# APPLYING TAX RATES OF 33,33% ON PRIMARY ENERGY IN INDONESIA

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## Abstract

High fuel consumption has a negative impact not only on the environment, but also can have wider impact on the country's economic conditions. Thus, steps need to be taken regarding the use of fuel in order to reduce the negative impact that results. The aims of this study is to analyze the impact that occurred on the industry and the Indonesian economy when a tax of 33,33% was determined on the use of primary energy, that is coal and petroleum products, through three simulations. By using a model from GTAP-E, the region is aggregated into 7 regions and the industrial sector will be aggregated into 11 industries. The result shows that simulation C has a significant impact on the industry and the Indonesian economy. In addition, this simulation is also able to reduce carbon dioxide gas emissions which derive from coal and petroleum.



Keywords: *Tax, Petroleum, Coal, GTAP-E*


## 1. Introduction

Energy has a very important role for the Indonesian economy. Not only as a source of fuel and industrial raw materials, but also as a reliable source of state revenue (Kementerian ESDM, 2013). The need for energy and transportation in Indonesia is quite high to encourage growth. One of the energy needed for sustainable economic growth is electricity. However, electricity supply is not in line with high growth (World Bank, 2018). The power plant used to date is still sourced from coal which is one of the largest types of fossil fuels producing greenhouse gas emissions. Since electricity needs continue to increase, greenhouse gas emissions in Indonesia will also increase as a result of burning fossil fuels.

The current energy sector trend observed by the World Bank (2016) which results in Indonesia's fossil fuel emission level will be tripled in 2030. This is in line with the research conducted by Sulistyono (2006) which states that fossil fuel reserves owned for now remain around 4,3 billion barrels for petroleum. Based on such the total reserves with a population of around 240 million people, it can be estimated that the country's oil reserves are only around 18 barrels per capita. Seeing this phenomenon, it can be estimated that petroleum reserves

will run out in another 25 years. Therefore, there needs to be an effort to ensure the availability of energy in the future.

One of the government policies as an effort to ensure the security of domestic energy supply is contained in the Presidential Regulation of the Republic of Indonesia (Perpres No. 5 Tahun 2006) concerning National Energy Policy. In the Perpres stated that what can be used as an alternative energy source is a certain type of energy resources, in lieu of fuel oil. The target is to reduce fossil fuel consumption, especially petroleum product to less than 20%. Through these efforts, the government has made plans to promote biofuel as an alternative energy resources in lieu of fossil fuels, but its development has not been as expected. The main cause of the obstruction of the development of biofuels is the government still provides sufficiently high subsidies for fuel oil (Sulistyono, 2006).

In recent years, fuel subsidies have absorbed more than 20% of the government budget. However, subsidies are not functioning properly because 40% of the subsidy felt by groups of households whose income is high, while less than 1% goes to the poorest groups (World Bank, 2014). Fuel subsidies carried out continuously like this can be detrimental to the Indonesian economy which impacts one of them is the budget deficit. With the low price of fuel, consumers will continue to increase their energy consumption in an inefficient and excessive manner. This consumption will result in high levels of greenhouse gas emissions, as well as impacts on the environment, health and others.

Many policy choices are being considered for reducing emissions in Indonesia. An integrated policy approach can include banking sector policies, taxes, incentive depreciation, and trade policies. This policy strategy needs to consider energy prices to improve energy efficiency, save on the use of fossil fuel and reduce greenhouse gas emissions. The

government has also begun to implement energy subsidy reforms as an effort to reduce high government spending on fuel subsidies.

The policy steps taken by the government are of course inseparable from the impact that will arise such as the high price of fuel which can then result in increases in other goods. With the increase in world oil prices and low domestic coal prices, Indonesia's energy sector has shifted from the use of oil to coal. This study was motivated by research conducted by Nong (2018) that analyze at the impact of the industrial sector in Vietnam when the policy scenario was the tax on the use of coal and petroleum products each at 33.33% and 50%. Which distinguishes this research from Nong (2018) is that the tax targeted here is only one type, i.e. 33.33% in the use of energy resources derived from fossils such as oil and petroleum. In addition, the country that will be the main focus is Indonesia, so it will be observed how the impact of this simulations on the conditions of the industrial sector in Indonesia.

The simulation that will be carried out is to set a tax rate on the use of 33.33% petroleum products and also for coal 33.33%. This, besides suppressing high use or consumption of fossil fuels, will also reduce the high level of carbon emissions. By doing energy efficiency, other than being able to reduce emissions also produce other benefits such as cleaner air, reduce congestion in terms of transportation, better waste management, and a more competitive production process.

As for this study there are several parts that need attention. Some literature reviews that support this research will be discussed in Section 2 that contains some basic theoretical studies that relate to the topic of this research. Furthermore, in Section 3 will provide an overview of the data and methods used in problem analysis. The results of the problem analysis and also the discussion related to this research will be explained in Section 4. The

last section of this research is conclusions which summarize the overall topic of this research, and also the references in order to make this research paper.

