International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2024, 14(4), 48-56.

Influence of Fossil Fuel Prices on Fossil and Renewable Electricity Consumptions, GDP, Inflation and Greenflation: A Case Study in the Asia Pacific Countries

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Received: 20 January 2024 **Accepted:** 08 May 2024 **DOI:** https://doi.org/10.32479/ijeep.15966

ABSTRACT

This study aims to examine the Influence of Fossil Fuel Prices on Fossil and Renewable Electricity Consumption, GDP, Inflation and Greenflation. This research is explanatory. The empirical analysis uses time-series data of Fossil Fuel Price, Fossil Electricity Consumption, Renewable Electricity Consumption, Inflation Rate and GDP in Asia Pacific Countries in the period 2016-2021. The inferential statistical method used to analyse this study is component-based using SmartPLS 4.0.9.6. The results of this study, find that fossil fuel price has a negative significant effect on fossil electricity consumption and a significant negative effect on renewable electricity consumption. Fossil electricity consumption has a significant negative effect on GDP and a negative insignificant effect on Inflation. Renewable electricity consumption has a positive significant effect on GDP and an insignificant negative effect on inflation (Greenflation). The novelty of this study is to examine how Fossil fuel prices have an effect on renewable electricity consumption and its impact on GDP and greenflation analysis using SmartPLS 4.0.9.6.

Keywords: Fossil Fuel Price, Electricity Consumption, Renewable, Gross Domestic Product, Inflation, Greenflation
JEL Classifications: B22, E21, E31, L94, O11, O13, Q21, Q31, Q41, Q43

1. INTRODUCTION

Every country will face five macroeconomic problems consisting of inflation, currency value, trade balance deficit, economic growth, and unemployment. The rapid economic development of a country will have an impact on the prosperity of that country and at the same time, prosperity will have the consequence of creating a disparity exists between the rich with the poor. This will also have an impact on the control of production factors such as natural resources, labour, capital, and others. The use of production factors aims to produce goods and services for the government, private sector, and households. The total production generated by a country is gross domestic product (GDP). Electricity is the final energy that is present in almost every production process activity to produce goods and services, in other words almost all production activities require electricity consumption then electricity costs become one of the cost components in every production activity to produce goods and services. Adi et al. (2022) found that electricity consumption has a positive significant effect on GDP.

Electricity is produced from fossil and renewable fuel plants. Power plants that use fossil fuels and renewable plants have specific differences in terms of investment and generation costs, as well as reliability and efficiency. Electricity produced from fossil and renewable fuels also has significant differences in the resulting environmental impacts such as emissions of NOx, SOx, particulates, CO_2, and others. More electricity consumption will have an economic impact and an impact on the environment that varies depending on the combination of power plants used to produce electricity or what we often call the energy mix. Adi et al. (2023) the net-zero scenario by 2050 (NZE) is a normative scenario that sets the stage to ensure that the global energy sector achieves net-zero emissions by 2050. Thus, environmentally friendly generators from new and renewable energy will dominate the energy mix in the future which will come.

Fossil fuels like crude oil, natural gas, and coal are experiencing volatility in their prices will have an impact on the production costs of electricity produced by these power plants therefore the selling price for electricity from these plants will be for both industrial and household consumers. Thus, increase price of fossil fuels which increases generation costs will have the potential to reduce the profit margin of the generation company if the selling price for electricity is not increased or is not subsidized by the Government.

Electricity costs are involved in almost every production activity, so ultimately the increase price of fossil fuels can affect the general increase in prices during that period, namely inflation. On the other hand, the LCOE of renewable power plants is still considered high compared to the LCOE of conventional fossil fuel power plants. The cost of component A or investment in renewable power plants is still high even though the cost of component C, namely the fuel cost, is relatively very cheap, even zero. The investment costs for renewable power plants which are still expensive have an impact on the price of electricity from renewable power plants also increasing. The consumption of renewable electricity can cause a general increase in prices or greenflation if this increase in the price of renewable electricity is directly borne entirely by consumers without subsidies and other government policies.

