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The Economic Price of Liquid Petroleum Gas, Poverty and Subsidy Removal Compensation Scenario in Indonesia

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ABSTRACT

Indonesia is one of the countries with the largest population in the world, implicating the higher energy needs for consumption. LPG is one of the most important energies consumed by the majority of Indonesians since 2008. There is a programme for LPG in Indonesia, namely the LPG subsidy price. However, it is not implemented accurately in order to keep Indonesians, particularly those living below the poverty line able to purchase LPG. The purpose of this research is to determine the relationship between the economic price of LPG and poverty, as well as the subsidy removal compensation in Indonesia. Vector Auto Regression (VAR) first difference was applied in this research, and the findings show that statistically LPG economy prices have a unilateral relationship with a significant impact on poverty. Two subsidies removal compensation scenarios result shows that approximately subsidy of minimum IDR 52 thousand per month will keep the poor beneficiaries just above the poverty line. There is a potential government saving per year for LPG subsidies removal.

Keywords: Economic Price, Liquid Petroleum Gas, Poverty, Subsidy Removal, VAR
JEL Classification: C3, H2, I3, L1

1. INTRODUCTION

This study is concerning about energy subsidy policy reforms, with energy being one of the National Medium-Term Development Plan's important points for period of 2020-2024. The policy of providing energy subsidies aims to realize a prosperous Indonesian society based on the principles of equity and justice (Gobel et al., 2021). Families that qualify are given this LPG subsidy after previously relying on kerosene and firewood for cooking. Both kerosene and firewood smoke are harm for health and environment for daily usage. As a result, LPG can be used as a cleaner energy source. Furthermore, LPG is more efficient than kerosene and firewood as it has three times the hot spot. The LPG consumption in 2019 was 113 thousand tons for industrial purposes, 7,447.00 thousand tons for households, and 206 thousand tons for commercial (Ministry of Energy and Mineral Resources, 2019). This demonstrates that the usage of LPG for household is very dominant, accounting for approximate 95.9% of total LPG consumption in Indonesia, applicated for cooking from 2007, when the kerosene commodity was replaced with LPG as stipulated in Indonesian government regulation number 104 of 2007 concerning the supply, distribution, and pricing of subsidized LPG (Cabinet Secretary, 2007). The Indonesian government provides a free start-up installation package based upon this government regulation, which includes replacing cooking utensils from kerosene-fuelled stoves with LPG-fuelled stoves and providing LPG subsidies to low-income households and small businesses.

The majority of kerosene is imported and it is more expensive than LPG imports. As a result, the transformation of the kerosene commodity into the LPG commodity has a positive impact as a savings for the Indonesian government. Unfortunately, this LPG can be purchased and used by both the wealthy and the poor, as it should be only poor people do because they have low purchasing power. This low purchasing power is linked to socioeconomic and employment status. Low socioeconomic status, persons with a low level of living welfare, with a threshold of 40% of the poorest population, whereas employment status is related to income that is insufficient economically to be included in the category of beneficiaries. Low purchasing power can be caused by a combination of low household consumption and high unemployment.

According to Indonesian government regulations, only the poor are eligible for a subsidized LPG, hence people who are financially capable should not purchase this subsidized LPG. They can purchase unsubsidized LPG in a form size of 5 kg, 12 kg and 15 kg. According to the integrated social welfare data (DTKS) based on Ministry of Social Regulation No. 19 of 2020, the poor who are included in the criteria for the beneficiaries of this subsidized LPG estimated as 29.1 million beneficiary families, micro-enterprises 0.6 million, small farmers 4.0 million, and small fishermen 0.3 million. This criterion is shared by 40% of the world's poorest people. Poor people who do not meet the above criteria, particularly those who are economically capable, are not eligible for subsidized LPG (Ministry of Finance, 2021). Several phenomena occur during its implementation. The poor, micro-enterprises, small farmers, and fishermen who are in the poorest 40% category only receive about 36.4% of subsidized LPG, implying that people who are economically capable also receive a larger portion of this subsidized LPG. The amount of subsidized LPG circulating in the market is increasing year after year. According to government data, the volume of subsidized LPG in 2010 was only 2.71 million tons, while the volume of non-subsidized LPG was 0.85 million tons. In 2020, the volume of subsidized LPG reached 7.14 million tons, while the volume of non-subsidized LPG fell to 0.62 million tons. This is ironic given that non-subsidized LPG should have a much larger volume portion than subsidized LPG as the number of poor people in the poorest 40% decile is only 117 million, assuming one family consists of four people. Meanwhile, the volume of non-subsidized LPG consumed by economically affluent people amounted to 151 million people, resulting in a much larger volume of non-subsidized LPG than the volume of subsidized LPG. The price difference between subsidized and non-subsidized LPG is so large as consumers prefer to buy subsidized LPG. Government data show that the price of subsidized LPG is IDR 4,250.00/kg since 2008, while the price of retail non-subsidized LPG is IDR 9,878.00/kg (Ministry of Finance, 2021).

