Original Research Article

The impact of government spending and government quality on energy poverty- a global evidence

ABSTRACT

This paper examines the impact of government spending on energy poverty. Using a sample covering 77 countries during the period of 2007-2022, we find that government spending could alleviate energy poverty, as evidenced by higher access to electricity and clean fuel for cooking. These results are consistent across a number of robustness tests. We further find that the favorable impact of government spending is more pronounced among countries with better effectiveness. Overall, our findings provide relevant implications for countries to attain energy security as well as alleviate energy poverty.

Keywords: energy poverty, government spending, government quality, sustainable development.

1. INTRODUCTION

Energy poverty generally refers to the inability of households to meet domestic/basic energy needs. The concern for energy poverty has become more relevant given its severity as well as its connect with the world's sustainable development. Specifically, in 2020, 3 billion people in the world (i.e. four out of ten) do not have access to electricity and clean fuel for cooking; these people are also suffering from indoor air pollution, leaving long-lasting impact on their health (Rose, 2021). The recent Russia and Ukraine conflict has raised the concern for energy security also for developed European countries (Chathamhouse, 2022); in other words, energy poverty has not been an issue of only less developed and developing countries; it has become a global concern. Several research has shown that energy poverty is an important part of sustaina- ble development (Churchill and Smyth, 2020) as it is closely related to human health (Pan et al., 2021), environmental protection (Hassan et al., 2022), and gender empow- erment (Sovacool, 2012).

Given this importance of energy poverty, research has been conducted to understand the various determinants of energy poverty. Several factors have been identified at the micro-level including socio-demographic variables including the level of education of lead family member, family size (Crentsil et al., 2019) or spatial location (Abbas et al., 2020) as well as at the macro-level such as financial development (Asonguand Odhiambo, 2020), and national culture (Chaudhry and Shafiullah, 2021). Nevertheless, there has not been much attention paid to the potential impact of government spending, which is among a key pillar of fiscal policy. Our paper fills this research gap by examining the impact of government spending on energy poverty.

There exists opposite prediction on the impact government spending on energy poverty. On the one hand, the government spending could help to alleviate the energy poverty. One of the key reasons is linked to the philosophy of Keynes (1936) who emphasized the role of government spending in boosting economic growth as well as maintaining social equality. According to advocates of the Keynesian model, an effective use of national wealth may enhance an economy's productive potential, resulting in economic advancement and improved general welfare (i.e. crowding-in effect) (Kandil, 2017). In the context of energy poverty, the government spending could help alleviate the energy poverty through several channels. Government spending could take forms of investment in energy infrastructure i.e. electricity generation and transmission, which could improve the access to energy of the population (Giannini et al., 2010). Alternatively, the government spending could be be translated to subsidies or price reduction to lower the energy costs, making it affordable and accessible for the whole population (Anderson et al., 2018).

On the other hand, government spending could attenuate the energy poverty condition. To explain, the opponents of Keynesian theory argue that greater government spending can stifle economic progress by competing away private-sector investment (i.e. crowding-out effect) (Bahal et al., 2018). In the context of energy poverty, the excessive and inefficient public spending could crowd-out the private sector investment, which could be more effective in some projects of energy production and transmission, leading to a lower access to energy or energy efficiency in the nation. As governments around the world are adopting stringent rules to discipline their spending (Gomez-Gonzalez et al., 2022), we favor the former impact; specifically, government spending could contribute to alleviate energy poverty.

The relationship between government spending and energy poverty could also be moderated by the overall government quality. Literature (i.e Kaufmann et al., 2005) generally advocates the crucial role of government quality; if governance and discipline are maintained, the government could best perform their duties to promote economic growth and ensure social welfare. In the context of energy poverty, we further postulate that countries with higher government quality could experience higher favorable impact of government spending on energy accessibility. In short, in this paper, we aim to address to questions: (i) What is the impact of government spending on energy poverty? and (ii) How does government quality moderate the relationship between government spending and energy poverty?

Our paper is organized as follows. Section 2 presents our research methodology with details about model, method of estimation, variables construction. Section 3 presents our baseline findings on the relationship between government spending and energy poverty as well as the moderating impact of government quality. Section 4 concludes our paper with a summary of findings, contributions, and implications.

