

THE EFFECT OF REVOCATION OF VALUE ADDED TAX EXEMPTION ON MARINE AND FISHERY IMPORTS: CGE MODEL EX-ANTE ANALYSIS

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ABSTRACT

Introduction/Main Objectives: Indonesia is one of the world's top three producers of marine and fishery products. Despite this, it still imports marine and fishery products, especially those that are used for production and consumption in hotels and restaurants, for catering, and in modern markets. **Background Problems:** The government facilitates these imports with value-added tax exemption. This research was conducted to see who would benefit from this incentive being revoked and whether doing so would fulfill the redistribution function of the taxation. **Novelty:** Unlike other research, which has only used either a macro or micro view, this research used both by employing a CGE model and microsimulation to see the effects of the VAT exemption revocation on marine and fishery products in Indonesia. **Research Methods:** The analysis focused on the effects of VAT exemption revocation on economic variables, such as the gross domestic product, exports, imports, trade balance, domestic production and demand, equivalent variation, prices, and income redistribution from changes in household consumption. The analysis was carried out with the CGE model, using GTAP Database 10. The simulation starts by adjusting the data baseline and then applying shocks to import tariffs. **Finding/Results:** The results show that revoking VAT exemption for the import of marine and fishery products would increase the gross domestic product, trade balance, domestic production and demand, and prices. On the other hand, it will decrease exports, imports, equivalent variation, and consumption. **Conclusion:** This research shows that the revocation of VAT exemption would not have a regressive effect; hence, it would fulfill the income redistribution function of the taxation. The government needs to evaluate the incentive. The limitation of this research is the use of formal documents only without considering non-tariff barriers as other factors

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INTRODUCTION

Indonesia has one of the longest coastlines and largest maritime areas in the world. According to The World Fact book published by the Central Intelligence Agency (2023), Indonesia has the third-longest coastline and the ninth-largest water area. According to data from the Geospatial Information Agency and the Indonesian Navy Hydrographic and Oceanographic Center (2018), Indonesia has the sixth-largest exploitable water area (archipelagic waters, territorial sea, and exclusive economic zone), which translates to Indonesia being the third-largest producer of marine and fishery products (as shown in Appendix D).

Despite this, Indonesia has only managed to become the fifteenth largest exporter of fishery products in the world. One reason for this low level of exports is its high domestic consumption. While the country is able to cater to such high consumption with its domestic production, for various reasons, it still imports fishery and marine products, which are subject to VAT exemption.

The marine and fishery products that are allowed to be imported are limited by Article 14 of the Minister of Maritime Affairs and Fisheries Regulation Number 6 of 2023 about The Preparation of Fisheries Commodity Balance Sheets, as follows:

1. Salting process
2. Bait
3. Hotel, restaurant, and catering consumption
4. Modern market
5. Food enrichment ingredients
6. Pulverizing production
7. Other usages, such as (a) the supply of raw materials that are used in fish processing units for business actors who have a General Import Identification Number, or (b) to meet

the people's consumption needs in border areas or special areas.

With those limitations, the import of fishery products is segmented for the middle-upper income consumers and industries that buy fishery products in modern markets, hotels, and restaurants, not the middle-income and lower-income consumers who usually buy these products in traditional markets. This narrative was supported by the Minister of Finance, Sri Mulyani, in 2018 when she said that Indonesia should not import fish unless there was scarcity, reckoning that the country has more water areas than it has land (Chandra, 2018). Thomas Darmawan, the chairperson of the fisheries division of the Indonesian Employers' Association (*Apindo*), in 2018, said that Indonesia only imported expensive fish, such as salmon and trout, which were consumed in restaurants (Jannah, 2018). The same thing was also said by the Secretary General of the Indonesia Norway Business Council (INBC), Deden Rochmawaty, who stated that salmon from Norway was utilized by luxury hotels and Japanese food restaurants (Basith, 2017).

Since Regulation Number 6 of 2023 has limited the import of marine and fishery products to only certain segments, the decision to give VAT exemption needs to be evaluated, especially based on who gets the benefit. If the VAT exemption, which is a form of tax incentive, is given to everyone with no exception, it will promote the income redistribution function of taxation. However, it becomes questionable when the VAT exemption is granted only to certain segments of taxpayers. The Organization for Economic Co-operation and Development (2014) and Tiwari et al. (2020) agree that exemptions, in general, are not the best option to achieve the redistribution function, especially when the ones who benefit the most are the rich taxpayers. This is why the

VAT exemption on the import of marine and fishery products should be evaluated.

This research has been conducted to see whether the tax incentive given to the import of marine and fishery products benefits Indonesia and fulfills one of the purposes of tax: redistribution. To see the benefits for Indonesia, firstly, an ex-ante analysis is carried out using the Computable General Equilibrium (CGE) model from the Global Trade Analysis Project (GTAP) Database 10. Mankiw (2016) explains that a general equilibrium model can explain the effect of production, distribution, and allocation of economic output on products and services. Using this model, the effect on the economy can be seen several ways: through changes in the gross domestic product as an indicator of growth (Mankiw, 2016); the trade balance, including exports and imports, considering that the incentive given is related to international trade; equivalent variation, which shows changes in consumer utility (Fally, 2018); and changes in price as a basis for determining changes in household consumption (Pyndick & Rubinfeld, 2018).

After that, the changes in household consumption that are indicated by the CGE model are used to determine whether the incentive fulfills the redistribution function of taxation. Household consumption is split into deciles to see which group in the economy suffers the most if the incentive is revoked (Isaak, 2023). The amount of consumption depends on income (Ikram et al., 2015), so grouping consumption by decile can reflect the income redistribution. The method used here is microsimulation with data from the National Social Economy Survey (*Susenas*).

Extensive research using GTAP has been conducted by Saptanto et al. (2017), Taufiqurrachman and Handoyo (2021), Kartini and Margaret (2020), Sanjaya (2021),

Giaseckeand Nhi (2010), Shagdar and Nyamdaa (2017), and Arndt et al. (2009). However, even though there is a lot of research using the CGE model or microsimulation, there is only limited research using the CGE model followed by microsimulation to see the effect of the revocation of VAT exemption, especially where the research has been conducted on marine and fishery products in Indonesia. This study will also confirm how the economy in Indonesia behaves and reacts to a shock involving VAT (consumption tax), which is mostly seen as being regressive. This research can also be used and replicated, especially by the government, to evaluate how effective the incentive is. Society can also see the incentive in a new light regarding its use and efficiency.

LITERATURE REVIEW

1. International Trade

Todaro and Smith (2015) state that trade liberalization is one of the main drivers of globalization. On the same side, Mankiw (2016) sees that international trade benefits everyone by allowing all countries to specialize in producing their best products and getting variations of goods and services from other countries. All these variations of goods sometimes pose threats to domestic industries, which need to have competitiveness and comparative advantage over their rivals, whether inside or outside their country.

Todaro and Smith (2015) define comparative advantage as a condition when producing one product has a lower opportunity cost than producing another product. Another definition is given by Pyndick and Rubinfeld (2018), who link the definition globally by defining comparative advantage as a condition when the cost of producing goods in one country, relative to the cost of producing other goods, is lower than in other countries.

The concept of comparative advantage was developed by David Ricardo in 1817 and became known as the Ricardian theory of comparative advantage. Ricardo (1817, in Hausmann et al., 2022) believes that a country will benefit more if it allocates its resources to produce goods with a comparative advantage. In his theory, Ricardo (1817, in Karimi & Malekshahian, 2018) uses a static model approach of trade between two countries that produce two identical goods using homogeneous labor as the only production factor, with the following assumptions about international trade: products are mobile, labor and capital are immobile, transportation costs are equal to zero, markets are perfectly competitive, and there is constant return of trade. The theory concludes that a country which can produce more goods than other countries is said to have a comparative advantage.

2. Prebisch-Singer Hypothesis

According to the United Nations Conference on Trade and Development (2021), a country is commodity export-dependent if sixty percent of its total exports come from the export of commodities. Being a commodity export-dependent country can lead to a natural resource curse, as told by Auty (1993, in Badeeb et al., 2017), who argues that a country that has abundant resources will be cursed to have low growth. However, Auty (2007) clarifies that it is not a deterministic phenomenon, but it depends on the government's policy. Badeeb et al. (2017) imply that there is a general agreement on the theory's validity. Van Der Ploeg (2011), in his research, supports the theory by saying that a resource-abundant country that has good governance, trade openness, and significant investment in resource exploration will benefit from their resources. Otherwise, with bad policy

and corrupt government, the resource curse theory will apply.

Commodities are primary products that are generated from extraction processes like farming, forestry, fishing, and mining (Todaro and Smith, 2015). The primary products are one of the main discussions in the Prebisch-Singer hypothesis, which posits that the terms of trade of commodities will keep decreasing as time goes on (Harvey et al., 2010). There are two approaches to avoid getting trapped in a resource curse where the terms of trade are decreasing; these are import substitution and export diversification. Jahan et al. (2021) imply that the Prebisch-Singer hypothesis pushes underdeveloped and developing countries to use those two approaches in international trade. Irwin (2021) states that the goal of import substitution is not to lessen the import but to shift the import from consumer goods to capital goods. That shift will be the parameter for the country to change direction from producing primary products to producing manufactured products, which, in this case, will lead to export diversification.