In State Speech on August 16, 2019, Indonesian President Joko Widodo stated unequivocally that energy subsidies, including LPG, electricity, and fuel (BBM), should be improved to be more effective and targeted in assisting the poor who are economically disadvantaged. This statement can be concluded that energy subsidies (electricity, LPG, and fuel) have not been effective or well targeted thus far, and solutions to become more targeted must be sought. The current subsidized LPG program has negative externalities, including (1) the emergence of new distortions, (2) the creation of inefficiencies, and (3) the failure to benefit those who are entitled to it (Gobel et al., 2021). In terms of subsidized LPG retail selling price, Indonesia has the lowest price which is IDR 4,250.00 among India, Malaysia, and Thailand. Similarly, when it comes to non-subsidized LPG prices, Indonesia has the lowest which in the range of IDR 7,700.00 - IDR 14,200.00 compared to other countries such as India, South Korea, Japan, China, and the Philippines (Wiratmaja, 2016). The price of subsidized LPG at the consumer level varies depending on distribution pattern to consumers. The majority of subsidized LPG prices sold in the market exceed the government's highest retail price (HET). This is due to unofficial costs such as loading and unloading, vehicle operations, and advertising costs. In fact, because LPG has become a necessity for cooking, people have no choice but to pay exorbitant prices for it. The highest retail price (HET) on the island of Java is an average of IDR 16,000.00, while it is around IDR 18,500.00 outside of Java such as South Sulawesi (Anwar, 2021). Meanwhile, for certain conditions, such as before Ramadan, the price of subsidized LPG at retailers in the Mamasa area of West Sulawesi can be in the range from IDR 30,000.00 to IDR 40,000.00.

The LPG subsidy programs are also being implemented in other countries to help the poor gain access to the LPG. The government of India provides assistance to the poor and vulnerable, particularly those affected by Covid-19. The subsidies are funded by fuel taxes, which are raised when oil prices fall. The drop in global oil prices has made the poor suffer more and the rich richer by allowing them to profit from low oil prices (Kuehl et al., 2021). LPG subsidies are provided in India through two schemes: (1) direct benefit transfer and (2) connection benefit. Direct benefit transfer is a type of subsidy in which all rural people, including the poor, buy LPG cylinders at a low cost, but the profit is transferred to their bank account in the form of a deposit. Meanwhile, the connection benefit is a type of subsidy in the form of 50 million free LPG connections for women living below the poverty line over a three-year period. As of September 2019, India had 80 million free LPG connections installed, with varying subsidies in each state (Minister of Petroleum and Natural Gas, 2020). The Indian government is currently working to increase targeted subsidy through both consumption and connection schemes, using volume and revenue targeting (Sharma et al., 2019). According to one study, wealthy households receive more than 40% of LPG subsidies in the state of Jharkhand (Sharma et al., 2021). It shows that India's LPG subsidy program exhibits the same phenomenon as Indonesia's. The specific purpose of this study is investigated the relationship between the economic price of LPG and poverty in Indonesia due to LPG national programme.

2. LITERATURE REVIEW

Subsidies are provided by the Mexican government for LPG, gasoline, and diesel products. A special committee determines the price of LPG, which is set lower than the global oil price. In the period of 1997 to 2019, Mexico had a sort of federal cash transfer program (opportunidades) to protect the poor. In 2002, the program's scope was expanded to include rural areas, and the name was later changed to Benito Juarez Scholarship Coordination (Dávila Lárraga, 2016; Kojima, 2016). Originally, the cash transfer program was intended for household groups selected based on geographical conditions such as illiteracy, education, access to health services, access to water pipes, access to electricity, population density, the presence of concrete floors in their homes, and household income (Sanchez et al., 2020). This program was expanded in 2007 to include energy subsidies (opportunidades energeticas). In 2007, the monthly subsidy was $4.57 USD; in 2008, it was $4.91 USD; and in 2010, it was $4.74 USD (Laan et al., 2012). In response to high global oil prices, blanket subsidies (gasoline, diesel, and LPG) are provided with total subsidies of $25 billion in 2008 (Kitson et al., 2016). Subsidies for LPG and electricity are provided at 21%-25% of the total energy subsidy to promote clean energy and reduce fuel pollution. Benefit from the cash transfer subsidy program is that allows households to spend their money on whatever they want instead of having to buy gasoline, diesel, LPG, or electricity (Sanchez et al., 2020).

