017). World net electricity generation was 20.2 trillion kilowatt-hours in 2010 and expected to increase 39.0 trillion kilowatt-hours in 2040 by 93%. The growth of electricity demand in the Organization of Economic Co-operation and Development (OECD) countries is slower than the non-OECD countries (IEA, 2022).

2 Literature review

In this section, we provide an overview of prior studies concerning the subject at hand, aiming to discern any existing research gaps. The escalation of greenhouse gas emissions in recent years has given rise to significant challenges for life on earth. In parallel, ecological degradation has surged over recent decades, attributed to human energy utilization practices. Recent decades have seen an increase in ecological degradation due to the way humans have used energy (Adebayo, 2022, 2023). Technologies that are clean, sustainable, and eco-friendly in energy use have led to sustainable resource use, and have greatly benefited the environment (Ramzan et al., 2023). As such, electricity is the cleanest form of energy that can be generated from renewable sources and is more environmentally sustainable. Therefore, the further thrust must be laid on renewable source of energy rather than non-renewables (Abbas et al., 2021; Abbas et al., 2023b; Jiakui et al., 2023).

2.1 Energy consumption and energy subsidies

In many countries, the subsidies are still high enough that low-income families cannot afford to take advantage of accessing clean energy for domestic use. Energy demand is linked to the demand for investments that stimulate economic growth, while the investment system must provide a means for reallocating financial resources to high return investments (Shahbaz & Lean, 2012). By implementing fiscal instruments such as subsidies, the government plays a significant role in generating energy and meeting electricity demand (Lan-garita et al., 2021). Subsidies are used by many countries to lower and stabilize the prices of electricity and their consumption. They are designed to protect consumers, particularly the poor, from high and fluctuating energy prices (Jazuli et al., 2021). But the subsidization leads to excessive consumption of electricity. According to a Jordanian study (Albatayneh et al., 2022) that investigated how energy subsidies affect energy consumption as well as consumption patterns within the residential sector revealed that the average household (without subsidies) consumes approximately 297 kWh/month, which is less than half what households on subsidized tariffs (616 kWh/month) consume. The removal of energy subsidies would lead to significant reductions in energy consumption/demand and emissions, but would have negative effects on macroeconomic variables (Lin & Jiang, 2011; Micah et al., 2023).

Based on a study conducted in India (Acharya & Sadath, 2017), an increase in the general price level caused by the withdrawal of the subsidy would reduce energy consumption

by eroding real incomes and having other welfare effects. Therefore, policy makers in India need to ensure that subsidy reaches those who deserve it while undergoing further reforms, so that the socioeconomic impact of reforms can be minimized at the same time as fiscal targets are met. Another study (Salehi-Isfahani et al., 2015) conducted in Iran found that providing electricity subsidies puts pressure on the government's deficit and raises concerns about waste, smuggling, and inefficiency. Subsidies for commercial fuels contribute to an increasing fiscal burden on the government, and the indirect impact of phasing out residential electricity subsidies is greater than the direct effect (Ilyas et al., 2022). Underdeveloped countries need to determine the optimal level of subsidies in order to ensure that electricity is affordable to the underprivileged. Therefore, the provision of electricity without subsidies becomes unaffordable, and at the same time providing it at subsidized rates has severe financial implications for the state finances (Khalid & Salman, 2020). Increasing energy prices and speculation about depleted oil reserves in recent years have revealed that the era of cheap and abundant energy, especially oil, is over (Miller & Sorrell, 2014). The cost of energy is now becoming increasingly significant relative to the costs of other factor inputs such as capital, labor, and land. The critical dependence of modern economies on energy in various forms underlines the need for effective development and use of scarce energy resources (OECD & IEA, 2011). Due to the intricate links between energy and the different sectors of the economy, as well as the need for sustainability of the environment, rethinking power generation systems is imperative, which requires shifting from non-renewable to renewable sources of energy (Hafeez et al., 2023; Langarita et al., 2021).

2.2 Expenditure on of power (EP) and gross fiscal deficit (GFD)

In India, most power distribution work is done by state-owned companies. Over the past few years, poor financial performance of power distribution companies has been a cause for concern. There are several factors that contribute to the losses suffered by these companies, including underpricing of tariffs and high levels of technical and commercial losses. According to the latest estimates, the accumulated losses as of March 2021 were ₹67,917 crores for which they are not able to pay for generators on time, invest in the infrastructure required to ensure continuous high-quality power, or transition from fossil fuel to renewable energy sources such as wind or solar. The overdue amount in respect of Jammu and Kashmir stood at ₹4,827 crores (NITI Aayog, 2021). In 2020–21, 16 states provided guarantees for borrowing of Rs 1.36 lakh crore, i.e., 0.67% of 2019–20 GDP posing a potential risk to state finances in the event of any default by these companies (Katoch, 2022a, 2022c; Tiwari & Suyra, 2020). Since state governments guarantee the loans taken by these companies, they become contingent liabilities of the states if an entity defaults. Due to these ongoing losses and higher state liabilities, there is a possibility that the risk of invoking these guarantees will rise further. It is estimated that the revenue gap per unit of power sold—average cost of supply minus average realizable revenues (ACS-ARR gap) for 2019–20 for Jammu and Kashmir was Rs. 2.1 per unit (RBI, 2020).