The results of previous studies on the influence of fossil fuel prices on electricity consumption from fossil fuel power plants, GDP and inflation have not been conclusive. Zamani (2016), Coal prices are influenced by supply and demand shocks in the oil market, but oil supply shocks do not affect oil prices, as it was found. Coal prices may be affected by an oil supply shock, aggregate demand shock, and oil-specific demand shock. The effect by aggregate demand shock on coal prices is higher than that of other shocks. Furthermore, the price of crude oil is significantly affected by coal price shocks. While Kaufmann and Hines (2018), found that smaller price increases for natural gas relative to the price increases for coal and oil will favour substitution towards natural gas. Their study shows that any increase in the price of crude oil at the wellhead affects the cost of oil and coal at electricity generating plants and a new equilibrium price for natural gas that is well below the new equilibrium price for the price of oil and coal at electricity generating plants and an increase in the coal price reduces the price of natural gas at electricity generating plants.

Coal price fluctuations will not only affect the coal industry itself but also relates to the development of the national economy and social stability (Zhu and Wang, 2017), Overcapacity causes a decrease in coal prices that affects not only the survival of coal enterprises, but also economic growth, energy security, and industrial raw material supply (Wang et al., 2020). There is a unilateral link between oil prices with economic growth and a bilateral causal link between fossil fuel energy consumption with economic growth, as well as between fossil fuel energy consumption with economic growth (Mensah et al., 2019). Economic growth was positively impacted by electricity's positive effects on industrial output (Alley et al., 2016) and Renewable and non-renewable electricity generation and growth have a strong positive and statistically significant correlation (Atems and Hotaling, 2018). The consumer price index (CPI) is a common measure of inflation that includes energy prices (or electricity prices). Intuitively, higher energy prices should drive up inflation (Iyke, 2015). Adi et al. (2022) found Inflation has a positive insignificant effect on electricity consumption.

To the best of the researcher's knowledge, there are currently no studies on the effect of consuming renewable energy on GDP and inflation simultaneously. Therefore, the novelty of this study is to examine renewable electricity consumption is influenced by the price of fossil fuels and its effect on GDP and greenflation analysis using SmartPLS 4. This study examines the Influence of Fossil Fuel Prices on Fossil and Renewable Electricity Consumption, GDP, and Inflation: A Case Study in the Asia Pacific Countries.

2. LITERATURE REVIEW AND HYPOTHESIS

The grand theory of this paper is energy economics, followed by electricity economics theory and macroeconomics to comprehend the connections between energy and macroeconomic matters.

The study of energy economics is part of applied economics, the economics of supplying energy involving exploration, development, production, transportation, storage, transformation and delivery of energy commodities; The economic logic of energy consumption decisions by various users; energy transactions through alternative market arrangements and their governance; the economic dimension of social and environmental impacts of energy use; and the planning, policy and performance of the industries, actors and governance mechanisms (Bhattacharyya, 2019).

2.1. Fossil Fuel Price on Electricity Consumption

Coal consumption causes pollution, while renewable energy consumption reduces emissions, making coal both absolutely and relatively expensive compared to oil and renewable energy encourages shifting from coal to oil and renewable energy. Price-driven substitution from coal and oil to renewable energy has promising prospects (Bloch et al., 2015). To mitigate the negative externalities associated with the fossil fuel sector, low-carbon and renewable energy technologies are needed. Renewable energy policy is focused on aiding the deployment of renewable power generators to decrease their costs by utilizing scale economies and technological learning. The expected outcome is that renewable power will continue without the need for further renewable energy subsidies once cost parity with fossil fuel generation is achieved. The cost of producing electricity using fossil fuels is not responsive to the large-scale penetration of renewable power, as implied by this reasoning (Foster et al., 2017). Carbon taxes or cap-and-trade programs are becoming increasingly used to reduce emissions through climate policies.

Higher production costs are associated with an increase in oil prices, and drives inflation (Shahbaz and Ali, 2016; in Shahbaz et al., 2017; Husnain et al., 2024), the long and short term are linked by a unilateral link between oil prices and energy consumption (fossil fuel) among all country groups (Mensah et al., 2019). Apergis and Danuletiu (2014), show a correlation between renewable with non-renewable electricity consumption based on data from 80 countries from 1980 to 2012. Foster et al. (2017) it is probable that the cost of fossil fuel power generation will rise due to the increased use of renewable energy sources, the transition to renewable energy is either slow or more costly than expected. Shahbaz et al. (2017) and Sarwar et al. (2017), the full panel confirmed a bidirectional relationship has been found between electricity consumption, oil prices, and GDP. Despite high oil prices, in the developing countries heavily depend on electricity consumption for maintain economic growth.