Subsidy programs for fossil energy products (gasoline, diesel, kerosene, and LPG) and electricity for the poor are available in Brazil. The LPG subsidy program is provided in the form of the Program of Social Interaction and Contribution for the Financing of Social Security, specifically to replace deforestation carried out by the poor, with the goal of reducing deforestation by 12% in 2010 compared to 2006, significant reliance on oil imports and lower greenhouse gas emissions (Goldthau, 2013). Subsidies are provided by the Malaysian government for electricity, gasoline, diesel, and LPG. In Malaysia, electricity is still subsidized at US$5 for the poor who use less than 200kWh per month (Bridel and Vis-Dunbar, 2013). Subsidies for RON97 gasoline were eliminated in 2010, and subsidies for RON95 gasoline and diesel were eliminated in 2014. Subsidies for LPG are still available in the form of regulated prices for household consumption. The subsidized LPG types are 12kg and 14kg but it is not for 50 kg. Problems arise when subsidized LPG, specifically 12 kg and 14 kg, is placed in 50 kg LPG cylinders and sold to the industrial and commercial sectors, causing this LPG subsidy to be ineffective (Bridel and Vis-Dunbar, 2013; Ying and Harun, 2019).

The Vietnamese government only provides poor people with electricity subsidies in the form of cash transfers equal to the first 30 kWh consumed each month. Meanwhile, the prices of gasoline, diesel, and kerosene are not subsidized, but rather regulated through the petroleum price stabilization fund (PPSF). This PPSF is collected from customers who purchase petroleum products (gasoline, diesel, and kerosene) for VND300.00 (USD 0.013) per liter. If the fuel price exceeds 7%, the retail price may be determined by the international market price (IEA, 2017; Kojima, 2016). Vietnamuse the kerosene instead of LPG not being subsidized by its government.

The Thai government subsidizes fossil energy products through an oil stabilization fund, tax breaks, and retail price caps for certain products such as compressed natural gas (CNG) and biofuel. The Thai government subsidized LPG products by US$6 billion from 2008 to 2014. The LPG subsidy was removed in January 2015, and since then, the poor in Thailand have had access to subsidized LPG via mobile phone technology, which costs THB18.13 (USD 0.53) per kilogram (IEA, 2017; Kojima, 2016). The Chilean government uses a price-adjusting mechanism to provide subsidies to mostly imported fossil fuels (kerosene, gasoline, diesel, and LPG). The price adjustment mechanism is implemented by creating a price stabilization fund and imposing tax rates in order to reduce the impact of oil price fluctuations and keep oil prices within 5% of international oil prices (IEA, 2017; Kojima, 2016). To protect domestic gasoline and LPG prices from fluctuations in international oil prices, the Peruvian government employs an oil price stabilization fund mechanism. However, due to the difficulty of dealing with the 2008 oil price spike, this program was revised by using a price-band, namely setting an upper and lower limit that will automatically be adjusted to international oil prices. The Philippine government only subsidy the electricity and eliminated all types of subsidies and provided tax breaks for some oil products, particularly diesel, for public transportation entrepreneurs and the poor (IEA, 2017).

3. DATA AND EMPIRICAL MODELS

Monthly data is used for the time series. The annually and semi-annually data will be interpolated to produce monthly data. The secondary data used ranges from 2010 to 2019, implying that each variable will have 40 data sets. Testing whether the time series data is stationary or not is one of the procedures that must be performed when estimating an economic model with time series data. Stationary data is the time series data that does not contain unit roots; non-stationary data is data that has a constant mean, variance, and covariance over time (Enders, 2015). If there is no significant change in the data, it is said to be stationary. The data fluctuates around a constant mean value, regardless of time or variance of these fluctuations (Makridakis et al., 1997; 1998). The stationarity test is required because if the data is not stationary, it will produce a spurious regression, as indicated by the R2 value and the t-statistic value, which has a significant effect but no economic meaning. Although the regression output results appear to be good, the least-square estimate is inconsistent (Enders, 2015).

The unit root test can be used to perform a stationarity test. There are several methods for performing a unit root test, including the Dickey-Fuller test (DF), the augmented Dickey-Fuller test (ADF), and Phillips-Perron test (PP). The ADF method will be used in this study. If the calculated ADF test statistic is less than the ADF critical value table value of 5% or the ADF probability value is less than the residual value in the output, H0 is rejected. If H0 is rejected, the data is stationary.

Final prediction error, Aikake's information criterion, Schwarz's information criterion, and Hannan Quinn's criterion are used to determine leg lengths. When these criteria are met, optimal lag is chosen; however, these criteria frequently lead to inconsistent conclusions. In a small sample, the AIC and FPE criteria explain the optimum lag better than the SC and HQ criteria, and vice versa. The lag check is used to find parameter estimates for the vector autoregressive model and to determine the optimal lag length that will be used in the next analysis. The lag length in the VAR model represents the degrees of freedom. If the optimal lag entered is too short, it is feared that the model's dynamics will not be fully explained. An optimal lag that is too long, on the other hand, will result in inefficient estimation due to the reduced degree of freedom, especially for models with small samples. As a result, before estimating the VAR, the optimal lag must be determined. The model with the lowest Akaike information criterion value is the best (Basuki, 2018; Basuki and Prawoto, 2019; Enders, 2015). After determining the optimal lag length, a stability test was performed (Table 1).

