Région et Développement
n° 58-2023
www.regionetdeveloppement.org

Access to modern energy and poverty in regions of Burkina Faso: Evidence from a panel data analysis

Souleymane DIALLO*

Abstract - Improving access to modern energy could be an important part of reducing poverty in developing countries. However, the studies of poverty in Burkina Faso have so far neglected this aspect. This article therefore analyzes the effect of access to modern energy on poverty in the 13 regions of Burkina Faso over the period 2003-2018. The results of the Driscoll-Kraay estimation method reveal that access to electricity and access to clean cooking fuels tend to reduce the incidence of poverty. This result suggests the need to strengthen electrification policies and to popularize and promote the use of clean fuels and technologies for cooking in the different regions of Burkina Faso in order to effectively combat poverty.

JEL Classification
Q42, I32, R11, O55

Key-words
Access to electricity
Access to clean fuels for cooking
Poverty
Burkina Faso

* Department of Economics, Center for Economic and Social Studies, Documentation and Research (CEDRES), Thomas Sankara University, Burkina Faso ; sleymandiallo@gmail.com

INTRODUCTION

Improving access to modern energy is key to achieving sustainable economic development in developing countries. As such, the Sustainable Development Goals (SDGs) adopted in 2015 emphasise the need to ensure access to reliable, sustainable and affordable energy services by 2030 (SDG 7). Also, universal access to energy features prominently in the African Development Bank's (AfDB) High5 goals and the African Union's Agenda 2063. Access to modern energy improves living conditions by meeting certain basic needs such as cooking, lighting homes, using appliances and many other needs (Ogbeide-Osaretin, 2021).

Burkina Faso is one of the countries with the lowest income levels in sub-Saharan Africa and in the West African region. Indeed, more than 41.4% of the population lived below the poverty line in 2018, i.e. 7.3 million people, 93.3% of whom live in rural areas (INSD, 2018). Also, the standard deviation of the incidence of regional poverty is 17.65, reflecting significant disparities in poverty levels between regions. For example, the incidence of poverty is 5.3% in the Centre region compared to 70.9% in the North region (INSD, 2018). According to Sovacool (2012), energy de-privation and poverty go hand in hand. Improving access to modern energy could therefore be an important means of reducing poverty in the regions of Burkina Faso.

The theoretical debate on the causal relationship between access to modern energy and poverty is based on two approaches. The first approach is based on Hosier and Dowd's (1987) theory of energy ladder or energy transition, which assumes that the level of income in a household conditions access to energy. According to this approach, access to modern energy may not significantly impact on the level of poverty. In contrast to this first approach, the second approach considers that access to energy is an essential factor in poverty reduction. According to this approach, access to modern energy increases the level of economic activity, improves productivity and enhances household capabilities by reducing energy deprivation (Hussein and Filho, 2012; Sen, 1982; Becker, 1965).

The national energy sector strategy in Burkina Faso aims to ensure access to quality energy services and promote energy efficiency (Ministère de l'Energie, 2018a). However, it must be noted that access rates to modern energy are still very low, with strong regional disparities. Indeed, the rates of access to electricity and modern fuels for cooking were 21.5% and 20.31% respectively at national level in 2018. For the rate of access to electricity, it was 68.7% in urban areas compared to 3.2% in rural areas. As for the rate of access to modern fuels for cooking, it was 11.84% in the Sahel region against 57.73% in the Centre region (Ministère de l'Energie, 2018b; INSD, 2018).

These low levels of access to modern energy motivate the use of traditional biomass to meet energy needs, with all its corollaries of health and environmental problems. The objective of this paper is therefore to analyse the effect of access to modern energy on poverty in the regions of Burkina Faso. The contribution of this research to the literature is mainly of two kinds. First, existing work analysing poverty in Burkina Faso has so far neglected the role of access to modern energy. This work is unique in that it pays particular attention to the role of access to mo-dern energy in poverty reduction in Burkina Faso. The second contribution of this research to the literature lies in the methodological approach. Given the regional face of poverty in Burkina Faso, a panel data econometric analysis that takes into account the different regions of the country and controls for cross-sectional dependence in the estimates was used.