Jammu and Kashmir's power sector accounted for 35.14% of its total investment in public utilities, which stood at 2705.44 crore as of 31st March 2016. Of this amount, 11.39% was in the form of capital and 88.5% was in the form of long-term loans (Shruti Tripathi, 2019). As one of India's ten special category states, Jammu and Kashmir faces serious financial difficulties because it cannot generate enough revenue on its own. The state has struggled with militancy from 1989 onwards, which has resulted in erosion of tax bases, power theft, inability to collect power revenues, increased expenditures, and other issues

caused by disturbed laws and order that have stunted the growth of state's income. Deficits have been rising due to continued tax and nontax revenue shortfalls and high expenditure pressures (CAGI, 2018). During 1990–91, the state government had a gross fiscal deficit of Rs. 660, which reached Rs. 10,246 in 2019–20, showing an increase of 93.56% over the past 30 years (RBI, 2020, 2021). Therefore, with a dramatic increase in expenditure on power and unmet targets for power tariff collection, the state is experiencing an increase in its gross fiscal deficit (CAGI, 2018). The mounting fiscal deficits are problematic if they become permanent (Abbas, 2021; Kumhof & Laxton, 2013). In a country like India, a government deficit that is highly and directly tied to energy expenditure has been shown to be associated with less public spending on health and other priority sectors (Khandelwal, 2015; Yu et al., 2022a) and to create inflationary conditions (Fakher, 2016). Fiscal deficits have also adverse effects on growth and there is a clear need to reduce it until the revenue deficit and corresponding government dissaving are eliminated, and it needs to be stabilized at 6% of GDP (Rangarajan & Srivastava, 2005).

3 Literature gap

The literature highlights the critical role of energy resources, particularly power, in influencing various sectors of the economy, including households, agriculture, industry, transportation, and communications. Energy availability has the potential to drive industrial development, ease cooking processes, and enhance agricultural productivity, thereby playing a significant role in a country's overall economic development. Consequently, as economies progress, their energy consumption tends to increase, leading to shifts in consumption patterns concerning energy forms and sources. Schumacher aptly describes energy as the foundation of modern life, an irreplaceable commodity, and a fundamental factor akin to air, water, or earth. However, despite the significance of energy in economic development, existing literature primarily focuses on the relationship between energy consumption, gross domestic product (GDP), economic growth, health, and education. Surprisingly, there is a notable gap in the research, as no prior studies have examined the direct impact of power expenditure on state finances. In light of this void, our study endeavors to fill this gap by exploring the influence of power expenditures on state finances in the specific context of Jammu and Kashmir.

4 Theoretical framework

It is crucial to have a theoretical framework to guide the entire research process in any research (Li et al., 2022; Shah et al., 2023b). A comprehensive review of recent literature has been conducted in this study to examine the relationship between EP and state finances. As a description of the proposed framework, this research model contains two variables. This study GFD as a dependent variable and EP as an independent variable to address literature gap above. The study model evaluates the influence of EP on GFD.

Using time series data, this paper explores the trends in electricity consumption and state finances in Jammu and Kashmir. Analyzing the trends in electricity consumption is important since people are building more and more houses, using modern technologies in agriculture and industry instead of the conventional ones, adding more appliances, and so forth, putting more pressure on the demand for electricity. The government's deficits have increased, especially

when it comes to supplying electricity and subsidizing it to ensure equity. Key parameters such as total electricity consumption/sold (Mkwd) and total power sector expenditure have been examined to measure the trends in the EP and GFD in UT of Jammu and Kashmir. This research work is conducted to find the answers of the following research questions:

- (a) What is the trend in electricity consumption in Jammu and Kashmir?
- (b) How do state finances behave when EP rises? In other words; what is the relationship between EP and GFD (*proxy for state finances*) in Jammu and Kashmir?

The primary contribution of this research work is its understanding of the trends in consumption of electricity and the relationship between EP and state finances from a regional perspective. We conducted our research by using data from Jammu and Kashmir, where the government subsidizes electricity. As a second contribution, this study contributes to enhancing knowledge that wastage and subsidies in electricity lead to fiscal deficits, and policy makers should ensure that subsidies reach only those who deserve it and act as a guide to conserve electricity. It became evident from the research that electricity is one of the necessities of modern life and without which society's operations cease to exist.

5 Hypothesis

The present research was based on the following hypotheses:

1. Null Hypothesis ($H_0: Y = \beta_0$)—Expenditure on power (EP) does not have a significant impact on the increase in the state's gross fiscal deficit (GFD) in Jammu and Kashmir.
2. Alternate Hypothesis ($H_1: Y = \beta_0 + \beta_1 X$)—Expenditure on power (EP) have a significant impact on the increase in the state's gross fiscal deficit (GFD) in Jammu and Kashmir.

6 Objectives of the study

The main objective of the study was to examine the implications of electricity consumptions and its impacts on gross fiscal deficit of Jammu and Kashmir. Key parameters such as electricity consumption, power sector expenditure and gross fiscal deficit (GFD) have been examined to measure the trends and impact of expenditure on power on GFD in Jammu and Kashmir. The study targets to achieve the following objectives:

- (a) To analyze the trends in the consumption and expenditure on power in Jammu and Kashmir.
- (b) To analyze and study the trends in gross fiscal deficit in Jammu and Kashmir.
- (c) To find out what relationship exists between EP and GFD in Jammu and Kashmir.

7 Data and methodology

This paper examines the relationship between EP and GFD using a panel sample dataset for Jammu and Kashmir covering the period 1990–91 to 2019–20. To determine whether EP have an impact on GFD, this study aims to address this research question comprehensively.

Table 1 Definitions and source of data

| Variable | Description | Source |
|----------|---|------------------------|
| ECP | Total power sector expenditure on the supply of power (independent variable) | RBI bulletins, 2021–22 |
| GFD | Fiscal deficit (GFD) is the excess of total expenditure, including loans, net of recovery, over revenue (including grants from abroad) and non-debt capital receipts (dependent variable) | RBI bulletins, 2021–22 |

This study employed GFD (*indicator for the state's finances*) as a dependent variable and EP as an independent variable, and data was obtained from the RBI Bulletins Table 1. The linear regression analysis was used to find the relationship between dependent and independent variables. The study is expected to find the solution of the following regression equation:

$$Y = \beta_0 + \beta_1 X \quad (1)$$

where Y = gross fiscal deficit (GFD), X = Expenditure on power (EP).

It is a known fact that the size of budget of the state government is increasing every year. With the growth in the size of the state government budgets, the total receipts and expenditures of the state increased significantly. Side by side the other key fiscal aggregates are also showing continuous changes accordingly. All these changes in some recent Government Budgets of Jammu and Kashmir can be seen from Table 2.