Stability tests were performed to ensure that the impulse response function and forecast error variance decomposition analyses performed on the VAR model were long-term valid. If all of the roots of the polynomial or characteristic polynomial functions of all variables have a modulus value of less than one or are in the unit circle, the VAR model is said to be stable (Basuki, 2018; Basuki and Prawoto, 2019; Enders, 2015). Based on the length of the lag mentioned above, a cointegration test will be performed to determine whether or not there will be a long-term balance, i.e., similarity of movement and stability of the relationship between the variables in this study. The cointegration test was performed in this study using the Johansen's cointegration test method. To test a number of cointegration vectors, a cointegration test using Johansen's method was performed. If it was determined in the previous stationarity test that all variables had been integrated in the first difference, it is necessary to test for cointegration between variables to determine the appropriate analysis method. If cointegration is not occurs, VAR first difference is the method to be used. If VAR is used, each variable can be changed in log form. All variables with values that are not fractions or percentages are converted to log form. The coefficient model is represented by this log figure as an elasticity number. If the cointegration test fails, the VAR method can still be used (Basuki, 2018; Basuki and Prawoto, 2019; Enders, 2015).

The causality test determines whether an endogenous variable can be treated as an exogenous variable. This is due to a lack of understanding of the interdependence of variables. If there are two variables A and B, determine whether A causes B or B causes A, or whether both apply, or whether there is no relationship between the two. Variable A causes variable B to mean how much the current period's value of B can be explained by the previous period's value of B and the previous period's value of A. The causality test can be performed using a variety of methods, including Granger's causality and error correction model causality. Because all variables in the VAR model are endogenous, each variable has the potential to affect other variables in the system based on F-Statistics values and other probabilities, the Granger causality test is used (Basuki, 2018; Basuki and Prawoto, 2019; Enders, 2015).

The IRF is used to calculate the response of a variable to a one-standard-deviation shock, both from other variables and from the variable itself. IRF analysis can also be used to predict shock

Table 1: Regression vector auto regression source data

Variables	Source data	Type of data	Period
LPG economic price	Ministry of Finance	Annually	2010–2019
Number of poverties	Statistics Indonesia	Semi-annually	2010–2019

LPG: Liquid petroleum gas

responses in the present and future. Because each coefficient in the VAR equation is not always easy to interpret, IRF is an excellent feature in VAR. FEVD is used to calculate the percentage contribution of a variable's variance caused by changes in other variables. The percentage of square prediction error of a variable as a result of shocks to the variable and other variables is examined in this analysis. The greater the percentage of a variable's shock contribution to other variables, the more sensitive that variable is to changes in other variables (Basuki, 2018; Basuki and Prawoto, 2019; Enders, 2015).

VAR first difference method will be used in this research because it is commonly used in economic research involving multivariate time series (Firdaus et al., 2021; Basuki 2018). Christopher Shims first proposed the VAR method as a promising macro-econometric framework in 1980 (Christoper Shims, 2002). VAR analysis includes data description, forecasting, structural inference, and policy analysis using forecasting, impulse response function, forecast error variance decomposition, and the Granger causality test. The prediction of the future based on current and historical data will use forecasting. The causal relationship between variables, the Granger causality test is used. The impulse response function (IRF) is used to trace current and future responses for each variable as a result of past changes or shocks to a variable (Firdaus et al., 2021). Forecast error variance decomposition (FEVD) is used to predict the contribution of each variable's percentage variance to changes in a specific variable. Proposed a general VAR equation (Enders, 2015):

$$JMK_t = \beta_0 + \sum_{t=1}^{n} \beta_{1t} JMK_{t-n} + \sum_{t=1}^{n} \beta_{2t} HKE_{t-n} + \delta_{nt}$$

Where:
HKE_t = The economic price of LPG at time t
JMK_t = The amount of poor people at time t
δ_{nt} = Vector error at time t (white noise)
β_0 = Vector intercept
$\beta_1 – \beta_2$ = The size matrix coefficient (nxn) for each i = 1,2,3.n

4. RESULT AND DISCUSSION

The result shows that all of the variables used in the study are stationary at the first difference level (Table 2). The optimal lag length must be investigated to determine if the estimates made will produce a valid model output. It is feared that if the lag length is too short, the model's dynamics will not be fully explained. However, if the optimal lag is too long, the resulting estimation becomes inefficient due to the reduced degree of freedom, particularly for small sample models. The optimal lag test results from LR, FPE, AIC, SC and HQ are selected based on the smallest number of lags which is lag 2. The following table showing the optimal lag length selection (Table 3).