3. Constant Elasticity of Substitution Production and Utility Function

The constant elasticity of substitution (CES) function was first introduced by Arrow, Chenery, Minhas, and Solow in 1961. At that time, two theories about substitution between labor and capital had already been developed: Leontief (substitution equal to zero) and Cobb-Douglas (substitution equal to one). The development of those two theories meant that any analysis which utilized them had to rely heavily on the assumption that the value of substitution was either zero or one, and the conclusions reached in any analysis would be limited (Arrow et al., 1961). However, with the CES function, the analysis becomes more

variative and not only limited to zero or one. Gohin and Hertel (2003) say that the CES function has a constant return to scale characteristic.

Arrow et al. (1961) show that the value of CES (σ) is derived from $\sigma = \frac{1}{1+\rho}$, with the minimum value of ρ is -1, because that value will result in infinite elasticity of substitution. If the value of ρ is between -1 and 0, the value of elasticity of substitution will be more than one (>1). However, if the value of ρ is closer to 0 ($\lim_{\rho \rightarrow 0}$), the value of elasticity of substitution will be unity (1) and turn into the Cobb-Douglas function. In the condition of ρ getting closer to 1 ($\lim_{\rho \rightarrow 1}$), it will turn into a linear function. If the value of ρ is getting closer to ∞ ($\lim_{\rho \rightarrow \infty}$), it will turn to a Leontief function (Saito, 2011; Bergholt, 2011).

CES function can be generalized to constant elasticity of transformation (CET), the Armington assumption, and constant difference of elasticities (CDE). The CET function has the same equation as CES, but the difference is on the concave because there is an opposite symbol in the substitution parameter, which is not negative (Pauw, 2003; Powell & Gruen, 1968). CET is commonly used on the supply side (Powell & Gruen, 1968) to determine the producer's decision on whether to allocate its product to the domestic or overseas (export) market (Lofgren & Cicowiez, 2018; Pauw, 2003; van der Mensbrugge & Peters, 2016).

The Armington assumption is another modification of CES, with the assumption that a product will be differentiated not only based on its type but also from its origin, so product A from country X and Y will have imperfect substitution in demand (Armington, 1969; Gilbert, 2013; Blonigen & Wilson, 1999). If CET looks at the supply side, Armington looks at the demand side by seeing the consumer

decision on whether to buy from the domestic or overseas (import) market (Lofgren & Cicowiez, 2018).

Despite being another modification of CES, CDE has a non-homothetic characteristic, and this allows it to see the effect of substitution (Hanoch, 1975; Corong et al., 2017). CDE, which is an implicitly additive functional form in CGE models, depends on one substitution parameter or the n substitutions parameter (Hertel et al., 1990).

4. Function of Tax

The function of tax is explained in Shora (2013, in Putra, 2017), Rahayu (2010, in Andito, 2015), and the Directorate General of Taxes (n.d.) who split the function into budget function (fulfilling revenue), regulatory function, stability function, and income redistribution function. This research focuses on income redistribution, which is a way to indirectly increase society's welfare by spreading wealth more equitably among high-income to lower-income members of society. Iswahyudi (2021) argues that the redistribution of society's wealth to lessen economic inequality is one of the main roles of tax.

There are also the four maxims of taxation as proposed by Smith (1776, in Gluckman & Turner, 2018): equity, certainty, convenience, and the economics of collection. Equity is defined as a proportional tax payment that considers taxpayers' ability to pay. The concept of proportionality in the first maxim is split into vertical and horizontal equity by Musgrave (1990, in Farrar et al., 2021). Vertical equity focuses on different classes of economy where the income is taxed in different amounts, while horizontal equity focuses on the same class of economy whose income will be taxed the same amount. Gultom et al. (2022) explain that VAT incentives can be given through VAT

exemption, VAT not collected, and VAT not imposed. These incentives can cause some economic distortions though, as observed by Wijaya and Arsini (2021), who find that the tax credit that cannot be credited because of the incentive can increase the price.

5. Prior Research

Liyana (2021) finds that VAT-related policies can have a positive impact on economic growth. This is because VAT is an efficient way of increasing tax income (Erero, 2021), and it basically becomes a 'money machine' for the country (Alavuotunki et al., 2019). Despite the benefits it brings, Thomas (2020) finds that VAT has a minimal redistributive effect because of the very low degree of progressivity and the increase in the poverty gap. This aligns with the findings of Gultom (2023), which show that consumption-based taxation benefits the government more than the taxpayer because it fulfills the budget function, regulatory function, and stability function, but not the redistribution function, if it is imposed in all classes. Therefore, it is crucial to achieve a balance between raising government revenue and ensuring a less regressive effect of VAT to avoid burdening the middle and low-income classes (Ishaqi & Mastor, 2024).

The less regressive the VAT is, the more it satisfies the function of redistribution since the upper-class group will be taxed more and additional income can be redistributed to the lower-class group. This redistribution is important in enabling the lower-class group to climb to the higher-class group or at least sustain their position. Promoting redistribution is important for Indonesia because its National Bureau of Statistics has reported that there was a 9.48 million decrease in the number of people in the middle-income class from 2019 to 2024, followed by a 12.72 million increase in the

number in the aspiring middleclass.

If the imposition of VAT is deemed regressive, then some measures to decrease the regressivity are needed, such as setting exemptions and/or multiple VAT rates (Tamaoka, 1994). The presence of exemptions shifts the tax burden away from what would be due under a single-rate system (Thomas, 2020), like in Indonesia, where VAT is imposed at a single rate (12%) on all subjects without looking at the taxpayers' economic class and whether they are poor, middle-class, or upper-class. However, these shifts of the tax burden do not always happen. If the imposition of VAT targets all subjects, then the VAT exemptions will also apply to all subjects. According to prior research, such as that conducted by the Organization for Economic Co-operation and Development (2014) and Harris et al. (2018), VAT exemptions on goods and services tend to be regressive and fail to achieve the redistribution target. It is also shown in the research conducted by Tiwari et al. (2020), that 48 percent of the tax expenditures related to VAT exemptions benefit households in the top three deciles. Indeed, Arnold (2012) recommends reducing the number of objects that are exempted from VAT to a minimum to raise the efficiency of the tax system, which aligns with the objective of the Ministry of Finance (2021), which is to impose VAT on essential goods to achieve equity in society, based on the ability to pay and without imposing overburdening taxes.

Another measure that can be taken is to set multiple rates. Multiple rates are often utilized to discriminate between things that are considered to be luxury goods and essential goods (Narayanan & Latiff, 2024). For that reason, although the use of a single rate has been a common practice in most countries, there are other countries that use multiple rates, like

Vietnam and Malaysia. In Vietnam, there are three VAT rates: 0% for exports, 5% for essential goods and services, and 10% for others (Hong & Thu, 2024). Essential goods and services comprise agricultural products, clean water, animal food, fertilizers, medical equipment, and teaching aids. Although the rates are different, the reduced rate for essential goods and services also benefits the rich because they consume all those objects too.

In the case of Malaysia, VAT, known as the Goods and Services Tax (GST), was once implemented with a single rate (6%) on 1 April 2015 to tackle deficit and debt problems within the nation (Abas, 2018, in Narayanan & Latiff, 2024). Later, the GST system was accused of adding more burden to the Malaysian public, which provoked the government to return to the Sales and Service Tax (SST) (Jamel & Popoola, 2020). This marked Malaysia as the first country in the world to go back to SST from GST/VAT (Li, 2018; Krishna et al., 2018 in Sidik et al., 2019). Under the SST regime, a 6% tax rate is imposed on services, while there are two rates for sales taxes on goods. As many as 5,612 goods are taxed at a rate of 10%, while 793 items are taxed at 5%. For comparison, under the GST regime, a total of 11,197 goods were taxed at 6% (Ghani et al., 2021). The SST is a single-stage tax that is imposed only at the manufacturing stage and when specific services are provided to the consumer, but GST is levied on the consumption of goods and services at every stage of the supply chain (Lim, 2019).

Although there is an adjustment of the rates to accommodate lower income needs, unintended results may occur if the government is unable to know the patterns of households' consumption and apply a reduced rate to things that are not consumed by the intended target (Tamaoka, 1994). Badola and Mukherjee (2024) find that the presence of multiple rates increases

the compliance burden because it makes it more complicated for taxpayers to comply with the tax system.

Increasing the consumption tax rate or imposing one, whether VAT or import duty (in any form, e.g., safe guard) tends to vary in its effect on the economy, with results showing that higher income and more open economies gain more (Keen & Lockwood, 2010). Hansen and İmrohoroğlu (2018) find that, in revenue-neutral conditions, an increase in the consumption tax rate, followed by a decrease in income tax, will impact the economy positively. However, the positive impact is tied mostly to producers, as shown in research by Krugman et al. (2018, in Riesfandiari et al., 2021), which finds that protection, by implying a quota or increasing the rate, will increase welfare to the producers but decrease consumer welfare and, in general, the country's welfare. In another study, Murwendah and Desyani (2023) also find that domestic farmers will gain benefit if the government maintains import duties, especially on raw products. Although Hansen and İmrohoroğlu (2018) find that increasing the consumption rate will have a positive impact, Riesfandiari et al. (2021) find otherwise, showing a decrease in welfare, output, and utility when a safeguard is imposed. It really depends on how major the proportion of that consumption tax is compared to other taxes and how much it affects the subject.