8 Results

In an age of digital technologies, energy is becoming increasingly important. The development and consumption of renewable energy, as well as the use of natural resources, increases the sustainability of our environment (Adebayo et al., 2023b). The majority of the appliances facilitating the use of these technologies depend on energy to work. For every citizen to live a quality life, it is vital that they have access to a clean and affordable energy supply. Governments are working to make clean energy more accessible by extending some subsidies, but, at the same time, increasing subsidies place heavy pressure on state fiscal deficits. Over the years, Jammu and Kashmir has struggled with a mounting fiscal deficit. The data from Table 2 shows that it was 660 crores in 1990–91 and has risen to 10,246 crores in 2019–20, which is alarming. Across the 1991 to 2020 period, the EP has increased continuously and GFD is also following the same trend.

After independence, the government of India and all its states and union territories adopted a deliberately deficit-financed policy to promote capital formation and infrastructure development, including the development of the power sector. As a result, with revenue expenditure consistently exceeding revenue receipts, and with low returns from earlier capital expenditures, the nation was faced with a structural deficit in its budget that threatened the sustainability of its fiscal position (Shruti Tripathi, 2019). Figure 2 depicts the trends in EP and GFD. The power sector expenditure has increased from 219 crores in 1990–91 to 9399 crores in 2018–19, and the fiscal deficit increased from 660 crores to 13,208 crores

Table 2 Trends in electricity consumptions, expenditure, and gross fiscal deficits from 1990–91 to 2019–20. Source: RBI bulletins, 2021–22

| Year | Total electricity consumption/sold (MkWh) | Total power sector expenditure (Rs. in crores) | Total revenue from power (Rs. in crore) | Gross fiscal deficit (Rs. in crore) |
|---------|---|--|---|-------------------------------------|
| 1990–91 | 1477 | 219 | 8 | 660 |
| 1991–92 | 1480 | 247 | 9 | 450 |
| 1992–93 | 1505 | 184 | 11 | 200 |
| 1993–94 | 1595 | 273 | 10 | 90 |
| 1994–95 | 1640 | 350 | 11 | –20 |
| 1995–96 | 1718 | 415 | 9 | 100 |
| 1996–97 | 1970 | 501 | 14 | 170 |
| 1997–98 | 2520 | 379 | 16 | 440 |
| 1998–99 | 2798 | 1126 | 112 | 1050 |
| 1999–00 | 2653 | 1545 | 235 | 1340 |
| 2000–01 | 2867 | 474 | 47 | 2170 |
| 2001–02 | 3193 | 533 | 86 | 750 |
| 2002–03 | 3325 | 692 | 96 | 1250 |
| 2003–04 | 3534 | 900 | 153 | –20 |
| 2004–05 | 3877 | 2216 | 598 | 1010 |
| 2005–06 | 4189 | 2983 | 601 | 1590 |
| 2006–07 | 4031 | 2603 | 502 | 1460 |
| 2007–08 | 4031 | 6854 | 933 | 2610 |
| 2008–09 | 4031 | 3496 | 1073 | 2330 |
| 2009–10 | 3539 | 3505 | 1261 | 2230 |
| 2010–11 | 4041 | 4542 | 970 | 2370 |
| 2011–12 | 4267 | 4252 | 1186 | 3690 |
| 2012–13 | 6096 | 4872 | 1866 | 4220 |
| 2013–14 | 5754 | 5137 | 3345 | 4550 |
| 2014–15 | 6136 | 5930 | 3096 | 6630 |
| 2015–16 | 6591 | 6295 | 3330 | 8060 |
| 2016–17 | 7230 | 6337 | 5091 | 8710 |
| 2017–18 | 7454 | 6564 | 5542 | 2779 |
| 2018–19 | 9399 | 7079 | 3435 | 13,208 |
| 2019–20 | 7758 | 7135 | 3839 | 10,246 |

during the same period indicating similar trends. The dotted red line depicts the linear trends of EP and GFD Fig. 2.

Increased electricity consumption or increased spending by the power sector to provide clean energy (electricity) to the people may be a contributing factor to the growing gross fiscal deficits in the state of Jammu and Kashmir. Since 1990–91, the trend has been continuing to 2019–20.

A scatter plot is a useful graphical tool to visualize the relationship between two variables. The scattered plot depicted that there is a positive correlation between EP and GFD in Jammu and Kashmir (Fig. 3). As one move from left to right along the x-axis (*expenditure on power increases*), the corresponding data points on the y-axis (*gross fiscal deficit*) tend to increase as well. This pattern indicates a positive relationship between the two

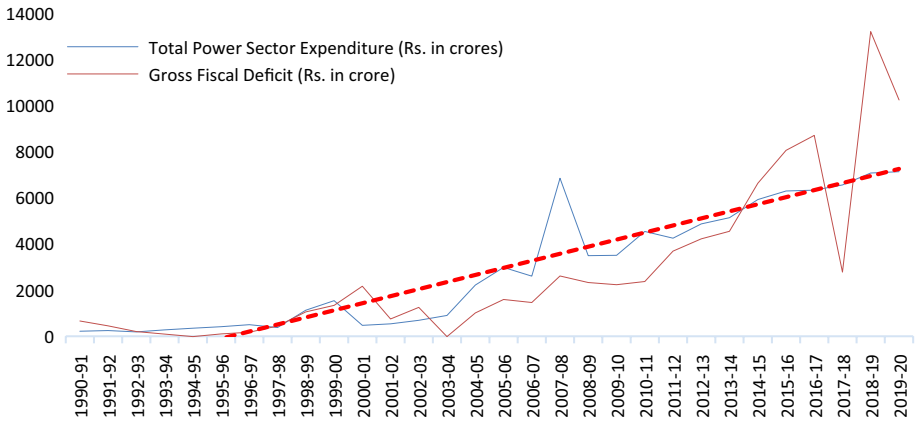


Fig. 2 Trends in power sector expenditure and gross fiscal deficits in Jammu and Kashmir. *Source:* RBI bulletins, 2021–22

