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THE IMPACT OF FUEL SUBSIDY TO THE INCOME DISTRIBUTION: THE CASE OF INDONESIA

Anggito Abimanyu*
Department of Economics and Business, Vocational School, Gadjah Mada University, Yogyakarta
anggito@ugm.ac.id

Muhammad Handry Imansyah
Faculty of Economics and Business, Lambung Mangkurat University, Banjarmasin
mhimansyah@ulm.ac.id

*Corresponding author: anggito@ugm.ac.id

ABSTRACT

This paper aims to examine the potential impact of energy subsidies (fuel and liquified petroleum gas or LPG)) on income distribution in Indonesia. Indonesia suffers from the high price of crude oil resulting in an increase in fuel subsidies from imports of crude oil. The impact of fuel subsidies has the potential to favor urban and high-income groups. This form of price subsidy has a weakness because all income groups can buy subsidized fuel and LPG. Therefore, in terms of fairness, this type of subsidy is not justified. The method of measuring the effect to income groups benefited from price subsidies used in this study is Miyazawa's input-output analysis. The study finds that the lower-income groups receive less benefits than the higher-income groups, and even the top decile earns the highest income. This study provides several reform examples conducted by some developing countries in overcoming the negative impacts of fuel subsidy policies that are politically and economically relevant to the conditions in Indonesia. To reduce the negative impacts of fuel price subsidies, the study suggests several policy initiatives that need attention from the government. These include the automatic subsidy price adjustment law, implementing a sustainable fuel subsidy social program, improving data quality and implementing a separate PSO (public sector obligation) policy.

Keywords: fuel subsidy, income distribution, fiscal policy, input-output analysis

JEL Classification:
D57, D60, E61, E62, H24

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INTRODUCTION

The economic impact of subsidies is generally negative, but this is not always the case. While subsidies reduce economic efficiency, it is also acknowledged that subsidies are usually given to protect targeted groups (usually the lower-income ones) or to maintain consumer purchasing power (Kojima, 2017).

Domestic fuel subsidies are given with strategic commodity arguments that concern the livelihoods of the majority populations (Foo et al., 2020). Fuel subsidies arise in developing countries because domestic consumer prices for fuel products are regulated directly by the government. Domestic fuel prices are adjusted ad hoc as an effort to protect domestic consumers from high and unstable oil prices (Coady et al, 2015).

Findings in the studies which examine subsidies on energy prices generally support the elimination of such subsidies and suggest the subsidy budget savings to be reallocated to social transfers for the households of lower income groups as part of the fuel subsidy reform policy (Coady et al., 2015; Kojima, 2017; UNDP, 2021). However, several studies find positive impacts of fuel subsidies on economic and social development (Boughanmi & Khan, 2019; Durand-Lasserve et al., 2015).

Some other studies find that the policy of subsidies on energy prices were useful in the aggregate indicators, such as inflation. Nevertheless, the policies impact negatively on income distributions (Matallah et al. 2022; Yusuf et al, 2017; Jara et al, 2018). In addition, fuel subsidies are concluded to be good in the short term but bad in the longer term (Soile & Mu, 2015).

This study estimates the impacts of fuel subsidies on economic and social development in Indonesia. It is found in the literature that there is only a few studies that investigate the impact of fuel subsidies on Indonesia's economy and social problems. This study is expected to contribute to the literature in two different ways. First, adding to the literature on the impact of energy price subsidies on social problems such as income distribution and inequality. Second, when the policies bring about negative impacts, providing matrix of policy options to change the policy pattern that are appropriate instead of subsidizing energy prices with the compensation schemes.

LITERATURE REVIEW

Amir et al. (2019) argued that the fuel subsidy program in Indonesia failed to effectively reduce poverty and inequality because it provided benefits not only to the poor and vulnerable households but also to the wealthy ones. The authors also found that the blanket subsidy nature of the fuel subsidy program led to an inevitable outcome due to the reduced price commodities were consumed by all customers, regardless of their income levels. Furthermore, the subsidy was mostly utilized and enjoyed by the higher-income Indonesians who owned vehicles.

APPLICATIONS FOR PRACTICE

- This study concludes that fuel subsidies in Indonesia worsen income distribution.
- Policy makers need to adopt a policy of gradually adjusting fuel prices.
- The fuel price policy must be accompanied by social policies that are planned, recorded and targeted.
- SOEs implementing PSO (public service obligation) must be transparent and separate in reporting the use of subsidized funds.

According to Jara et al. (2018), the elimination of all fuel subsidies in Ecuador would result in an increase in poverty and income inequality, given the reliance of low-income households on gas subsidies. However, the authors emphasized that if the subsidy removal only targeted gasoline and diesel, the effect on poverty and income distribution would be negligible., Jara et al. (2018), thus, suggested that it is crucial to subsidize the right types of goods, particularly those predominantly consumed by the poor. Regarding this, implementing an appropriate subsidy policy is essential.

Meanwhile, Yusuf et al., (2017) provided comprehensive analysis between the pros and cons of energy subsidy. Their simulations suggest that the impacts of subsidy removal varies across sectors and regions, with negative effects on manufacturing sectors and the economy as a whole but potential benefits for the environment, and combining fuel subsidy removal with an indirect tax cut could mitigate negative impacts and receive support from elites, although alternative compensation mechanisms and region-specific approaches have not been explored in-depth (Yusuf et al., 2017).

Numerous studies show inefficiencies in energy price subsidies (Arze del Granado et al., 2012; Feng et al., 2018; Ogarenko & Hubacek, 2013). The studies found inefficiencies in administrative matters and resource allocation. Ogarenko & Hubacek (2013) stated that energy subsidies lead to inefficient resource allocation and result in excessive energy consumption. Meanwhile, Soile & Mu (2015) found that the top 20% of households receive twice the benefit of fuel

subsidies compared to the bottom 20%. This finding shows that the top income group receives more benefits than the bottom income group, and it worsens income distribution. Feng et al. (2018) examined the impact of energy price increases on different income groups. The results indicate that low-income households are more adversely affected by energy price hikes than high-income households, considering both direct and indirect effects of energy price changes. They offered policies to vulnerable households through cash transfers, targeted subsidies for public transportation, or food.