The cointegration test is used to determine whether a group of variables that are not stationary at the data level meet the requirements of the integration process, in which all variables are stationary at the first difference. If the variable data is stationary

Table 2: Stationary result at first difference

Variable	t-statistics value	MacKinnon critical values			Probability	Remarks
		1%	5%	10%		
MIS	−10.95539	−3.486551	−2.886074	−2.579931	0.0127	Stationary
LPG	−1.79344	−2.585405	−1.943662	−1.614866	0.0694	Stationary

LPG: Liquid petroleum gas

Table 3: Lag length criteria selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	661.7908	NA	4.87e-09	−13.46512	−13.41236	−13.44378
1	698.6912	71.54148	2.49e-09	−14.13655	−13.97829	−14.07254
2	707.9875	17.64412	2.23e-09	−14.24464	−13.98087*	−14.13795*
3	711.2194	6.001961	2.27e-09	−14.22897	−13.85969	−14.07960
4	712.2601	1.890379	2.41e-09	−14.16857	−13.69378	−13.97653
5	712.4901	0.408322	2.61e-09	−14.09164	−13.51134	−13.85692
6	712.5016	0.019856	2.83e-09	−14.01024	−13.32443	−13.73284
7	712.5406	0.066186	3.07e-09	−13.92940	−13.13808	−13.60933
8	712.6879	0.243498	3.33e-09	−13.85077	−12.95395	−13.48803
9	712.9502	0.422809	3.61e-09	−13.77449	−12.77216	−13.36907
10	713.3073	0.561220	3.90e-09	−13.70015	−12.59231	−13.25205
11	713.7346	0.654024	4.21e-09	−13.62724	−12.41389	−13.13646
12	747.8848	50.87675	2.29e-09	−14.24255	−12.92369	−13.70909
13	759.0816	16.22402*	1.99e-09*	−14.38942	−12.96505	−13.81329
14	763.3437	6.001624	1.99e-09	−14.39477*	−12.86489	−13.77596
15	765.3037	2.680002	2.09e-09	−14.35314	−12.71775	−13.69166
16	766.2900	1.308371	2.25e-09	−14.29163	−12.55074	−13.58748
17	766.8374	0.703906	2.44e-09	−14.22117	−12.37477	−13.47434
18	767.1939	0.443808	2.66e-09	−14.14682	−12.19490	−13.35731
19	767.4795	0.343778	2.91e-09	−14.07101	−12.01359	−13.23882
20	767.7521	0.317174	3.20e-09	−13.99494	−11.83201	−13.12008
21	768.0404	0.323542	3.51e-09	−13.91919	−11.65075	−13.00165

Note: (*) significance

at the first difference, it must be tested for cointegration to determine whether or not there is cointegration between variables. If cointegration is not occurs, the VAR first difference method is preferable and can be used in the next stage. The Johansen cointegration test perform based upon the trace and maximum eigenvalue criteria. The results of cointegration test show that there is no cointegration based on the statistics of the trace test (Table 4). Therefore, VAR first difference is selected as a model conclusion.

The Granger causality test was used to determine whether there is a relationship between two variables, whether it is unidirectional or reciprocal, or whether there is no relationship at all. Because each variable has the potential to become an exogenous or endogenous variable, this causality test is carried out further to determine the causal relationship between variables (Table 5). The result shows that the variable of economic price of LPG statistically has unilateral affect to the poverty. IRF analysis is used to explain the impact of shocks on one variable on another variable; in this analysis, the impact is analyzed not only in the short term, but also for some time in the future as long-term information. The dynamic effect for each variable can be seen in this analysis if the variable is exposed to certain shocks of one standard error in each equation. The IRF analysis is also used to determine how long the effect on the response will last. IRF can be represented as a graph, with the horizontal axis representing the period in months and the vertical axis representing the response value in percentage (Figure 1). The following graph showing the MIS variable response to LPG variable shock and vice versa.

The IRF analysis will explain the impact of the shock on one variable on another variable, which in this case is not only in the short term but can be analyzed for several future horizons as long-term information. We can see the long-term dynamic response of each variable in this analysis if there is a certain innovation (shock) of one standard error in each equation. The horizontal axis represents the time period in months, while the vertical axis represents the percentage response value. Response to MIS variable, the initial response rate of the MIS variable is 0.003% start decreased with a positive trend until 10th month, when it began reached the horizontal axis, then steadily until the 60th month.