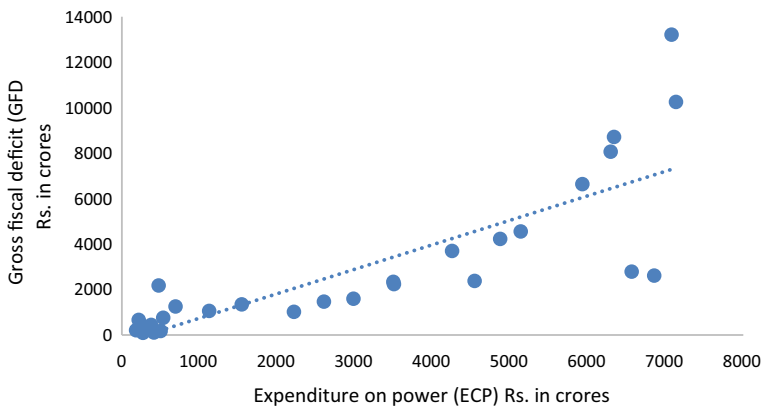


Fig. 3 Scattered plot. *Source:* RBI bulletins, 2021–22

variables. It was observed that the data points tend to cluster or form a general upward trend on the scatter plot. This clustering suggests that as expenditure on power increases, the gross fiscal deficit tends to rise consistently. In order to summarize the general trend of the data, a line of best fit has been drawn. This line represents the estimated linear relationship between the two variables. The slope of the line is positive, indicating that for every increase in EP, the GFD tends to increase by a certain amount.

A simple linear regression was carried out to test if expenditure on power (EP) significantly predicted gross fiscal deficit (GFD). We consider GFD outcome variable to empirically test the relationship with EP. A regression model summary shows three variables: R , which measures the association between the independent and dependent variables, R Square, which measures the influence of the independent variables on the dependent variable, and Adjusted R Square, which measures the reliability of the regression results. These results are presented in Tables 3 and 4. Our results show that EP positively influences GFD. Table 3 displays information about the two variables, EP and GFD in Jammu and Kashmir. The value in the column R shows the correlation between

Table 3 Model summary

| Model | R | R square | Adjusted R square | Std. error of the estimate |
|-------|--------------------|----------|-------------------|----------------------------|
| 1 | 0.822 ^a | 0.676 | 0.665 | 1941.70790 |

^aPredictors: (Constant), Rs. in Crores

Table 4 Regression analysis

| Variable | Coefficient | Std. error | t-Statistic | Prob |
|------------------------------------|-------------|-----------------------|-------------|----------|
| C | -334.7940 | 542.9015 | -0.616675 | 0.5424 |
| RS_IN_CRORES_ TOTAL_POWER_SE... | 1.076780 | 0.140753 | 7.650110 | 0.0000 |
| R-squared | 0.676391 | Mean dependent var | | 2810.767 |
| Adjusted R-squared | 0.664834 | S.D. dependent var | | 3353.927 |
| S.E. of regression | 1941.708 | Akaike info criterion | | 18.04486 |
| Sum squared resid | 1.06E+08 | Schwarz criterion | | 18.13828 |
| Log likelihood | -268.6730 | Hannan-Quinn criter | | 18.07475 |
| F-statistic | 58.52419 | Durbin-Watson stat | | 1.737351 |
| Prob(F-statistic) | 0.000000 | | | |

Dependent variable—GFD; Independent variable—ECP

EP and GFD in Jammu and Kashmir. In this case $r=0.822$, indicates a very strong relationship between the EP and GFD of the state. The R^2 found in Table 3 is 0.676. This therefore means the EP (*independent variable*) only contribute about 67.6% to the GFD (*dependent variable*), while other factors not studied in this research contributes 32.4% of the variations in GFD.

The significance of predictor (EP) of the outcome (GFD) using Analysis of Variance (ANOVA) shows that the f-statistic value is 58.52419 and the P value is less than 5% ($P=0.05$) which is significant, we can say that the regression model significantly predicts GFD. The results indicated that the model was a significant predictor of GFD. Also $F(1,28)=58.524$, $P<0.001$. Table 3 indicated that the $P<0.05$, it can be said that it significantly contributed to the model. From the analysis, the variable indicated a positive coefficient having positive relationship between the dependent and independent variable. To examine the relationship between EP and GFD, we estimated Eq. (2) to find β for the group. The results of this estimation show that the β is statistically significant with a reasonably high R -squared. Therefore, it can be concluded that the increase in expenditure on power results in an increase in the state's gross fiscal deficit (GFD). The analysis gave rise to the following model:

$$\text{Gross fiscal deficit (GFD)} = \beta_0 + \beta_1 \text{ Expenditure on Power (EP)}$$

Replacing the β 's with the correct values gives us the following predictor model:

$$\text{GFD} = -334.794 + 1.077 \text{ EP} \quad (2)$$

The results shown in Eq. (2) reveal that, holding the predictor variable constant, GFD would be -334.794 units. The data findings analyzed also show that taking all other

factors at zero, a unit increase in EP will lead to a 1.077 increase in in GFD in Jammu and Kashmir.

9 Discussion

In our comprehensive study, we discovered a compelling positive correlation between EP and GFD in the Jammu and Kashmir. The findings from our research provide robust evidence in support of the hypothesis that power expenditures play a pivotal role in driving up the state's gross fiscal deficit, consequently posing challenges to the overall fiscal sustainability in the state. Interestingly, the findings of this study are in consistent with those of the study (Shruti Tripathi, 2019) conducted in Jammu and Kashmir on the evaluation of state finances in 2016–17 which revealed that the state's fiscal situation had deteriorated due to its taking over debt under Ujwal DISCOM Assurance Yojana (UDAY)¹ schemes. As a result, their consolidated fiscal deficits rose above the Fiscal Responsibility and Budget Management Act (FRBM) threshold. Further, the study showed that the GFD-GDP ratio continued to surpass the FRBM threshold in 2017–18, owing to a decrease in power revenue receipts. Similarly, a study by the Comptroller and Auditor General of India on state finances in Jammu and Kashmir revealed that the Power Departments tariff collection targets were not met. As a result of the shortfall in revenue collection and the continual use of power subsidies, the state's financial sustainability was compromised (CAGI, 2018). Our findings, which were also confirmed by another study (Salehi-Isfahani et al., 2015) conducted in Iran, prove that providing electricity subsidies increases the government's deficit and leads to waste, smuggling, and inefficiency.