2. 2 LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

There have been several studies conducted to understand the various determinants of energy poverty. Several factors have been identified at both the micro- and macro- level. For instance, employing logit model, Ogwumike and Ozughalu (2015) documented age and gender of household head, educational attainment, family size, and region of residence as key determinants of energy poverty in Nigeria. Likewise, Crentsil et al. (2019) report the impact of several socio-demographic characteristics of the household head, such as age, gender, and educational attainment, as well as spatial locations on the level of energy poverty in Ghana. Studying the Pakistan household-level data, Quratul-Ann and Mirza (2021) found that the higher age and educational level of the household head, higher receipt of remittance as well as the higher latitude of the household location significantly decreases the likelihood of energy poverty. Studying six South Asian countries, Abbas et al. (2020) reported that household wealth, house size, occupation, education, and household head gender as significant negative drivers of energy poverty while household size, age of the household head, residential location were recognized as the positive determinants of energy poverty.

These studies mostly focus on single country context; the sampled countries mainly locate in less developed Africa region or emerging Asian countries. The recent Russia and Ukraine conflict has raised the concern for energy security also for developed European countries (Chathamhouse, 2022); in other words, energy poverty has not been an issue of only less developed and developing countries; it has become a global concern. Accordingly, there is a need for a global study on the determinants of energy poverty.

The macro-economic determinants of energy poverty have received less attention than the micro-counterparts. For example, sampling 65 nations, Nguyen et al. (2021) investigated the association between energy poverty and financial development and found that financial development helps to lower the chance of energy poverty. Similarly, Eren et al. (2019) highlighted that the use of renewable energy is promoted by financial development in India. Likewise, for a group of EU nations, Anton and Nucu (2019) reported that financial development promotes the use of renewable energy.

Government spending is a key pillar of fiscal policy. The existing literature generally provides evidence to support the important role of government spending in promoting human development (Gupta et al., 2002), consumption (Galí et al., 2007), economic growth (Mitchell, 2005), and income equality (De Mello and Tiongson, 2006). Nevertheless, there is also mixed evidence on the impact of government spending on poverty; the impact varies according to the sector of receiving government spending, how well it is targeted and the way in which it is financed (Anderson et al., 2018).

Energy poverty, due to its far-reaching effect on the affected population, has received more attention from the government and policymakers around the world. If alleviating energy poverty becomes urgent, government policies would be prioritized to deal with it. Among several policies, government spending is often expected to effectively resolve energy poverty (ADB, 2013). Hence, this line of reasoning suggests the potential relationship between government spending and energy poverty. Accordingly, the study aims to test this potential relationship in the global context.

The impact of government spending on energy poverty is not a priori clear. The government spending could help to alleviate theenergy poverty. According to advocates of the Keynesian model, an effective use of national wealth may enhance an economy's productive potential, resulting in economic advancement and improved general welfare (i.e. crowding-in effect) (Kandil, 2017). In the context of energy poverty, the government could invest in energy infrastructure i.e. electricity generation and transmission, which could improve the access to energy of the population (Giannini et al., 2010). Alternatively, the government could introduce subsidies or price reduction to lower the energy costs, making it affordable and accessible for the disadvantaged population (Anderson et al., 2018). However, the opponents of Keynesian theory argue that greater government spending can stifle economic progress by competing away private-sector investment (i.e. crowding-out effect) (Bahal et al., 2018). In the context of energy poverty, the excessive and inefficient public spending could crowd-out the private sector investment, which could be more effective in some projects of energy production and transmission, leading to a lower access to energy or energy efficiency in the nation.

As governments around the world are adopting stringent rules to discipline their spending (Gomez-Gonzalez et al., 2022), the negative impact of excessive and inefficient spending is likely to be avoided. Hence, we favor the former impact and develop the following hypothesis:

H1: Government spending is negatively associated with energy poverty.