The response rate of LPG variable start decreased with a negative trend until 5th month then increased until reached the horizontal axis at 15th month then steadily until 60th month. Response to LPG variable, the initial response rate of LPG variable is 0.012% start decreased with a positive trend until 35th month when it began reached the horizontal axis, then steadily until the 60th month. The initial response rate of MIS variable is –0.015 start increased with a negative trend until 20th month when it began reached the horizontal axis, then steadily until 60th month.

The above graph shows the MIS and LPG variables variance decomposition. The fluctuation of each variable due to the occurrence of a shock can be determined by analyzing the role of each shock in explaining fluctuations in LPG and MIS variables using FEVD analysis, also known as variance decomposition analysis, in which the contribution of variable shocks in the system

Figure 1: Impulse response function (IRF) result

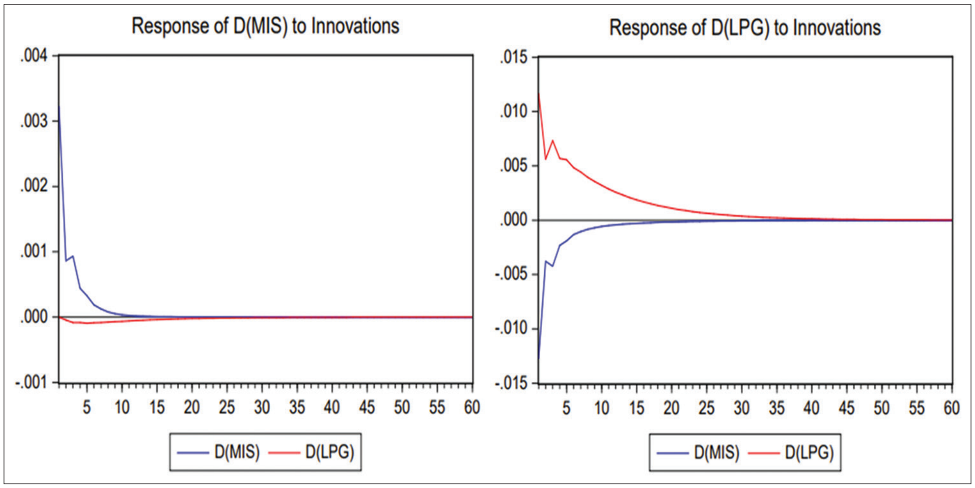


Table 4: Johansen cointegration test result

Hypothesized Number of CE (s)	Eigenvalue	Trace statistic	0.05 Critical value	Probability**
None	0.045781	8.592567	15.49471	0.4044
At most 1	0.026229	3.109746	3.841466	0.0778

Note: (**) significance

Table 5: Granger causality result

Null hypothesis	Observation	F-statistic	Probability
LPG does not granger cause MIS	118	1.91099	0.1527
MIS does not granger cause LPG		3.58684	0.0309*

LPG: Liquid petroleum gas, Note: (*) significance

to changes in certain variables can be determined. In the first period, the first MIS (amount of poverty) is determined by the MIS variable itself, the LPG variable has not contributed. In the second period, the role of the LPG variable has begun to be seen, where the LPG variable has a contribution to the amount of poverty by 0.017, while the MIS variable itself contributes 99.983%. In the 60th period, the contribution of MIS decreased to 99.42% and the contribution of the LPG variable to 0.58%.

Subsidies are being phased out, which is an unpopular policy given that LPG is a basic necessity for many people. People's purchasing power decreased as a result of the elimination of this subsidy. People's purchasing power will dwindle, increasing the number of poor people. As a result, if the revocation of subsidies is to be carried out, many things must be prepared, including the provision of adequate compensation. This does not rule out the possibility of chaos if the amount of compensation does not correspond to the community's needs for LPG and the government is slow in providing compensation (Figure 2).

The compensation mechanism can also influence whether or not the LPG sale and purchase transaction goes smoothly. This is possible if the mechanism is implemented in a closed system in which people who were previously able to purchase subsidized LPG are no longer able to do so. As a result, it is critical to socialize and raise public awareness about the importance of subsidies for the poor, particularly those in the 40 % decile of the poorest people. It is hoped that there will be a relationship between the number of subsidies received by beneficiary families (KPM), the number of subsidies issued by the government, and the estimated savings obtained through the direct transfer scheme. The number of poor will be determined in accordance with the provisions of the BPS in September 2020, where a family income of IDR 2,216,714.00/month is considered to be below the poverty line (Figure 3).

The subsidy removal compensation 1st scenario is based on the compensation target, which is the beneficiary families in the integrated social welfare data and the LPG subsidy of IDR 45.2 trillion (Table 6). Compensation that falls below the benchmark has the potential to increase poverty, decrease government subsidies, and increase government savings, and vice versa. Scenario-1 shows that the LPG subsidy IDR 5,723.00/kg will have potential saving the government budget of IDR 18.8 trillion. The IDR 5,723.00/kg of LPG is the difference from the economic price and the retail selling price. The provision of compensation of IDR 51,507.00 (round up to IDR 52 thousand) as a benchmark has an impact on the provision of government subsidies of IDR 26.4 trillion and potential savings of IDR 18.8 trillion in the Figure 4.