Studies have shown that economic growth, financial development, improvements in socioeconomic conditions, and changes in consumption patterns can put additional strain on natural resources, increase pollution, and contribute to climate change; however, nuclear, and renewable energy, and government stability are contributing to the environment sustainability (Abbasi et al., 2021a, 2021b; Adebayo et al., 2023b; Adebayo & Ullah, 2023). Health financing allocations are dependent on macroeconomic policies, such as a sustained economy and income mobilization (Adebayo & Kartal, 2023; Behera & Dash, 2019). The reduction in GFD would have significant and positive economic consequences for health Katoch, 2022a, 2022b, 2022c), education (Katoch & Nawaz, 2018), and economic development (Ifanti et al., 2013). Lowering the GFD would allow the government to allocate sufficient funds to sectors like health and education, which would have a great effect on reducing morbidity and mortality rates and increasing literacy. Health outcomes are interrelated with educational and labor market outcomes, so improving economic conditions would have a profound effect on society, particularly on children since they would be able to avoid malnutrition and other health related issues (Katoch et al., 2017, 2022a, b). The implications of these results are significant for policy makers seeking to maintain fiscal sustainability. Therefore, it is necessary to keep power expenditures within a certain range. We acknowledge, however, that our study has some limitations, including a short time period, and other variables, such as expenditures on education, health, and military-related expenditures, which were not considered in assessing the relationship. The future research

¹ A scheme called UDAY was launched under the Government of India on November 15, 2015, in order to promote operational and financial efficiency within the State DISCOMs. This scheme was established with the intention that all could have access to affordable and reliable power 24 h a day, 7 days a week.

should address these limitations and explore other factors that might have an impact on the state's finances as well as suggest policy implications for maintaining fiscal sustainability.

10 Limitation of the study and future directions

Our study examines the impact of expenditure on power (EP) on gross fiscal deficits (GFDs) in Jammu and Kashmir, India, for the period from 1990–91 to 2019–20. However, EP is not the only factor to consider, as there are also other factors such as expenditures related to health, social security, education, food distribution, rural development, and crises like COVID-19 that put pressure on state finance. Future research should address these limitations and explore additional factors that may impact state finances. The possible areas are:

1. Analyzing state finances over an extended period will enable future research to identify and address potential fiscal risks. Among other things, the research might examine how demographic changes, such as aging populations, affect state budgets and how innovative approaches can be found to deal with long-term fiscal challenges.
2. To enhance fiscal sustainability, it may be worthwhile to assess the impact of technological adoption and data-driven decision-making on expenditure management.

11 Conclusion and policy implications

It has historically been argued that energy consumption and economic growth are related, but the evidence on energy consumption and state finances is almost nonexistent in the current literature. The purpose of this study was to fill the gap in the existing literature. This is the first study of its kind to empirically investigate the relationship between expenditure on power and gross fiscal deficit in Jammu and Kashmir, India. The per capita gross consumption of electricity in Jammu and Kashmir is following the same trend and length as that recorded at the all-India level, indicating steady growth for several years. Due to the higher demand for and consumption of electricity per capita in Jammu and Kashmir than in the rest of India, this union territory is trying its best to provide electricity to its residents. We have used data from RBI bulletins and applied regression analysis to find the results. The power sector expenditure has increased continuously from 1990–91 to 2019–20, and same trend has been followed by the fiscal deficit of the state during the same period. Considering the empirical findings, mounting GFD represents a significant obstacle to the overall development of the state, which is also due to increasing expenditures on power. Almost every country is striving to control its fiscal deficits while keeping an adequate fund available for the development of priority sectors such as health and education. It might be possible to reduce expenditures on power by targeting subsidies to the power sector. Developing countries face several challenges in their quest for social and economic development as a result of a lack of access to electricity. As the governments have been involved in improving electricity access by extending the subsidies which has placed a pressure on state finances. The results of the regression analysis indicated that there is a positive and significant relationship between the expenditure on power (EP) and gross fiscal deficits (GFD) of the state. As a result of the consistently growing fiscal deficit, the state's financial

health has been adversely affected. Therefore, there is great need to control the fiscal deficits within reasonable ranges. The study bears the following policy implications:

- (a) For curbing the rising pressure on state finances caused by immense power subsidies for domestic needs, the study recommended a targeted subsidy approach. From a policy perspective, this study suggests that governments should devote more attention to long-term solutions to electrification and ensure fair access for all its citizens. The possible way may be that governments must improve the economic conditions of residents in the states so they can afford electricity at market prices and the government will no longer be required to provide subsidies.
- (b) The hilly terrain of Jammu and Kashmir makes small energy projects using renewable energy sources like solar, wind, hydro, and geothermal more feasible to satisfy local needs. As a result, fossil fuel dependency can be reduced, energy security can be enhanced, and the environmental impact of power generation can be mitigated.
- (c) By promoting energy-saving technologies, practices, and appliances across a wide range of sectors, such as industries, commercial buildings, and households, through incentives, regulations, public awareness campaigns, and investing in research and development initiatives that aim to improve power generation and energy conservation.

Declarations

Conflict of interest The author declared that he has no known competing financial interests that could have appeared to influence the work reported in this paper.