Analysis on the effect of the VAT can be done by using the CGE model and microsimulation. The CGE model can simulate how a policy can affect economic indicators in a country. Sanjaya (2021) implies that the impacts of an individual tax policy on the domestic economy may vary, and an ex-post analysis will be difficult to implement because future effects of the new policy are hard to isolate. That is why the CGE analysis is needed to consider such

problems. Giesecke and Nhi (2010) also remark upon the effectiveness of using the CGE analysis, saying that for a complex tax like VAT, the model is good to use because it includes many commodities and agents. Aside from using the CGE model, microsimulation can also be used to see the effects of the policy on households. This will not only show the effect of a policy on macroeconomic factors but also reflect the implementation of the redistribution function by looking at the microeconomic data (Isaak, 2023).

METHOD, DATA, AND ANALYSIS

1. Type and Source of Data

The data are taken from GTAP Database version 10. GTAP was formed in 1992 to reduce costs for researchers who wanted to analyze international economic problems quantitatively (Hertel, 1997). These data provide references from 2004, 2007, 2011, and 2014; 121 countries, 20 aggregate regions, and 65 sectors (Aguilar et al., 2019). GTAP uses input-output data tables from all countries and adjusts them with international data. Macroeconomic data are taken from the World Bank's World Development Indicators (WDI); taxes on income and production factors are taken from the International Monetary Fund (IMF); and the energy data are taken from the International Energy Agency (IEA). Besides using GTAP, the authors use the STATA microsimulation model to see changes in household consumption. The model is adopted from Niklas Isaak's research, with data from Susenas 2019, and price changes from the CGE model become input for the model (Isaak, 2023).

2. Aggregation

In this research, the authors aggregate the regions from 140 regions to 12 regions (see

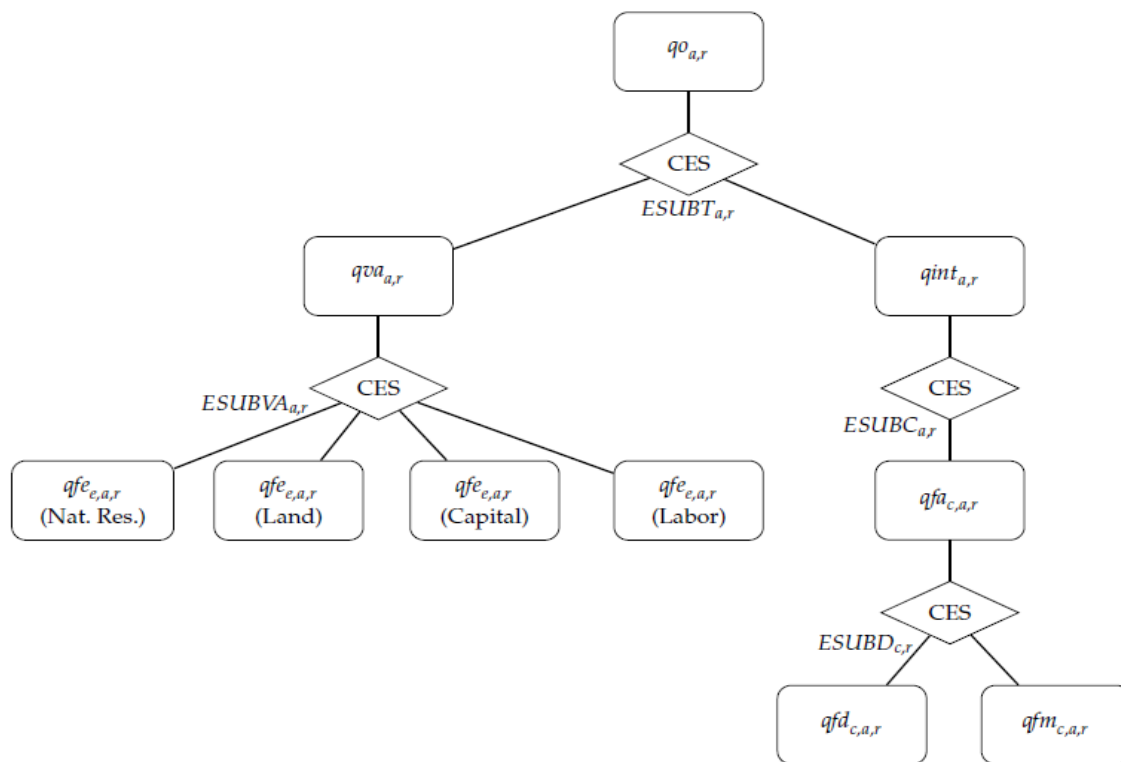
Appendix II) and 65 sectors to 12 sectors (see Appendix III). The 12 regions are chosen based on Indonesia's partner countries, which export considerable value and amount to Indonesia (see Appendix IV). The 12 sectors are aggregated based on input-output analysis from Indonesia's input-output table of 185 products in 2016 (the latest one). The authors choose which sectors have a multiplier effect relationship, whether forward integration or backward integration, with fishery and marine sectors, which, in this case, are fish, shrimp, crustaceans, other biota, and seaweed.

3. Research Model

This research uses a quantitative descriptive method by simulating GTAP model v7 in RunGTAP v3.75. All GTAP models are implemented using the economic modeling software GEMPACK (Harrison & Pearson, 2007). Hertel (1997) explains that a CGE model gives specifications on economic relations mathematically, which are shaped into a model that can predict changes in variables, like price, output, and welfare, that result from changes in economic policy. The CGE models economic connections through mathematical formulations, which enables it to forecast alterations in those economic variables (Mughtar et al., 2024).

In GTAP model v7, the nested structures, as shown in Figure 1, describe each actor's behavior. In GTAP, the nominal variables are in uppercase, while percentage changes are in lowercase. In the production nest (supply side) and consumer nest (demand side), production and utility functions, such as CES, Cobb-Douglas, Leontief, CDE, Armington, and CET are used accordingly (Sanjaya, 2021) to determine the behavior, including how to split the goods or determine which goods to consume or produce based on the source of those goods.

Figure 1. Production Nested Structure



Source: Corong et al. (2017)

4. Data Analysis Technique

The authors will check if the tax tariff in the database is the same as the actual tariff before the policy is simulated (Malcolm, 1998). If the tariff is already the same, the authors will make a database adjustment to the reference year according to the condition in 2022. The adjustment will be made by giving shocks to macro variables, like GDP, population, and endowment factor (Bou langer et al., 2016). The data that are used as shocks are taken from the World Development Indicator as used in Aguiar et al. (2019) and from the Food and Agriculture Organization as used in Burfisher (2021). These shocks are applied to make the data as close as possible to the actual condition in 2022, so the baseline shifts from 2014 to 2022. Baseline adjustments like these have previously been made by Bou langer et al. (2016), Diffenbaugh et al. (2012), and Dixon and Rimmer (2023).

Additional simulation will be done by giving tariff shocks to import taxes, representing the application of value-added tax tariff, but keeping the import duty. In determining the tariff for the import duty, the authors use the most favorable nation (MFN) tariff and preferential tariff from all trade agreements that Indonesia has. As stated in Law Number 7 of 2021 on Harmonization of Tax Regulations, the value-added tax tariff imposed is eleven percent. Article 22 of the tax tariff used is from the Minister of Finance Regulation Number 34/PMK.010/2017 as last amended with Minister of Finance Regulation Number 41/PMK.010/2022. In calculating the applied tariff, which is going to be used as the shock, the authors use the calculation in Bouët et al. (2005); Laborde (2010), who contributed to GTAP database 7; and Guimbard et al. (2012), who contributed to GTAP database 8 and on (Aguiar et al., 2019).

After running the simulation with the applied tariff, the authors will see and interpret the GDP, export, import, trade balance, equivalent variation, and price changes to see the impact of policy on the economy. Then, the authors will use the price changes from the CGE model in STATA microsimulation to see which groups of households suffer the most from the policy change.

RESULT AND DISCUSSION

1. Gross Domestic Product

Table 1 shows the simulation results for gross domestic product (GDP). Positive changes in GDP can be seen in Indonesia, China, Russia, South Korea, and Japan, while other regions suffer negative changes. The most significant positive change is in Indonesia, while the most significant negative change is in the Oceania region.

The details of each change in the GDP component by expenditure approach can be seen in Table 2. Consumption, investment, and government expenditure represent domestic

transactions. In consumption and government expenditure, Indonesia, China, Russia, South Korea, and Japan see positive change, while other regions suffer negative change. On the investment side, Indonesia, China, Russia, Canada, South Korea, Japan, the United Kingdom, Norway, and the European Union see positive changes, while other regions suffer negative changes.