The subsidy removal compensation 2nd scenario is based on the compensation target, which is the beneficiary families in the integrated social welfare data as the only LPG user with the LPG subsidy of IDR 45.2 trillion (Table 7). Scenario-2 shows that the LPG subsidy IDR 5723/kg will have potential saving the government budget of IDR 30.31 trillion. The IDR 5723/kg of LPG is the difference from the economic price and the retail selling price. The impact on this provision of the government subsidies is IDR 14.89 trillion and potential savings of IDR 30.31 trillion in associated with the IDR 52 thousand per family. Based

Table 6: Liquid petroleum gas subsidy and potential government budget saving scenario-1

Scenario 1: The targets are all beneficiary family in social welfare integrated database								
Estimate LPG subsidy in 2022 IDR 45.2 Triliun								
Asumption and Parameter	ICP US$ 50/barel			LPG economic price IDR 9.972/kg				
	Kurs IDR14.450,00			Retail selling price IDR 4.250/kg				
	Volume 7.9 Juta MT			Equivalent subsidy IDR 5.723/kg				
Beneficiary target	Number (million)	LPG quota	Kg per cylinder	Months	Total volume (million kg)	Equivalent to (IDR/kg)	Equivalent in monthly (IDR/kg)	LPG subsidy (IDR Triliun)
Government regulation	[A]	[B]	[C]	[D]	[E]=[A]×[B]×[C]×[D]	[F]	[G]=[B]×[C]×[F]	[H]=[E]×[F]
Poor family	24.4	3	3	12	2,632	5,723	51,507	15.06
Micro enterpreneur	0.54	9	3	12	175	5,723	154,521	1.00
Small fishermen	0.32	12	3	12	138	5,723	206,028	0.79
Small farmer	3.86	12	3	12	1,668	5,723	206,028	9.55
Total beneficiaries	29.1				4,613			26.40
Potential government saving in budget								18.80

LPG: Liquid petroleum gas

Table 7: Liquid petroleum gas subsidy and potential government budget saving scenario-2

Scenario 2: The targets are all beneficiary family in social welfare integrated database for LPG consumer only								
Estimate LPG subsidy in 2022 IDR 45,2 Triliun								
Asumption and Parameter	ICP US$ 50/barel			LPG economic price IDR 9.972/kg				
	Kurs IDR 14.450,00			Retail selling price IDR 4.250/kg				
	Volume 7.9 Juta MT			Equivalent subsidy IDR 5.723/kg				
Beneficiary target	Number (million)	LPG quota	Kg per cylinder	Months	Total volume (million kg)	Equivalent to (IDR/kg)	Equivalent in monthly (IDR/kg)	LPG subsidy (IDR Triliun)
Government regulation	[A]	[B]	[C]	[D]	[E]=[A]×[B]×[C]×[D]	[F]	[G]=[B]×[C]×[F]	[H]=[E]×[F]
Poor family	15.46	3	3	12	1,670	5,723	51,507	9.56
Micro enterpreneur	0.34	9	3	12	73	5,723	154,521	0.42
Small fishermen	0.2	12	3	12	65	5,723	206,028	0.37
Small farmer	2.45	12	3	12	794	5,723	206,028	4.54
Total beneficiaries	18.45				2,602			14.89
Potential government saving in budget								30.31