Kpodar & Djiofack (2009) found that the rise in gasoline and diesel prices primarily affects non-poor households, the increase in kerosene prices is particularly detrimental to the poor. They also show that high-income households benefit more from oil price subsidies, suggesting that such subsidies are not an efficient way to secure income for poor households compared to targeted subsidies.

Feng et al. (2018) examined the impact of energy price increases on different income groups. The results indicate that low-income households are more adversely affected by energy price hikes than high-income households, considering both direct and indirect effects of energy price changes. They offered policy to vulnerable households through cash transfers, food and public transportation targeted subsidies.

Energy price subsidies are always related to income inequality, as the policy can result in the condition which all people enjoying low energy prices. Many studies have shown that energy price subsidies are an expensive and inefficient social safety net (El-Katiri & Fattouh, 2017). Matallah et al. (2022) also found that energy price subsidies are effective in addressing income inequality in Algeria. They emphasized that controlling corruption has a significant negative effect on income inequality. Hence, they maintain that government subsidies and corruption control are crucial to minimizing income inequality in Algeria (Matallah et al., 2022).

A study that explored the impact of energy price subsidies by Arze del Granado et al. (2012) finds that most of the benefits from price subsidies go to high-income households, further reinforcing the level of income inequality. However, study by Boughanmi & Khan (2019) indicated that a 50% reduction in energy subsidies would cause to a slight increase in gross domestic product (more than 0.5%) and government savings (almost 3 billion US $), but experiencing a decline in household welfare by approximately 3%. This was mainly due to an increase in the private consumption price index (or general inflation). The study also finds that the effect on the Gini coefficient is relatively small. This shows that in the short term, the effect on income inequality is not too sensitive.

Similar results on the distributional impact of the means of redistributing subsidies was also found by Durand-Lasserve et sal. (2015) where the choice of the redistribution scheme plays a crucial role in determining the overall distributional performance of the reform. They added that cash transfers and food subsidies could make reforms more attractive to the targeted households and poverty reduction programs. Nugraha (2013) whose study examined the income distribution of energy and electricity finds that the impact biased to a higher income group in Indonesia. In addition, a study by SMERU research Institute contended that maintaining the subsidy policy becomes challenging due to the absence of assurance regarding the country's ongoing advantages from the escalating prices of commodities (SMERU Research Institute, 2022).

This current study aims to examine tax expenditure for providing price energy subsidies differently, rather than to measure the distributional effect of subsidy reduction. Most studies have examined the distribution of the reduction or removal of subsidies. The subsidy means tax expenditure for the energy sector since the subsidy is provided to the output of the energy sector. Therefore, the distributional effect can be measured for which income group benefited the most.

Some governments face the same problem on reducing energy subsidies to cover inflation and protect poor people due to the volatility of world energy prices. However, some governments have slowly reduced and removed subsidies on energy with different policies (Soile & Mu, 2015).

Overall the literature review shows that benefits and pitfalls of fuel subsidies to the economy and income distribution vary among developing countries. In general, it could be argued that the typical subsidies can restrain the decline in household purchasing power and inflation in the short term, while they will exacerbate income distribution and inequality between the more advantaged and the less advantaged households and between the urban and the rural sector. This study deploys the input-output methodology that will prove empirically the impacts of fuel subsidies in Indonesia.

RESEARCH METHODOLOGY

Input-output analysis is a useful analytical tool for identifying the inter-industry relationship amongst sectors in the economy. Furthermore, it can be utilized to study the effects of policies such as fuel subsidies on various household income groups.

		Model Open I/O	*Model Close I/O*
Early impact	=	1	1
Direct impact	=	$\sum a_{ij}$	$\sum a_{ij}^*$
Indirect impact	=	$\sum b_{ij} - 1 - \sum a_{ij}$	$\sum b_{ij} - 1 - \sum a_{ij}^*$
Total impact	=	$\sum b_{ij}$	$\sum b_{ij}^*$

a_{ij} and a_{ij}^* are direct input *coefficients;* b_{ij} and b_{ij}^* are inverse matrix coefficients

Miyazawa's Input-Output (I-O) Analysis, also known as extended input-output analysis. This model is able to measure the impacts on income groups. The following is the basic equation for the I-O matrix:

$$AX + Y = X$$

A is the Leontief matrix n x n with each element in the matrix A a_{ij} representing the amount of production of sector i (row sector) which is used as an intermediate input in the production of output sector j (column sector).

$$A_{ij} = X_{ij}/X_j$$

Where *Xij* is the value of the flow of goods or services from sector *i* to sector *j;*

Technology Coefficient Matrix (A)

The technological matrix is the aij cells, where the value is:

aij = xij/Xj

aij = technology coefficient

xij = flow from industry i to j

Xj = total input for the sector j

Matrix A represents the composition of input used in the production process of sector i, which reflects the technology used by that sector. In the IO analysis, the Leontief production function is used, which assumes "constant returns to scale".

Leontief Inverse Matrix (B)

Leontief inverse matrix is coefficient of b_{ij}, where the value is:

B= $(I - A)^{-1}$

bij = $(I-A)^{-1}$

aij = technology coefficient

xij = flow from industry i to j

Xj = total input for sector j

Each column in matrix A shows the composition of input use in the production process of sector i. This coefficient reflects the technology used by the production sector. In the "I-O" model analysis, the coefficients follow the assumption of Leontief's production function, namely "constant return to scale".

Analysis of Inter-Sector Relations

Rasmussen (1956) and Hirschman (1959) originally developed analysis to examine the interrelationships between sectors and determine strategies for development policies. There are two types of linkages: (1) "backward linkages", which relate to inputs such as raw materials and are calculated based on column totals, and (2) "forward linkages", which are related to sales of finished goods and calculated based on row totals. These two linkages have two types of impacts, namely "direct and indirect impacts". Both of these coefficients can be expressed mathematically by using a formula (Miller & Blair, 2009).

Miyazawa Input-Output Model

Based on "*SAKERNAS (Survei Angkatan Kerja Nasional* or National Labor Survey) and *SUSENAS (Survei Sosial Ekonomi Nasional* or National Economic and Social Survey) data", this study divided households into ten different groups. This grouping is conducted by dividing the primary input in the value-added rows, which originally represented one, into ten household groups. Likewise, the wage and salary lines are divided into ten income groups. Meanwhile, the consumption column is divided into ten household consumption groups. A method for calculating the impact of income distribution can be found in Miyazawa (1976). This analysis intends to examine the impact of fuel subsidies on potential income inequality. With this study it is possible to assess the income groups that benefit the most from fuel subsidies.