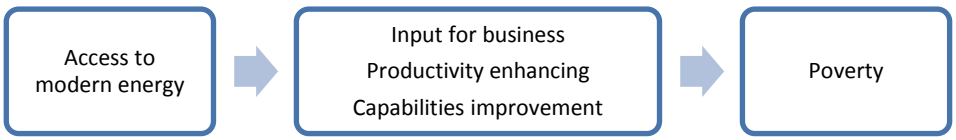
The rest of the article is organised around 4 sections. Section 1 reviews the literature, while Section 2 describes the research methodology. Section 3 presents and analyses the empirical results.

1. ACCESS TO MODERN ENERGY AND POVERTY: A BRIEF REVIEW OF THE THEORETICAL AND EMPIRICAL LITERATURE

Theoretically, the relationship between access to modern energy and poverty has two approaches in the literature. The first approach is based on the energy ladder or energy transition theory which states that income level is a determining factor in access to energy (Hosier and Dowd, 1987). According to this theory, extremely poor households are condemned to use traditional energy (biomass) while richer households tend to opt for the consumption of increasingly modern and sustainable energy. Following this approach, access to modern energy may not have a significant effect on poverty reduction.

The second approach argues that access to modern energy reduces poverty by increasing the level of economic activity, productivity and empowerment (see Figure 1). According to this approach, energy is first of all an important production input for enterprises, and as such, access to modern energy could increase the level of economic activity, create jobs and reduce poverty. Second, access to modern energy could improve household productivity. Indeed, in Becker's (1965) time allocation theory, access to modern energy is considered a positive technological shock for the household. According to this theory, access to modern energy increases not only the household's time allocation, thanks to night lighting, but also the marginal return on time spent on housework, income generating activities or leisure. Finally, energy access increases household capabilities by reducing energy deprivation.

Figure 1. Theoretical linkages between access to modern energy and poverty



Source: Author, adapted from Hussein and Filho (2012).

Empirically, a still very limited literature has examined the effect of access to modern energy on poverty. First, there is work considering a set of countries through panel data analysis. Okwanya and Abah (2018) analysed the effect of energy consumption on poverty in 12 African countries over the period 1981 to 2014. The results of estimations using the Fully Modified Ordinary Least Squares (FMOLS) estimator and the Granger causality test revealed that energy consumption has a negative influence on poverty levels.

Kousar et al. (2020) also examined the relationship between energy consumption and poverty in 5 South Asian countries over the period 1985 to 2018 using Dynamic Ordinary Least Squares (DOLS) and FMOLS. The results show that energy consumption has a negative impact on poverty. In the same vein, Tsaurai (2021) also analysed the causal relationship between energy consumption and poverty in the Brazil Russia India China and South Africa (BRICS) countries over the period 1995 to 2018. The results of the econometric estimations reveal a negative effect of energy consumption on poverty.

Second, some work has analysed the effect of access to modern energy on poverty by focusing on a single country specifically. Thiam (2011) analysed the effect of access to energy on poverty in Senegal. The results of the analyses conclude that access to energy has a negative effect on poverty. Ogbeide-Osaretin (2020) studied

the relationship between energy consumption and poverty reduction in Nigeria over the period 1990 to 2017. The estimation of a staggered lag autoregressive error correction (ARDL) model shows that biomass energy consumption significantly increases poverty levels while access to electricity reduces poverty.

Using the instrumental variables method, Aghaei and Lawell (2022) examined the relationship between energy consumption and poverty in Iran over the period 1989 to 2018. The results of the Three and Two Stages Least Squares (3SLS and 2SLS) estimations revealed that energy consumption has a negative direct effect on poverty and a negative indirect effect on poverty through the reduction of inequality. Kousar and Shabbir (2021) also analysed the relationship between energy consumption and poverty in Pakistan over the period 1985 to 2017. The results of the estimation of an Autoregressive Distributed Lag (ARDL) error correction model and the Sobel test show that energy consumption has a negative effect on poverty.

2. METHODOLOGY AND DATA

2.1. Econometric model and estimation method

With reference to the theoretical work of Pachauri and Spreng (2004) and Hussein and Filho (2012), in order to analyse the effect of access to modern energy on poverty in the regions of Burkina Faso, we start with the following functional form:

$$POV_{it} = f(AME_{it}, X_{it}) \quad (1)$$

where POV_{it} is a poverty indicator for the region i on the date t, AME_{it} an indicator of access to modern energy and X_{it} a vector of additional variables that can explain the poverty level.

