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6 Impact of Fishery Policy on Fishery Manufacture Output, Economy and Welfare in Indonesia

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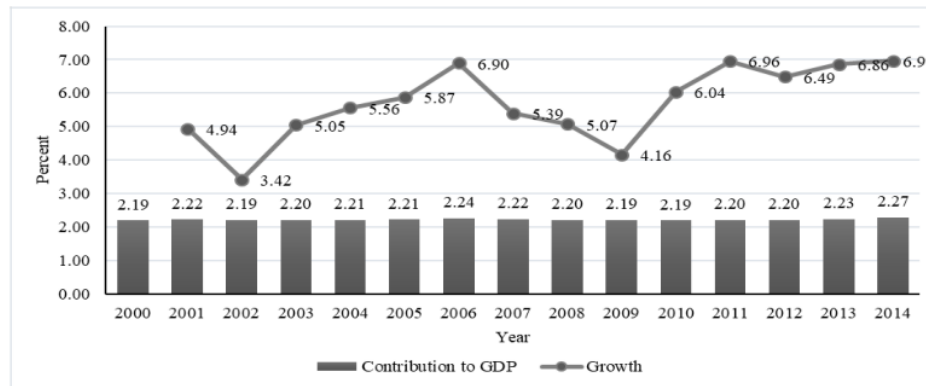
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Abstract. The fisheries sector and fish manufacturing industry are the bright prospect sectors of Indonesia, due to its huge potency, which has not been worked out optimally. In facts, these sectors can generate a large amount of foreign exchange. The Government has paid significant attention to the development of these sectors. This study simulates the impact of fishery policies on the production of fish manufacturing industry, national economic and welfare in Indonesia. By employing the Input-Output Analysis approach, impacts of various government policy scenarios are developed, covering fisheries technical policy, as well as infrastructure development policies in the fisheries sector. This study indicates that the policies in the fisheries sector increase the output of fishery, the production of fish manufacturing industry, the sectoral and national outputs, as well as the level of national income.

1. Introduction.

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The fishery sector, especially the capture fisheries in marine waters of Indonesia is a very potential and strategic sector to become the mainstay of economy. It supported by the fact that Indonesia is an archipelagic country with 17,504 islands [1] and has the coastline of 99,000 km with the marine fisheries area is 5.8 million km² – with maximum potential sustainable yield of fish resources in marine waters at 6.5 million tons per year, with an allowable catch of 5.2 million tons/year (80% of maximum sustainable yield). In addition, the sector provides employment for about 2,667,440 people and 2,186,900 of whom are fishermen who capture fisheries in marine waters [3].

Based on the Food and Agricultural Organization [4], the total capture of production in marine waters was 81.5 million tons in 2014, and Indonesia ranked the second largest in the world after China. The Indonesia's production of fisheries capture in marine waters was 6,204,669 tons in 2015 [1]. According to the Indonesia Central Bureau of Statistics or BPS [1], it was known that the contribution of the fishery sector as a whole - including aquaculture - reached 65957.5 trillion rup in 2014, was 7 percent of the growth rates, and compared to the Gross Domestic Product (GDP), the contribution of this sector was 2.27 percent. Table 1 displays the development of Indonesian fishery sector along 2000-2014. The capture fishery sector alone exported 95.4 thousand tons or 268.1 million US \$ in 2016 [5]. The value of potency of the fishery sector is greater when includes the calculation of inter-linkages with other sectors. The all of related sectors also absorb workers and exports.



Source: [6], processed

Figure 1. Growth and contribution of Fishery sector to the GDP at Constant Prices (2000-2014)

According to the Development Planning Agency (Bappenas) study [2], it identified several problems of the Indonesian fishery sector, which cause the sector performance are not optimal and sustainable yet. Some issues which are related to marine capture fisheries are: 1) the rampant of illegal fishing activities; 2) the overfishing in some coastal waters of Indonesia; 3) the using of destructive fishing gear; and 4) the weaknesses of the control system of fish resource utilization.

Due to the various problems of fisheries, the Government of Indonesia issued some policies, and this study examines the impact of the policies on the national and sectoral economy and welfare. The scope of policies which be analyzed in this study is limited to the marine capture fishery policies, based on the 2015-2019 Strategic Plan of the Directorate General of Capture Fisheries of Ministry of Marine and Fisheries Affairs [3]. These policies are in the scope of marine capture fisheries, namely the investment of fishery business and the construction of fishery ports.