## 2. Literature Review

Fossil fuels are the main source of export revenues. Specific challenges and policies that can be carried out on fossil fuels, i.e coal, oil and gas as the center of the Indonesian economy are discussed in the research conducted by Dutu (2016). The study also examines the impact of the exploitation of fossil fuels on the Indonesian environment. The result is given the large role played by fossil fuels in Indonesia, it is not surprising that the greenhouse gas emissions produced in 1990 amounted to 1,1 billion tons (bt) to 1,9 billion tons (bt) in 2012. This makes Indonesia as the fifth largest producer of greenhouse gas (GHG) emission in the world.

The target to be achieved in 2025 is that the policy will be directed towards reducing carbon emissions. For the COP21 summit in Paris last year, the Indonesian government is committed to reducing the country's carbon emissions by 29% in 2030. In addition, fuel subsidies for petroleum products, especially gasoline, will be completely removed. The use of large amounts of coal to produce electricity will be a challenge for Indonesia in its commitment to reduce the effects of greenhouse gases. One step that can be taken to reduce the demand for fossil fuels as electricity generators is that the price of electricity must be returned to a positive level and gradually reduce electricity subsidies.

Indonesia's total primary energy production (coal, natural gas, petroleum and renewable energy) in 2015 was 2.848.025 thousand SBM where around 1.887.366 thousand SBM were exported abroad. In the same year, Indonesia had to import energy for 348.267 thousand SBM. Most of the exports are coal, while most of the imports are petroleum, fuel oil and LPG. Indonesia's energy exports in 2015 reached 66% of total energy production or more than half.

While energy imports reached 27% of the total primary energy supply in the same period or almost one third (Sekretariat Jenderal DEN, 2016).

Increased consumption of domestic fuel oil and a decline in petroleum production have caused oil exports to decline, while imports of oil and fuel oil continue to increase. In contrast to petroleum, Indonesian coal production is expected to continue to increase, not only to meet domestic needs but also to meet foreign demand (exports). National coal production cannot be separated from the increasing domestic and foreign (export) demand. Domestic use of coal includes the use of PLTU, iron and steel industry, cement industry, paper industry, and other industries. Thus, in this study, the use of fossil fuels is still relatively high. Since some industrial sectors in Indonesia tend to still depend on non-renewable energy resources, such as coal and petroleum, this study will look at the impact of taxation on the use of petroleum and coal in the industrial sector in Indonesia.

There are several studies that analyze the impact of tax imposition on various countries, but more towards carbon taxes such as Coxhead et al. (2013), Cabalu et al. (2015), Andre et al. (2005) and Fullerton and Heutel (2007). Research on the imposition of fuel taxes in Indonesia is limited, especially those using the general equilibrium approach. Coxhead et al. (2013) evaluated the impact of environmental taxation in Vietnam using the general equilibrium model introduced in 2012 in industries and household groups. The tax applied is to convert environmental taxes into carbon taxes using emissions intensity. In addition to using the general equilibrium model, Coxhead et al. (2013) also used the ORANI-G model and linked input-output data with national household survey data to examine the level of consumption and household welfare. The results show that Vietnam's real GDP declined by 0,35-0,63%. Meanwhile, output and products from petroleum decreased substantially compared to the decrease in output from other fuel products.

Carbon taxes have been proposed or even applied in many countries and regions around the world to reduce GHG emission as observed by Liu et al. (2018). In this study, an analysis of the socio-economic impact of carbon taxes will be carried out using the Computable General Equilibrium (CGE) model in Saskatchewan, Canada. The results show that the impact of the carbon tax on real GDP and nominal GDP are all negative. A decrease in nominal GDP is more significant than a decrease in real GDP. Under certain carbon tax rates, changes in household consumption, total investment and exports are more significant. In Saskatchewan, more than 67% of GHG emissions are related to combustion. The impact of carbon taxes on various industries will differ significantly. The steps to impose carbon taxes on fossil fuel energy will directly affect prices and output, which in turn will have a major impact on other energy sectors, including fossil fuel power plants. However, the imposition of a carbon tax will have a positive impact on other utilities, other manufacturing, trade, transportation and warehousing. The impact of carbon taxes on fishing, hunting and trapping, and support activities for agriculture and forestry is very small. Coal and petroleum products make the biggest contribution to the reduction of greenhouse gas emissions associated with combustion, which shows that clean coal and petroleum technology may be a challenge in the future and a crucial issue in order to achieve economic growth and reduce greenhouse gas emissions global.

## 3. Methodology

### *3.1 Data*

The main data source in this study uses a database derived from the energy-environment version of the Global Trade Analysis Project, GTAP-E, with base year 2011. This database consists of 140 regions around the world and 57 industrial sectors. Furthermore, aggregations in the GTAP-E database will be aggregated into 7 regions (Table A in

Appendix), and the industrial sector will be aggregated into 11 industries (Table B in Appendix).

*3.2 Models*

Various approaches have been carried out to analyze emissions reductions through carbon taxes in various countries. This study will analyze the impact of taxes imposed on industries in Indonesia that use energy sources derived from fossil fuels using models from GTAP-E. This model is applied as an extended version of the GTAP model (Burniaux & Truong, 2002) that works with the concept of running policy scenarios in many countries and can be used to see the impact of these policies. The production structure of all industries in all regions is similar but with different assumptions for parameter values at various levels of the CES function.