The proposed functional form of equation (1) can be rewritten in econometric form in panel data as follows:

$$POV_{it} = \beta_0 + \beta_1 AME_{it} + \sum_{j=2}^{n} \beta_j X_{jit} + \xi_{it} \quad (2)$$

with ξ_{it} an error term.

Theoretically, access to modern energy is supposed to reduce poverty through improving the productivity of capital and labour, stimulating business and empowering people. It seems reasonable to expect a negative influence of energy access on poverty levels. In line with the literature on the determinants of poverty, a number of variables can be used as control variables in the econometric estimates. This will have the advantage of overcoming some econometric problems such as omitted variables and unobservable characteristics bias. For example, the level of human capital could have an impact on poverty. Indeed, according to Chaudhry and Rehman (2009), the development of human capital allows individuals to easily find a secure job and have a decent income. A negative effect of human capital on poverty can then be expected.

Access to safe drinking water is an important aspect of maintaining a healthy individual and could reduce poverty through improved productivity. Indeed, access to drinking water has a direct impact on daily life, and human survival has the potential to lift people out of poverty (Goff and Crow, 2014). Access to drinking water could therefore significantly reduce poverty, especially in rural areas. Also, the size of the population could also have an effect on poverty. Indeed, according to the Malthusian theory of population, a large increase in population size would lead to a decrease in per capita income and thus lead to poverty. According to this theory, a positive effect of population size on poverty can be expected. Finally, in developing countries such as Burkina Faso, the majority of the poor derive their income from agriculture (Noufé, 2020). So, an increase in agricultural production can lead

to an increase in producers' incomes and improve also the availability and accessibility of food, thus enhancing food security. This could result in a reduction in po-verty, especially in a country like Burkina Faso where agriculture occupies the majority of the working population.

The empirical model for estimation purposes can therefore be rewritten, taking into account the control variables, as follows:

$$POV_{it} = \beta_0 + \beta_1 AME_{it} + \beta_2 LR_{it} + \beta_3 ASW_{it} + \beta_4 POP_{it} + \beta_5 AP_{it} + \xi_{it} \quad (3)$$

where LR_{it} represents the literacy rate, ASW_{it} the rate of access to safe drinking water, POP_{it} the total population and AP_{it} the agricultural production.

In order to choose the appropriate estimator for the econometric estimation of equation (3) to minimise the bias in estimating the parameters, a number of preliminary econometric tests can be carried out. When the time dimension is small, as in our research, unit root tests can be dispensed with as they suffer from serious size distortions and lack power (Dialga and Ouoba, 2022; Gengenbach et al., 2009). However, it is very important to test cross-sectional dependency (Tugcu, 2018). Indeed, this allows to detect the possible existence of interdependence between individuals that may lead to spillover effects in case of shocks. The Lagrange Multiplier (LM) test by Breusch and Pagan (1980) and the Lagrange Multiplier test with bias correction developed by Baltagi et al. (2012) were used to analyse cross-sectional dependence in this research. For these tests adapted to fixed-effects panel data, the null hypothesis assumes no cross-sectional dependence while the alternative hypothesis supports the presence of cross-sectional dependence.

When cross-sectional dependence is confirmed, the standard estimators for fixed effects, random effects or the standard pooled OLS estimator are not efficient because the estimated standard errors are biased (Hoechle, 2007). In order to overcome this econometric problem, this research uses the robust standard error method of Driscoll and Kraay (1998). The method consists of applying a Newey and West (1987) type correction to the sequence of cross-sectional means of the moment conditions. This approach deals with cross-sectional, spatial and temporal dependence and calculates standard errors that are robust to heteroskedasticity and serial correlation (Tsani, 2013). This technique improves the covariance matrix in terms of large constants and can be used for panel data with a short or large T (Musah et al., 2021; Driscoll and Kraay 1998).The method also overcomes potential problems of simultaneity bias and endogeneity between variables when all variables are considered with a lag of order 1 in parameter estimation (Dialga and Ouoba, 2022; Ouoba, 2016; Cerra and Saxena, 2008).