3. METHODOLOGY

3.1 Model Specification

In line with Nguyen et al. (2021) and Dimnwobi et el. (2022), we investigate the impact of government spending on the energy poverty by estimating the following regression model:

$$Enegy\_pov_{i,t} = \alpha_i + \beta_1 Gov\_Exp_{i,t-1} + \beta_2 Gov\_qual_{i,t-1} + \beta_3 Ln(GDP)_{i,t-1} + \beta_4 Open_{i,t-1} + \beta_5 Unemployment_{i,t-1} + \beta_6 Inflation_{i,t-1} + \lambda_i + \Theta_t + \varepsilon_{i,t} \quad (1)$$

To test for the moderating effect of government quality on the relationship between government spending and energy poverty, we augment model (1) with an interaction term between government spending and government quality as below:

$$Enegy\_pov_{i,t} = \alpha_i + \beta_1 Gov\_Exp_{i,t-1} + \beta_2 Gov\_qual_{i,t-1} + \beta_3\, Gov\_Exp_{i,t-1} * Gov\_qual_{i,t-1} + \beta_4 Ln(GDP)_{i,t-1} + \beta_5 Open_{i,t-1} + \beta_6 Unemployment_{i,t-1} + \beta_7 Inflation_{i,t-1} + \lambda_i + \Theta_t + \varepsilon_{i,t} \quad (2)$$

Where $Enegy\_pov_{i,t}$ is the dependent variable, capturing the level of energy poverty of the country i in year t. In line with prior literature (i.e. Churchill et al., 2020), we evaluate the level of energy poverty via two aspects: percentage of the population with access to clean fuels and technologies for cooking in the total population (Clean_fuel); percentage of the population with access to electricity in the total population (Access_elec). Though there remains some controversy on the definition aswell as measure of energy poverty; these two measures are the most frequently used one (Churchill et al., 2020; Ullah et al.; 2021)

To proxy for the government spending, we employed the government expense to GDP ratio (Gov_exp), which is defined as the cash payments for operating activities of the government in providing goods and services (World Bank 2022). As a robust check, we also use another measure namely the general government final consumption expenditure to GDP (Gov_cons).

To proxy for the government effectiveness (Gov_eff), we use the Government Effectiveness Index from the World Governance Indicators database. This index measures the quality of public services, civil service, policy formulation, policy implementation and credibility of a government's commitment to raise these qualities or keeping them high (World Governance Indicator). The higher the index is, the better the quality of the government will be.

We also included several macro-economic variables which could potentially affect the level of energy poverty in one country. These variables include inflation rate (Inflation), natural logarithm of GDP per capita (Ln_gdp), unemployment rate (Unemploy) and trade openness (Openness). Table 1 displays the definition of the main variables used in our empirical analysis.

Table 1. Variables definition and specification

Name	Definition	Source
Accesstoelectriticy	Access_elec = Population with access to electricity to total population (%); where Access to electricity is the percentage of population with accesstoelectricity.Electrificationdataarecollected from industry, national surveys and internationalsources.	

Clean fuel forcooking	Clean_fuel=populationwithaccesstocleanfuels and technologies for cooking to total population. Access to clean fuels and technologies forcookingistheproportionoftotalpopulationprimarilyusingcleancookingfuelsandtechnologies for cooking. Under WHO guidelines, keroseneisexcluded fromcleancookingfuels.	World Development Indicator
Government expense	Gov_exp=GovernmentexpensetoGDP(%);where Expense is cash payments for operatingactivities of the government in providing goodsandservices.Itincludescompensationof employees (such as wages and salaries), interest andsubsidies,grants,socialbenefits,andother expensessuch asrentanddividends.	
Totalgovernmentexpenditure	Gov_cons=finalconsumptionexpendituretoGDP(%);whereFinalconsumptionexpenditureisthe generalgovernmentfinalconsumptionexpenditure(generalgovernmentconsumption).	
Governmenteffectiveness	Gov_eff is an index that measures the quality ofpublic services, civil service, policy formulation,policy implementation and credibility of a government'scommitmenttoraisethesequalitiesor keepingthemhigh.	WorldGovernance Indicator
GDPper capita	Ln(GDP)=naturallogarithmofGDPpercapital	
Inflation	Inflation=Annualchangeinconsumerpriceindex(%)	
Unemployment	Unemploy=unemployedpeopletototallaborforce(%)	World Development Indicator
Tradeopenness	Openness= Trade openness to GDP (%), whereTrade is the sum of exports and imports of goodsandservicesmeasured as ashareofgross domestic product	

It is worth noting that, country fixed effects (λ_i) are also incorporated in the base- line model (1) to control for the cross-country heterogeneities. Year fixed effects (Θ_t) are also incorporated to account for some events such as past energy crisis or the recent Covid-19 pandemic, which potentially affect the level of energy poverty. Additionally, we lagged all right-hand-side variables for one year period to mitigate the reverse causality, which could run from the energy poverty to government spending (ref). Finally, $\varepsilon_{i,t}$ is the error term and is clustered at the country level to account for the presence of serial correlation in the data.