Table 1. Gross Domestic Product Changes per Region (in Percentages)

Region	Changes
Indonesia	0.0796
China	0.0002
Russia	0.0002
Canada	(0.0006)
Oceania	(0.0015)
South Korea	0.0006
Japan	0.0002
US	(0.0012)
UK	(0.0001)
Norway	(0.0008)
EU27	(0.0001)
Rest of World	(0.0011)

Source: Processed from GTAP

Table 2. Changes in GDP's Component in Expenditure Approach (in Percentages)

Region	Consumption	Investment	Government Expenditure	Export	Import
Indonesia	0.000964	0.000209	0.000639	(0.002529)	(0.002782)
China	0.000002	0.000008	0.000002	(0.000011)	0.000002
Russia	0.000002	0.000009	0.000002	(0.000002)	0.000004
Canada	(0.000006)	0.000003	(0.000006)	(0.000017)	(0.000009)
Oceania	(0.000015)	(0.000005)	(0.000015)	(0.000051)	(0.000037)
South Korea	0.000006	0.000012	0.000006	0.000001	0.000004
Japan	0.000002	0.000018	0.000002	(0.000007)	(0.000007)
US	(0.000013)	(0.000009)	(0.000013)	(0.000062)	(0.000030)
UK	(0.000001)	0.000021	(0.000001)	(0.000011)	0.000000
Norway	(0.000008)	0.000005	(0.000008)	(0.000017)	(0.000008)
EU27	(0.000001)	0.000021	(0.000001)	(0.000007)	(0.000001)
Rest of World	(0.000012)	(0.000002)	(0.000011)	(0.000022)	(0.000018)

Source: Processed from GTAP

The results of this simulation show that the revocation of VAT exemption will increase Indonesia's GDP. This result is in line with research by Liyana (2021) that says VAT-related policy can correlate positively to an increase in the macro economy of Indonesia and with Giesecke and Nhi (2010), who find that exemption removal will affect GDP positively. Positive improvement in GDP is also found in research by Kartini and Margaret (2020) on imposing higher tariffs on imports. Shagdar and Nyamdaa (2017) also find that increasing VAT will impact GDP positively.

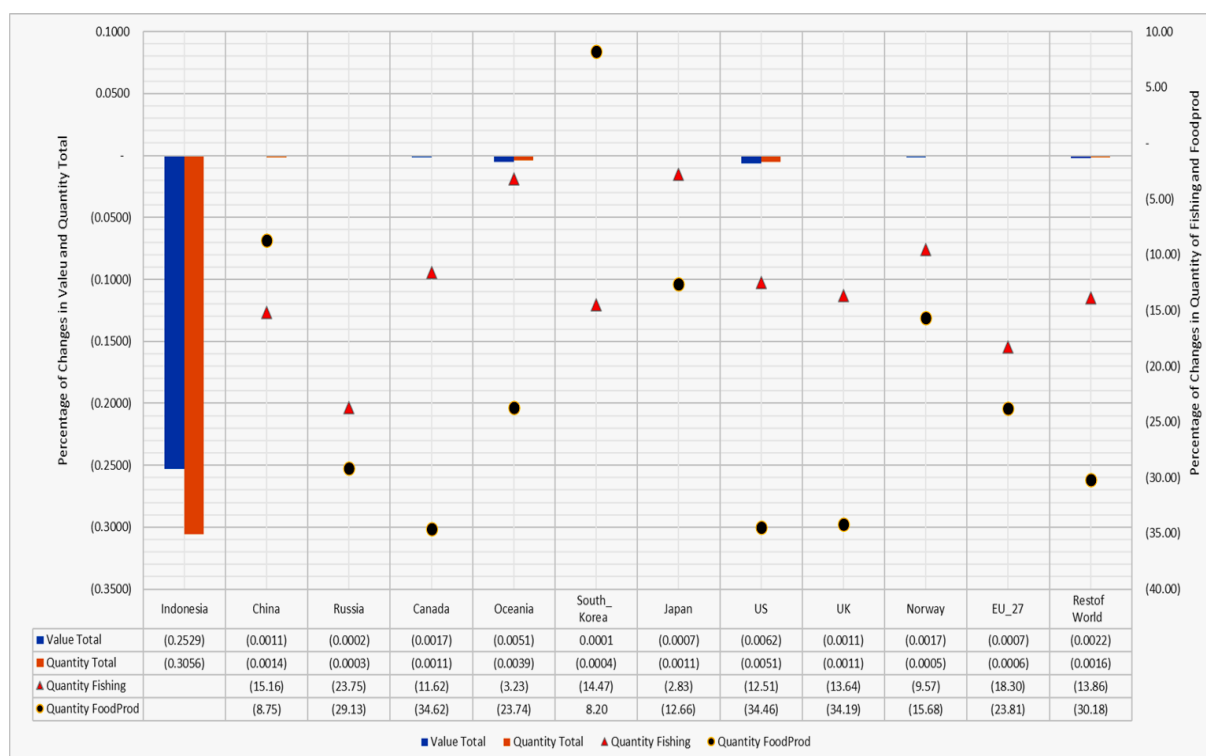
Changes in consumption, investment, and government are influenced by the changes in demand for each actor and price change. CES Armington also plays a role in this, showing differences in changes of price between imported and domestic goods (based on the source). This condition is explained by consumer preferences, budget constraints, and customer choice in

consumer behavior theory (Pyndick & Rubinfeld, 2018). The positive changes in consumption are mainly attributed to consumption by firms/producers.

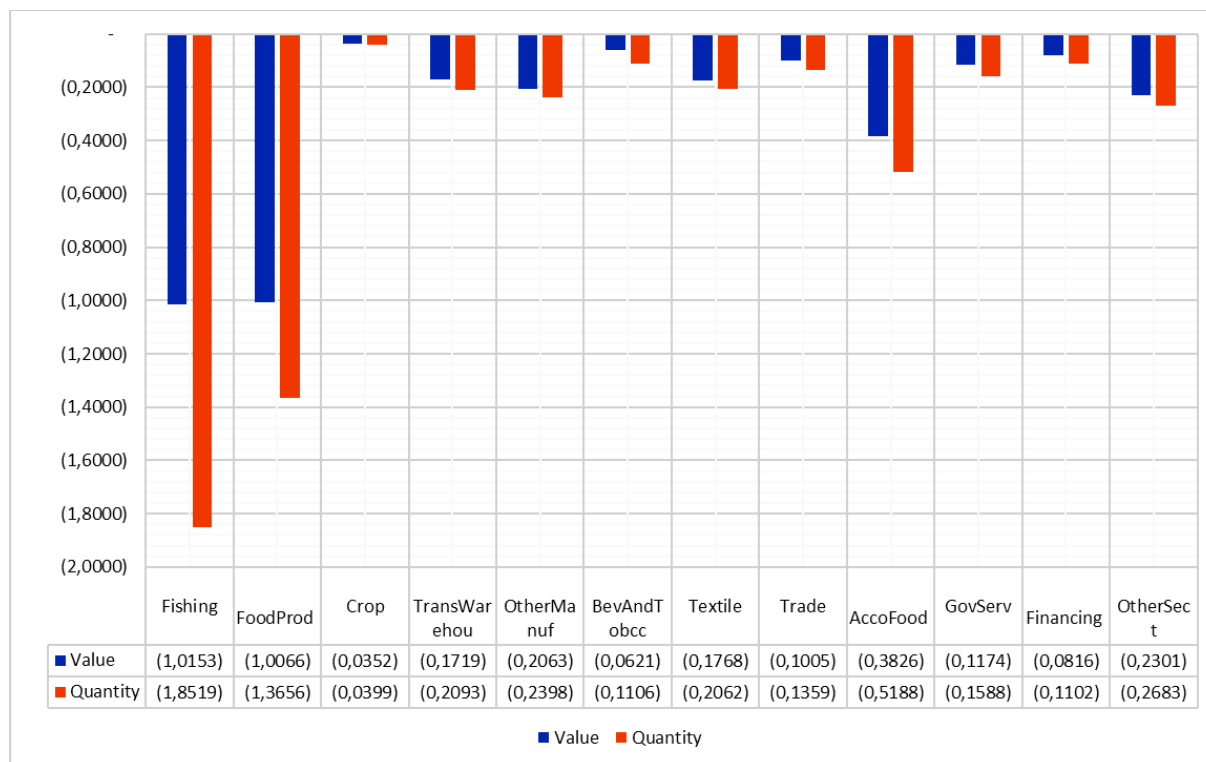
2. Exports

Figure 2 shows the simulation's effect on total export value per region. The decreases in total value of exports and quantities in all regions are below one percent. The regions that suffer the highest negative change in the fishing sector are Russia, the European Union, and China. In contrast, other regions with the lowest negative change are Oceania, Japan, and Norway. In the food production sector, regions with the highest negative change in quantity are Canada, the United States, and the United Kingdom, while the ones with the lowest negative change are China, Japan, and Norway. As for the food production, only one region sees positive change, which is South Korea.

Figure 2. Changes in Exports' Value and Quantity per Region (in Percentage)



Source: Processed from GTAP

Figure 3. Changes in Value and Quantity of Export per Sector in Indonesia (in Percentage)

Source: Processed from GTAP

If we focus on Indonesia, all sectors face negative changes, although only in small percentages and less than one percent. This is due to the fact that there is only a small proportion of the fishery and marine sector in the total import of Indonesia, which is only 0.23 percent. The fishing and food production sectors, which are given the shock, face the most significant adverse changes in quantity and value, with the number of exports facing considerable negative changes compared to the value. It means that the decrease in exports in the fishery and marine sectors happens in a commodity with a low unit value.

The result shows that the simulation can decrease the quantity and value of exports in Indonesia. It aligns with the research conducted by Kartini and Margaret (2020), which found that tariff imposition will decrease export value, but contradicts Shagdar and Nyamdaa (2017). The decrease in quantity and value of total

exports from other regions (apart from Indonesia) is below one percent. This shows that even though those regions are the leading exporter of fishery and marine products to Indonesia, the proportion of the products' exports to their total export is insignificant, so the impact is negligible.

