

**ANALYSIS OF THE IMPACT OF INCREASING THE VALUE OF  
FERRONICKEL EXPORTS ON DOMESTIC INDUSTRY AND IMPORTS USING  
THE 2016 INDONESIAN INPUT-OUTPUT TABLE**

**ANALISIS DAMPAK PENINGKATAN NILAI EKSPOR FERONIKEL  
TERHADAP INDUSTRI DALAM NEGERI DAN IMPOR DENGAN  
MENGUNAKAN TABEL INPUT-OUTPUT INDONESIA TAHUN 2016**

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**ABSTRACT**

*This study aims to determine the economic impact of increased ferronickel (FeNi) exports in Indonesia due to the nickel ore downstream policy implemented on January 1, 2020. The study employs a quantitative approach with Indonesia's 2016 Input-Output model (I-O Table) to measure the multiplier effect on the domestic economy and imports. The analysis reveals that the manufacturing industry sector has a forward linkage of 5.504 and an output multiplier of 1.845, making it the most positively impacted sector. In 2020, the increase in FeNi exports boosted the domestic output of the manufacturing industry sector by IDR40.091 billion or 0.61%. In addition, the agriculture, forestry, fisheries, and mining sectors also benefit. However, this policy also triggers increased imports of capital goods and raw materials to support nickel processing. These findings indicate that the downstreaming of nickel ore can have a significant economic impact, mainly through increased domestic output in the manufacturing industry sector, while indicating the need to strengthen supporting industries to reduce import dependence.*

**Keywords:** Ferronickel, Downstream, Input-Output, Multiplier Effect.

**ABSTRAK**

Studi ini bertujuan untuk mengetahui dampak ekonomi dari peningkatan ekspor feronikel (FeNi) di Indonesia akibat kebijakan hilirisasi bijih nikel yang diimplementasikan pada tanggal 1 Januari 2020. Studi ini menggunakan pendekatan kuantitatif dengan menggunakan model Input-Output (Tabel I-O) Indonesia tahun 2016 untuk mengukur dampak pengganda terhadap perekonomian domestik dan impor. Hasil analisis menunjukkan bahwa sektor industri pengolahan memiliki keterkaitan ke depan sebesar 5,504 dan pengganda output sebesar 1,845, menjadikannya sektor yang paling terdampak positif. Pada tahun 2020, peningkatan ekspor FeNi meningkatkan output domestik sektor industri pengolahan sebesar Rp40,091 miliar atau 0,61%. Selain itu, sektor pertanian, kehutanan, perikanan, dan pertambangan juga diuntungkan. Namun, kebijakan ini juga memicu peningkatan impor barang modal dan bahan baku untuk mendukung pengolahan nikel. Temuan ini menunjukkan bahwa hilirisasi bijih nikel dapat memberikan dampak ekonomi yang signifikan, terutama melalui peningkatan output domestik di sektor industri pengolahan, sekaligus mengindikasikan perlunya penguatan industri pendukung untuk mengurangi ketergantungan impor.

**Kata Kunci:** Feronikel, Hilirisasi, Input-Output, Efek Pengganda.

**INTRODUCTION**

International trade in nickel commodities generally shows an upward trend from year to year. Export and import transactions of this commodity are carried out by almost all countries in the world, including Indonesia. Based on data from the United States Geological Survey (USGS) and the Ministry of Energy and Mineral Resources (Kementerian ESDM) in 2020,

Indonesia has the largest nickel reserves in the world as much as 52% or 72 million tons of Ni from the total world nickel reserves of 139 million tons of Ni. Indonesia recorded nickel mining production of 800 thousand tons of Ni, or 29% of world nickel production 2019. It makes Indonesia important in supplying nickel raw material needs in the world. According to Azis and Abrianti (2021), Indonesia controls 37.2% of nickel trade

worldwide as the largest nickel supplier or exporter in 2019. However, the exported commodity is still in the form of raw nickel ore.

With this great potential and to maximize the economic added value of nickel commodities, the Indonesian government, through the Ministry of Energy and Mineral Resources, implemented a nickel commodity downstream policy by imposing a ban on nickel ore exports as of January 01, 2020. This provision is contained in Article 62A of Ministerial Regulation (Permen) of Ministry of Energy and Mineral Resources Number 11 of 2019 concerning the Second Amendment to Permen of Ministry of Energy and Mineral Resources Number 25 of 2018

concerning Mineral and Coal Mining Business. Nickel ore with a grade of <1.7% is prohibited from being sold abroad before being processed and refined first. So, holders of Mining Business Permits (IUP) for production operations must use nickel ore for domestic utilization.