3.2 Data and Sample

We retrieve data for our empirical study mainly from the World Development Indicators from the World Bank; except for the Government effectiveness (Gov_eff) is sourced from the World Governance Indicators database. All data are winsorised at 1st percentile level. We

retain countries with all available data for our variables in the model. To this end, our sample consists of 869 observations from 77 countries during the period of 2007-2022.

4. RESULTS AND DISCUSSION

4.1 Descriptive Summary

Table 2 displays the detailed descriptive statistics for all variables used in regression models. There are around 85.6% and 71.69% of the population in the sampled countries having access to electricity and clean fuel for cooking. However, the level of accessibility tends to be unequal across the sampled countries as both measures namely Access_fuel and Clean_fuel having high standard deviation of 24.43% and 33.83%, respectively. Additionally, the spending of the government on average accounts for 24.96% of national GDP with significant differences across countries (i.e SD of 10.77%).

Table 2. Descriptive summary

Variables	N	mean	sd	min	max
access_elec	869	85.58	24.43	14.40	100.00
clean_fuel	842	71.69	33.83	0.90	100.00
gov_exp	869	24.96	10.77	4.29	49.32
gov_effect	869	-0.03	0.97	-1.76	2.04
ln_gdp	869	8.87	1.37	6.17	11.32
unemploy	869	7.95	5.63	0.72	28.01
inflation	869	4.04	4.43	-1.42	25.23
openness	869	94.06	54.04	24.39	329.47

Table 3 shows the correlation matrix of the variables included in the model. As can be seen in Table 3, the two measures of energy poverty namely Access_elec and Clean_fuel are highly related with its correlation being 0.87. Our key variable of interest is government spending (i.e. gov_exp) being positively and significantly correlated with two measures of energy poverty. With regards to other variables, all correlation coefficients are below 0.6. Overall, the correlation matrix indicates that multicollinearity is not a significant issue that affects our analysis.

Table 3. Correlation matrix

	1	2	3	4	5	6	7	8
access_elec	1							
clean_fuel	0.88*	1						
gov_exp	0.49*	0.578*	1					
gov_effect	-0.03	-0.015	0.03	1				
ln_gdp	0.59*	0.51*	0.43*	-0.05	1			
unemploy	0.02	0.03	0.37*	-0.11*	-0.00	1		
inflation	-0.29*	-0.28*	-0.16*	-0.03	-0.39*	-0.03	1	
openess	0.26*	0.314*	0.21*	-0.03	0.31*	0.02	-0.14*	1

4.2 Empirical Findings

Table 4 presents the empirical evidence for the impact of government expenditure on energy poverty. The first column reports our baseline finding, with access to electricity (Access_elec) being our dependent variable. In the second column, we replace the dependent variable with access to clean fuel for cooking (Clean_fuel). In the final column, we provide a robust check by using an alternative measure of government spending namely the total final government consumption (i.e. Gov_cons). Across the table, the coefficients of government spending are positive and significant at 5% and1% level. This indicates that the government spending could help to improve access to electricity and clean fuel; hence, in other words, government spending could contribute to lower the country's energy poverty. This finding is congruent to the study of Che and Jiang (2021).

For the impact of other explanatory variables, countries with higher GDP per capital tend to have better access to energy, evidenced via the positive and significant coefficients of Ln_GDP variable. This could be explained by the fact that people living in high-income countries could have higher affordability for energy. Additionally, higher unemployment rate is associated with lower access to energy as unemployment could lower people's income as well as affordability for energy.