2.2. Electricity Consumption on GDP

Lee (2005) the correlation between co-movement and causality between energy consumption and GDP in 18 developing countries was re-examined. His findings indicated that energy consumption has a positive significant influence on GDP in Indonesia, but not in Hungary. Chandran et al. (2010) explored the association between electric energy consumption with real gross domestic product (GDP) in Malaysia using a bivariate and multivariate model. Their findings indicated that electricity consumption positively and significantly impacts GDP, while Squalli (2007) found a negative causal relationship between GDP and electricity consumption in OPEC members. Whereas Acaravci and Ozturk (2010) in a panel study of 15 transition countries, there was no evidence of cointegration between electricity consumption with GDP per capita.

Shahbaz and Feridun (2012) found Electricity consumption is influenced by a long-run equilibrium relationship and economic growth, not vice versa. Al-mulali et al. (2014) found the impact of renewable electricity consumption was found to be greater than that of non-renewable electricity consumption on GDP growth in 18 Latin American countries. Alley et al. (2016) found that electricity supply did not have a direct significant effect on GDP and industrial output. Adi et al. (2022) found electricity consumption has a positive significant effect on GDP in Indonesia, and vice versa.

Apergis and Danuletiu (2014), indicate that there is long-run positive causality running from renewable energy consumption to real GDP for the total sample as well as across regions from 80 countries. The empirical findings provide strong evidence that the interdependence between renewable energy consumption and economic growth indicates that renewable energy is important for economic growth and likewise economic growth encourages the use of more renewable energy sources. Tugcu and Topcu (2018), when energy consumption is measured by total energy use, however, the results provide strong support for an asymmetric relationship between energy consumption and GDP growth in the long run.

2.3. Electricity Consumption on Inflation

The linear cointegration of electricity consumption, inflation, and GDP growth was observed. It was evident that there is a causal flow in at least one direction. Inflation was found to Granger cause electricity consumption in the short run (Iyke, 2015). Bekhet and Othman (2011), found a one-way Granger causality flow from electricity consumption to inflation, this means that increasing electricity consumption has had an impact on inflation. Adi et al. (2022) found inflation has a positive insignificant effect on electricity consumption in Indonesia.

Lu et al. (2023) significantly found Evidence of two unidirectional causalities between inflation and renewable energy, and from renewable energy to economic growth. The findings also emphasise the critical role that renewable energy plays in the production process and its comprehensive and positive economic effects. Deka et al. (2022) found that inflation rate positive significantly affects the renewable energy consumption, and Deka et al. (2024) found that Renewable energy development is negatively impacted by oil prices, inflation rates, and public sector credit.

To the best authors' knowledge, most research on renewable electricity consumption with inflation emphasizes the influence of inflation on renewable electricity consumption or renewable development. In this study, the authors examined the influence of renewable electricity consumption on inflation or what is often referred to as greenflation, namely the general prices increase over a certain period which is driven by the consumption of renewable electricity as part of the production cost component.

3. RESEARCH METHODS

This paper is explanatory research, which aims to explain the effect of independent variables on dependent variables through testing the structural model. Time-series data is used in the empirical analysis of Fossil Fuel Prices, Fossil Electricity Consumption, Renewable Electricity Consumption GDP, and Inflation Rate of the Asia Pacific Countries from 2016 to 2021. Inferential statistical analysis is an analysis that focuses on the areas of analysis and interpretation of data to conclude. The inferential statistical method is used to analyse the variance in this study-based or component-based with partial least squares (PLS). Multivariate statistical technique known as Analysis of PLS performs multiple comparisons between the dependent variable and multiple independent variables (Adi et al., 2022; Adi et al., 2023).

3.1. Research Variables

The problem in this study is formulated into a simultaneous model, which is a model formed through more than one dependent variable that is explained by one or several independent variables, where the dependent variable will at the same time act as an independent variable for other relationships tiered. The theoretical research model and hypotheses were validated by using SmartPLS 4.0.9.6. PLS is an SEM tool that uses a component-based approach for estimation, so it places minimal restrictions on sample size and residual distribution and is especially useful in areas where there are weak theories and limited understanding of relationships among variables (Table 1). Partial Least Square is a variance-based structural equation analysis (SEM) that can simultaneously test measurement models as well as structural models. The measurement model is utilized to assess validity and reliability, while the structural model is utilized to evaluate causality by testing hypotheses with prediction models.