This downstream policy has had a very significant impact on the volume of nickel ore exports. Table 1 shows that in 2020, the volume of nickel ore exported was only 1.4 tons, with a foreign exchange contribution of USD116. It differs from the previous three periods, namely, 2017 to 2019. The export volume has increased every year.

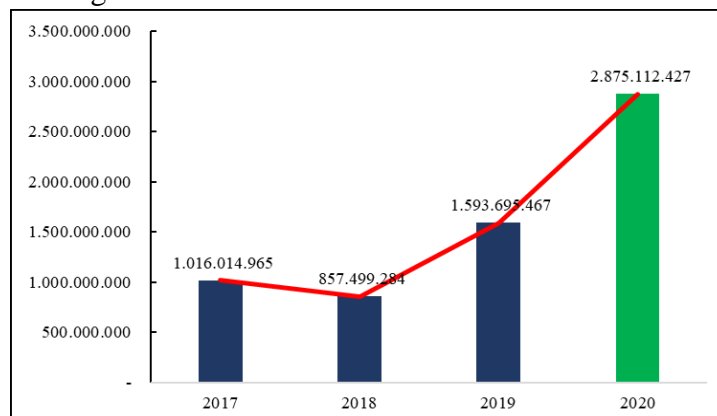
**Table 1. Export Volume and Export Value of Nickel Ore HS Code 260400 for the Period 2017 to 2020**

Year	Export Volume (kg)	Export Value (USD)
2017	4,882,728,000	155,189,438
2018	19,764,459,000	628,026,534
2019	32,380,132,000	1,097,012,523
<b>2020</b>	<b>1,404</b>	<b>116</b>

Source: processed from United Nations (UN) Comtrade Database (2024)

On the other hand, this decision spurred an increase in refined nickel production. One of the processed nickel products whose production has increased sharply since the implementation of nickel downstreaming is ferronickel

(FeNi). FeNi is a smelter product with an average nickel content of 20%. From 2019 to 2020, FeNi export transactions experienced a massive surge, as presented in Figure 1 and Figure 2.

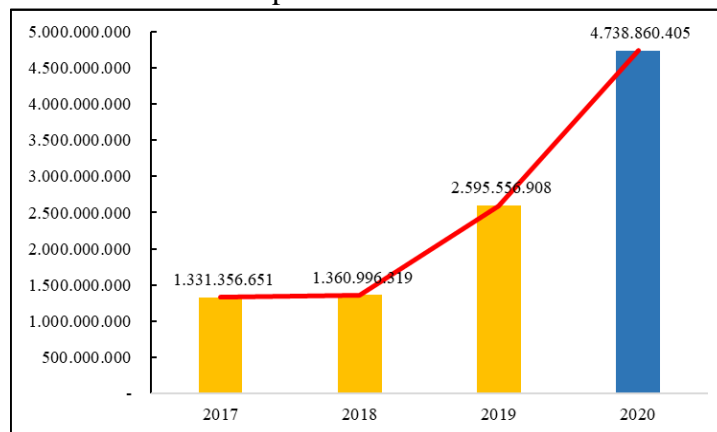


**Figure 1. Export Volume of FeNi HS Code 720260 Period 2017 to 2020 in Kilogram Units**

Source: processed from UN Comtrade Database (2024)

In Figure 1, it can be seen that there was an increase in FeNi production by 1.281 million tons of Ni compared to 2019. It has implications for the increase in export value obtained by Indonesia in 2020 of USD4,738.86 million, as seen in Figure 2. The existence of a shock in the form of an increase in both the export

volume and export value of FeNi commodities proves that the nickel downstream policy can significantly impact the Indonesian economy.



**Figure 2. Export Value of FeNi HS Code 720260 Period 2017 to 2020 in USD Units**

Source: processed from UN Comtrade Database (2024)

Based on the above background, this study aims to analyze the multiplier impact caused by the nickel ore export ban. This research is limited to increased FeNi commodity exports with HS code 720260 throughout 2020. Explaining the economic impact of the final demand of increased FeNi exports, this study uses the Indonesia Input-Output (I-O Table) model of Total Transactions at 2016 Basic Prices released by the Central Statistics Agency (BPS).

## METHODS

This study uses a quantitative approach with an Input-Output analysis model (I-O Table) to measure the economic impact of increasing FeNi exports on Indonesia's domestic and import sectors in 2020. The data used in this study are secondary data from the 2016 Indonesian Input-Output Table published by BPS and the export value of FeNi commodities issued by UN Comtrade. Cahyono and Sumargo (2005) revealed that analysis using the I-

O Table is an effective tool to explain the impact of a policy on output measurably.

