Jurnal Pertahanan

THE ROLE OF THE INDONESIAN STEEL INDUSTRY IN SUPPORTING THE INDONESIA DEFENSE INDUSTRY

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Article Info

Abstract

The steel industry plays a pivotal role in driving the economy of a country because its production is used not only as raw material by many downstream industries, such as defense, machinery, and automotive industries, but also for infrastructure development, such as roads, bridges, and buildings. This study aims to analyze the role of the Indonesian steel industry in supporting the Indonesian defense industry and analyze the steel industry value chain, the competitiveness of domestic steel products against imported steel, and the relationship between the steel industry and the defense industry. This research used sequential mixed research methods, using raw data of manufacturing survey by Central Statistics Agency (BPS). Descriptive analysis, such as geometric growth rate, competitiveness analysis using the Trade Specialization Index (ISP), and analysis of the linkage between upstream and downstream steel industries using the 2010 Input-Output Table, employed in this research. The results showed that out of 16 million tons domestic demand for iron, more than half came from imports. Regarding the role of the steel industry in supporting the defense industry, it can be concluded that the contribution of domestic steel products is very small and has not been able to fully support the defense industry, because there are still many types of steel that must be imported to meet the needs for raw materials for the defense equipment. The 2010 Input-Output Table also shows that the value of domestic steel products used as raw material by the domestic weapons, ammunition, and metallurgy industries was only around IDR. 247.44 billion or only 0.14% of the total domestic use of steel.

INTRODUCTION

To meet domestic steel demand, the government continues to develop the steel industry by producing various types of steel that were previously imported. Through the import substitution strategy implemented by the government since the 1970s, the structure of the domestic steel industry has been gradually strengthened, which is expected to reduce the dependence of Indonesia on imported steel and increase the added value of the domestic steel industry (Kementerian Perindustrian, 2015).

Indonesia has quite a lot of iron ore resources, both as raw material for pellets, sponge iron, etc., which are scattered in several provinces. Until the end of 2013, iron ore was only exported in the form of raw materials at low prices, then Indonesia imported processed pellets, sponge iron, and others at higher prices. Through Law No. 4 of 2009 on Mineral and Coal Mining, starting January 12, 2014, the government has banned the export of iron ore in its raw form. Since the enactment of Law No. 4 of 2009, several smelter companies have been established to process iron ore into pellets, sponge iron, and other inputs, so that the structure of the steel industry in Indonesia becomes stronger and more complete from upstream to downstream.

Initially, the development of the steel industry in Indonesia was prioritized to meet the demand for steel for development; roads, bridges, office buildings, markets, houses, and other infrastructure buildings. Along with the population growth, technological developments and the increasing demand for various types of steel, such as household needs and office equipment, the motor vehicle industry, the defense industry (the weaponry industry, combat vehicles, and submarines), the need for various types of steel also continues to increase.

Numerous types of steel directly support the defense industry and are an integral part of many diversified military applications (Zekelman Industries, 2007). Steel's importance to the military must also be looked at in a broader context to include both direct and indirect to the military infrastructure. All of the steel goes into the tanks, ships, and many military types of equipment.

Nevertheless, the development of demand for various types of downstream industries has not been matched by the supply of types of steel required domestically, so some have to be imported. The rapid development of weapons, automotive, machinery, and other technologies that require certain types of steel with very high specifications and quality, cannot be matched by the domestic steel industry and must be imported from abroad. As a result, the value of steel imports also continues to increase every year which in turn can burden the Indonesian economy. If the demand for defense industry steel was very dependent on imports, it could endanger the domestic defense system, because other countries could estimate the number of defense equipment produced in Indonesia.

As one of the main components in producing various defense equipment produced by the defense industry, such as PT. Pindad which produces various types of weapons and combat vehicles, PT. PAL which produces warships and submarines, as well as other defense industries, the availability of steel has an imperative role. This study aims to determine the role of the steel industry in supporting defense industries such as PT. Pindad and PT. PAL. In addition, this research also analyzes the performance of the steel industry in Indonesia, the competitiveness of steel products against imported steel, the use of steel in PT. Pindad and PT. PAL, and the linkages between the steel industry and the defense industry.