Table 4. The impact of government spending on energy poverty

	(1) access_elec	(2) clean_fuel	(3) access_elec	(4) clean_fuel
L.gov_exp	0.122**	0.131***		
	(0.046)	(0.043)		
L.gov_cons			0.330**	0.273**
			(0.127)	(0.122)
L.gov_eff	-1.575	-0.267	-0.784	-0.157
	(1.697)	(1.112)	(1.409)	(1.117)
L.ln_gdp	19.102***	12.760***	14.981***	15.446***
	(6.144)	(4.797)	(4.984)	(4.281)
L.unemploy	-0.376**	-0.033	-0.204	-0.210
	(0.153)	(0.120)	(0.143)	(0.141)
L.inflation	-0.035	-0.013	0.027	0.052
	(0.038)	(0.032)	(0.053)	(0.055)
L.openess	-0.025	-0.018	-0.012	-0.017
	(0.027)	(0.021)	(0.018)	(0.018)
Constant	-87.595	-44.511	-54.664	-72.737*
	(54.328)	(42.704)	(43.669)	(37.184)
Country FE	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes
Observations	869	842	1,207	1,158
R-squared	0.385	0.412	0.360	0.407
#countries	77	75	99	94

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 reports the moderating impact of government quality on the relationship between government spending and energy poverty. The focus is placed on the coefficient of the interaction term between government spending and government quality. Such coefficients are both positive and significant at 10% level. This implies that countries with better

government quality could experience higher favorable impact of government spending on the level of energy accessibility.

Table 5. The moderating impact of government effectiveness

VARIABLES	(1) access_elec	(2) clean_fuel
L.gov_expense	0.115**	0.124***
	(0.049)	(0.045)
L.goveffect	-5.019	-2.019
	(3.172)	(1.845)
L.gov_expense#L.goveffect	0.156*	0.078*
	(0.090)	(0.043)
L.ln_gdp	19.552***	13.007***
	(6.255)	(4.784)
L.unemploy	-0.388**	-0.039
	(0.157)	(0.121)
L.inflation	-0.034	-0.012
	(0.037)	(0.031)
L.openess	-0.024	-0.018
	(0.025)	(0.021)
Constant	-91.737	-46.645
	(55.490)	(42.713)
Country FE	Yes	Yes
TimeFE	Yes	Yes
Observations	869	842
R-squared	0.394	0.417
Numberofcountries	77	75

Robuststanderrorsinparentheses
***p<0.01,**p<0.05,*p<0.1

5. CONCLUSIONS

In this study, we analyze the impact of government spending on energy poverty. Using a sample covering 77 countries during the period of 2007-2022, we find that government spending could alleviate energy poverty, as evidenced by higher access to electricity and clean fuel for cooking. These results are consistent across a number of robustness tests. We further find that the favorable impact of government spending is more evident among countries with better government quality/ effectiveness. Given these findings, our paper lends support to importance of government spending, which has been shown to have impact on human development (Gupta et al., 2002), consumption (Galí et al., 2007), economic growth (Mitchell, 2005), income equality (De Mello and Tiongson, 2006).

Our findings provide some relevant implications for countries to tackle the issue of energy poverty. The increase in the government spending could contribute to the better access to energy. Nevertheless, an overall quality of government should be maintained to elevate the favorable impact of government spending.

REFERENCES

1. Abbas, K., Li, S., Xu, D., Baz, K., & Rakhmetova, A. (2020). Do socioeconomic factors determine household multidimensional energy poverty? Empirical evidence from South Asia. *Energy Policy*, 146, 111754.

2. ADB (2013): Maximising access to energy for the poor in developing Asia. Accessed via https://www.adb.org/sites/default/files/publication/31163/maximizing-access-energy-poor-developing-asia.pdf

3. Anderson, E., d'Orey, M. A. J., Duvendack, M., & Esposito, L. (2018). Does government spending affect income poverty? A meta-regression analysis. *World Development*, 103, 60-71.

4. Anton, S. G., &Nucu, A. E. A. (2020). The effect of financial development on renewable energy consumption. A panel data approach. *Renewable Energy*, 147, 330-338.

5. Asongu, S. A., & Odhiambo, N. M. (2021). Inequality, finance and renewable energy consumption in Sub-Saharan Africa. *Renewable Energy*, 165, 678-688.

6. Bahal, G., Raissi, M., & Tulin, V. (2018). Crowding-out or crowding-in? Public and pri- vate investment in India. *World Development*, 109, 323-333.

7. Chathemhouse (2022). "The Ukraine war and threas to food and nergy security". Access via https://www.chathamhouse.org/2022/04/ukraine-war-and-threats-food-and-energy-security

8. Chaudhry, S. M., & Shafiullah, M. (2021). Does culture affect energy poverty? Evidence from a cross-country analysis. *Energy Economics*, 102, 105536.