The data used in this study is derived from the Miyazawa Input-output Table, which divided wages

and household consumption across 73 sectors into deciles for both rural and urban areas. This study uses Indonesia's 2016 Input-Output data from the Central Statistics Agency (BPS).

In the simulation, the impact of energy (fuel and LPG) price subsidies on income distribution was measured by applying the amount of energy (fuel and LPG) subsidy allocated in the 2023 Indonesian state budget.

RESULT AND DISCUSSION

Brief Indonesian Economic Performance

Over the past ten years, from 2012 to 2022, the Indonesian economy had achieved modest economic growth above 5%, except during the 2020 pandemic, a contraction of -2.07%. Economic growth which was quite stable during the decade was reduced by declining inflation towards the long-term inflation target of 3% plus or minus 1%. During the peak of the pandemic of 2020, inflation decreased to 1.68% due to weak purchasing power, then increased to 3.36%, in 2022 concurrent with the start of the recovery process (Haryono, 2022).

The Indonesian government responded to its fiscal expansion policy in dealing with the COVID-19 pandemic. During 2020 and 2021 state budget provided fiscal stimulus by increasing spending allocation, especially social spending and business incentives to deal with the impacts of the pandemic. The government expanded the state budget deficit in 2021 up to -5.70% of GDP to accommodate additional tax incentives and allocations for social spending, including fuel and other energy subsidies.

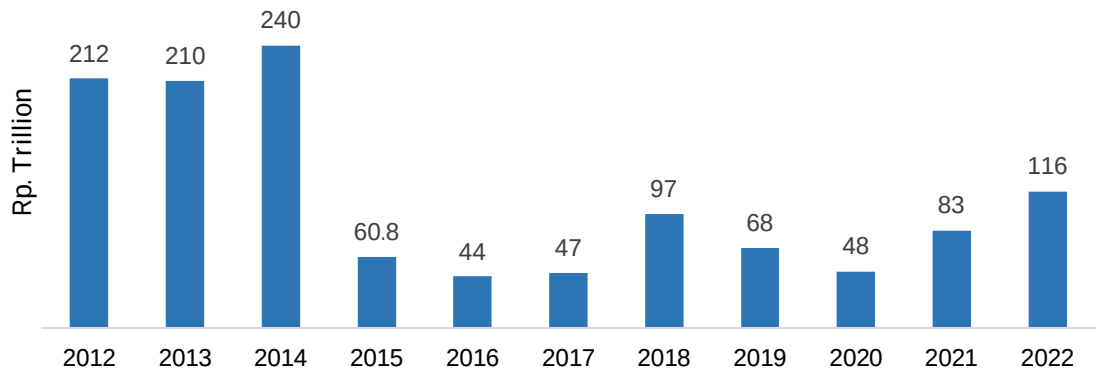
In 2022, at the same time as the increase in state revenue from natural resources, the government increased the significant portion of fuel subsidy to protect the household purchasing power (Puspasari, 2023). Fuel subsidy ratio reached 3.745% of total state budget spending. If coupled

Table 1 Indonesian Economy and State Budget, 2012-2022

Year	Growth	Inflation	Deficit Budget (% of GDP)	Energy Subsidy/ Budget (%)		Debt/GDP (%)
				Fuel	Energy	
2012	6.23	4.30	-1.67	14.21	18.86	22.95
2013	5.56	8.38	-1.69	12,5	16.11	24.70
2014	5.21	8.36	-2.56	13.61	19.38	24.68
2015	4.88	3.35	-2.21	3,03	5.75	27.00
2016	5.02	3.02	-2.15	2.34	5.73	28.34
2017	5.07	3.61	-2.41	2,26	4.69	29.38
2018	5.17	3.13	-1.82	4.40	6.91	30.10
2019	5.02	2.72	-1.84	1,67	3.88	30.59
2020	-2.07	1.68	-1.76	1.84	4.20	39.26
2021	3.71	1.87	-5.70	2,07	4.02	41.20
2022	5.31	3.36	-4.85	5.50	7.70	40.90

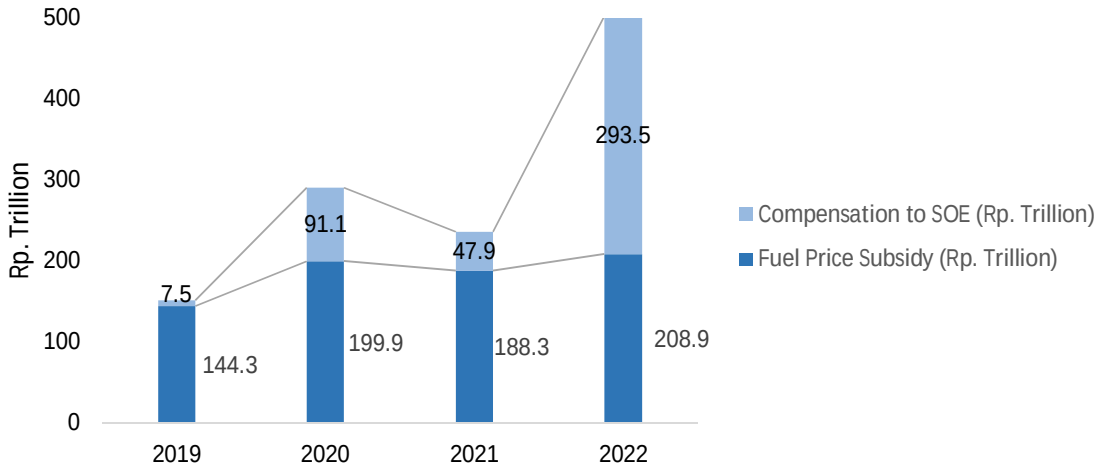
Source: Indonesian Annual State Budget Document, 2012-2022

Figure 1 Fuel Subsidy (Rp. Trillion)



Source: Indonesian annual state budget, various years

Figure 2 Indonesian Fuel Subsidy and Compensation During Pandemic, 2019-2022 (Rp Trillion)



Source: Ministry of Finance, Indonesian State Budget, 2019-2022

Table 2 Fuel Subsidy, Compensation and Proportion of State Budget, 20190-2022

	2019	2020	2021	2022
Fuel Price Subsidy (Rp. Trillion)	68.2	47.7	83.3	116.0
Fuel Subsidy/Budget (%)	1.67	1.88	2.07	5.50
Fuel+Compensation/Budget (%)	1,97	5,46	3,79	16,26

Source: Ministry of Finance, Indonesian State Budget, 2019-2022

with the ratio of electricity subsidies which reached 5.68% of total budgeted spending (Table 1). If the Indonesian government is consistent with the fuel price adjustment policy that has been implemented since the end of 2014, the fuel subsidies would have been below 2% of total budget spending. Even though it is likely expansive, the state budget deficit can be reduced back to a level below 3%, namely 2.38% in 2022 and the debt ratio is still maintained below 40%.