3.2. Analysis of Measurement Model

The procedure assessment of reflective measurement models contains three necessary tests, namely, composite reliability to evaluate external consistency, then individual indicator reliability and average variance extracted (AVE) to evaluate the convergent validity (Hair et al., 2014). Composite reliability values of 0.60-0.70 in exploratory research and values from 0.70 to 0.90 in more advanced stages of research are regarded as satisfactory, whereas values below 0.60 indicate a lack of reliability (Nunnally and Bernstein, 1994).

Reflective measurement models' validity assessment focuses on convergent validity and discriminant validity. For convergent validity, researchers need to examine the AVE. An AVE value of 0.50 and higher indicates a sufficient degree of convergent validity, meaning the latent variable explains more than half of its indicators' variance. The primary evaluation criteria for the structural model are the R^2 measures and the level and significance of the path coefficients (Hair et al., 2011).

Discriminant validity is the extent to which a construct is correct and distinct from other constructs by empirical standards. The Fornell-Larcker criterion is a more conservative approach to assessing discriminant validity, and the square root of each construct's AVE should be higher than the highest correlation of any other construct (Hair et al., 2014).

3.3. Development of Research Structural Model and Hypotheses

The structural model that was analysed is presented in the flowchart in Figure 1.

According to the literature review and previous studies, there are six hypotheses in this study:

H1: Fossil fuel price has a negative significant effect on fossil electricity consumption.

H2: Fossil fuel price has a positive significant effect on renewable electricity consumption.

H3: Fossil electricity consumption has a positive significant effect on GDP.

H4: Fossil electricity consumption has a positive significant effect on Inflation.

H5: Renewable electricity consumption has a positive significant effect on GDP.

H6: Renewable electricity consumption has a positive significant effect on Inflation (Greenflation).

Table 1: Latent variables and indicators

Code	Latent variable	Indicator/s		Sources
X1	Fossil fuel price	X1.1	Spot Crude-Dubai (US dollars per barrel)	BP statistic
		X1.2	Spot Crude-Brent (US dollars per barrel)	BP statistic
		X1.3	Spot Crude-Nigerian (US dollars per barrel)	BP statistic
		X1.4	Spot Crude-West Texas (US dollars per barrel)	BP statistic
		X1.5	Natural Gas-Japan CIF (US dollars per million Btu)	BP statistic
		X1.6	Natural Gas-Japan Korea Marker (JKM) (US dollars per million Btu)	BP statistic
		X1.7	Natural Gas-Average German Import Price (US dollars per million Btu)	BP statistic
		X1.8	Natural Gas-UK (Heren NBP Index) (US dollars per million Btu)	BP statistic
		X1.9	Natural Gas-Netherlands TTF (DA Heren Index) (US dollars per million Btu)	BP statistic
		X1.10	Natural Gas-US (Henry Hub) (US dollars per million Btu)	BP statistic
		X1.11	Natural Gas-Canada (Alberta) (US dollars per million Btu)	BP statistic
		X1.12	Coal-Northwest Europe marker price (US dollars per tonne)	BP statistic
		X1.13	Coal-US Central Appalachian coal spot price index (US dollars per tonne)	BP statistic
		X1.14	Coal-Japan steam spot CIF price (US dollars per tonne)	BP statistic
		X1.15	Coal-China Qinhuangdao spot price (US dollars per tonne)	BP statistic
		X1.16	Coal-Japan coking coal import CIF price (US dollars per tonne)	BP statistic
		X1.17	Coal-Japan steam coal import CIF price (US dollars per tonne)	BP statistic
		X1.18	Coal-Asian marker price (US dollars per tonne)	BP statistic
X2	Fossil electricity consumption	X2.1	Oil (terawatt-hours)	BP statistic
		X2.2	Natural gas (terawatt-hours)	BP statistic
		X2.3	Coal (terawatt-hours)	BP statistic
		X2.4	Nuclear energy (terawatt-hours)	BP statistic
		X2.5	Hydroelectric (terawatt-hours)	BP statistic
X3	Renewables electricity consumption	X3.1	Renewables (terawatt-hours)	BP statistic
X4	GDP	X4.1	Gross domestic product	World bank and IMF
X5	Inflation	X5.1	Inflation	World bank and IMF