9. Che, X., & Jiang, M. (2021). Economic Policy Uncertainty, Financial Expenditure and Energy Poverty: Evidence Based on a Panel Threshold Model. *Sustainability*, 13(21), 11594.

10. Churchill, S. A., Smyth, R., & Farrell, L. (2020). Fuel poverty and subjective wellbeing. *Energy Economics*, 86, 104650.

11. Crentsil, A. O., Asuman, D., & Fenny, A. P. (2019). Assessing the determinants and drivers of multidimensional energy poverty in Ghana. *Energy Policy*, 133, 110884.

12. De Mello, L., & Tiongson, E. R. (2006). Income inequality and redistributive government spending. *Public finance review*, 34(3), 282-305.

13. Dimnwobi, S. K., Onuoha, F. C., Uzoechina, B. I., Ekesiobi, C. S., &Nwokoye, E. S. (2022). Does public capital expenditure reduce energy poverty? Evidence from Nigeria. *International Journal of Energy Sector Management*, (ahead-of-print).

14. Eren, B. M., Taspinar, N., &Gokmenoglu, K. K. (2019). The impact of financial development and economic growth on renewable energy consumption: Empirical analysis of In- dia. *Science of the Total Environment*, 663, 189-197.

15. Galí, J., López-Salido, J. D., &Vallés, J. (2007). Understanding the effects of government spending on consumption. *Journal of the European Economic Association*, 5(1), 227-270.

16. Gomez-Gonzalez, J. E., Valencia, O. M., & Sánchez, G. A. (2022). How fiscal rules can reduce sovereign debt default risk. *Emerging Markets Review*, 50, 100839.

17. Gupta, S., Verhoeven, M., & Tiongson, E. R. (2002). The effectiveness of government spending on education and health care in developing and transition economies. *European Journal of Political Economy*, 18(4), 717-737.

18. Hassan, S. T., Batool, B., Zhu, B., & Khan, I. (2022). Environmental complexity of globalization, education, and income inequalities: New insights of energy poverty. *Journal of Cleaner Production*, 340, 130735.

19. IEA (2010). "Energy poverty: How to make modern energy access universal?" World Energy Outlook 2010.

20. Kandil, M. (2017). Crowding out or crowding in? Correlations of spending components within and across countries. *Research in International Business and Finance*, 42, 1254-1273.

21. Kaufmann, D., Kraay, A., &Mastruzzi, M. (2005). Governance matters IV: governance indicators for 1996-2004. World bank policy research working paper series, (3630).

22. Mitchell, D. J. (2005). The impact of government spending on economic growth. *The Heritage Foundation*, 1813, 1-18.

23. Nguyen, C. P., Su, T. D., Bui, T. D., Dang, V. T. B., & Nguyen, B. Q. (2021). Financial development and energy poverty: global evidence. *Environmental Science and Pollution Research*, 28(26), 35188-35225.

24. Ogwumike, F. O., &Ozughalu, U. M. (2016). Analysis of energy poverty and its implications for sustainable development in Nigeria. *Environment and development economics*, 21(3), 273-290.

25. Pan, L., Biru, A., &Lettu, S. (2021). Energy poverty and public health: Global evidence. *Energy economics*, 101, 105423.

26. Pereira, M. G., Freitas, M. A. V., & da Silva, N. F. (2010). Rural electrification and energy poverty: Empirical evidence from Brazil. *Renewable and Sustainable Energy Reviews*, 14(4), 1229-1240.

27. Quratul-Ann, A. R., & Mirza, F. M. (2021). Determinants of multidimensional energy poverty in Pakistan: a household level analysis. *Environment, Development and Sustainability*, 23(8), 12366-12410.

28. Rose, M (2021). "Energy poverty and indoor air pollution: a problem as old as humanity that we can end within our lifetime". Our World In data.

29. Sovacool, B. K. (2012). The political economy of energy poverty: A review of key challenges. *Energy for Sustainable Development*, 16(3), 272-282.

30. Ullah, S., Khan, M., & Yoon, S. M. (2021). Measuring Energy Poverty and Its Impact on Economic Growth in Pakistan. *Sustainability*, 13(19), 10969.