Norway and Oceania have a considerable proportion of fishery and marine product exports to total exports. Even though their export, in this research, in the fishing and fish production sectors to Indonesia decreases, they face positive changes in export to other regions. This means that they will shift their export from Indonesia to other countries because those products have a high comparative advantage. Kostoska and Hristoski (2018) say that if one country specializes in one product, in the end, that country will be a net exporter of that product, because it has a comparative advantage. South Korea is the only country with positive change.

The simulation shows that they can diversify the product which is proven by the decrease in the export quantity of the Fishing sector (fresh fish) and the increase in the export quantity in the food production sector (preserved fish).

Although the shock is applied to import tariffs on fishing and food production sectors, the value and quantity of exports face negative changes. This change is caused by the increase in the import price of fishery and marine products, resulting in a shift in demand from imported goods to domestic goods. The increase in domestic demand cannot be offset by the increase in output (production), so there is less excess supply to export. This is in line with Burfisher (2011, in Rosyadi & Widodo, 2018), who says that tariffs will increase import prices, so economic actors will shift their demand to domestic goods, causing the exports to decrease and export prices to increase.

Sectors other than fishing and food production also face negative changes in exports because those sectors are mainly input sectors

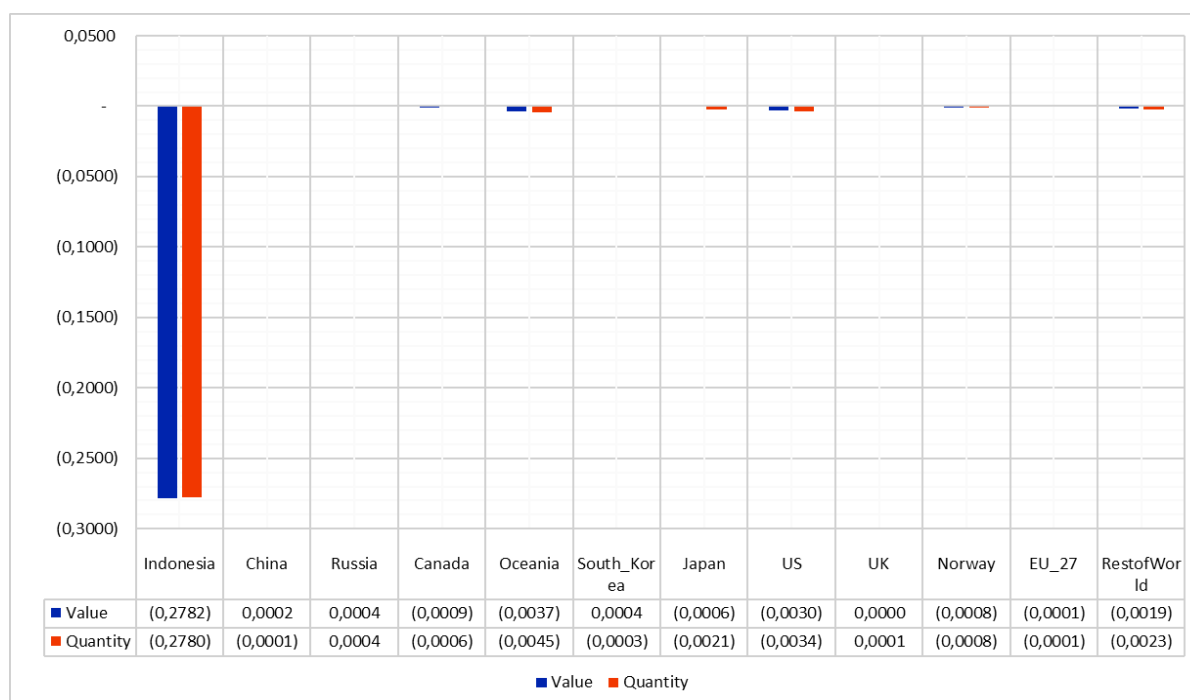
for the fishing and food production sectors. The increasing output of the fishing and food production sectors increases demand for input products (or intermediate products) and services, which lowers the excess supply. This shows that the revocation can push the domestic fishing and food production sectors to develop.

3. Imports

Figure 4 shows the simulation's effect on the total value of imports per region. There are positive import changes in China, Russia, South Korea, and the United Kingdom, while other regions face negative changes.

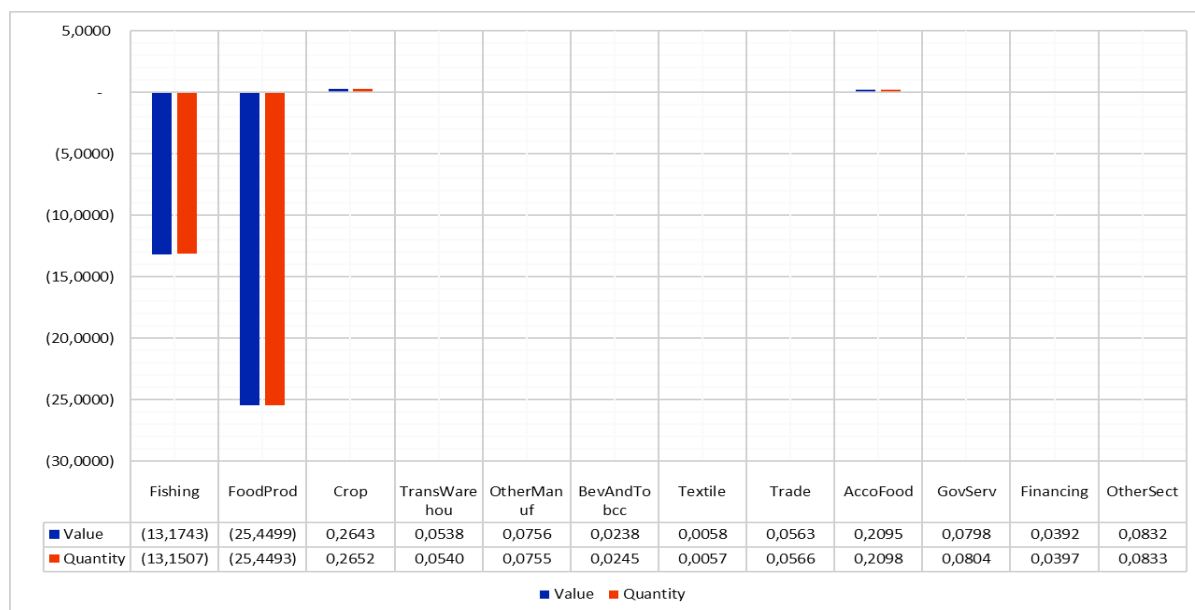
Figure 5 shows the simulation's effect on the total value of imports per region. The fishing and food production sectors face a massive negative change in the value and quantity of imports, especially the food production sector, which decreases around 25 percent in value and quantity. This shows that Indonesia predominantly imports fish in preserved condition, whether frozen or salted.

Figure 4. Changes in Imports' Value and Quantity per Region (in Percentage)



Source: Processed from GTAP

Figure 5. Changes in Value and Quantity of Imports per Sector in Indonesia (in Percentages)



Source: Processed from GTAP

The results show that the simulation can decrease the quantity and value of imports in Indonesia, in line with Kartini and Margaret (2020). The massive decrease in food production (25 percent) and fishing (13 percent) show that revoking VAT exemption can change consumer behavior significantly. This also shows that consumer behavior towards the import of those products is very sensitive to price changes, in this case, by having additional tax from VAT.

If the authors compare the imports and exports, sectors other than fishing and food production face increase in imports and decrease in exports. This is because in most of those sectors, output is decreasing, while at the same time, the fishing and food production sectors need their products as the input. This forces the fishing and food production sectors to import more to fulfil their needs for input.

4. Trade Balance

Table 3 shows the effect of the simulation on trade balance per region. Even though Indonesia only has two sectors that show a positive change (in Table 4), the country’s trade balance still has

a positive change. Other regions face negative changes due to the decrease in the export of fishery and marine products, especially in the food produce sector. The United States is the only country other than Indonesia that faces a positive change in the trade balance because other sectors, except food production, experience a bigger decrease in imports than exports (in terms of nominal value).

Table 3. Changes in Trade Balance per Region (in Million USD)

Region	Changes
Indonesia	118.9748
China	(42.2334)
Russia	(2.6571)
Canada	(3.7582)
Oceania	(2.7725)
South Korea	(1.8533)
Japan	(4.1111)
US	19.3346
UK	(8.2336)
Norway	(1.7823)
EU27	(42.2603)
Rest of World	(28.6474)

Source: Processed from GTAP

Table 4 provides information about the changes in trade balance per sector. In the fishing and food production sector, positive change can be seen, whereas in other regions, the trade balance shows a negative change.

Table 4. Changes in Trade Balance per Sectors in Indonesia (in Million USD)

Sectors	Changes
Fishing	18.0717
FoodProd	829.3515
Crop	(3.3263)
TransWarehou	(23.8102)
OtherManuf	(14.1852)
BevAndTobcc	(0.8721)
Textile	(11.5722)
Trade	(2.6504)
AccoFood	(5.8890)
GovServ	(3.9291)
Financing	(1.8043)
OtherSect	(660.4096)

Source: Processed from GTAP

The results show that the simulation can increase Indonesia's trade balance. Rosyadi and Widodo (2018), who have researched the United States' policy to increase tariffs on imports from China, find an increase in the United States' trade balance. The increase in the trade balance caused by imposing tariffs is also found by Kartini and Margaret (2020).