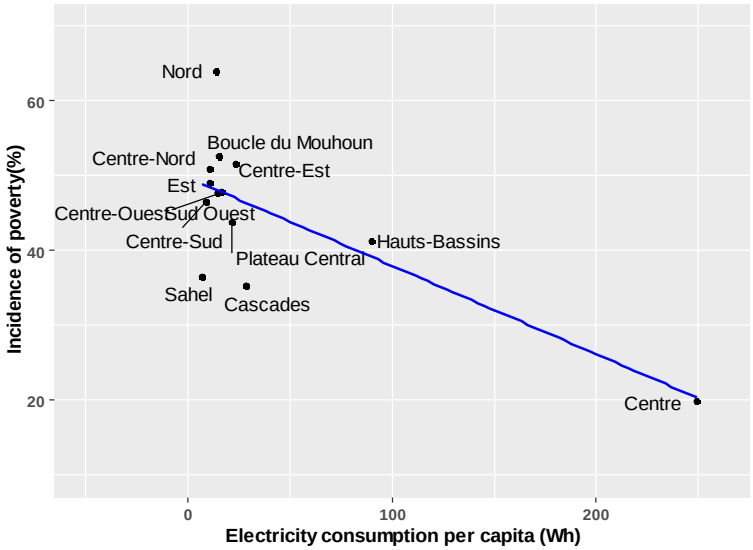
2.2. Data

This research uses panel data covering the 13 regions of Burkina Faso (see Table A1 in the appendix) over the period 2003 to 2018[1]. The choice of study period is mainly justified by the availability of data. Nonetheless, this analysis period is interesting because several large-scale policies in terms of access to modern energy services have been put in place over the period. For example, there is the National Multifunctional Platforms Programme, implemented in two phases over the periods 2004-2009 and 2010-2015. There was also the "Foyers améliorés au Faso" project, which was implemented from 2005, and the National Domestic Biogas Programme from 2009. Finally, there are also the butane gas and electricity subsidy policies. Poverty is most often conceived as a multidimensional concept. Indeed, poverty can

[1] Depending on the availability of poverty data, the years 2003, 2006, 2009, 2014 and 2018 were considered.

be analysed not only from a monetary perspective, but also from a non-monetary point of view. However, due to lack of data, as in Okwanya and Abah (2018), Kousar et al. (2020) and Ogbeide-Osaretin (2020), the incidence of poverty was used as the dependent variable.

Figure 1. Relationship between poverty incidence and per capita electricity consumption



Source: Author.

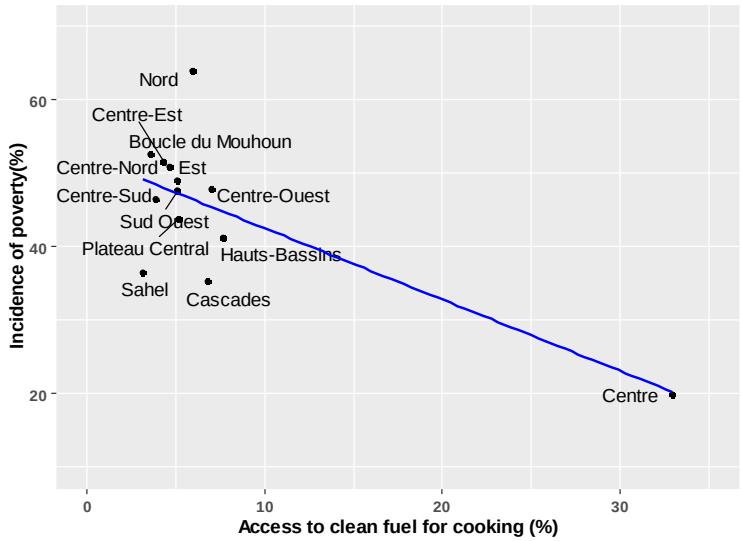
In line with the International Energy Agency definition, access to modern energy in this research is captured using two indicators namely access to electricity and access to clean fuels for cooking. Access to electricity is approximated by per capita electricity consumption in watt-hours and access to clean fuels for cooking is measured by the percentage of the total population using butane gas for cooking. The level of human capital is approximated by the literacy rate. Access to safe drinking water is measured by the percentage proportion of the total population with access to drinking water. In line with Ouoba (2018), population size is captured by total population and agricultural production by grain production. Tables A2 and A3 in the appendix present the data sources and descriptive statistics for all variables used, respectively.