Macroeconomic policies targeting recovery of economic growth and reducing inflation during the pandemic crisis have been quite effective for Indonesia. In order to be able to strengthen macroeconomic stability that can mitigate the impact of the crisis, the policy of changing the price of subsidies to targeted subsidies is a prerequisite (Abimanyu & Imansyah, 2023).

Fuel Subsidy and Policy

During 2012 to 2022, the fuel subsidy spent by the Indonesia government can be seen as Figure 1 below. The amount of fuel subsidy depends on the difference between administered and economic prices and the domestic fuel consumption. Moreover, the amount of the subsidy is also influenced by the exchange rate. The economic price of fuel is calculated from the international price of crude oil as raw material for refining fuel, and other costs including PERTAMINA's margin. PERTAMINA is state-owned oil company which according to the regulation, is responsible to providing and distributing fuel throughout Indonesia. The company, consequently, receives distribution costs and profit margins in accordance with the regulation.

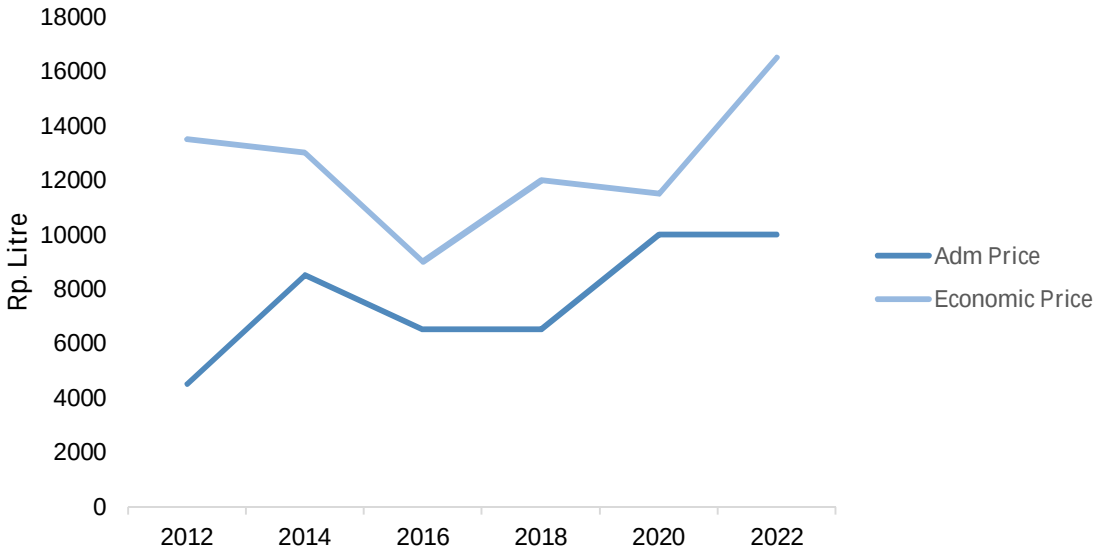
As illustrated in Figure 1, in the last ten years (2012-2022), fuel subsidy is fluctuated. The first three years (2012-2014) experienced the highest level, reaching the top of 240 trillion Rupiahs in 2014. The following three years the subsidy decreased dramatically, then increased again slightly in the last four years; reaching 116 trillion Rupiahs in 2022. In 2014 and 2018, due to the Parliament and Presidential elections, domestic fuel price adjustment did not take in place. Policies regarding the automatic adjustment of fuel prices are politically and legally unacceptable.

In 2019 to 2022, especially in 2022, to protect people's purchasing power from the higher domestic fuel prices during pandemic crisis, the government spent extra compensation. This budget

of fuel subsidy was 116 trillion rupiah (or 5.50% of total annual budget) did not include energy compensation. If the compensation is included, the budget proportion of fuel and energy subsidy becoming more than 500 trillion rupiah or 16,26% of the year's expenditure (see Figure 2 and Table 2). The fuel compensation fee is paid to PERTAMINA and PLN as a strategic initiative to strengthen the financial resilience of BUMN, thereby ensuring the consistent availability of energy at affordable prices to the society (Kementerian Keuangan, 2022b).

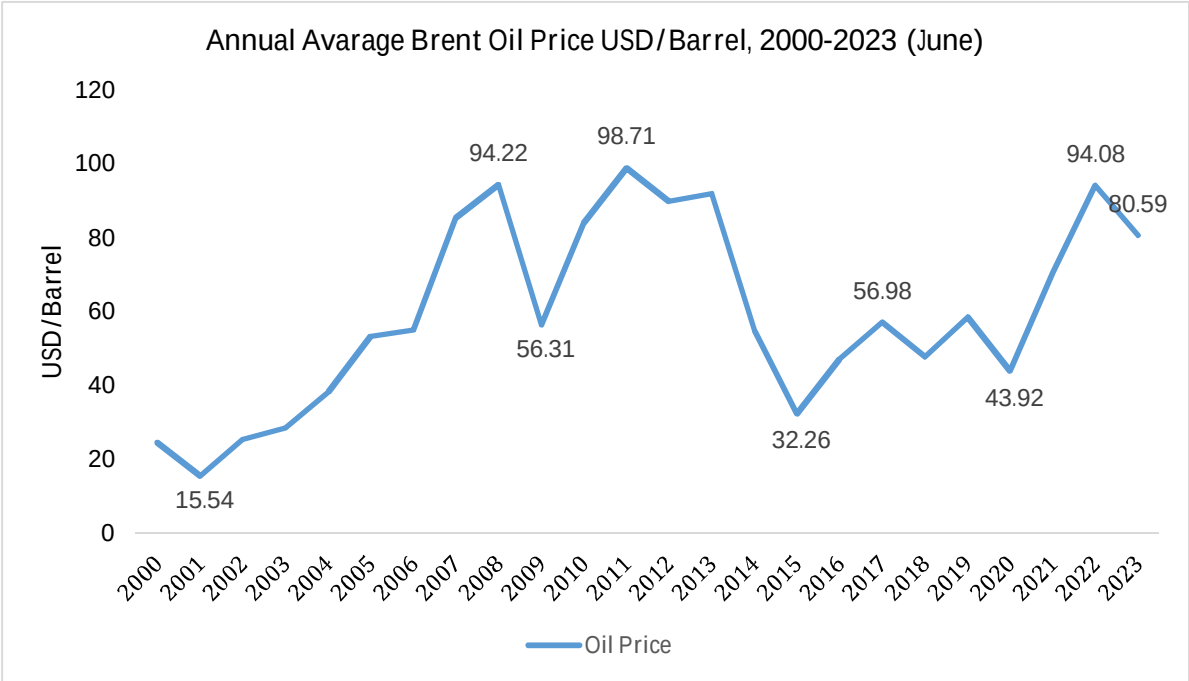
Since the economic turbulence and Covid-19 pandemic crisis, the world crude oil price somewhat fluctuated. The government lowered the price of