Changes in trade balance reflect exports and imports. In the fishing and food production sectors, even though both exports and imports decrease, the decrease in imports is higher than exports, resulting in positive changes in the trade balance. In other sectors, imports are increasing and exports are decreasing due to the effort to fulfil domestic demand for input and intermediate goods for fishing and food production. This situation causes the trade balance in those sectors to show negative changes.

5. Production (Output) and Domestic Demand

Table 5 shows the changes in production (output) and total domestic demand after the simulation. After the simulation, all sectors still have an excess of supply, but the total is lower than before. The results show an increase in productivity and domestic demand, in line with research by Shagdar and Nyamdaa (2017) but contradicting the findings of Riesfandiari et al. (2021). The increase in output comes from the incentive for the producers to produce more because of the increase in domestic price (Pudjiastuti & Kembauw, 2018), while the increase in domestic demand is due to the increase in import price, which shifts the demand from imported to domestic products (Burfisher, 2011, in Rosyadi & Widodo, 2018). This increase in domestic demand is in line with the findings of Giesecke and Nhi (2010), which show that exemption removal increases consumption.

Producers will export if there is excess supply from the domestic market (Golovin et al., 2020; Pudjiastuti & Kembauw, 2018). If excess supply decreases, the amount to be exported will also decrease. This proves the result for exports, in which value and quantity decreased. The increase in domestic demand from all sectors is higher than the output increase. This results in a domestic price increase.

6. Equivalent Variation

Table 6 shows the changes in equivalent variation per component, such as allocative efficiency, terms of trade, and the effect of changes in investment and savings. In allocative efficiency, there are only four regions with positive changes: China, Russia, South Korea, and Japan, while other regions suffer negative changes, including Indonesia.

Table 5. Comparison of Production (Output) and Total Domestic Demand Pre and Post-Simulation (in Units)

Sectors	Pre			Post		
	Output	Total Demand	Excess Supply	Output	Total Demand	Excess Supply
Fishing	22,574	21,551	1,024	22,631	21,627	1,005
FoodProd	79,711	70,902	8,809	80,858	72,169	8,689
Crop	7,991	5,691	2,300	7,990	5,691	2,299
TransWarehou	125,335	115,765	9,570	125,360	115,810	9,550
OtherManuf	19,106	13,745	5,361	19,086	13,738	5,349
BevAndTobcc	18,186	17,143	1,043	18,183	17,142	1,042
Textile	45,926	39,720	6,206	45,888	39,695	6,193
Trade	197,977	196,978	999	198,069	197,071	998
AccoFood	49,008	48,380	628	48,989	48,365	625
GovServ	142,906	140,848	2,058	142,923	140,869	2,054
Financing	57,077	55,966	1,112	57,072	55,962	1,110
OtherSect	1,468,349	1,261,637	206,711	1,467,385	1,261,223	206,162
Total	2,234,146	1,988,325	245,820	2,234,435	1,989,360	245,075

Source: Processed from GTAP

Table 6. Changes in Equivalent Variation per Region (in Million USD)

Region	Allocative Efficiency	Terms of Trade	IS Effect	Total Changes
Indonesia	(218.0024)	130.0441	7.0968	(80.8616)
China	3.7761	(2.7277)	7.9911	9.0397
Russia	0.6175	0.4346	0.8438	1.8958
Canada	(0.0254)	(1.0700)	(0.5604)	(1.6558)
Oceania	(0.7757)	(7.1648)	(0.2274)	(8.1678)
South Korea	2.3703	(1.0681)	0.1735	1.4757
Japan	0.1958	(7.0137)	(0.1009)	(6.9189)
US	(4.4624)	(26.3133)	(27.7104)	(58.4863)
UK	(0.3737)	(0.1025)	(0.1489)	(0.6250)
Norway	(0.2296)	(2.1272)	0.3442	(2.0127)
EU_27	(1.6872)	(8.4055)	7.2931	(2.7996)
Rest of World	(12.9910)	(74.5328)	5.0029	(82.5209)

Source: Processed from GTAP

As for terms of trade, only Indonesia and Russia have positive changes, while other regions face negative changes. In investment and savings effect, seven regions have positive changes: Indonesia, China, Russia, South Korea, Norway, the European Union, and the Rest of the World. In comparison, the other five regions face negative changes.

Table 7 shows the changes in allocative efficiency in Indonesia based on the tax type. Negative changes can be seen in import, export, consumption, and income taxes, while others have positive changes. Table 8 details the changes in trade in Indonesia based on the effect of each change in international price, export price, and import price.

Table 7. Changes in Equivalent Variation from Allocative Efficiency in Indonesia (in Million USD)

Tax Type	Allocative Efficiency
Production Tax	1.698347
Primary Factor Tax	0.357692
Income Tax	(0.0001)
Input Tax	0.6372
Consumption Tax	(63.2046)
Investment Tax	0.8088
Government Tax	-
Export Tax	(4.6312)
Import Tax	(153.6686)
Total	(218.0024)

Source: Processed from GTAP

Table 8. Changes in Equivalent Variation from Terms of Trade in Indonesia (in Million USD)

Sector	International Price	Export Price	Import Price	Total
Fishing	0.0529	8.6340	0.0605	8.7474
FoodProd	0.3704	31.3023	0.1997	31.8724
Crop	(0.0148)	0.1246	0.0022	0.1120
TransWarehou	0.0490	3.5910	0.0227	3.6627
OtherManuf	(0.0039)	1.8305	0.0021	1.8287
BevAndTobcc	(0.0010)	0.5082	0.0047	0.5119
Textile	(0.0025)	1.8124	0.0288	1.8387
Trade	0.0087	0.3564	0.0017	0.3668
AccoFood	(0.0002)	0.8586	0.0091	0.8675
GovServ	(0.0019)	0.8661	0.0062	0.8703
Financing	0.0064	0.3215	0.0023	0.3301
OtherSect	(0.0045)	78.2149	0.8252	79.0356
Total	0.4584	128.4205	1.1652	130.0441

Source: Processed from GTAP

Allocative efficiency reflects the distribution of resources to reach optimal utility (Decker et al., 2017). In this case, allocative efficiency can be defined as a condition when price is on the level where marginal cost equals marginal utility (Malik et al., 2020). In Indonesia, adverse changes in allocative efficiency can be seen from the effect of import, export, consumption, and income taxes. Burfisher (2021) explains that the economic effect of import tariffs is the increase in import prices, which, in the end, will cause import quantity to go down and decrease economic efficiency and welfare. The interesting

aspects in this simulation are the positive changes in production tax, primary factor tax, input tax, and investment tax. This condition indicates that, by revoking the VAT exemption, efficiency from production will rise. This shows a similarity to findings by Arndt et al. (2009), Murwendah and Desyani (2023), and Shagdar and Nyamdaa (2017), which show that imposing tariffs or VAT will protect domestic producers.

The terms of trade can be explained by the changes in export prices, import prices, and global prices. This is because the terms of trade will grow when a commodity's import price

decreases relative to its export price (Rosyadi & Widodo, 2018). In Indonesia, all sectors show positive changes in terms of trade, showing that export prices are becoming more robust relative to import prices. Positive changes in terms of trade can be seen in Kartini and Margaret (2020), who examined the imposition of tariffs on imports in the agriculture sector. The exemption removal in Giesecke and Nhi (2010) also shows that the terms of trade increase. The food production sector, as a forward-linked sector from fishing, shows a significant increase in its terms of trade. As previously explained, this sector also faces increased productivity, as shown by Giesecke and Nhi (2010). This is one of the ways to escape the condition in the Prebisch-Singer hypothesis, as reported by Jahan et al. (2021), by engaging in export diversification from fishing (primary) to food production (secondary). On the investment and savings effects side, Huff and Hertel (2000) state that, if a region is a net savings supplier, the equivalent variation will rise if there is a relative increase in savings price to investment price.

The explanations show that although production and trade show positive numbers, they cannot balance the decrease of equivalent variation from consumption and imports. This is

in line with Krugman et al. (2018, in Riesfandiari et al., 2021), who state that tariffs will increase the welfare of that specific commodity producer but will decrease the welfare of the consumer and nation in aggregate. Research by Riesfandiari et al. (2021) also finds that tariffs (in their case, safeguards) will decrease society's welfare. But the finding here contradicts Muhamad and Nugroho (2018), who find that lowering tariffs will also lower the welfare, and Kartini and Margaret (2020), who find that the higher the tariffs are, the more they positively affect the welfare.

7. Price

Table 9 shows the changes in the export and import price indexes. The increase in the export price index happens in Indonesia, China, Russia, South Korea, and Japan. In contrast, the decrease in export prices happens in Canada, Oceania, the United States, the United Kingdom, Norway, the European Union, and the Rest of the World. On the import side, the import price index increases in China, Russia, Oceania, South Korea, Japan, the United States, and the Rest of the World, while the rest face a decrease in the import price index.