METHODS

This research used sequential mixed research methods. The quantitative research used the 2017 Manufacturing Industry Survey data from the Central Statistic

Agency (BPS), while the qualitative research was conducted through a Focus Group Discussion (FGD) with several source persons from the management of the Indonesian steel industry association.

The Manufacturing Industry Survey is conducted annually by BPS and covers all large industries (which have a workforce of 100 people or more) and medium-sized industries (which have a workforce of between 20-99 people), including the steel industry. Thus, all 310 companies engaged in the steel industry, both large and medium industries, were involved in this study. However, after processing the data, it turned out that several steel industry companies did not collect their data completely.

In addition to secondary data from BPS, the data sources for this study also came from associations of Indonesian steel industry companies and PT. Pindad and PT. PAL. Data from PT. Pindad and PT. PAL was about the use of steel in the two companies, which were differentiated according to the volume and value of steel usage, and the origin of the steel both domestic and imported. There were several methods of analysis used in this research, namely descriptive analysis, such as tables, average growth rate (geometric mean), competitiveness analysis using the Trade Specialization Index (ISP) method, and analysis of the linkage between upstream and downstream steel industries by using the 2010 Input-Output Table (BPS, 2015). The formula for calculating the Geometric Growth Rate and the Trade Specialization Index (ISP) (Kementerian Perdagangan RI, 2009), is as follows:

Geometric Growth Rate:

$P_t = P_0 (1 + r)^t$

where:

P_t = the value of exports or imports for the current year

P_0 = base year export or import value

r = growth rate

t = length of the period

Trade Specialization Index:

$$ISP = \frac{X - M}{X + M}$$

Where;

X = export value and M = import value

ISP values range from (-1) to (+1). If the ISP is positive (> 0), the value of Indonesian steel exports is greater than imports, which means that the competitiveness of Indonesian steel products is better than imported steel, conversely, if the ISP is negative (<0), the value of imported steel is greater than the value of exports which means that Indonesian steel products are less competitive than imported steel products.

RESULT AND DISCUSSION
Steel Industry Value Chain

Figure 1 exhibits the value chain or tree for the steel industry, from sand/iron ore to various types of steel end products which are widely used as raw materials for various downstream industries, such as the defense industry, the automotive industry, households, and offices appliance industry. It can also be seen from Figure 1 that there are still several types of steel that have not been produced domestically (red color) so that to meet domestic demand, several types of steel must be imported from various countries, especially China.