Figure 3 Fuel Price: Administration vs Economic (Rp/Litre)



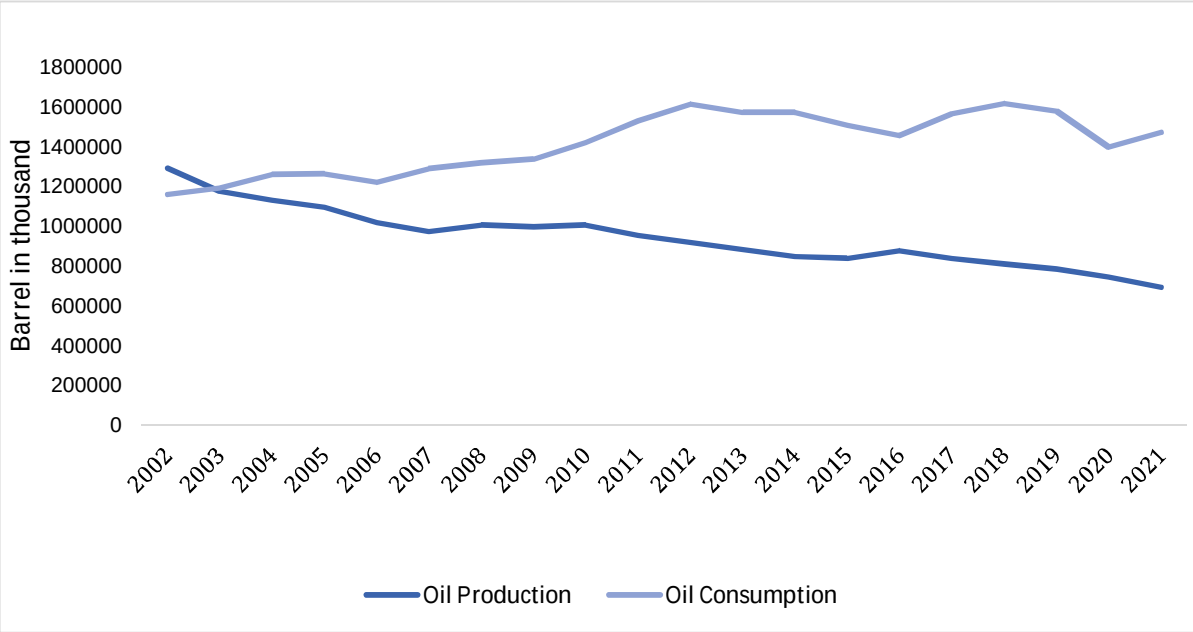
Source: Indonesian annual state budget, various years

Figure 4 World Crude Oil Prices USD/Barrel



Source: OPEC

Figure 5 Oil Production and Consumption



Source: Kusnandar (2022)

fuel in 2020 and but then increased sharply it in 2022. In 2022 the government decided to increase the domestic price significantly due to higher price gap between administered (in this case the Pertalite fuel type) and economic fuel price (see Figure 3).

In two decades, the world has experienced high crude oil prices of around US$100 per barrel in 2008, 2011-2013 and 2022. For Indonesia, the increase in crude oil prices impacted on increases in oil and gas revenues, followed by an increase in fuel subsidy costs due to raw materials which were imported from overseas. However, the rise in world oil prices is detrimental to Indonesia's state budget and balance of payments as well as the macro economy.

The world oil prices are seen increasing since 2020 and currently remain quite high (Figure 4). The increase in world oil prices occurred from supply disruptions due to Covid-19 pandemic and geopolitical tensions between Russia and Ukraine as well as increasing world oil demand.

Domestic fuel prices are also very dependent on the level of domestic fuel consumption. Figure 5 shows the increase in fuel consumption, and since 2013, Indonesia has been importing crude oil into the country which has been increasing with reference to the international oil prices. The tendency to import crude (including fuel) occurs because Indonesia's crude production continues to decline along with the age of crude oil wells and the absence of new oil investment. Fuel consumption has been stagnant since 2014 mainly due to the substitution of fuel to gas and coal for power generation.