Figure 1 shows the relationship between the average level of poverty incidence and average per capita electricity consumption for the 13 regions of Burkina Faso over the period 2003-2018. Analysis of the graph shows that the regression line has a negative slope indicating a negative correlation between poverty incidence and per capita electricity consumption. For example, the northern region with the highest incidence of poverty also has very low per capita electricity consumption, while the central region with the lowest incidence of poverty is associated with a higher level of per capita electricity consumption.

Figure 2 shows the relationship between the average level of poverty incidence and the average rate of access to clean fuels for cooking for the 13 regions of Burkina Faso over the period 2003-2018. Analysis of the graph shows a negative correlation between poverty level and access to clean fuels for cooking. These results are similar to those in Figure 2. These preliminary results from the gra-

phical analysis point to a negative effect of access to modern energy on poverty. It is then necessary to conduct econometric analyses to better understand the nature of the relationship between access to modern energy and poverty in the regions of Burkina Faso.

Figure 2. Relationship between poverty incidence and access to clean fuels for cooking



Source : Author.

3. RESULTS AND DISCUSSION

Table 1 shows the results of the cross-sectional dependence tests of Breusch and Pagan (1980) and Baltagi et al. (2012). The analysis of the results shows that the cross-sectional dependence is statistically significant at the 1% level for both tests. These results imply the existence of cross-sectional dependence between the different regions of Burkina Faso. In other words, a shock in a given region could have spillover effects to other regions. The proven presence of cross-sectional dependence between regions motivates and therefore makes relevant the use of an estimation method such as the Driscoll and Kraay (1998) technique, which overcomes this econometric problem.

Table 1. Cross-sectional dependence test

Tests	Statistic	Decision
Breusch-Pagan LM	133.392 ***	Presence
Bias-corrected scaled LM	2.810***	Presence

Note: (***), (**), (*) significant at the (1%), (5%) and (10%) level respectively.
Source: Author.

3.1. Effect of access to modern energy on poverty

The basic results of the estimation of the effect of access to modern energy on poverty are reported in Table 2. The analysis of the results reveals that access to modern energy negatively impacts the level of poverty in the regions of Burkina Faso. Indeed, the coefficients associated with access to electricity (estimate 1) and

access to clean fuels for cooking (estimate 2) are negative and statistically significant at the 1% level. An increase in electricity consumption of one percentage point leads to a reduction in poverty incidence of 0.0117%. Also, an increase in the rate of access to butane gas for cooking by one percentage point leads to a reduction in the incidence of poverty by 0.0118%. Thiam (2011) and Ogbeide-Osaretin (2020) found the same result for Senegal and Nigeria respectively.

Table 2. Results of the baseline estimation

Dependent variable: Incidence of poverty (log)
Estimation method: Driscoll and Kraay (1998)

	Access to electricity (1)	**Access to clean fuels for cooking (2)**
Access to modern energy	-0.0117***	-0.0118**
	(0.001)	(0.004)
Literacy rate	-0.0332***	-0.0320***
	(0.003)	(0.007)
Access to safe drinking water	-0.0033*	-0.0085**
	(0.001)	(0.002)
Total population (log)	1.3129***	1.1228***
	(0.182)	(0.199)
Agricultural production (log)	-0.1127	-0.1459
	(0.172)	(0.233)
Constant	-3.3307**	-1.9002
	(0.984)	(1.690)
R^2	0.4731	0.3899
Fisher statistic	3373.7***	51.7***
Number of regions	13	13
Number of observations	65	65

Note: standard errors ( ). (***), (**), (*) significant at the (1%), (5%) and (10%) level respectively.
Source: Author.

Theoretically, several arguments could explain this result. Firstly, this result could be justified by the improvement in productivity induced by better access to modern energy in accordance with Becker's (1965) time allocation theory. Indeed, access to electricity and clean fuels for cooking improves the household's time allocation through night lighting on the one hand and the reduction of time spent collecting biomass energy sources (wood, millet stalk, grass, etc.) on the other. Access to clean fuels for cooking could also improve household health by limiting greenhouse gas emissions in the kitchen. The time and health gains improve household productivity and generate additional income, thereby reducing poverty.