LPG: Liquid petroleum gas

Figure 2: Forecast error variance decomposition result

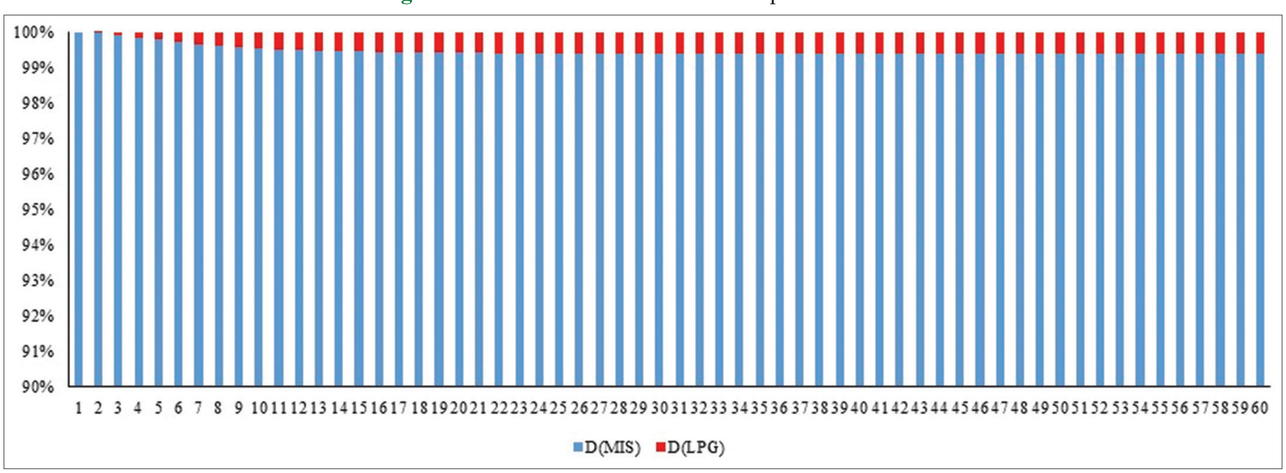


Figure 3: Subsidy removal compensation scenario 1

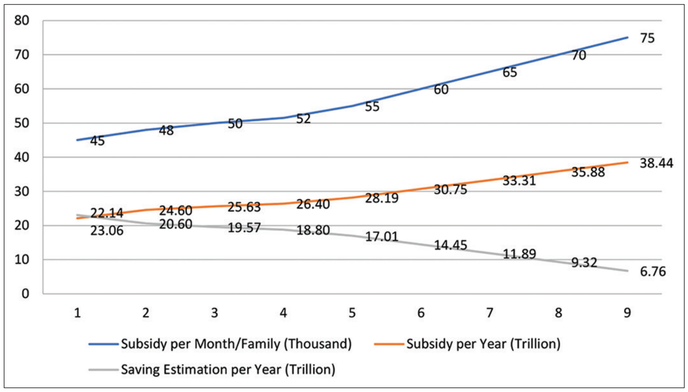
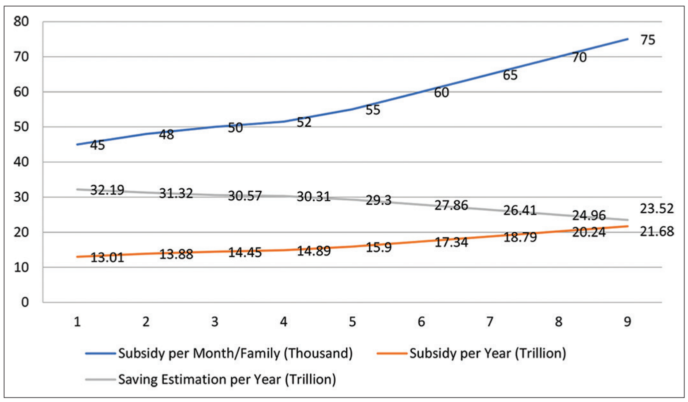


Figure 4: Subsidy removal compensation scenario 2



upon Figures 3 and 4, when the amount of subsidy increase, the potential saving for the government is decreasing and vice versa

5. CONCLUSION

The Granger causality test results show that the variable economic price of LPG for the period 2010-2019 has a statistically significant effect on poverty. The rise in LPG prices will result in an increase in poverty. It is a one-sided relationship in which only the economic price of LPG affects poverty, but poverty has no statistical impact on the economic price of LPG. According to the results of another journal study on the relationship between economic prices of LPG, the economic prices of LPG affect the inflation rate. This finding is consistent with the study, as high inflation will increase the amount of poverty. The right compensation will keep the recipients above the poverty line. Furthermore, the correct number of beneficiaries, as shown in the integrated social welfare data, has the potential to significantly reduce the government budget. This savings can be used to fund other worthwhile programs such as education, research, health, and medicine.

This study consistent with the findings of a study conducted by the Indonesia-Australia Economic Cooperation Program, which found that increase in LPG prices, in this case the removal of LPG subsidies, have a significant impact on increasing poverty. It is due to the fact that people rely on LPG for their basic needs. The absence of this LPG will cause other product prices to rise. It is critical to consider providing compensation for those in need in order to increase their purchasing power. The results of this study have implications for the establishing and implementation of government policies related LPG. Policies related to LPG prices must take into account the social welfare conditions of the community. Otherwise, the policy will potentially cause harm to society, increase inflation and consequently the number of poverties in Indonesia could increase.

This study is part of the author's research on the transformation of LPG subsidies in Indonesia. LPG subsidies in Indonesia have not run as expected due to many factors, ranging from less strict policies and the behaviour of people who mostly consume subsidized LPG. This study is still very possible to be deepened in more detail, such as making an updated database of subsidized LPG recipients and also creating mechanism on how to explain to the public about the allocation of subsidized LPG which should only be for the poor so that socio-economically capable people can stop using LPG subsidized. In addition, specific for creating the energies policy related to LPG prices that are appropriate so that they can be tolerated by the community and do not burden the government budget can also be an opportunity for future research.

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