To capture the comprehensive impact of government policy on the fisheries industry on economy and welfare, the Input-Output (I-O) analysis is employed. The I-O analysis is a powerful in measuring the impact on the economy through inter-sectoral linkages, and is commonly used in many countries. Several Input-Output models of fisheries industry and the impact toward economy which are developed in several countries, among others the Commercial Fishing Model of Northeast U.S. [7], UK Sea Fishing [8], models of fisheries Input-Output in U.S. [9], Pacific Coast Fisheries [10], Wildlife and Fisheries Recreation in Mississippi, U.S. [11], and a hybrid model for fish harvester [12].

2. Method

2.1 Data

The data employed in this study are the input-output table with the based price transaction of 185 sectors of the 2010 Input-Output (I-O) table of Indonesia, the latest I-O Table published by BPS [13]. Sector list can be seen in the 2010 I-O Table of Indonesia [13].

2.2 The development of shock scenario

The policy scenarios used in this study are obtained from the 2015-2019 Strategic Plan [3], which covers the amount of business investment in the marine capture fisheries sector and the fishery port

construction fund throughout 2015-2019. The forming of the shock for the policies simulation is explained with the information in Table 1.

Table 1. Shock Scenarios

Description	Total
The investment value of capture fishery business 2015-2019 (trillion rupiah)	127
Number of fishing ports that meet operational standards 2015-2019	262
Average cost of 1 fishing port construction	90
Value of fishing port construction (trillion rupiah)	23.580

The data of the business investment value of marine capture fishery at [8] the amount of port construction along 2015-2019 is obtained from 2015-2019 Strategic Plan of Directorate General of Capture Fisheries Ministry of Marine and Fisheries [18]. The cost of constructing a fishing port is obtained from the Fishery Port Information Center, Ministry of Marine Affairs and Fisheries [14]. The magnitude of investment value and cost of post construction are the value of policies shock on selected sectors in Table I-O, namely Sector 33 (Fish) and Sector 152 (Road, Bridge and Port).

2.3 Impact of fishery sector policy on national and sectoral economy: Input-Output model approach

Input-Output Analysis is a general equilibrium analysis, based on data in the form of transaction matrices of goods and services, with emphasis on the sectoral production side. The transaction matrices include several blocks that are grouped into 4 quadrants ie intermediate transaction quadrant, final demand quadrant, primary input quadrant, and the primary input to final demand quadrant [15]. The inter-block linkage scheme in the Input-Output model is explained briefly through the following Figure 2:

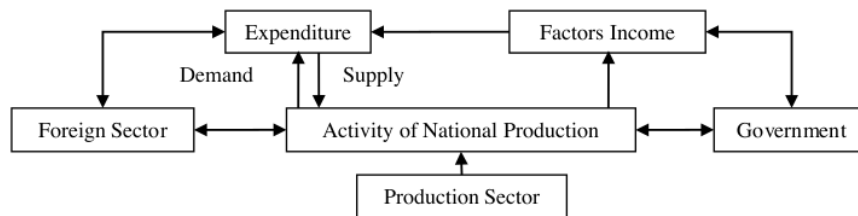


Figure 2. Scheme of Input-Output Model

Briefly, it can be explained that the production sector absorbs input from the household sector, namely primary inputs: capital, labor, and land. The production sector produces consumer goods for household needs, and intermediate goods for other sectors. The production sector also exports. Households receives income from producers as remuneration of primary input, and transfer from the government. Government obtains tax from household. The production activity box at the national level in Figure 2 displays the production side of GDP, the factor's revenue box shows the income side of GDP and the expenditure side exhibits the expenditure side of GDP.

The impact of the changes in investment of fishery business and the construction of fishery port to sectoral output changes, is calculated by the following formula:

$$\Delta X = (I-A)^{-1} \Delta Y \dots\dots\dots (1)$$

where ΔY represents a vector of changes in the final demand (including investment) and ΔX vector of output change. A is the technological coefficient matrix and $(I-A)^{-1}$ is Leontief inverse matrix [15].

The impact of the policy shocks on sectoral household income is calculated by the following formula:

$$\Delta H = H_R (I-A)^{-1} \Delta Y \dots\dots\dots (2)$$

where ΔH represents the income changes vector, H_R represents income coefficient of sectoral household income [15].

3. Results and Discussion

Tables 2 and 3 present the simulation results of 185 sector classification of 2010 Indonesia Input-Output, which covers the sectoral and national impacts of output and household income. The results which are presented in the two tables cover the ten sectors which have the greatest impact, and special observations on two sectors of the fish processing industry namely the sector of Dried Fish and Salted Fish (code 55) and the Fish Processing and Preservation (code 56).