Secondly, energy is an essential input in the production process and business development. Improved access to modern energy can therefore increase the level of economic activity, create jobs and reduce poverty levels (Hussein and Filho, 2012). Finally, better access to modern energy reduces the level of energy deprivation and strengthens household capabilities in the long term. Indeed, energy deprivation contributes strongly to the increase of poverty through the deterioration of the financial situation of households. According to Sovacool (2012), in developing countries, energy expenditure accounts for 20-30% of the annual income of poor households and a further 20-40% of this income is spent on indirect costs associated with energy collection and use.

Table 3. Results of the robustness analyses

Dependent variable: Incidence of poverty (log)
Estimation method: Driscoll and Kraay (1998)

	Access to electricity (1)	**Access to clean fuels for cooking (2)**
Access to modern energy	-0.0116***	-0.0133**
	(0.001)	(0.004)
Literacy rate	-0.034***	-0.033***
	(0.004)	(0.007)
Access to safe drinking water	-0.0034*	-0.0083**
	(0.001)	(0.002)
Total population (log)	1.306***	1.160***
	(0.188)	(0.218)
Agricultural production (log)	-0.110	-0.1405
	(0.177)	(0.239)
Constant	-3.3018**	-2.2086
	(0.993)	(1.794)
R^2	0.474	0.399
Fisher statistic	314.3***	62.8***
Number of regions	12	12
Number of observations	60	60

Note: standard errors ( ). (***), (**), (*) significant at the (1%), (5%) and (10%) level respectively.
Source: Author.

The results also show that the literacy rate has a negative and statistically significant effect on poverty at the 1% threshold (estimates 1 and 2). An improvement in the literacy rate reduces the incidence of poverty in the regions of Burkina Faso. This result supports Becker's (1995) idea that human capital significantly increases economic well-being and reduces poverty. Indeed, an increase in the level of human capital makes it easier for individuals to find secure employment and have a decent income (Chaudhry and Rehman, 2009). Ouoba (2017; 2018) also found this result when analysing poverty in the regions of Burkina Faso.

Furthermore, population size has a positive and statistically significant influence on poverty. An increase in population size leads to an increase in the incidence of poverty in the regions of Burkina Faso. This result is in line with the predictions of Malthusian population theory, which holds that a large increase in po-pulation size leads to a decrease in per capita income and welfare, which tends to increase poverty. Also, an increase in population increases the pressure on land and natural resources; the resulting lack of land and natural resources increases the incidence of poverty (Ahlburg, 1996). Klasen and Lawson (2007) and Pham and Riedel (2019) had reached the same result in Uganda and Vietnam respectively.

3.2. Robustness analysis

In order to analyse the robustness of the basic estimation results, the models are re-estimated by removing the "Centre" region. Referring to Figures 2 and 3, we can wonder about the potential impact of the "Centre" region on the results obtained. It is therefore important to see whether the results are stable when this region is omitted from the analyses. Table 3 shows the results of the estimates without the "Centre" region. The analysis of the results confirms the negative effect of access to electricity and access to clean fuels for cooking on poverty in the

regions of Burkina Faso. Also, the literacy rate and the rate of access to safe drinking water have a negative and significant impact on the incidence of poverty. Finally, population size has a positive influence on the incidence of poverty. These different results corroborate those of the baseline estimates, thus reflecting their robustness.

CONCLUSION AND POLICY IMPLICATIONS

Access to energy plays an essential role in improving living conditions and fighting poverty in developing countries. This paper aimed to analyse the effect of access to modern energy on poverty in the 13 regions of Burkina Faso over the period 2003-2018. Preliminary econometric tests revealed the existence of cross-sectional dependence, thus motivating the use of the Driscoll-Kraay method for the estimates. The analysis of the results of the baseline estimates shows that access to modern energy reduces the level of poverty. Indeed, access to electricity and clean fuels for cooking has a significant negative impact on the incidence of poverty in the regions of Burkina Faso. These results remain robust when the "Centre" region is removed from the estimates. In terms of economic policy implications, this result suggests that Burkina Faso's governments should work to improve access to modern energy in the different regions of the country in order to reduce poverty levels. This could be achieved by implementing new and/or strengthening existing electrification policies at national, regional and local levels. Also, policies aimed at establishing and/or strengthening the dissemination and promotion of clean fuels for cooking and technologies could be an effective way to fight poverty in Burkina Faso.

REFERENCES

Aghaei M., Lin Lawell C.Y., 2022, Energy, economic growth, inequality, and poverty in Iran, *The Singapore Economic Review, 67*, 02, 733-754.