Table 9. Changes in Export and Import Price (in Percentage)

Region	Changes in the Export Price Index	Changes in the Import Price Index
Indonesia	0.0529	(0.0002)
China	0.0002	0.0003
Russia	0.0002	0.0000
Canada	(0.0006)	(0.0003)
Oceania	(0.0012)	0.0008
South Korea	0.0005	0.0007
Japan	0.0003	0.0014
US	(0.0011)	0.0004
UK	(0.0001)	(0.0000)
Norway	(0.0012)	(0.0001)
EU27	(0.0001)	(0.0000)
Rest of World	(0.0006)	0.0005

Source: Processed from GTAP

Table 10 shows the effect of the simulation on household consumption price, whether aggregate or based on the source of goods (domestic or import) in Indonesia. Table 10 also shows that the increase in household consumption price in the fishing and food sectors is higher than the increase in household consumption price (aggregate) of all actors in the economy (producers, households, government, and investment and savings), and vice versa in other sectors.

The results show that the simulation will increase the domestic and export price indexes and decrease the import price indexes. This aligns with Riesfandiari et al. (2021), who find that safeguards (imposition of tariffs) will increase prices. Changes in export and import prices affect that country's trade terms; positive changes in export prices will increase the terms of trade and vice versa, while positive changes in import prices will decrease the terms of trade and vice versa (Rosyadi & Widodo, 2018).

The increase in import prices will increase domestic demand for domestic goods, which, in the end, will increase domestic goods prices. There is a tendency for price convergence, which is when a commodity price, if measured in the same currency, will converge into the same price (Hałka & Leszczyńska-Paczesna, 2019). In this case, import and domestic prices will move together and influence each other to reach the same price level. However, the convergence of prices on the same level in the real world is hard to achieve because of trade barriers, consumer preferences, monopolies, and price stickiness (Hałka & Leszczyńska-Paczesna, 2019).

8. Household Consumption

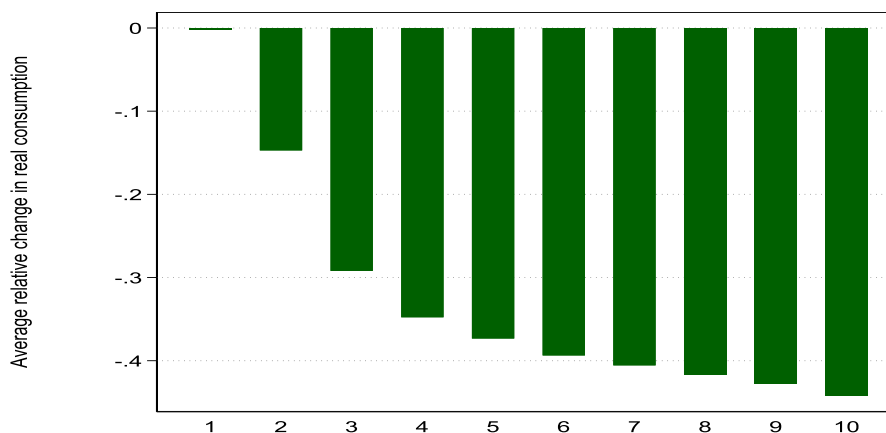
Figure 6 and Figure 7 show the expected decrease in consumption after the simulation. The data show the total consumption of fish products, including fresh fish, fresh mollusks, fresh crustaceans, preserved fish, preserved mollusks, and preserved crustaceans. Those expenditures are split into ten deciles.

Table 10. Changes in Price Index and Household Consumption Price in Indonesia (in Percentage)

Sector	Price Index	Household Consumption Price (Aggregate)	Household Consumption Price on Domestic Goods	Household Consumption Price on Import Goods
Fishing	0.8524	0.9912	0.8524	13.1310
FoodProd	0.3639	1.1088	0.3639	17.5123
Crop	0.0047	0.0040	0.0047	(0.0010)
TransWarehou	0.0375	0.0350	0.0374	(0.0002)
OtherManuf	0.0336	0.0287	0.0336	0.0000
BevAndTobcc	0.0486	0.0480	0.0486	(0.0007)
Textile	0.0295	0.0272	0.0295	0.0001
Trade	0.0355	0.0347	0.0354	(0.0003)
AccoFood	0.1369	0.1319	0.1369	(0.0003)
GovServ	0.0415	0.0399	0.0415	(0.0006)
Financing	0.0286	0.0281	0.0286	(0.0004)
OtherSect	0.0383	0.0339	0.0383	(0.0002)

Source: Processed from GTAP

Figure 6. Changes in Real Household Consumption per Expenditure Decile in Indonesia in the Fishing Sector (in Percentage)



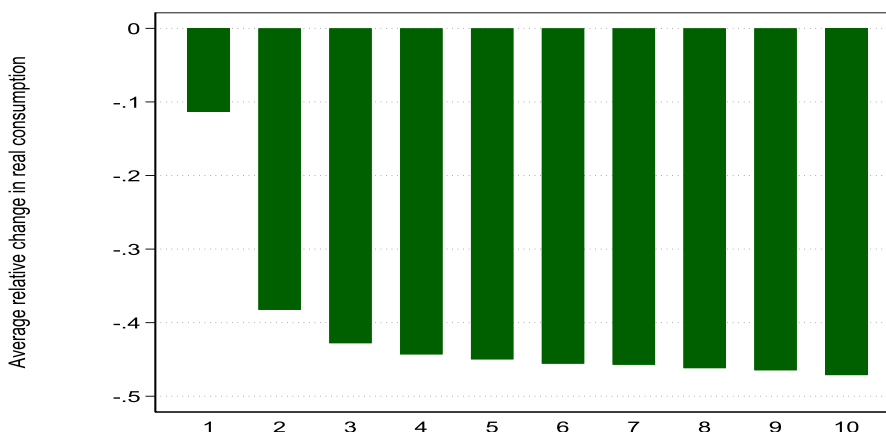
Source: Processed from STATA

Figure 6 shows the effect of the price increase on the fishing sector (only fresh fish, fresh mollusks, and fresh crustaceans). In contrast, Figure 7 shows the effect of price increases on the fishing and food production sector (fresh fish, fresh mollusks, fresh crustaceans, preserved fish, preserved mollusks, and preserved crustaceans). Although in a different magnitude, both figures show that the groups that face the worst effect are the higher deciles.

The result shows that the simulation decreases household consumption in both comparisons, and the deciles that face the worst

effect are the higher deciles. The findings of Arndt et al. (2009) show the same phenomena, with the top 40 percent of earners from urban areas suffering a negative impact from VAT being raised. This is because those that enjoyed the incentive were, in fact, in the higher deciles. This is in line with the Organization for Economic Co-operation and Development (2014) and Harris et al. (2018), who state that these taxpayers being exempted does not reflect the redistributive function because the beneficiaries are not only the ones who need it but also the wealthy taxpayers.

Figure 7. Changes in Real Household Consumption per Expenditure Decile in Indonesia in the Fishing and Food Production Sector (in Percentage)



Source: Processed from STATA

With the revocation of VAT exemption, by using the import data in 2022, which is IDR 8,363,183,378,310 (USD529,348,907), additional revenue of IDR 919,950,171,614 (USD58,228,380) could be collected, with the exchange rate used taken from Decree of the Minister of Finance Number 48/KM.10/KF.4/2024. Gultom (2023) finds that taxes imposed on consumption will achieve budget and stability functions because they give more revenue to the government. This additional revenue must be allocated to help the fishery and marine sector, such as by giving incentives or subsidies to fishermen or poor people to help them consume fish, as found by Arnold (2012). This can help achieve a redistributive function, as mentioned in research by Tiwari et al. (2020), Erero (2021), Ministry of Finance (2021), and Thomas (2020).

9. Policy and Regulatory Implications

From the simulation, revoking the VAT exemption will affect the indicators in Indonesia as follows:

1. An increase in gross domestic product;
2. A decrease in value and quantity of export;
3. A decrease in value and quantity of import;
4. An increase in trade balance;
5. An increase in productivity and domestic demand;
6. A decrease in welfare (equivalent variation);
7. An increase in domestic and export price index;
8. A decrease in import price index; and
9. A decrease in household real consumption (higher in the higher decile of expenditure).

The results show that if a policy to revoke the VAT exemption is imposed, a lot of indicators will show positive improvement. Even though the equivalent variation decreases, it shows that the actor who benefits the most is the

producer, showing positive improvement in equivalent variation. The decrease is mainly attributed to more steep decrease on consumers' side from the effect of the increase in price. It can be avoided if the government can use the additional revenue to provide:

1. Assistance, like additional ships, gasoline, tools, fish seeds, and facilities to make it easy for marine and fishery producers to get business credit; or
2. Subsidies, like a reduction of the price of marine and fishery products to social assistance (bansos) cardholders or other consumers that need the products more.

Additionally, the decrease in consumers' side effects is mostly in the higher decile of expenditure. This proves that even though VAT is known to be regressive, in this case, it shows a progressive effect. This can happen because, from the start, the people who enjoy the incentive are those from the higher decile.

If the decision to revoke the VAT exemption is set to be done, then the government must revise the Government of The Republic of Indonesia Regulation Number 49 of 2022 so that the marine and fishery products are excluded from the exemption. This will somehow impact the producers, as they need to include the import in their VAT return as a factor to match between input and output VAT. Also, if the producers have not been assigned as taxable entrepreneurs before, they need to be assigned as one and will have the responsibility to withhold/collect VAT.