## RESULT

### Forward Linkage and Backward Linkage

The mining and quarrying sector and the manufacturing industry sector are included in the nickel processing and refining industry as described in the 2020 Standard Classification of Indonesian Business Fields published by the Ministry of Investment / Investment Coordinating Board (BKPM). So, this research focuses on analyzing the effect of increasing exports in these sectors.

Linkage analysis explains the relationship between specific sectors and other economic sectors. Generally, there are two linkages: backward linkage analysis, known as attractiveness, and forward linkage analysis, known as the degree of sensitivity. Backward linkage describes the changes in one sector that will result in the input supply sector also changing. Meanwhile, forward linkage

describes changes in final demand in all upstream sectors that are responded to by downstream sectors (Wijaya et al., 2014).

**Table 2. Direct Forward Linkage and Direct Backward Linkage**

Sector	Direct Forward Linkage	Direct Backward Linkage
Mining and quarrying	0.416	0.324
Manufacturing industry	2.281	0.610

Source: processed from BPS (2024)

Table 2 shows that the mining and quarrying sector has a Direct Forward Linkage (DFL) of less than 1. It explains that the ability of these two sectors to influence downstream inputs is still lower than the average of all economic sectors. On the other hand, the DFL of the manufacturing industry sector is greater than 1, so this sector can impact downstream inputs above average compared to other sectors. Furthermore, the mining and quarrying sector and the manufacturing industry sector have a Direct Backward Linkage (DBL) smaller than 1, and these two sectors can only influence the sector's growth supply below average or relatively smaller than the other sectors.

Based on Table 3, the mining and quarrying sector and the manufacturing industry sector have high Total Forward Linkage (TFL) of 2.138 and 5.504. This value explains that every time the final demand of the two sectors increases by

IDR1, it will increase the input of the downstream sector, namely the mining and quarrying sector, by IDR2.138 and increase the input of the downstream sector of the manufacturing industry sector by IDR 5.504. The Total Backward Linkage (TBL) value for both sectors also shows a reasonably high TBL, where each is the mining and quarrying sector of 1.603 and the manufacturing industry sector of 2.112. This value illustrates that an increase in final demand by IDR1, *ceteris paribus*, will increase the upstream production output of the mining and quarrying sector by IDR1.603 and the upstream production output of the manufacturing industry sector by IDR2.112. The high linkage between a sector and its upstream sector indicates the important role of intermediate inputs for the production process in the related sector.

**Table 3. Total Forward Linkage and Total Backward Linkage**

Sector	Total Forward Linkage	Total Backward Linkage
Mining and quarrying	2.138	1.603
Manufacturing industry	5.504	2.112

Source: processed from BPS (2024)

### Analysis of Domestic Output Multiplier

The output multiplier estimates the ripple effects of economic impacts caused by variations in sectoral output. (Isard, 1960 cited in Setiawan & Ariutama, 2018). These effects include changes in household income due to sectoral output changes, employment opportunities generated by such changes,

and the added value derived from each sector (Isard, 1960, cited in Setiawan & Ariutama, 2018). The output multiplier aims to illustrate that every change in final demand by one currency unit will increase output in all economic sectors by the value of the output multiplier owned by a sector (Wijaya et al., 2014).

**Table 4. Five Sectors with the Largest Domestic Simple Output Multiplier**

Sector	Simple Output Multiplier
Electricity and gas supply	2.606
Construction	1.861
Manufacturing industry	1.845
Transportation and warehousing	1.805
Health and social work services	1.731
<b>Average</b>	<b>1.649</b>

Source: processed from BPS (2024)

Based on Table 4, the five sectors with the most significant multiplier values are include the electricity and gas supply sector, the construction sector, the manufacturing industry sector, the transportation and warehousing sector, and the health and social work services sector. FeNi commodity is a commodity produced by the manufacturing industry sector. The manufacturing industry sector has an output multiplier of 1.845. This value implies that for every one-unit increase in final demand for the manufacturing sector, the sector's output increases by IDR1.845.

The manufacturing sector is a sector that has a reasonably large output multiplier number because it is the third largest sector, and its value is above the average output multiplier number. However, the mining and quarrying sector is not included in the five largest sectors and is below the manufacturing

sector. It indicates that if nickel commodities are only exported in nickel ore, it will produce a relatively small output because nickel ore is a commodity from the mining and quarrying sector. Conversely, suppose nickel ore products are downstream, processed, and refined, one of which becomes FeNi. In that case, it will produce a larger output multiplier because it includes commodities produced from the manufacturing industry sector.

#### **Impact of Increase in FeNi Export Value on Industries/Sectors in Domestic Economy and Imports**

A significant change in the value of FeNi exports due to the nickel ore export ban will also cause output multipliers in related sectors and other sectors.