Ahlburg D.A., 1996, Population growth and poverty, in *The impact of population growth on well-being in developing countries*, 219-258, Springer, Berlin, Heidelberg.

Baltagi B.H., Feng Q., Kao C., 2012, A Lagrange Multiplier test for cross-sectional dependence in a fixed effects panel data model, *Journal of Econometrics, 170*, 1, 164-177.

Becker G. S., 1965, A Theory of the Allocation of Time, *The Economic Journal, 75*, 299, 493-517.

Becker G.S., 1995, *Human capital and poverty alleviation,* Washington: World Bank, Human Resources Development and Operations Policy.

Breusch T.S., Pagan A.R., 1980, The Lagrange multiplier test and its applications to model specification in econometrics, *The Review of Economic Studies, 47*, 1, 239-253.

Cerra V., Saxena S.C., 2008, Growth dynamics: the myth of economic recovery, *American Economic Review, 98*, 1, 439-457.

Chaudhry I.S., Rahman S., 2009, The impact of gender inequality in education on rural poverty in Pakistan: an empirical analysis, *European Journal of Economics, Finance and Administrative Sciences, 15*, 1, 174-188.

Dialga I., Ouoba Y., 2022, How do extractive resources affect human development? Evidence from a panel data analysis, *Resources, Environment and Sustainability, 7*.

Driscoll J.C., Kraay A.C., 1998, Consistent covariance matrix estimation with spatially dependent panel data, *Review of Economics and Statistics, 80*, 4, 549-560.

Gengenbach C., Palm F.C., Urbain J.P., 2009, Panel unit root tests in the presence of cross-sectional dependencies: Comparison and implications for modelling, *Econometric Reviews, 29*, 2, 111-145.

Goff M., Crow B., 2014, What is water equity? The unfortunate consequences of a global focus on 'drinking water', *Water International, 39*, 2, 159-171.

Hoechle D., 2007, Robust standard errors for panel regressions with cross-sectional dependence, *The Stata Journal, 7*, 3, 281-312.

Hosier R.H., Dowd J., 1987, Household fuel choice in Zimbabwe: an empirical test of the energy ladder hypothesis, *Resources and Energy, 9*, 4, 347-361.
Hussein M.A., Filho W.L, 2012, Analysis of energy as a precondition for improvement of living conditions and poverty reduction in sub-Saharan Africa, *Scientific Research and Essays, 7*, 30, 2656-2666.
INSD (Institut National de la Statistique et de la Démographie), 2018, Enquête Harmonisée sur les Conditions de Vie des Ménages (EHCVM).
Klasen S., Lawson D., 2007, The impact of population growth on economic growth and poverty reduction in Uganda, *Diskussionsbeiträge*, 133, 21.
Kousar S., Shabbir A., 2021, Analysis of environmental degradation mechanism in the nexus among energy consumption and poverty in Pakistan, *Environmental Science and Pollution Research, 28*, 22, 27528-27541.
Kousar S., Ahmed F., Pervaiz A., Zafar M., Abbas S., 2020, A panel co-integration analysis between energy consumption and poverty: new evidence from South Asian countries, *Studies of Applied Economics, 38*, 3.
Ministère de l'Energie, 2018a, Stratégies dans le domaine de l'énergie 2019-2023.
Ministère de l'Energie, 2018b, Annuaire statistique 2018 du Ministère de l'énergie.
M**usah M., Kong Y., Mensah I.A., Antwi S.K., Donkor M.,** 2021, The connection between urbanization and carbon emissions: a panel evidence from West Africa, *Environment, Development and Sustainability, 23*, 11525-11552.
Newey W.K., West, K.D., 1987, Hypothesis testing with efficient method of moments estimation, *International Economic Review*, *28*, 3, 777-787.
Noufé T., 2020, Agricultural productivity and poverty of agricultural households in Burkina Faso, *African Journal of Economic and Sustainable Development, 7*, 4, 287-306.
Ogbeide-Osaretin, E.N., 2021, Analysing energy consumption and poverty reduction nexus in Nigeria, *International Journal of Sustainable Energy, 40*, 5, 477-493.
Okwanya I., Abah P.O., 2018, Impact of energy consumption on poverty reduction in Africa, *Journal of Applied Statistics, 9*, 1, 5.
Ouoba Y., 2016, Natural resources: Funds and economic performance of resource-rich countries, *Resources Policy, 50*, 108-116.
Ouoba, Y., 2017, Artisanal versus industrial mining: impacts on poverty in regions of Burkina Faso, *Mineral Economics, 30*, 3, 181-191.
Ouoba Y., 2018, Industrial mining land use and poverty in regions of Burkina Faso, *Agricultural Economics, 49*, 4, 511-520.
Pachauri S., Spreng D., 2004,. Energy use and energy access in relation to poverty, *Economic and Political Weekly*, *39*, 3, 271-278.
Pham T.H., Riedel J., 2019, Impacts of the sectoral composition of growth on poverty reduction in Vietnam, *Journal of Economics and Development, 21,* 2, 213-222.
Sen A., 1982, *Poverty and famines: an essay on entitlement and deprivation,* Oxford University Press.
Sovacool B.K., 2012, The political economy of energy poverty: A review of key challenges, *Energy for Sustainable Development, 16*, 3, 272-282.
Thiam D.R., 2011, Renewable energy, poverty alleviation and developing nations: Evidence from Senegal, *Journal of Energy in Southern Africa, 22*, 3, 23-34.
Tsani S., 2013, Natural resources, governance and institutional quality: The role of resource funds. *Resources Policy, 38*, 2, 181-195.
Tsaurai K., 2021, Energy consumption-poverty reduction nexus in BRICS nations, *International Journal of Energy Economics and Policy, 11*, 3, 555-562.
Tugcu C.T., 2018, Panel data analysis in the energy-growth nexus, EGN, in A.N. Menegaki (Ed.) *The economics and econometrics of the energy-growth nexus*, 255-271, Academic Press.