4. EMPIRICAL RESULTS AND DISCUSSIONS

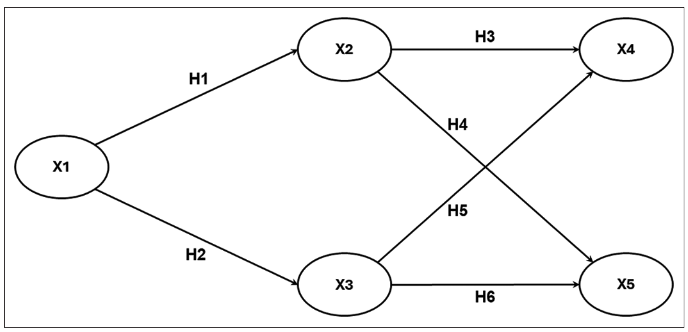
Before the path analysis testing, three necessary tests are required, namely, composite reliability to evaluate external consistency, individual indicator reliability and AVE to evaluate the convergent validity of the reflective model. Indicators with scores below the critical value will be eliminated from the model.

4.1. Empirical Results

4.1.1. Outer model evaluation

To examine an indicator for each variable, it is necessary to consider the outer weight value in a formative indicator model and the outer loading in a reflective indicator model. The results of PLS-SEM algorithm analysis showed the following five variables as shown in Table 2.

Figure 1: Structural research model



Considering indicators of X1.11 and X1.16 in Table 2 have values of outer loading lower than 0.7, then these indicators are dropped in measuring variable of X1 Fossil Fuel Price. It will be measured again without involving those indicators and the results are presented in Table 3.

Referring to Table 4, all loading factors are >0.7, all Composite Reliability and Cronbach's alpha are >0.7, and AVE of all latent variables are >0.5, indicating that the scales used to measure the model in this study are reliable. Renewable Electricity Consumption, GDP and Inflation in this study is a single-item construct.

Referring to Table 5, for the Fossil Electricity Consumption - Renewable Electricity Consumption construct there is little dispute, the difference is too small which is 0.021453985, and can be ignored (Ab Hamid et al., 2017). Overall, discriminant validity can be accepted for this measurement model and supports the discriminant validity between the constructs.

4.1.2. Assessment of structural model (inner model)

R^2 values with variance explanation were evaluated using the thresholds of 0.25, 0.50, and 0.75, which are equivalent to small, moderate, and substantial values, respectively (Hair et al., 2013). The goodness of fit model in the PLS analysis is in the form of Q^2 and is calculated from the R^2 values, having a range value of $0 < Q^2 < 1$.

Referring to Table 6, the R2 figures for Fossil Electricity Consumption, Renewable Electricity Consumption and Inflation

Table 2: Outer loadings

Indicators	X1 fossil fuel price	X2 fossil electricity consumption	X3 renewable electricity consumption	X4 GDP	X5 inflation
X1.1	0.949864389				
X1.10	0.910291811				
X1.11	0.462020985				
X1.12	0.899227447				
X1.13	0.867578922				
X1.14	0.916714177				
X1.15	0.866163127				
X1.16	0.692487781				
X1.17	0.98707916				
X1.18	0.930258025				
X1.2	0.95519646				
X1.3	0.936641231				
X1.4	0.980263851				
X1.5	0.889881646				
X1.6	0.865499604				
X1.7	0.927368282				
X1.8	0.86372071				
X1.9	0.86670018				
X2.1		0.982964464			
X2.2		0.940488995			
X2.3		0.974829166			
X2.4		0.9029196			
X2.5		0.963355507			
X3.1			1		
X4.1				1	
X5.1					1

Table 3: Outer loadings

Indicators	X1 fossil fuel price	X2 fossil electricity consumption	X3 renewable electricity consumption	X4 GDP	X5 inflation
X1.1	0.943922846				
X1.10	0.914176757				
X1.12	0.903015075				
X1.13	0.861411067				
X1.14	0.922909475				
X1.15	0.872889031				
X1.17	0.982414329				
X1.18	0.933495123				
X1.2	0.950761494				
X1.3	0.931657985				
X1.4	0.979512762				
X1.5	0.883696861				
X1.6	0.877086385				
X1.7	0.935690354				
X1.8	0.875506504				
X1.9	0.878322896				
X2.1		0.982973425			
X2.2		0.940514494			
X2.3		0.974811159			
X2.4		0.902923381			
X2.5		0.963334849			
X3.1			1		
X4.1				1	
X5.1					1

Table 4: PLS-SEM assessment results of reflective measurement model - convergent validity