**Table 5. Changes in Domestic Output as a result of a Shock in the Value of FeNi Exports in Millions of Rupiah Units**

Sector	Before Shock	Output Change	After Shock
Manufacturing industry	6,495,229,767	40,091,139	6,535,320,906
Agriculture, forestry, and fisheries	1,896,147,384	5,569,800	1,901,717,185
Mining and quarrying	1,118,050,683	2,794,605	1,120,845,288
Wholesale and Retail			
Trade; Repair of Cars and Motorcycles	2,411,401,412	2,561,111	2,413,962,523
Transportation and warehousing	1,482,724,513	1,226,561	1,483,951,073

Source: processed from BPS (2024)

Based on the data in Figure 2, the total increase in the value of FeNi exports during 2020 compared to 2019 is

USD2,143,303,497. When multiplied by the exchange rate from the Ministry of Finance Decree (KMK) applicable on

December 31, 2020, which was IDR14,228, the total increase in the export value of FeNi amounted to IDR30,494,922,155,316.

From this total increase related to domestic output, Table 5 shows that the sector that experienced the most enormous output change was the processing industry sector, which amounted to IDR40,091,139 million. This amount was more significant than the total increase due to the large output multiplier from the manufacturing industry sector. When viewed from the percentage change, the increase in FeNi exports in 2020 increased the domestic output of the manufacturing industry sector by 0.61%.

In addition to the impact on the manufacturing industry sector, other

sectors significantly affected by the increase in FeNi export value are the agriculture, forestry, and fisheries sector, as well as the mining and quarrying sector. Although the raw materials for FeNi processing are commodities from the mining and quarrying sector, it turns out that other sectors also have a greater impact than the mining and quarrying sector, namely the agriculture, forestry, and fisheries sector. The impact on this sector can occur because the downstream processing of nickel will produce FeNi products, which in turn become raw materials in the tool or equipment industry used in the agriculture, forestry, and fisheries sector.

**Table 6. Changes in Imports as a result of a Shock Change in the Value of FeNi Exports in Millions of Rupiah Units**

Sector	Before Shock	Output Change	After Shock
Manufacturing Industry	1,781,017,933	3,109,838	1,784,127,771
Mining and quarrying	115,974,656	417,435	116,392,091
Agriculture, forestry, and fisheries	107,709,850	322,242	108,032,092
Company Services	108,848,579	129,509	108,978,088
Information and communication	54,418,917	50,279	54,469,196

Source: processed from BPS (2024)

Regarding the impact on the value of imports, Table 6 explains that the manufacturing industry sector is the most significant output value change in imports as an increase in the value of FeNi exports. It can occur because raw material processing requires products from industrial processing, such as machinery and other raw material products. Hence, the most significant import increase is also in the manufacturing sector. Unlike the results of domestic output change, the mining and quarrying sector was the second largest sector that experienced imported output change. The nickel downstreaming policy by processing

first can also cause an increase in imports of mining and quarrying sector products. This import increase can occur due to other raw materials used to produce FeNi, which must still be obtained through imports.

## CONCLUSION

By conducting a linkage analysis of the sectors related to the increase in the value of FeNi exports, it can be concluded that any increase in the final demand of the two sectors by IDR1 will increase the input of the downstream sector, namely the mining and quarrying sector by IDR2.138 and increase the input of the downstream sector of the

manufacturing industry sector by IDR5.504. Meanwhile, each increase in final demand by IDR1, *ceteris paribus*, will increase the upstream production output of the mining and quarrying sector by IDR1.389 and the upstream production output of the manufacturing sector by IDR1.946.

From the results of the multiplier analysis of Indonesia's Input-Output in 2016, the sector with the most significant domestic multiplier output value is the electricity and gas supply sector, followed by the construction sector and the manufacturing industry sector in second and third place. Government policy by downstreaming nickel is the right step because the output multiplier value of the manufacturing industry sector is greater than the output multiplier value of the mining and quarrying sector, so the downstreaming of nickel will produce greater domestic output.

The increase in the value of FeNi exports has a considerable impact on changes in domestic output, especially in the manufacturing industry sector. However, in addition to the impact on this sector, the shock also affected the agriculture, forestry, and fisheries sector, and the mining and quarrying sector in second and third place. Regarding changes in import output, the sector with the most enormous impact is the manufacturing industry sector, followed by the agriculture, forestry, and fisheries sector, and the mining and quarrying sector in second and third place. It shows that nickel ore processing activities still require capital goods/equipment and other raw materials that must still be obtained from outside Indonesia.

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