ANNEX

Table A1. List of regions

1. Boucle du Mouhoun	6. Centre-Ouest	11. Plateau Central
2. Cascades	7. Centre-Sud	12. Sahel
3. Centre	8. Est	13. Sud Ouest
4. Centre-Est	9. Hauts-Bassins	
5. Centre-Nord	10. Nord	

Source: Author.

Table A2. Sources of variables

Variables	Sources
Incidence of poverty	Living Conditions Surveys 2003, 2006, 2009, 2014, 2018
Electricity consumption	INSD statistical yearbooks
Access to butane gas for cooking	Living Conditions Surveys 2003, 2006, 2009, 2014, 2018
Literacy rate	INSD statistical yearbooks
Access to safe drinking water	INSD statistical yearbooks
Total population	INSD statistical yearbooks
Cereal production	INSD statistical yearbooks

Source: Author.

Table A3. Descriptive statistics

Variables	Mean	Std. dev	Min	Max
Incidence of poverty (log)	3.737	0.445	1.668	4.261
Access to clean fuels for cooking (%)	7.415	10.633	0.200	57.730
Electricity consumption	39.204	66.116	1.763	305.989
Literacy rate (%)	26.488	13.022	8.600	75.900
Access to safe drinking water (%)	60.645	13.026	35.170	90.000
Population (log)	7.034	0.404	6.113	7.957
Agricultural production (log)	5.563	0.652	3.777	6.895

Source: Author.

Accès à l'énergie moderne et pauvreté dans les régions du Burkina Faso : une analyse en données de panel

Résumé - L'amélioration de l'accès à l'énergie moderne pourrait constituer un élément important de la réduction de la pauvreté dans les pays en développement. Cependant, les études sur la pauvreté au Burkina Faso ont jusqu'à présent négligé cet aspect. Cet article analyse en ce sens l'effet de l'accès à l'énergie moderne sur la pauvreté dans les 13 régions du Burkina Faso sur la période 2003-2018. Les résultats de l'estimation par la méthode de Driscoll-Kraay révèlent que l'accès à l'électricité et l'accès à des combustibles propres pour la cuisson tendent à réduire l'incidence de la pauvreté. Ce résultat suggère la nécessité de renforcer les politiques d'électrification et de vulgariser et promouvoir l'utilisation des combustibles et technologies propres pour la cuisson dans les différentes régions du Burkina Faso afin de lutter efficacement contre la pauvreté.

Mots-Clés
Accès à l'électricité
Accès aux combustibles de cuisson propres
Pauvreté
Burkina Faso