Latent variables	Indicators	Loading factors >0.70*)	Cronbach's alpha 0.70-0.90*)	Composite reliability >0.70*)	AVE >0.50*)
X1 fossil fuel price	X1.1	0.943922846	0.988488489	1.020317022	0.83934263
	X1.2	0.950761494			
	X1.3	0.931657985			
	X1.4	0.979512762			
	X1.5	0.883696861			
	X1.6	0.877086385			
	X1.7	0.935690354			
	X1.8	0.875506504			
	X1.9	0.878322896			
	X1.10	0.914176757			
	X1.12	0.903015075			
	X1.13	0.861411067			
	X1.14	0.922909475			
	X1.15	0.872889031			
	X1.17	0.982414329			
	X1.18	0.933495123			
X2 fossil electricity consumption	X2.1	0.982973425	0.974732319	0.977849809	0.908869145
	X2.2	0.940514494			
	X2.3	0.974811159			
	X2.4	0.902923381			
	X2.5	0.963334849			
X3 renewable electricity consumption			1	1	1
X4 GDP			1	1	1
X5 inflation			1	1	1

*)Sarstedt et al. (2017)

are small, and GDP is moderate. The Q^2 value can be calculated as follows:

$$Q^2 = 1 - (1-0.035685368)\,(1-0.017192606)\,(1-0.344302923)\,(1-0.005493082)$$

$$Q^2 = 0.3819861216$$

The model's explanation of the phenomenon under study is 38.2%, as can be observed.

4.2. Discussion of the Results

The goodness of fit model is 38.2%, the model can explain the phenomenon being studied is not so high, and many variables outside the model have not been accommodated in this research

Table 5: Discriminant validity - Fornell-Larcker

Items	X1 fossil fuel price	X2 fossil electricity consumption	X3 renewable electricity consumption	X4 GDP	X5 inflation
X1 fossil fuel price	0.916156444				
X2 fossil electricity consumption	−0.188905711	0.953346288			
X3 renewable electricity consumption	−0.131120578	0.974800274	1		
X4 GDP	0.037423981	0.467127751	0.534571314	1	
X5 inflation	0.130425959	−0.073737872	−0.073546212	−0.150306023	1

Table 6: Goodness of fit

Endogenous variables	R-square
X2 fossil electricity consumption	0.035685368
X3 renewable electricity consumption	0.017192606
X4 GDP	0.344302923
X5 inflation	0.005493082

model. Discussion of the results, referring to Table 7, is as follows:

4.2.1. Fossil fuel price on fossil electricity consumption and renewable electricity consumption

The results indicate that there is a negative significant effect of Fossil Fuel Price on Fossil Electricity Consumption, and support H1. This finding emphasizes the influence of fossil fuel prices on fossil electricity consumption from previous studies, namely, Mensah et al. (2019) found a unilateral cause-and-effect link from oil prices to energy consumption, while Shahbaz et al. (2017) and Sarwar et al. (2017), the full panel confirmed a Bidirectional relationship found between electricity consumption, oil price and GDP.

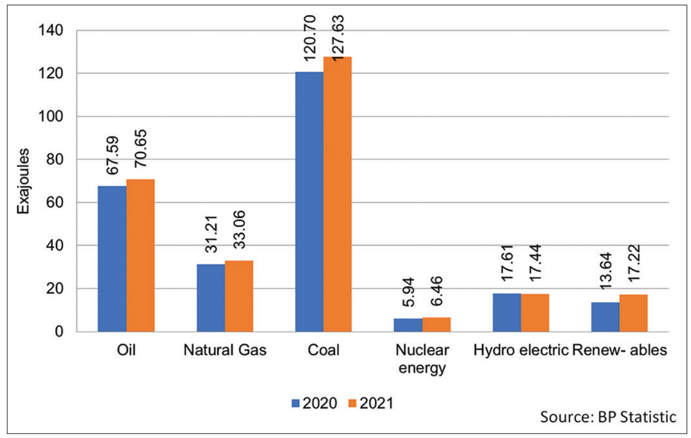
Fossil Fuel Price has negative significant effect on Renewable Electricity Consumption, and not support H2. This means that when the price of fossil fuel increases, renewable electricity consumption decreases significantly, vice versa. This finding is not in line with Bloch et al. (2015) while coal consumption causes pollution making coal both absolutely and relatively expensive compared to oil and renewable energy encourages shifting from coal to oil and renewable energy. Referring to Graph 1, the percentage increase in renewable electricity consumption from 2020 to 2021 is the highest compared to the increase in electricity consumption from other fuels but based on the renewable portion of the energy by fuel consumption mix, it is still small.