The relationship between producers and consumers in the GTAP-E model is shown in Figure 3.1. In the lower box, describes the demand for input from the coal mining industry and petroleum products to produce outputs. The CES function allows industries to choose inputs based on relative price changes in inputs so as to produce minimum costs. Whereas the Leontief function only allows those industries to choose inputs at a fixed level without regard to the relative price changes of inputs. Outputs generated from the coal and petroleum industries will then be supplied to other industries which will be used as intermediate inputs. In addition, outputs from the two industries will be supplied for use by households and governments in the domestic and international markets.

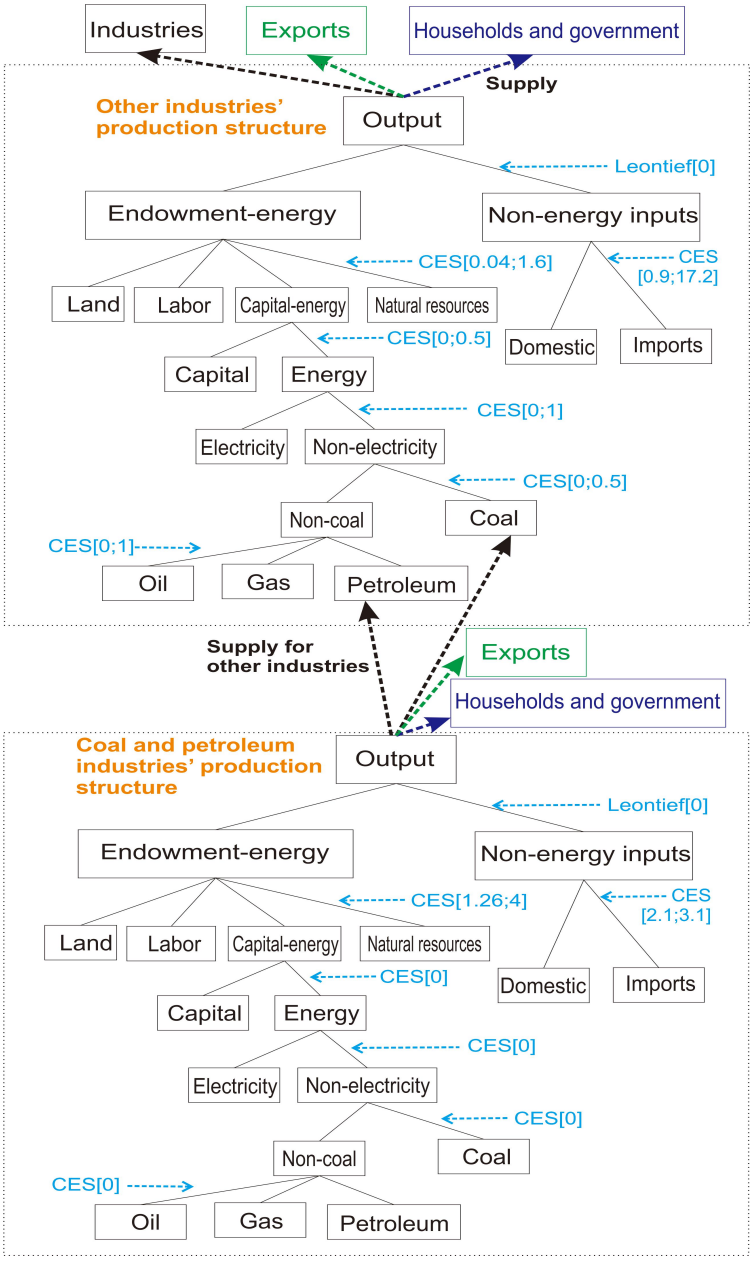



**Figure 3.1.** The production structure in the GTAP-E model (*Source* : Nong, 2018)

In every economic activity, the household acts as a supplier of labor, which then receives income for the contribution of the labor force. Then the household group will use their income to purchase goods and services, while the rest can be used to saving. On the other hand, the government collects taxes to receive its income, such as production, income, sales, import and export taxes. The government also uses its income to carry out public expenditure whose purpose is to benefit the community.

In this study, when taxes are given on petroleum products and coal, their commodity prices will directly influence demand by other sectors, thus affecting the level of output, as well as demand for other inputs such as labor, capital and intermediate inputs. In addition, changes in the price of coal and petroleum products will also change their relative prices compared to other commodities, especially other energy inputs, which cause changes in the proportion of inputs due to substitution effects in CES functions. Household income is also affected cause of changes in labor demand and real wage levels. Thus, the application of taxes on coal and petroleum products makes it possible to affect economic conditions. Since Indonesia is a country that exports imports coal and petroleum, changes in domestic prices as taxes allow them to influence bilateral trade conditions.

The analysis in this study was designed in three policy scenarios. This policy scenario is also simulated in short-term closing arrangements. From this simulation we will see the impact on the industrial sector and the economy in Indonesia. The three policy scenarios include: the first scenario (Sim A) in the form of tax rates for petroleum products is 33.33%; the second scenario (Sim B) in the form of tax rates on coal is 33.33% and the third scenario (Sim C) is the imposition of a tax rate of 33.33% which is given together on both types of fossil fuels.