Social Compensation from Fuel Subsidy Cuts

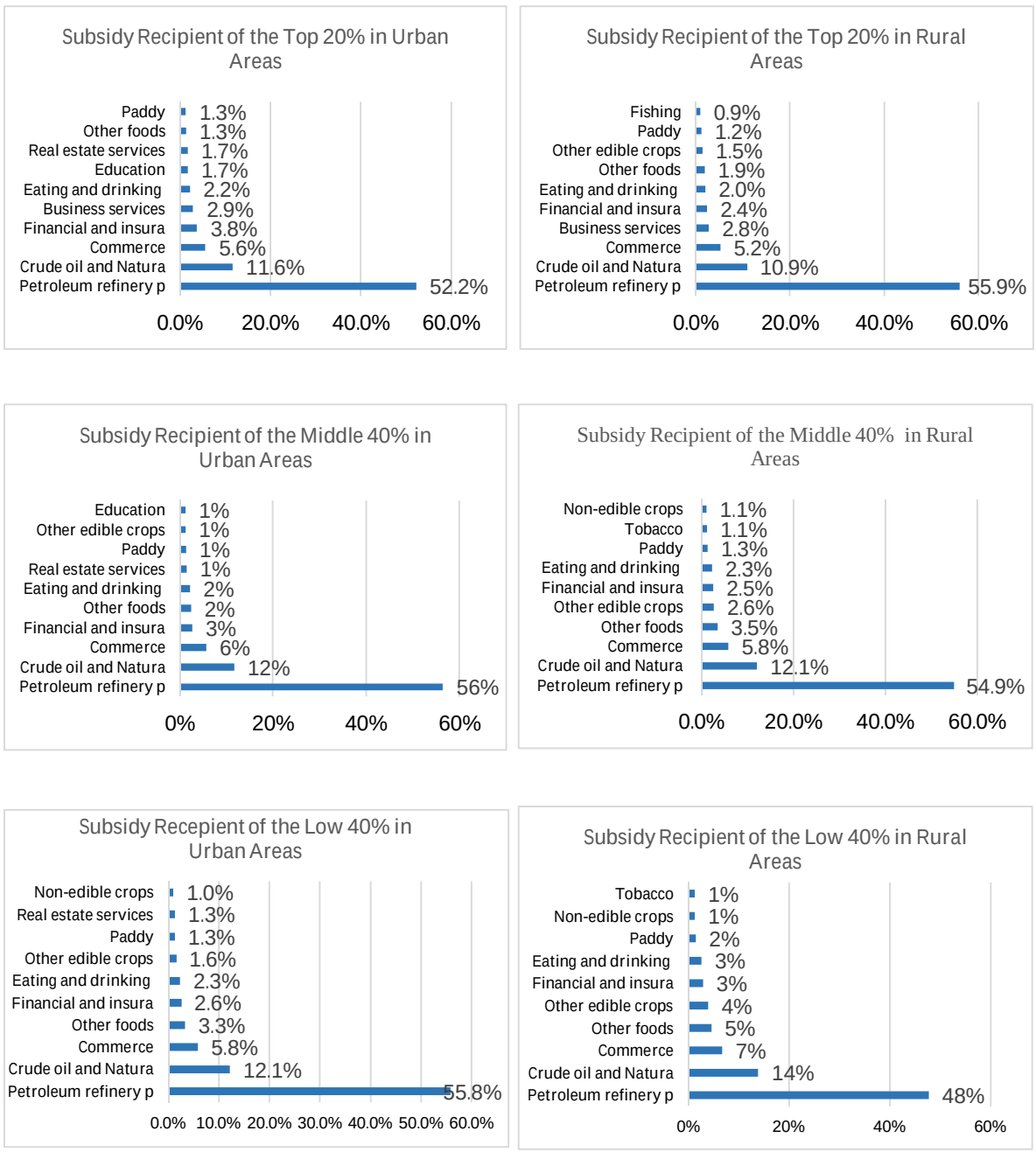
In 2005 and 2008, when the Indonesian government made the bold decision to cut fuel subsidies through price increases, a social compensation scheme was introduced from savings in fuel subsidy allocations (Asian Development Bank, 2015). Since then, every time the government makes a similar policy regarding increasing fuel prices, the fuel subsidy savings are allocated for social assistance to poor households or the targeted economic sector.

The social compensation program is provided in the following forms, among others (Kementerian Komunikasi dan Informatika, 2022):

1. Direct Cash Transfer (BLT) in cash to beneficiaries' families;
2. Social Assistance ("BANSOS"), including vouchers, in-kind transfers in the form of food for school students, rice, health assistance, and energy subsidies;
3. Social protection ("PERLINSOS") for the affected families and household services;
4. Social Security in the form of health and work accident insurance;
5. Assistance to workers in the form of training, business incentives, pre-employment program and wage subsidy assistance (BSU).

In 2022, the government took another bold step in reducing fuel subsidy. As a form of diverting

Figure 6 The Impact of the Energy Price Subsidy to Household Income Group in Urban and Rural Areas



Source: Central Bureau of Statistics/ *"Badan Pusat Statistik"* or BPS, IO Energy Miyazawa Table, 2021, calculated by the authors

fuel subsidies and compensation, the government provided a significant social protection program as a form of social assistance that is given fairly to all affected groups of people who work through Wage Subsidy Assistance ("*Bantuan Subsidi Upah" or* BSU) as well as the poor and vulnerable through Fuel and Oil Direct Cash Assistance ("*Bahan Bakar Minyak Bantuan Langsung Tunai*" or BBM BLT) (Kementerian Keuangan, 2022a).

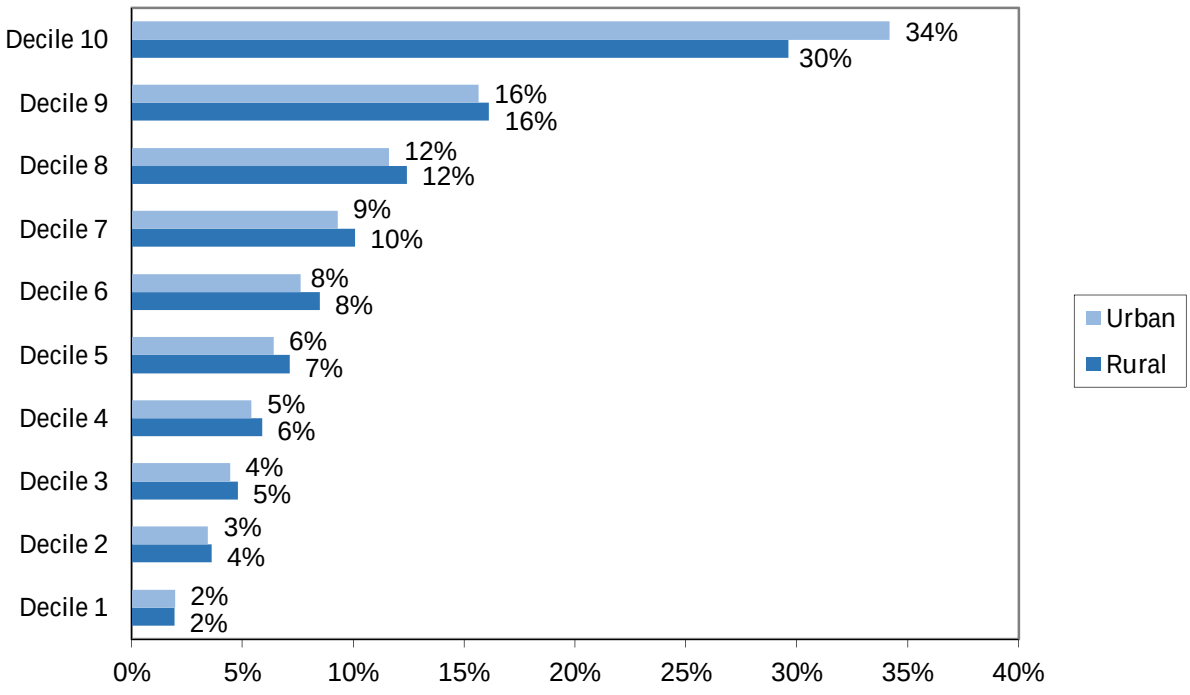
Cash transfer programs are the main poverty alleviation policies in several developing countries. The positive impact of Direct Cash Assistance (BLT) in Indonesia can be seen from the level of welfare of beneficiary households (Khomaini, 2020).