CONCLUSION AND SUGGESTION

The simulation of revoking the VAT exemption on the import of fishery and marine products shows that the revocation brings positive benefits to Indonesia. The original purpose of giving the incentive to boost the fishery and marine industries is no longer proven valid

because, in contrast to its intended use, revoking the incentive grants an increase in GDP, trade balance, productivity, and demand. This also shows that tax incentives do not always bring the boost in the economy that is expected, and it needs to be reviewed regularly.

The results also show a transition in demand and consumption from import to domestic. This will have a positive economic impact on domestic producers and fishermen if they can match their supply with the increasing demand. The revocation of incentive also shows no regressive impact on household consumption, which means that the higher expenditure decile suffers more than the lower expenditure decile. This is an ideal condition, because if VAT is imposed, then those who will pay more are the higher decile, while the lower decile can enjoy the redistributive effect if the government can allocate the additional tax revenue, estimated at IDR 919,950,171,614 (USD58,228,380) to better incentives or policies.

With the aforementioned explanation, the suggestions that the authors can give are as follows:

1. The government should evaluate the policy of VAT exemption on the import of fishery and marine products to prevent regressive effects and inequality in incentives.
2. If the revocation of VAT exemption is executed, to anticipate the increase in price and the decrease in fish consumption, the government needs to use additional money to strengthen the fishery and marine sectors, for example, through assistance or subsidies to either producers or consumers.
3. The government must give investment-based incentives, not consumption-based ones, such as the import VAT exemption.
4. The government needs to lower the logistic cost to support production and domestic

demand, which should render the VAT exemption policy unnecessary.

The limitation of this research is the use of formal documents only, while data regarding illegal fishing is not included. Another limitation is that the authors did not include the non-tariff barriers like quality and safety, sustainability, third-party certification, and traceability of fishery and marine products in the research but focused only on tariff barriers (VAT).

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Appendix I. Production of Marine and Fisheries Product in 2020 and 2030 Projection

	Production			Of which aquaculture		
	2020	2030	Growth of 2030 vs 2020	2020	2030	Growth of 2030 vs 2020
	1 000 tonnes (live weight equivalent)		%	1 000 tonnes (live weight equivalent)		%
Africa	12 044	13 763	14.3	2 250	2 759	22.6
Egypt	2 011	2 339	16.3	1 592	1 911	20.0
Nigeria	1 045	1 208	15.6	262	318	21.4
South Africa	602	522	-13.3	6	12	90.5
Americas	21 903	24 499	11.8	4 375	5 623	28.5
Argentina	840	896	6.7	2	2	10.3
Brazil	1 339	1 527	14.1	629	751	19.3
Canada	901	1 061	17.8	171	244	42.5
Chile	3 259	4 290	31.6	1 486	2 193	47.6
Mexico	1 780	1 910	7.3	279	296	6.2
Peru	5 770	6 210	7.6	144	184	28.2
United States of America	4 694	5 298	12.9	448	548	22.3
Asia	124 960	143 182	14.6	77 384	94 095	21.6
China	62 846	73 608	17.1	49 620	60 068	21.1
India	14 141	16 775	18.6	8 636	10 995	27.3
Indonesia	12 152	13 678	12.6	5 227	6 598	26.2
Japan	3 751	3 471	-7.5	599	684	14.1
Korea, Republic of	1 934	1 933	-0.1	566	633	11.7
Philippines	2 766	3 337	20.6	854	1 045	22.3
Thailand	2 618	2 763	5.5	962	1 113	15.6
Viet Nam	8 023	9 123	13.7	4 601	5 202	13.1
Europe	17 096	18 696	9.4	3 263	3 704	13.5
European Union ¹	5 026	5 555	10.5	1 094	1 256	14.9
Norway	3 941	4 012	1.8	1 490	1 612	8.2
Russian Federation	5 342	5 855	9.6	270	368	36.3
Oceania	1 752	1 972	12.5	229	264	15.7
Australia	284	305	7.4	106	129	21.3
New Zealand	482	541	12.1	119	131	10.3
World²	177 757	202 112	13.7	87 501	106 445	21.7

Source: Food and Agriculture Organization (2022)

Appendix II. Region Aggregation

No.	Code	Region Description	Description
1	Indonesia	Indonesia	Indonesia.
2	China	China	China.
3	Russia	Russia	Russian Federation.
4	Canada	Canada	Canada.
5	Oceania	Australia NZ Rest of Oceania	Australia; New Zealand; Rest of Oceania.
6	South Korea	South Korea	Korea.
7	Japan	Japan	Japan.
8	US	United States	United States of America.
9	UK	United Kingdom	United Kingdom.
10	Norway	Norway	Norway.
11	EU_27	European Union 27	Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; Sweden.
12	Rest of World	Rest of World	Hong Kong; Mongolia; Taiwan; Rest of East Asia; Brunei Darussalam; Cambodia; Lao People's Democratic Republic; Malaysia; Philippines; Singapore; Thailand; Viet Nam; Rest of Southeast Asia; Bangladesh; India; Nepal; Pakistan; Sri Lanka; Rest of South Asia; Mexico; Rest of North America; Argentina; Bolivia; Brazil; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela; Rest of South America; Costa Rica; Guatemala; Honduras; Nicaragua; Panama; El Salvador; Rest of Central America; Dominican Republic; Jamaica; Puerto Rico; Trinidad and Tobago; Caribbean; Switzerland; Rest of EFTA; Albania; Belarus; Ukraine; Rest of Eastern Europe; Rest of Europe; Kazakhstan; Kyrgyzstan; Tajikistan; Rest of Former Soviet Union; Armenia; Azerbaijan; Georgia; Bahrain; Iran Islamic Republic of; Israel; Jordan; Kuwait; Oman; Qatar; Saudi Arabia; Turkey; United Arab Emirates; Rest of Western Asia; Egypt; Morocco; Tunisia; Rest of North Africa; Benin; Burkina Faso; Cameroon; Cote d'Ivoire; Ghana; Guinea; Nigeria; Senegal; Togo; Rest of Western Africa; Central Africa; South Central Africa; Ethiopia; Kenya; Madagascar; Malawi; Mauritius; Mozambique; Rwanda; Tanzania; Uganda; Zambia; Zimbabwe; Rest of Eastern Africa; Botswana; Namibia; South Africa; Rest of South African Customs ; Rest of the World.

Source: Processed from GTAP

Appendix III. Sector Aggregation

No.	Sectors Code	Short Description	Description
1	Fishing	Fishing Live Fresh Chill	Fishing.
2	FoodProd	Including Salt Frozen Fish & Pellet	Food products not elsewhere classified (nec) (including frozen, fillets, smoked, dried, and salted fish).
3	Crop	Crops incl seaweed	Crops nec.
4	TransWarehou	Including Fsh vessel, trans, warehou	Transport equipment nec; Transport nec; Water transport; Air transport; Warehousing and support activity.
5	OtherManuf	Including Fish hooks and line	Manufactures nec.
6	BevAndTobcc	Beverages and Tobacco	Beverages and tobacco products.
7	Textile	Including Fish Net	Textiles.
8	Trade	Trade	Trade.
9	AccoFood	Accommodation, Food and service	Accommodation, Food and servic.
10	GovServ	Government Service, Education, Health and Social	Public Administration and defends; Education; Human health and social work.
11	Financing	Financial service and insurance	Financial services nec; Insurance.
12	OtherSect	Other sectors	Paddy rice; Wheat; Cereal grains nec; Vegetables, fruit, nuts; Oil seeds; Sugar cane, sugar beet; Plant-based fibers; Bovine cattle, sheep and goats; Animal products nec; Raw milk; Wool, silk-worm cocoons; Forestry; Coal; Oil; Gas; Minerals nec; Bovine meat products; Meat products nec; Vegetable oils and fats; Dairy products; Processed rice; Sugar; Wearing apparel; Leather products; Wood products; Paper products, publishing; Petroleum, coal products; Chemical products; Basic pharmaceutical products; Rubber and plastic products; Mineral products nec; Ferrous metals; Metals nec; Metal products; Computer, electronic and optic; Electrical equipment; Machinery and equipment nec; Motor vehicles and parts; Electricity; Gas manufacture, distribution; Water; Construction; Communication; Real estate activities; Business services nec; Recreational and other service; Dwellings.

Source: Processed from GTAP

Appendix IV. Value and Quantity of Indonesia Import from Partner Country and Shares Percentage

No.	Countries	Value (in USD)	% shares	Volume (in Kg)	% shares
1	China	103,807,672	19.38	82,809,941	40.44
2	Russia	69,130,517	12.91	13,572,319	6.63
3	Canada	45,990,905	8.59	3,974,524	1.94
4	Oceania	35,695,899	6.66	4,120,341	2.01
5	South Korea	31,239,669	5.83	17,938,607	8.76
6	Japan	29,602,728	5.53	17,092,286	8.35
7	US	28,044,784	5.24	3,708,352	1.81
8	UK	18,491,986	3.45	4,103,087	2.00
9	Norway	16,128,215	3.01	3,274,136	1.60
10	EU27	11,004,212	2.05	3,257,855	1.59
11	Rest of World	146,515,843	27.35	50,905,664	24.86
12	Total	535,652,430	100.00	204,757,112	100.00

Source: Processed from International Trade Centre (2023)