## 4. Results & Discussion

By applying taxes on two types of fossil fuels, i.e. coal and petroleum, the impact that will occur in addition to the economic aspect, that is also the case in the environment. Reducing carbon dioxide emissions as a cause of greenhouse gas effects is one of the targets that the government wants to achieve in any country. The policy simulation carried out in this study resulted in the biggest reduction in carbon dioxide emissions in two types of fossil fuels,

i.e. coal and petroleum. As in Figure 4.1. which shows the environmental impact that occurs as a result of the policy through simulation A, simulation B and simulation C.

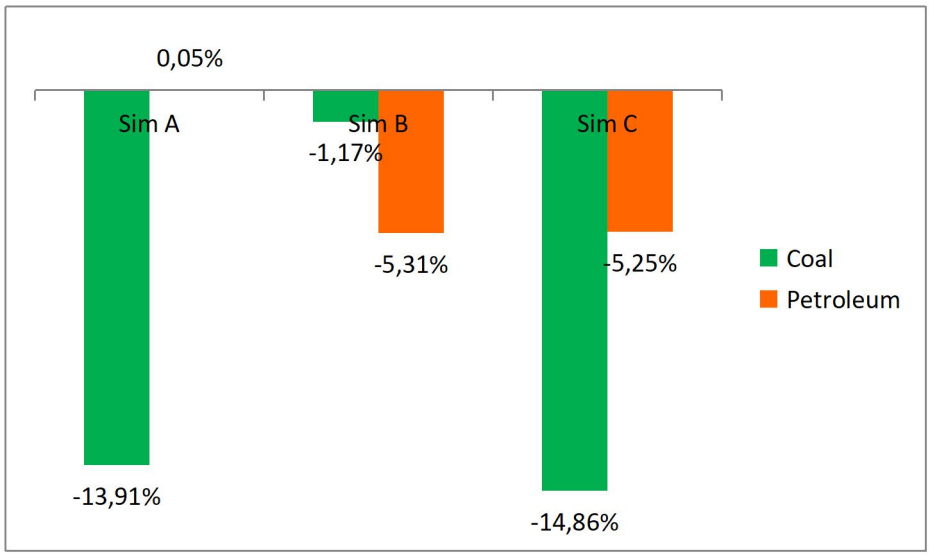



**Figure 4.1.** Carbon dioxide emissions in Indonesia (% change)

These results indicate that in simulation A, that is by applying a tax of 33.33% on coal resulted in a decrease in carbon dioxide emissions from coal itself. However, this policy simulation brings increased emissions to petroleum products but is not too significant because it is only 0.05%. The reduction in carbon dioxide emissions from petroleum products only occurs around 5% for simulations B and C. Both of these simulations look better if they want to reduce emissions from petroleum rather than simulations A. Simulation C applies taxes for both types of fossil fuels, petroleum and coal, 33.33% each with an emission reduction effect of 14.86% for carbon dioxide emissions derived from coal. This indicates that with three policy simulations carried out to reduce emissions, simulation C looks more effective for both types of energy resources.

*4.1. Impact on the industrial sector in Indonesia*

While a country implements a policy on the use of energy resources, either by limiting usage, imposing taxes or otherwise it will certainly have an impact on the industrial sector.

This is because the industrial sectors depend on energy resources to carry out their productivity. Figure 4.2 shows the results of Simulation C test on industrial sector demand for two energy resources in Indonesia. With this simulation, the results show that by applying taxes on primary energy such as coal and petroleum, the impact on energy demand of this type is likely to decline in some industrial sectors. The biggest decline in demand for energy resources of coal occurred in the electricity industry sector which amounted to 15,34%. This is in line with simulation A, where there is a decline in demand for the most significant coal in the electricity industry (see Figure A in Appendix). The reason might be because the industry is still quite dependent on coal as an energy resource for power plants. So, when taxes are imposed on coal, the industry is trying to reduce its consumption of this type of fossil fuel, in order to balance their production costs with electricity tariffs.