References

- Abbas, J. (2021). Crisis management, transnational healthcare challenges and opportunities: The intersection of COVID-19 pandemic and global mental health. *Research in Globalization*, 3, 100037. <https://doi.org/10.1016/J.RESGLO.2021.100037>
- Abbas, J., Al-Sulaiti, K., Lorente, D. B., Shah, S. A. R., & Shahzad, U. (2023a). Reset the industry redux through corporate social responsibility: The COVID-19 tourism impact on hospitality firms through business model innovation. *Economic growth and environmental quality in a post-pandemic world* (pp. 177–201). Routledge.
- Abbas, J., Mubeen, R., Iorember, P. T., Raza, S., & Mamirkulova, G. (2021). Exploring the impact of COVID-19 on tourism: transformational potential and implications for a sustainable recovery of the travel and leisure industry. *Current Research in Behavioral Sciences*, 2, 100033. <https://doi.org/10.1016/J.CRBEHA.2021.100033>
- Abbas, J., Wang, L., Ben Belgacem, S., Pawar, P. S., Najam, H., & Abbas, J. (2023b). Investment in renewable energy and electricity output: Role of green finance, environmental tax, and geopolitical risk: Empirical evidence from China. *Energy*, 269, 126683. <https://doi.org/10.1016/J.ENERGY.2023.126683>
- Abbasi, K. R., Abbas, J., Mahmood, S., & Tufail, M. (2021a). Revisiting electricity consumption, price, and real GDP: A modified sectoral level analysis from Pakistan. *Energy Policy*, 149, 112087. <https://doi.org/10.1016/J.ENPOL.2020.112087>
- Abbasi, K. R., Adedoyin, F. F., Abbas, J., & Hussain, K. (2021b). The impact of energy depletion and renewable energy on CO₂ emissions in Thailand: Fresh evidence from the novel dynamic ARDL simulation. *Renewable Energy*, 180, 1439–1450. <https://doi.org/10.1016/J.RENENE.2021.08.078>
- Acharya, R. H., & Sadath, A. C. (2017). Implications of energy subsidy reform in India. *Energy Policy*, 102, 453–462. <https://doi.org/10.1016/J.ENPOL.2016.12.036>
- Adebayo, T. S. (2022). Trade-off between environmental sustainability and economic growth through coal consumption and natural resources exploitation in China: New policy insights from wavelet local multiple correlation. *Geological Journal*. <https://doi.org/10.1002/GJ.4664>

- Adebayo, T. S. (2023). Towards unlocking the chain of sustainable development in the BRICS economies: Analysing the role of economic complexity and financial risk. *Geological Journal*. <https://doi.org/10.1002/GJ.4694>
- Adebayo, T. S., & Kartal, M. T. (2023). Effect of green bonds, oil prices, and COVID-19 on industrial CO₂ emissions in the USA: Evidence from novel wavelet local multiple correlation approach. *Energy & Environment*. <https://doi.org/10.1177/0958305X231167463>
- Adebayo, T. S., Samour, A., Alola, A. A., Abbas, S., & Ağa, M. (2023a). The potency of natural resources and trade globalisation in the ecological sustainability target for the BRICS economies. *Heliyon*. <https://doi.org/10.1016/j.heliyon.2023.e15734>
- Adebayo, T. S., & Ullah, S. (2023). Formulating sustainable development policies for China within the framework of socioeconomic conditions and government stability. *Environmental Pollution*, 328, 121673. <https://doi.org/10.1016/J.ENVPOL.2023.121673>
- Adebayo, T. S., Ullah, S., Kartal, M. T., Ali, K., Pata, U. K., & Ağa, M. (2023b). Endorsing sustainable development in BRICS: The role of technological innovation, renewable energy consumption, and natural resources in limiting carbon emission. *Science of The Total Environment*, 859, 160181. <https://doi.org/10.1016/J.SCITOTENV.2022.160181>
- Albatayneh, A., Juaidi, A., Abdallah, R., Peña-Fernández, A., & Manzano-Agugliaro, F. (2022). Effect of the subsidised electrical energy tariff on the residential energy consumption in Jordan. *Energy Reports*, 8, 893–903. <https://doi.org/10.1016/J.EGYR.2021.12.019>
- Balsalobre-Lorente, D., Abbas, J., He, C., Pilař, L., & Shah, S. A. R. (2023). Tourism, urbanization and natural resources rents matter for environmental sustainability: The leading role of AI and ICT on sustainable development goals in the digital era. *Resources Policy*, 82, 103445. <https://doi.org/10.1016/J.RESOURPOL.2023.103445>
- Behera, D. K., & Dash, U. (2019). Impact of macro-fiscal determinants on health financing: Empirical evidence from low-and middle-income countries. *Global Health Research and Policy*, 4(1), 1–13. <https://doi.org/10.1186/S41256-019-0112-4/TABLES/5>
- CAGI. (2018). Report of the comptroller and auditor general of India on state finances in J&K. www.agjk.nic.in.
- Cook, P. (2011). Infrastructure, rural electrification and development. *Energy for Sustainable Development*, 15(3), 304–313. <https://doi.org/10.1016/j.esd.2011.07.008>
- Costa-Campi, M. T., Jové-Llopis, E., & Trujillo-Baute, E. (2019). Energy poverty in Spain: An income approach analysis. *Energy Sources, Part B: Economics, Planning and Policy*, 14(7–9), 327–340. <https://doi.org/10.1080/15567249.2019.1710624>
- Fakher, H.-A. (2016). The empirical relationship between fiscal deficits and inflation (case study selected Asian economies). *Iranian Economic Review*, 20(4), 551–579. <https://doi.org/10.22059/IER.2016.59605>
- Hafeez, A., Dangel, W. J., Ostroff, S. M., Kiani, A. G., Glenn, S. D., Abbas, J., & Mokdad, A. H. (2023). The state of health in Pakistan and its provinces and territories, 1990–2019: a systematic analysis for the global burden of disease study 2019. *The Lancet Global Health*, 11(2), e229–e243. [https://doi.org/10.1016/S2214-109X\(22\)00497-1](https://doi.org/10.1016/S2214-109X(22)00497-1)
- IEA. (2017). Energy Access Outlook 2017: From poverty to prosperity. In: *World energy outlook special report*. https://iea.blob.core.windows.net/assets/9a67c2fc-b605-4994-8eb5-29a0ac219499/WEO2017SpecialReport_EnergyAccessOutlook.pdf.
- IEA. (2022). *India's clean energy transition is rapidly underway, benefiting the entire world—Analysis—IEA*. <https://www.iea.org/commentaries/india-s-clean-energy-transition-is-rapidly-underway-benefiting-the-entire-world>.
- Ifanti, A. A., Argyriou, A. A., Kalofonou, F. H., & Kalofonos, H. P. (2013). Financial crisis and austerity measures in Greece: Their impact on health promotion policies and public health care. *Health Policy*, 113(1–2), 8–12. <https://doi.org/10.1016/J.HEALTHPOL.2013.05.017>
- Ilyas, R., Hussain, K., Ullah, M. Z., & Xue, J. (2022). Distributional impact of phasing out residential electricity subsidies on household welfare. *Energy Policy*, 163, 112825. <https://doi.org/10.1016/J.ENPOL.2022.112825>
- Iorember, P. T., Iormom, B., Jato, T. P., & Abbas, J. (2022). Understanding the bearable link between ecology and health outcomes: The criticality of human capital development and energy use. *Heliyon*, 8(12), e12611. <https://doi.org/10.1016/J.HELIVON.2022.E12611>
- Jazuli, M. R., Steenmans, I., & Mulugetta, Y. (2021). Navigating policy dilemmas in fuel-subsidy reductions: Learning from Indonesia's experiences. *Sustainability: Science, Practice, and Policy*, 17(1), 391–403. <https://doi.org/10.1080/15487733.2021.2002024>
- Jiakui, C., Abbas, J., Najam, H., Liu, J., & Abbas, J. (2023). Green technological innovation, green finance, and financial development and their role in green total factor productivity: Empirical insights from China. *Journal of Cleaner Production*, 382, 135131. <https://doi.org/10.1016/J.JCLEPRO.2022.135131>