Table 2. Impact of the largest sectoral output and Fish Processing Industry

Rank	Code	Sector	Output Change (Million Rupiah)
1	33	Fish	128,557,932.00
2	152	Road, Bridge, and Port	23,612,197.58
3	95	Oil and Gas Refinery Products	7,215,167.72
4	156	Trade of the other than Cars and Motorcycles	5,895,496.74
5	72	Animal Food Processed	5,378,009.81
6	30	Agriculture, Forestry and Fisheries Services	3,572,377.33
7	38	Crude Oil	2,941,945.73
8	48	Various Mining Goods	2,204,996.54
9	94	Other Goods from Non-Metal Material	1,975,938.98
10	39	Natural Gas and Geothermal	1,827,347.95
97	56	Fish Processing and Preservation	59,291.87
150	55	Dried Fish and Salted Fish	8,193.88
		National Output Change	213,099,172.00

From Table 2, it can be seen that the two sectors which experiences the increase of investment, have the highest impact of output compared to other sectors. The increase of investment in fishery business and fishery port directly and indirectly also lead to the increase of other sector outputs, namely the Sector 95 (which the product is fuel) and Sector 156 (which one of its activities is motor boat trade), as the two other largest impacted sectors. These sectors have highly interlinkage to the Sector 33 and 152. The investment increase will promote the increase of fishing activities and push the use of fuel and trade in ships and other fishery equipment. Sectors that utilize the output of Sector 33 and Sector 152 as its inputs for their production processes (such as Sector 56 and 55), are had relatively small output compared to other sectors as listed in Table 1. It implies that the backward link (input path) of Sector 33 and Sector 152 are higher than the forward link (output path). In the national level, the investment of fishery business by 127 trillion rupiah and the fishery port construction by 23.58 trillion rupiah will increase the national output by 213.10 trillion rupiah.

Tabel 3. Impact of the largest sectoral income and Fish Processing Industry

Rank	Code	Sector	Income Change (Million Rupiah)
1	33	Fish	23,093,052.85
2	152	Road, Bridge, and Port	3,516,128.16
3	156	Trade of the other than Cars and Motorcycles	1,114,137.77
4	95	Oil and Gas Refinery Products	874,893.99
5	30	Agriculture, Forestry and Fisheries Services	755,651.49
6	48	Various Mining Goods	648,386.33
7	72	Animal Food Processed	423,294.77
8	94	Other Goods from Non-Metal Material	337,765.44
9	158	Land Transportation Services beside Rail Transport	234,520.56
10	170	Financial and Banking Services	223,006.06
125	56	Fish Processing and Preservation	3,156.28
161	55	Dried Fish and Salted Fish	591.70
		National Income Change	35,185,261.61

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Table 3 displays the largest increase in sectoral household income due to increase of the investment in Sector 33 and Sector 152. Other sectors that have the largest impact in income, almost in line with the impact of output, ie Sector 156, Sector 95, and so on. In addition to having the high linkage to the Sector 33 and Sector 152, these sector also have higher household income coefficients than other sectors, which indicate that they have more labor-intensive than other sectors. In the national level, the income will increase by 35.2 trillion rupiah due to the increase in the investment.

4. Conclusion

The direct and indirect impacts of fisheries policy through the investment increase in fisheries bussiness and fishery port construction, are enjoyed highest by sectors which has high interlinkage with the fishery and port construction sectors. The increase of fisheries sector activity by investment increasing in the sector will attract inputs such as fuel-producing and trade of boats and fishery equipment, and promote the other sectors which use fishery output as its inputs, such as the fish preservation sector. From the the impact rankings, the sectors which preserve inputs for the fisheries and port sectors have the greatest impact in comparison with user-output sectors. It is reasonable because the output of the Fish sector are largely the final product that is consumed by people and is also exported.

The implication of the simulation results are the needed of a systemic policy that also supports the sectors which preserve input for fishery sector – which strengthens the domestic sector – as the investment policy increase the output, consumption and export of fisheries, as well as benefit the sector that preserve the inputs for fisheries sector.

To produce a more comprehensive study, and with some limitations in this study, there may be some development in the future. First, the development of shock scenarios by employing econometric model to obtain a more precise estimate of the value of shocks. Second, the use of global injection rates throughout 2015-2019 which combines the annual impact, ignores the emerging annual impacts for the next year, so in the future, a dynamic I-O model can be developed which can adapt the annual policy scenarios.

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