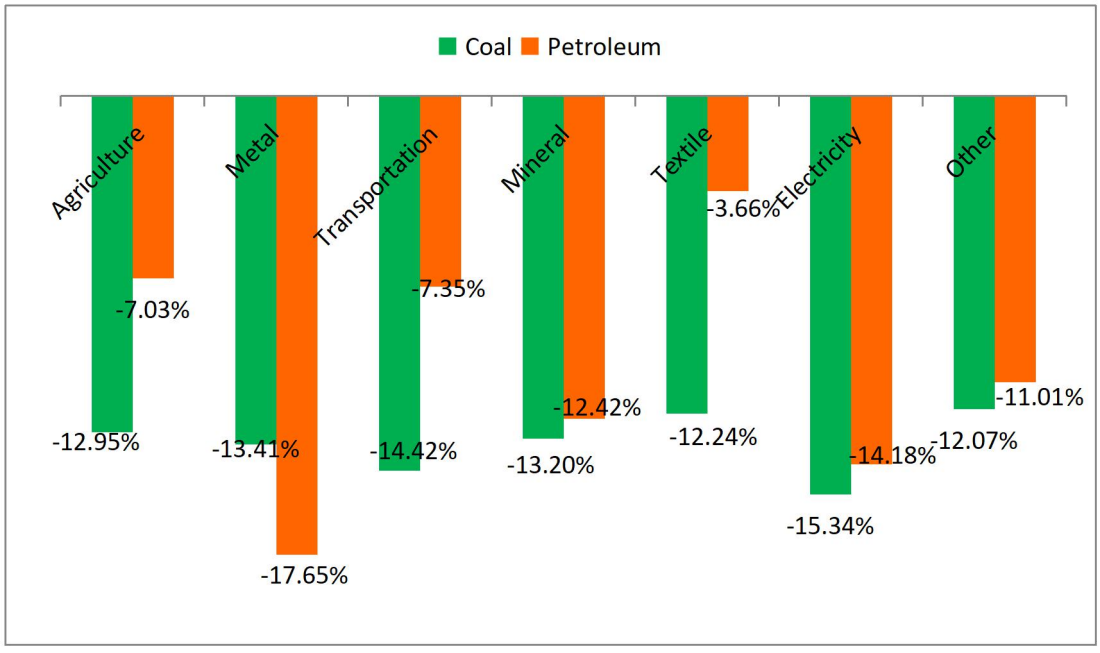



**Figure 4.2.** Simulation C : Demand of coal and petroleum in industrial sectors in Indonesia (% change)

In this Sim C, a significant decrease in demand for petroleum occurred in the metal sector. This industry experienced the greatest decline in demand, which amounted to 17,65% compared to other sectors. In Figure 4.2, it shows that the transportation industry sector

experienced a decline of only 7,35%, whereas as we know that this sector is the most likely sector to occur the most significant decline. Evidence of a significant decline in demand for petroleum is also shown through Sim B (see Figure B in Appendix). Sim B applies taxes only to petroleum, and the results show that the decline in the transportation sector is only around 7%, while the highest decline in demand occurs in the metal industry.

The results of all of these simulations show that, there is one industrial sector that has consistently experienced a significant decline in demand for coal and petroleum. This sector is the electricity industry sector where in each type of simulation, this sector shows responsiveness. This industry has occured a decline in demand for fossil fuels above 12%, further indicating that this industry is an industry that is very responsive to policies taken related to fossil fuels of coal and petroleum.

In order to observe industrial productivity, it can usually be seen from the output it produces. Table 4.1 shows the condition of industrial output when a simulation of A, B and C. is applied. The results show that in Sim A, the most responsive industry is the electricity, where there is a decrease in output by 4,1%. In the coal, metals and minerals industry have decreased below 1%. In fact, the transportation sector and other industries occured a very small impact which was below 0,1%. This shows that the industrial sector is not significantly affected by the tax imposed on coal. One industry that has increased output is natural gas. As an alternative energy resource, gas can replace the position of coal which is considered the main cause of greenhouse gas emissions. So that when coal is taxed which results in decreased demand for coal, consumers tend to switch to alternative energy resources. This reason has triggered an increase in output in the industrial sector due to consumer demand that has shifted from coal consumption to gas consumption.

**Table 4.1** Industry output of commodity in Indonesia (% change)

| Industrial Sector | Simulation | | |
|---|---|---|---|
| | A | B | C |
| Agriculture | 0,01 | -0,09 | -0,09 |
| Coal | -0,62 | 3,22 | 2,62 |
| Metal | -0,21 | -1,01 | -1,22 |
| Transportation | -0,02 | -1,93 | -1,95 |
| Mineral | -0,21 | -0,58 | -0,8 |
| Oil | 0,15 | -2,41 | -2,25 |
| Textile | 0,18 | 0,4 | 0,58 |
| Gas | 0,39 | 3,23 | 3,63 |
| Petroleum | 0,09 | -25,7 | -25,58 |
| Electricity | -4,1 | -7,37 | -10,95 |
| Others | -0,03 | -0,41 | -0,44 |

Sim B in Table 4.1 shows that this simulation has a very significant impact on the output of petroleum products. The decline in this industry amounted to 25,7% as a sign that all this time the dependence on petroleum products was still high. Petroleum products is one of the most sought-after energy sources because in Indonesia itself has been subsidizing these products. So, when there is a simulation of taxation on petroleum products, it will automatically increase the price of the product which consequently consumers will reduce their demand and the industrial sectors respond by decreasing their outputs. From this Sim B, the transportation and electricity sectors occured a greater decrease in output compared to when simulation A was carried out. The decrease in output was almost 2% and 7,4% respectively, when this simulation applied taxes on petroleum products. In addition, this simulation can provide opportunities for the coal and gas industry sector to increase its output. This is evident from the increase in output produced from each coal and gas industry, that is 3,22% and 3,23%.