- Katoch, O. R. (2022a). Author's response to comment on "Determinants of malnutrition among children: A systematic review." *Nutrition*, 102, 111733. <https://doi.org/10.1016/J.NUT.2022.111733>
- Katoch, O. R. (2022b). Determinants of malnutrition among children: A systematic review. *Nutrition*, 96, 111565. <https://doi.org/10.1016/j.nut.2021.111565>
- Katoch, O. R. (2022c). Work from home during COVID-19: Perceptions of academic professionals in India. *South Asian Journal of Social Studies and Economics*, 14(3), 11–27. <https://doi.org/10.9734/SAJSSE/2022/V14I330381>
- Katoch, O. R., & Nawaz, A. (2018). Social exclusion, caste and health status of women and children in Jammu and Kashmir, India. *American International Journal*, 23(1), 75–79. <https://doi.org/10.2139/ssrn.3234145>
- Katoch, O. R., Sehgal, S., Sharma, R., & Nawaz, A. (2022a). Analysis of the targets and progress toward Meeting the 2030 agenda for SDG 7 on affordable and clean energy: Evidence from India. *Journal of Energy Research and Reviews*, 12, 92–102. <https://doi.org/10.9734/JENRR/2022/V12I4251>
- Katoch, O. R., Sharma, A., & Nawaz, A. (2017). Determinants of malnutrition (Stunting) among rural farming households: Evidences from Rural Areas of. *Asian Journal of Research in Social Sciences and Humanities*, 7(7), 166–176.
- Katoch, O., Sharma, R., & Parihar, S. (2022b). Socio-economic factors and academic performance of children in district Doda Of Jammu and Kashmir, India. *Journal of Positive School Psychology*, 6(2), 6525–6541.
- Katoch, O. R., Sharma, R., Parihar, S., & Nawaz, A. (2023). Energy poverty and its impacts on health and education: A systematic review. *International Journal of Energy Sector Management*. <https://doi.org/10.1108/IJESM-10-2022-0007/FULL/XML>
- Khalid, S. A., & Salman, V. (2020). Welfare impact of electricity subsidy reforms in Pakistan: A micro model study. *Energy Policy*, 137(October), 111097. <https://doi.org/10.1016/j.enpol.2019.111097>
- Khandelwal, V. (2015). Impact of energy consumption, GDP & fiscal deficit on public health expenditure in India: An ARDL bounds testing approach. *Energy Procedia*, 75, 2658–2664. <https://doi.org/10.1016/J.EGYPRO.2015.07.652>
- Kose, T. (2019). Energy poverty and health: The Turkish case. *Energy Sources, Part B: Economics, Planning and Policy*, 14(5), 201–213. <https://doi.org/10.1080/15567249.2019.1653406>
- Kumhof, M., & Laxton, D. (2013). Fiscal deficits and current account deficits. *Journal of Economic Dynamics and Control*, 37(10), 2062–2082. <https://doi.org/10.1016/J.JEDC.2013.05.001>
- Langarita, R., Cazcarro, I., Sánchez-Chóliz, J., & Sarasa, C. (2021). The role of fiscal measures in promoting renewable electricity in Spain. *Energy Conversion and Management*. <https://doi.org/10.1016/j.enconman.2021.114480>
- Li, Y., Al-Sulaiti, K., Dongling, W., Abbas, J., & Al-Sulaiti, I. (2022). Tax avoidance culture and employees' behavior affect sustainable business performance: The moderating role of corporate social responsibility. *Frontiers in Environmental Science*, 10, 964410. <https://doi.org/10.3389/FENV.2022.964410/BIBTEX>
- Lin, B., & Jiang, Z. (2011). Estimates of energy subsidies in China and impact of energy subsidy reform. *Energy Economics*, 33(2), 273–283. <https://doi.org/10.1016/J.ENERCO.2010.07.005>
- Lloyd, P. J. (2017). The role of energy in development. *Journal of Energy in Southern Africa*, 28(1), 54–62. <https://doi.org/10.17159/2413-3051/2017/v28i1a1498>
- Looney, B. (2021). Statistical review of world energy 2021. <http://www.indiaenvironmentportal.org.in/files/file/bp%20statistical%20review%20of%20world%20energy%202021.pdf>.
- Micah, A. E., Bhangdia, K., Cogswell, I. E., Lasher, D., Lidral-Porter, B., Maddison, E. R., Nguyen, T. N. N., Patel, N., Pedroza, P., Solorio, J., Stutzman, H., Tsakalos, G., Wang, Y., Warriner, W., Zhao, Y., Zlavog, B. S., Abbafati, C., Abbas, J., Abbasi-Kangevari, M., & Dieleman, J. L. (2023). Global investments in pandemic preparedness and COVID-19: Development assistance and domestic spending on health between 1990 and 2026. *The Lancet Global Health*, 11(3), e385–e413. [https://doi.org/10.1016/S2214-109X\(23\)00007-4](https://doi.org/10.1016/S2214-109X(23)00007-4)
- Miller, R. G., & Sorrell, S. R. (2014). The future of oil supply. *Philosophical Transactions Series A, Mathematical, Physical, and Engineering Sciences*. <https://doi.org/10.1098/RSTA.2013.0179>
- Ministry of Power, Government of India (2020). Growth of Electricity Sector in India from 1947–2020. https://cea.nic.in/wp-content/uploads/pdm/2020/12/growth_2020.pdf.
- Musango, J. K. (2014). Household electricity access and consumption behaviour in an urban environment: The case of Gauteng in South Africa. *Energy for Sustainable Development*, 23, 305–316. <https://doi.org/10.1016/j.esd.2014.06.003>
- NITI Aayog. (2021). Turning around the power distribution sector: Learnings and best practices from reforms. https://www.niti.gov.in/sites/default/files/2021-08/Electricity-Distribution-Report_030821.pdf.
- Niu, S., Jia, Y., Ye, L., Dai, R., & Li, N. (2016). Does electricity consumption improve residential living status in less developed regions? An empirical analysis using the quantile regression approach. *Energy*, 95, 550–560. <https://doi.org/10.1016/j.energy.2015.12.029>
- OECD & IEA. (2011). OECD green growth studies energy. <https://www.oecd.org/greengrowth/greening-energy/49157219.pdf>.