Beneficiary families ("*Keluarga Penerima Manfaat"* or KPM), namely the bottom 30% of the community (the poorest and most vulnerable) received BLT BBM assistance, including 16 million workers whose wage/salary is a maximum of IDR 3.5 million/month. The assistance of IDR 600 thousand was given one-time payment to fund (earmark) the "PERLINSOS" program, job creation

and transportation sector subsidies/assistance i.e., public transportation, motorcycle taxis, fishermen, and Micro, Small and Medium Enterprises. It was expected that the provision of this additional social cushions would benefit to the purchasing power of the poor and vulnerable, and thus reduce poverty by -1.07% (Kementerian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi, 2022).

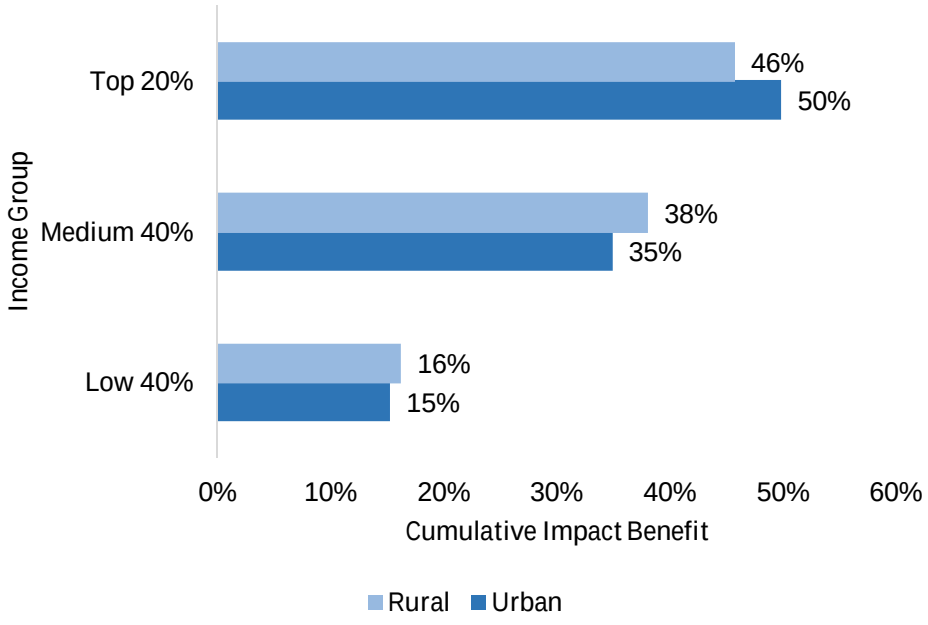
Another significant program for compensation scheme given in 2022 was fuel BBM BLT direct cash

Figure 7 Percentage Impact Benefit to Decile Income Group (%)



Source: BPS, Miyazawa IO Table, calculated by authors

Figure 8 Percentage Impact Benefit to The Three Income Group (%)



Source: BPS, Miyazawa IO Table, calculated by authors

transfer program. This assistance was provided in the context of strengthening social protection and increasing the effectiveness of social assistance programs that aim to reduce the expenditure burden of poor families in meeting daily needs and basic needs in meeting fuel oil. In addition, BBM BLT is given with the aim of protecting the purchasing power of the poor and vulnerable who are affected by the increase in fuel prices.

Result and Analysis

The impact of fuel subsidies and LPG on income distribution is biased towards the top decile and the urban population. From Figure 6, it can be concluded that from three sectos (petrol, crude and commerce), the top decile receives the highest gain due to energy subsidies (fuel and LPG). Decile 10 receives 30% and 40% of the subsidy for the rural and urban populations, respectively. This indicates that the top decile receives 30% of the total subsidy for the rural population, while the urban population receives 40% of the total subsidy (see Figure 7). Conversely, decile 1 only receives 2% of the total subsidy for both rural and urban areas. This phenomenon shows that there is an unequal impact of energy price subsidies.

The household income group decile 7 only receives 9% and 10% of the subsidy for rural and urban populations, respectively. When the household income groups are aggregated into the top 20% income group, 40% middle-income group, and 40% lowest-income group, it is evident that there is an unequal distribution of energy price subsidies. For example, the top 20% income group in rural and urban populations receives 46% and 50% of the subsidy respectively (see Figure 8 for detail). Conversely, the lowest 40% income group receives only 16% of the total subsidy (rural population) and 15% of the total subsidy (urban populations). This study suppports other studies that found that energy price subsidies have an unequal distribution effect, benefiting the upper-income group, except for LPG (Soile & Mu, 2015; Matallah et al., 2022; Kpodar & Djiofack, 2009; Jara et al., 2018).

Examining the proportional impacts of energy subsidies (petroleum and LPG) in the 2023 State Budget on the top 20% household income group in urban areas, this study finds that the sectors with the maximum increase in income are petroleum and refinery, crude and natural gas, commerce, financial and insurance services, manufacturing of other foods, and eating and drinking. The majority of the benefits go to the petroleum and refinery, and crude and natural gas sectors, which comprise more than 60% of the total benefits. In rural areas, the phenomenon is similar, with predominantly petroleum and refinery and crude and natural gas sectors benefiting, while other sectors only receive approximately 10% of the total benefits. This is the distributional impact on a sectoral basis.