Some industrial sectors that occured significant changes in their output when carrying out simulation C were the transportation sector, coal, oil, gas, electricity and petroleum products. This simulation combines two tax imposition simulations so that the results obtained will be different from a single tax simulation. Industries that occur an increase in output in this simulation are coal and gas. The increase in coal output in this simulation was 2,62%. However, the increase in coal is not higher compared to the increase in output that occurs when Sim B is carried out. In the gas sector, an increase in output of 3,63% which is no different from the increase that occurs in Sim B. The transportation sector, oil and petroleum products have decreased output almost the same as Sim B. While the electricity sector has a different output decline between Sim B and C. Output from the electricity sector fell by almost 11% in the Sim C while in Sim B it only dropped 7,37%.

*4.2. Impact on the Indonesian economy*

In general, the 33,33% tax imposed jointly on the use of petroleum and coal products is enough to affect the Indonesian economy, rather than taxing one of these types of fossil fuels. As shown in Figure 4.3, Sim A only results in an increase in the real price index on coal and electricity. This result is not surprising because the tax imposed on coal will result in high prices of coal products themselves, while the electricity industry sector is still sufficient to use coal as a power plants, so that when coal prices rise, electricity will rise in price.

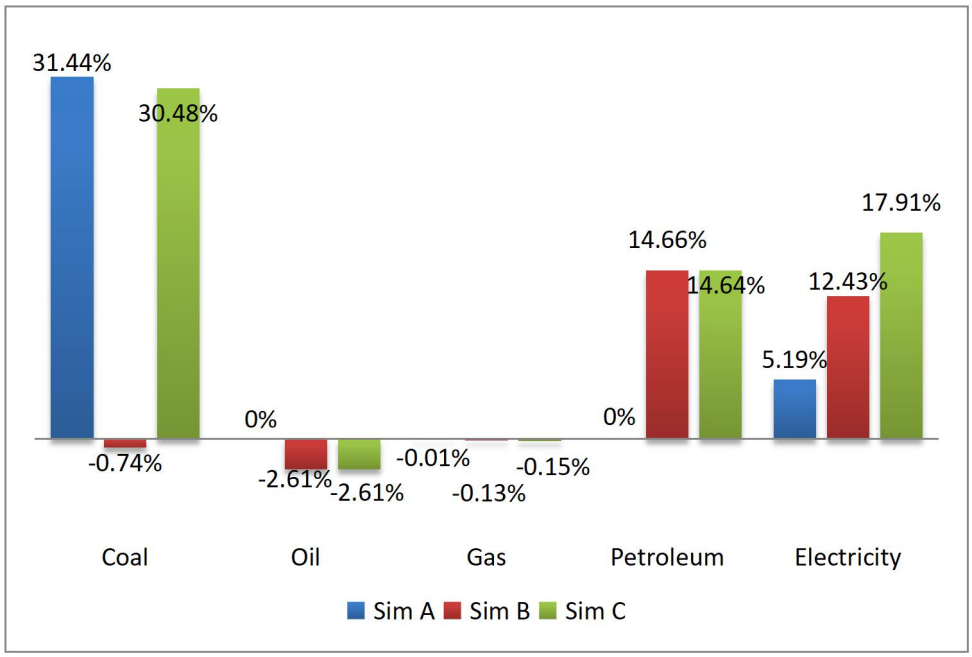



**Figure 4.3** Real energy price index (% change)

The opposite of Sim A, Sim B actually decreases the real price index of coal, but is not too significant because it is only 0,74%. In this simulation, the real price index of petroleum products will increase by 14,66%. In addition, the electricity industry sector also increased by 12,43%. The three main energy sectors affected by the Sim C are coal, electricity and petroleum products. When the tax imposition simulation is carried out jointly on coal and petroleum, the result turns out that the three main sectors raised the real price index above 14%. This increase in energy prices is certainly one of the causes of demand in the energy sector and also production output is declining.

Figure 4.4 shows the decline in GDP in Indonesia in three simulation conditions. When the simulation only imposes taxes on coal, the change in GDP values only decreases by 0,02%. Whereas in the remaining two simulations, Sim B and C, changes in GDP fell by 0,25 and 0,27 respectively.