- Ramzan, M., Razi, U., Qudoods, M. U., & Adebayo, T. S. (2023). Do green innovation and financial globalization contribute to the ecological sustainability and energy transition in the United Kingdom? Policy insights from a bootstrap rolling window approach. *Sustainable Development*, 31(1), 393–414. <https://doi.org/10.1002/SD.2399>
- Rangarajan, C., & Srivastava, D. (2005). Fiscal Deficits and Government Debt: Implications for growth and stabilisation on JSTOR. *Economic and Political*, 2, 2919–2931.
- RBI. (2020). State finances: A study of budgets of 2020–21. <https://rbidocs.rbi.org.in>.
- RBI. (2021). Reserve Bank of India—RBI Bulletin. https://www.rbi.org.in/Scripts/BS_ViewBulletin.aspx?Id=20691.
- Salehi-Isfahani, D., Wilson Stucki, B., & Deutschmann, J. (2015). The reform of energy subsidies in Iran: The role of cash transfers. *Emerging Markets Finance and Trade*, 51(6), 1144–1162. <https://doi.org/10.1080/1540496X.2015.1080512>
- Shah, S. A. R., Zhang, Q., Abbas, J., Balsalobre-Lorente, D., & Pilař, L. (2023a). Technology, urbanization and natural gas supply matter for carbon neutrality: A new evidence of environmental sustainability under the prism of COP26. *Resources Policy*, 82, 103465. <https://doi.org/10.1016/J.RESOURPOL.2023.103465>
- Shah, S. A. R., Zhang, Q., Abbas, J., Tang, H., & Al-Sulaiti, K. I. (2023b). Waste management, quality of life and natural resources utilization matter for renewable electricity generation: The main and moderate role of environmental policy. *Utilities Policy*, 82, 101584. <https://doi.org/10.1016/J.JUP.2023.101584>
- Shahbaz, M., & Lean, H. H. (2012). Does financial development increase energy consumption? The role of industrialization and urbanization in Tunisia. *Energy Policy*, 40(1), 473–479. <https://doi.org/10.1016/j.enpol.2011.10.050>
- Shruti Tripathi. (2019). Evaluation of state finances: Jammu and Kashmir 2006–07 to 2016–17. https://finco.mindia.nic.in/writereaddata/html_en_files/fincom15/StudyReports/10.pdf.
- Tiwari, S., & Suyra, S. (2020). State of state finances. <https://prsindia.org/policy/analytical-reports/state-state-finances-2020-21>.
- Topolewski, T. (2021). Relationship between energy consumption and economic growth in European countries: Evidence from dynamic panel. *Energies*, 14(3565), 1–12. <https://doi.org/10.3390/en14123565>
- Wang, S., Abbas, J., Al-Sulati, K. I., & Shah, S. A. R. (2023). The impact of economic corridor and tourism on local community's quality of life under one belt one road context. *Evaluation Review*. <https://doi.org/10.1177/0193841X231182749>
- Yu, S., Abbas, J., Draghici, A., Negulescu, O. H., & Ain, N. U. (2022a). Social media application as a new paradigm for business communication: The role of COVID-19 knowledge, social distancing, and preventive attitudes. *Frontiers in Psychology*, 13, 903082. <https://doi.org/10.3389/FPSYG.2022.903082/BIBTEX>
- Zhang, T., Shi, X., Zhang, D., & J. X. (2019). Socio-economic development and electricity access in developing economies: A long-run model averaging approach. *Energy Policy*, 132(October 2018), 223–231. <https://doi.org/10.1016/j.enpol.2019.05.031>
- Zhuang, D., Abbas, J., Al-Sulaiti, K., Fahlevi, M., Aljuaid, M., & Saniuk, S. (2022). Land-use and food security in energy transition: Role of food supply. *Frontiers in Sustainable Food Systems*, 6, 1053031. <https://doi.org/10.3389/FSUFS.2022.1053031/BIBTEX>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

Authors and Affiliations

Om Raj Katoch¹ 

✉ Om Raj Katoch
orkatoch@gmail.com

¹ Department of Economics, Government Degree College Batote, J&K, Affiliated to University of Jammu, Jammu, Jammu and Kashmir, India