For the middle 40% household income group, petroleum and refinery and crude and natural gas sectors are the top beneficiaries of the subsidy, with other sectors obtaining less than 8% in both urban and rural areas. Meanwhile, for the low 40% household income group, the phenomenon is similar, indicating that the impact of the energy subsidy is relatively minimal on other sectors.

On closer examination, the top beneficiary of the subsidy is the decile 10 of the household income group, receiving almost 30% and 35% in rural and urban areas, respectively. In contrast, the decile 1 of the household income group only receives approximately 2% in both rural and urban areas. This uneven distribution of the impact highlights the need for greater equity in the distribution of energy subsidies.

CONCLUSION

This study proves that fuel subsidies in Indonesia are more beneficial for the 20% of households with the highest incomes and the proportion is between 46% in urban areas and 50% in rural areas. Fuel subsidies also benefit the energy sector (petroleum and crude oil) more than 50% and the commercial and industrial sectors more than 10%, and the rest is divided into other sectors. Other sectors are generally medium and small scale. These results conclude the need for reform in fuel and energy subsidy policies in general in Indonesia.

The purpose of policy reform on fuel subsidies is to increase economic efficiency, change the pattern of fuel subsidies from price subsidies to targeted subsidies, budget reallocation for social spending, and support for renewable energy investment (ADB, 2015). The biggest challenge of fuel subsidy reform is the regulatory certainty of a fuel subsidy policy with an automatic fuel price adjustment pattern and mechanism. This regulation will be followed by reallocating the subsidy budget for social programs that are right on target and a fuel price policy that can reduce greenhouse gas emissions and enhance the green economy. Table 3 shows a matrix of objectives, policy tools, policy impacts and countries that have experienced the reforms.

From the matrix below, detailed explanations can be drawn which illustrate the keys to success of fuel policy reform in Indonesia. First, enacting the Energy Subsidy Law which contains a comprehensive and long-term plan that is principled and binding regarding changes to price-based subsidies to targeted subsidies. This law was stipulated to avoid the politicization of the fuel

Table 3 Government Policy Initiatives Matrix

No	Purpose	Policy/Tools	Impact	Countries
1.	Certainty of Subsidy Policy	The Fuel Subsidy Law regulates a comprehensive fuel subsidy policy and the principle of subsidies that provide certainty	Certainty of automatic price adjustments, targeted subsidy programs as well as policy transparency and accountability	Iran, Jordan and Domenica Republic
2.	Implement Automatic Fuel Price Adjustment	Government regulations on institutional responsibility, price formulas, pricing mechanisms, fairness aspects, and policy accountability	Guarantee public transparency, a simple price mechanism, and be able to reduce the impact of inflation	Chile, Peru, South Africa, the Philippines, Turkey and Mauritius
3.	Define Social and Green Program	Annual Budget Policy agreed upon the Government and Parliament.	Targeted subsidy for cash or non-cash transfer, social protection, poverty programs and SDG programs	Indonesia, Gabon, Ghana, Nigeria, Morocco and Mozambique
4.	Improve Data Quality	Presidential Decree on the Management of Single Data regarding Household Identity, Household Economic-Social Information and the Environment	Reducing target errors, overlapping targets and inefficiencies in budget allocations and transparency in allocating	Chile, Ghana, Indonesia, India, Iran
5.	Continuous public communication	Develop an action plan for effective public communication on fuel subsidies and social programs	Increase awareness and understanding of price subsidy transfer programs to targeted subsidy programs	Many countries
6.	Improve the PSO performance of SOEs	Further develop credible separate PSO financial report	PSO implementation within the SOEs celarer and more transparant	Many countries

Source: Developed from several literatures (Kojima, 2017; Coady et al., 2015; UNDP, 2021).

subsidy transfer policy which actually benefits the people. Second, establishing a credible and transparent mechanism for automatic price adjustment in a government regulation. Automatic price adjustment policies should be clear, simple and have clear boundaries. The government regulations also cover the decision-making process as well as the governance of implementing activities, both Ministries and Institutions as well as SOEs. Third, establishing social programs in a government regulation as well as the Annual State Budget Law to ensure that the programs are well planned, structured, do not easily change and do not overlap. Program targets need to be set every year in the state budget to ensure budget availability and can be adapted to the dynamic socio-economic conditions of society. Fourth, improving and ensuring a reliable database to implement targeted subsidy provision to the intended households and sectors. Database management is stipulated in the Law by a credible institution and funded by the state with adequate and academically accountable data collection methods. Fifth, carry out outreach with a continuous communication strategy with various stakeholders through physical meetings, printed media, and electronic and social media. The communication strategy is advocative and educative but must be quite persuasive. In addition to socialization regarding the Subsidy Policy Law and Regulations, it is also regarding the impact of transferring subsidies and beneficiaries of social programs. Sixth, improving the performance and governance of BUMN (State Owned Enterprises, SOEs) such as PERTAMINA and PLN which obtain a mandate as a PSO (Public Service Obligation) in the implementation of the subsidy policy. Within the

SOE, PSO financial report needs to be separated from other commercial reports. So that the social responsibility for the assignment of PSO to the BUMN is clear and transparent.

With the deployment of the Miyazawa Input-Output method, this study proves a negative impact from subsidizing fuel prices on equality of beneficiaries between income groups and sectors in the Indonesian economy. The provision of a compensation scheme for the increase in fuel prices is given on an ad hoc basis. This approach complicates the planning of social programs that will be carried out. Given the evidence that fuel subsidies in Indonesia are still significant due to the world oil price dynamics and thus will continue to fluctuate, it is suggested that this social program be carried out so that fuel subsidy policy reforms are immediately refined with automatic price adjustments and linked to social compensation and comprehensive energy reforms. This study provides several suggestions and steps for reform in the field of sustainable energy.

This study identifies several limitations in terms of methodology and scope. First, the input-output model uses the one-country static deterministic model. Second, this study does not discuss quantitatively the various feasibility of social programs as compensation for the fuel budget allocation policy. Further studies need to provide added value in terms of modeling and also studies regarding the feasibility of the fuel price compensation social program.

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