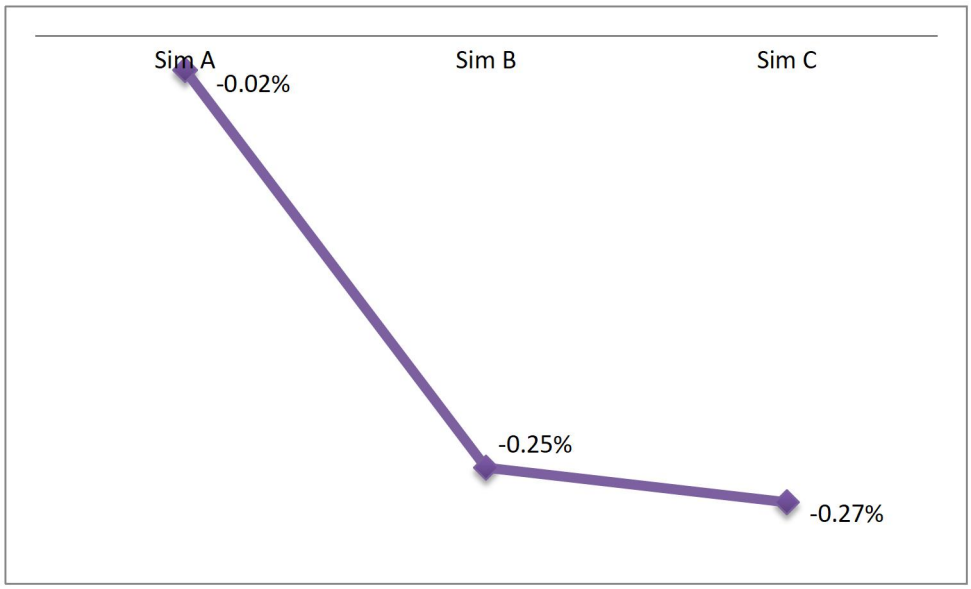



**Figure 4.4** Value of GDP in Indonesia (% change)

## 5. Conclusion

The current energy sector trend observed by the World Bank (2016) which results in Indonesia's fossil fuel emissions will be tripled in 2030. Since resources are limited, there needs to be an effort to to ensure the availability of energy in the future. One of the government policies as an effort to ensure the security of domestic energy supply is contained in the Presidential Regulation of the Republic of Indonesia (Perpres No. 5 Tahun 2006) concerning National Energy Policy.

In the Perpres, it is stated that what can be used as an alternative energy resource is a certain type of energy source, as a substitute for fuel oil. The target is to reduce consumption of fossil fuels, especially petroleum. The high level of fuel consumption has implications for the high impact of pollution produced. However, the negative impact of high fuel consumption is not only on the environment, but also can have a wider impact on the state. Thus the state needs to take steps to use fuel in order to reduce the negative impact that results from high consumption of fuel.

A step that can be taken is to apply taxes to reduce the use of these energy sources. In this study, the simulation that was carried out was that the government applied targeted taxes of 33,33% for petroleum products and 33,33% for coal in industrial sectors in Indonesia that use coal and petroleum products. The purpose is that the tax will substantially reduce emissions levels, and encourage countries to move to a low-carbon economy. In addition, taxes are expected to be able to change the government subsidy budget so that it can be used for national consumption and savings. However, there is a major concern by the public that there will be a huge negative impact on the economy.

Considering that this research is still a motivated simulation from Nong (2018) and I have not found much of this kind of study applied in Indonesia, the number of reference studies that I find is still very limited regarding this problem in Indonesia. The results of a study conducted by Nong (2018) show that an increase in taxes on consumption of petroleum products is significantly harmful to the Vietnamese economy. On the other hand, an increase in taxes on coal consumption seems to have a relatively small impact on the economy. In terms of reducing emissions, an increase in taxes on petroleum products can only help the country to reduce its emissions level by 7,12%, while an increase in taxes on coal causes a decrease of 10,25%. As a result, an increase in taxes on petroleum products tends to be inefficient compared to an increase in taxes on coal in terms of economic growth and emission reduction.

From the three tax scenarios simulated in this study, Sim C that is the imposition of tax on coal and petroleum products, has a significant impact on changes in the industry and economy of Indonesia. In terms of the ultimate goal of reducing carbon dioxide emissions, this C simulation is able to reduce the impact of emissions from coal and petroleum by 14,86% and 5,25% respectively. This can be motivated by the decline in demand for the industrial sector in these two energy resources.

Demand for coal and petroleum products has increased together due to taxation in these two types of energy. As a result the real price index of coal and petroleum has increased. Coal price occured increases in Sim A and C, petroleum price increases in Sim B and C and electricity price increase in all simulations. In Sim A, there is no impact on real price changes in petroleum, while in Sim B the impact that arises is the decline in prices on coal. So, it can be seen that the Sim C can lead to price increases in coal as well as petroleum and electricity.

In addition to triggering a decline in demand, the increase in prices in primary energy can result in a decline in production output in the industrial sector. The decline looks significant in Sim B and C. The results are not too different between the two in all industrial sectors. However, the output from the electricity industry sector occured the biggest decrease in the C simulation which was 10,95%. The choice of simulation C will have a high price of primary energy resulting in negative conditions or a decrease in demand, output and even GDP. Changes in the value of GDP with simulation C will decrease by 0,27%, while in simulation A only decreases by 0,02%.

For the purpose of reducing dependence on coal and petroleum consumption, simulation C is an effective simulation to applied. Imposing taxes on coal and petroleum which results in high prices of both energy so consumers will reduce their demand. From here, the output of the primary energy sector will indirectly change according to the conditions of demand. When the output and demand for coal and petroleum decreases, this can lead to unfavorable conditions in GDP, but another impact that arises is that this condition can encourage the industrial sector, government and households to increase the use of renewable energy sources, so that the reduction in carbon dioxide emissions that are being proclaimed by many countries can be achieved as expected.