The author suggests for further research to add several other variables such as the reliability and efficiency of power plants into the model. This is intended to find out whether intermittent and reliability factors cause this influence to be negative.

4.2.2. Fossil electricity consumption on GDP and inflation

Fossil electricity consumption has a negative significant effect on GDP, and not support H3. This means that when fossil electricity consumption increases, GDP decreases not significantly, vice versa. This finding not in line with Chandran et al. (2010) that found electricity consumption positively and significantly impacts GDP but supported Squalli (2007) found thar found a negative causal relationship between GDP and electricity consumption.

Graph 1: Total primary energy of Asia pacific in 2021: Consumption by fuel



Fossil Electricity Consumption has a negative insignificant effect on Inflation, and not support H4. This means that when fossil electricity consumption increases, Inflation decreases not significantly, vice versa. This finding not in line with Bekhet and Othman (2011) that found increasing electricity consumption has had an impact on inflation. The non-significant finding is in line with Adi et al. (2022) in a different direction.

4.2.3. Renewable electricity consumption on GDP and inflation (greenflation)

Renewable Electricity Consumption has a positive significant effect on GDP, and support H5. This means that when renewable electricity consumption increases, GDP decreases significantly. This finding in line with Apergis and Danuletiu (2014) that found long-run positive causality running from renewable energy to real GDP. Renewable energy is important for economic growth and economic growth encourages the use of more renewable energy sources.

Renewable Electricity Consumption has a negative not significant effect on Inflation (Greenflation), and not support H6. This means that when renewable electricity consumption increases, Inflation (Greenflation) decreases not significantly. This finding is a novelty of this study that renewable electricity consumption does not cause increasing in the general price increase namely greenflation in the Asia Pacific countries. The beta coefficient of −0.033488049 means a weak influence and can be interpreted as meaning that the increase in renewable electricity consumption reduced prices in general insignificantly in the same period.

Table 7: Path coefficients and the significance of the structural

Path coefficients	Beta	T statistics	P-values	Hypothesis decisions
X1 fossil fuel price → X2 fossil electricity consumption	−0.188905711	3.653567	0.000261	Supported
X1 fossil fuel price → X3 renewable electricity consumption	−0.131120578	2.591197	0.009592	Not supported
X2 fossil electricity consumption X4 GDP	−1.084560108	1.754252	0.079449	Not supported
X2 fossil electricity consumption X5 inflation	−0.041093713	0.135716	0.892051	Not supported
X3 renewable electricity consumption → X4 GDP	1.591800804	2.667202	0.007673	Supported
X3 renewable electricity consumption → X5 inflation	−0.033488049	0.113575	0.909579	Not supported

5. CONCLUSIONS, IMPLICATIONS, LIMITATIONS AND SUGGESTIONS

5.1. Conclusions

This study used time-series data of Fossil Fuel Prices, Fossil Electricity Consumption, Renewable Electricity Consumption GDP, and Inflation Rate of the Asia Pacific Countries from 2016 to 2021. The inferential statistical method is used to analyse the variance in this study-based or component-based with partial least squares (PLS) using SmartPLS 4.0.9.6 software.

The conclusions from the data processing results are as follows, fossil fuel price has a negative significant effect on fossil electricity consumption and have a negative significant effect on renewable electricity consumption. Fossil electricity consumption has a negative significant effect on GDP and negative insignificant effect on Inflation. Renewable electricity consumption has a positive significant effect on GDP and negative insignificant effect on inflation (Greenflation).

In other words, in general renewable electricity consumption does not cause greenflation in the Asia Pacific countries. Increasing renewable electricity consumption will decrease prices in general in the same period insignificantly.

5.2. Implications

Since in general renewable electricity consumption does not cause greenflation, It is hoped that renewable energy will become cheaper and more renewable power plants will be built to reduce emission levels throughout the world.

5.3. Limitations and Suggestions

In this research model, we only test three variables that influence inflation, namely fossil fuel prices, fossil and renewable electricity consumptions. For further research, the authors suggest including several other variables that can cause inflation, namely money supply, foreign direct investment, economic growth, interest rate and others.

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