## Appendix

**Table A**. Aggregated regions

1. China
2. India
3. Indonesia
4. Japan
5. Saudi Arabia
6. United State
7. Rest of World

**Table B**. Aggregated industrial sectors

a. Agriculture
b. Coal
c. Electricity
d. Gas
e. Metal
f. Mineral
g. Oil
h. Petroleum
i. Textile
j. Transportation
k. Other

**Figure A.** Simulation A : Demand of coal in industrial sectors in Indonesia (% change)

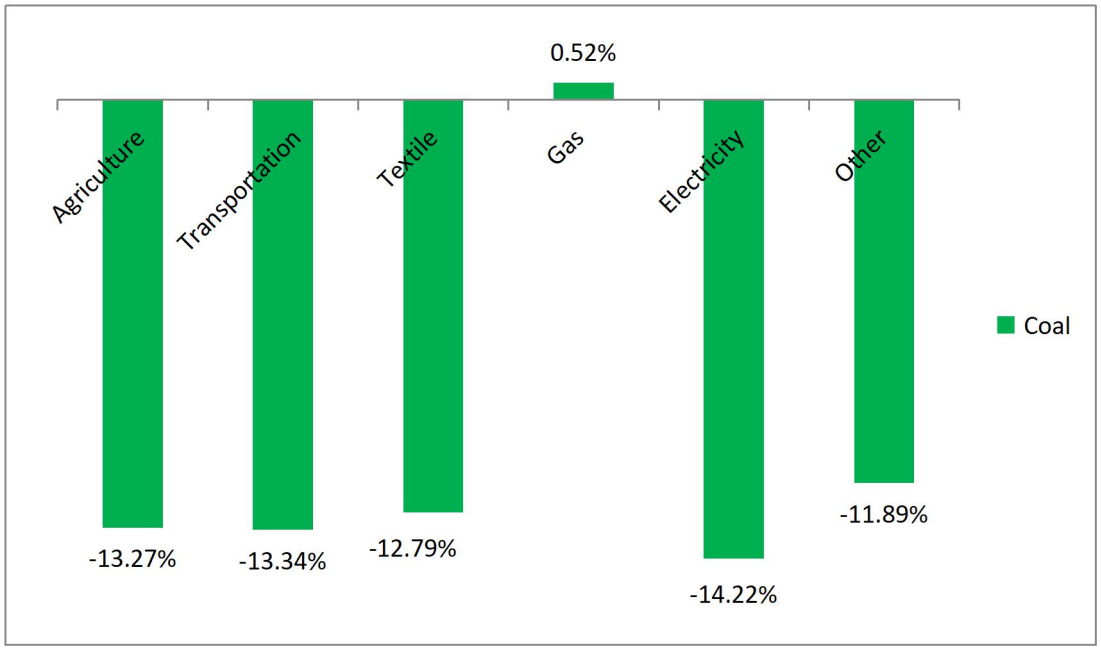
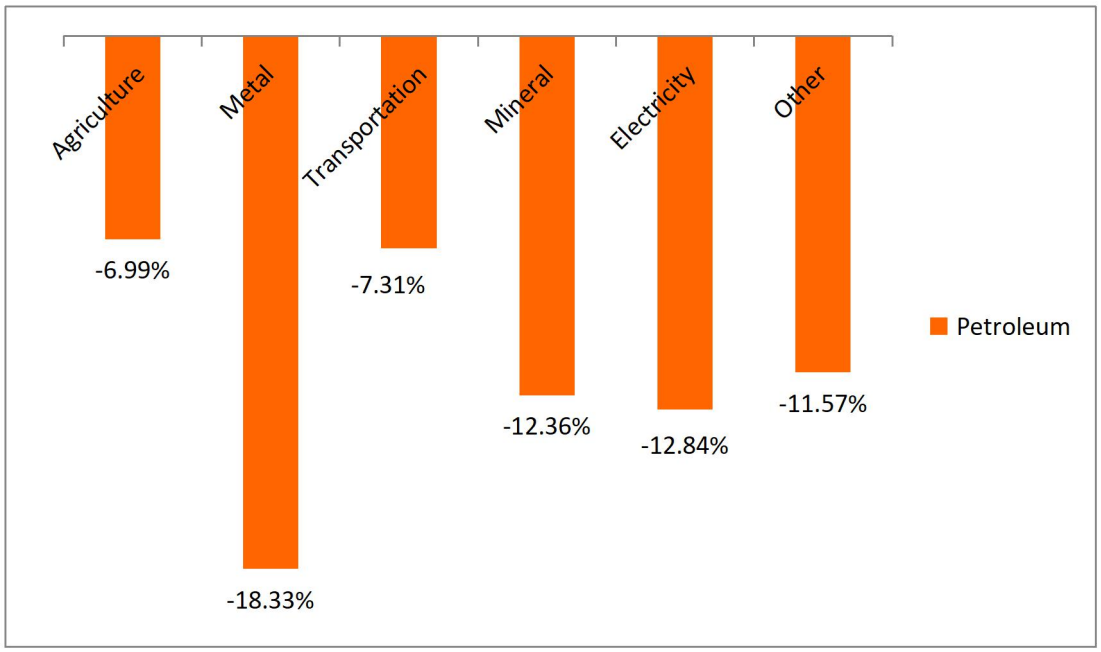


**Figure B.** Simulation B : Demand of petroleum in industrial sectors in Indonesia (% change)

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