Regarding industries that process iron ore into iron ore concentrate and then processed into pellets, etc, currently, several smelter companies process iron ore into concentrates, pellets, sponge iron, and others. Thus, the need for pellets, sponge iron, and others as raw materials for various types of steel industries that have been imported so far have been partially fulfilled, thereby saving the foreign exchange. In addition, the existence of a smelter that processes iron ore into pellets and other products, can also employ many laborers, create added value, and contribute to Gross Domestic Product (GDP).
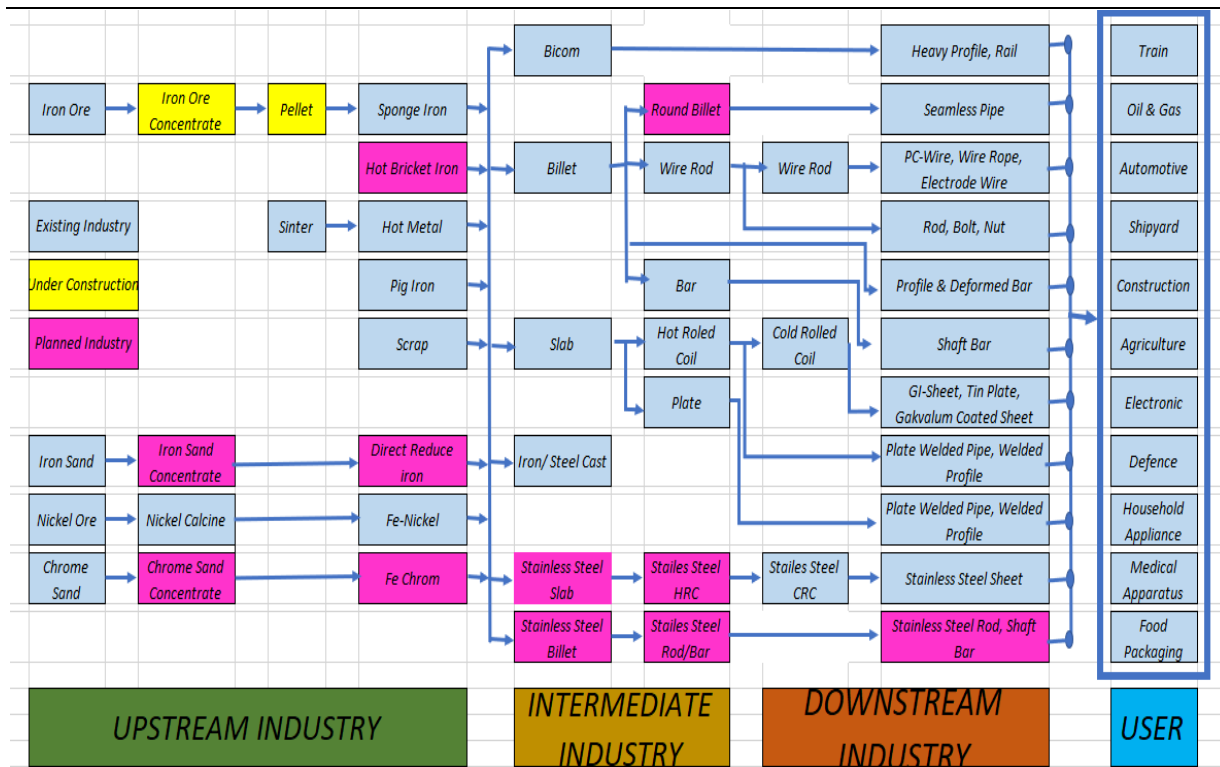
Figure 1. Steel Industry Value Chain
Source: Indonesian Iron Steel Industry Association, 2015

The existence of a smelter that processes iron ore/sand into iron ore concentrate then processed into pellets/sponge iron/pig iron has started to appear a lot since 2012 after the issuance of Law Number 4 of 2009 concerning Mineral and Coal Mining. The construction of an iron ore smelting plant which if processed will have an added value of 5.2 times greater than the added value of unprocessed iron ore (Suherman, 2016). This is expected to be able to meet the demand for pellets/sponge iron/pig iron as raw material for the national steel industry and can reduce dependence on imports, which in turn can strengthen the structure of the domestic steel industry.

According to the Directorate General of Mineral, Coal, and Geothermal, the potential of iron ore in Indonesia is quite large, which is around 1 billion tons, and is spread across almost all provinces (Haryadi & Saleh, 2012). To date, exploration of crude iron ore has only been carried out simply and has not been processed into pellets. Most of the raw iron ore is then

exported at relatively cheap prices because it has not been processed. Ironically, Indonesia then imports processed iron ore in the form of pellets, as input from the domestic steel industry.

The quality (iron content) of iron ore scattered in various provinces in Indonesia is not inferior to that of imported iron pellets. The results of research (laboratory tests) conducted by Aritonang (2019) show that the iron content (Ferrum) of iron sand in several places in Indonesia is better than the iron content of imported iron pellets. From iron sand samples taken in Lumajang Regency (East Java), Tanggamus Regency (Lampung), and Tasikmalaya Regency (West Java), it can be seen that the iron content (Ferrum) of iron sand in the three locations respectively are; 73.05% in Lumajang, 72.03% in Tasikmalaya and 71.03% in Tanggamus. Compared to the iron content of pellets from three importing countries, namely Brazil (68.9%), Sweden (66.5%), and Chile (61%), the iron content of iron ore in Indonesia is much higher.

Characteristics of Steel Industry Companies

Every year, BPS conducts a Manufacturing Industry Survey of all industrial companies throughout Indonesia, including the iron and steel industries. The results of the 2017 Manufacturing Industry Survey show that of all iron and steel industry companies in Indonesia, around 49.14% of iron and steel industry companies, the source of capital is purely from company owners or non-capital facilities, 38.29% are Domestic Investment status (PMDN) and 12.57% have Overseas Investment status (PMA) (Table 1).

The low percentage of iron steel industry companies with Overseas Investment status indicates that investment in the iron and steel industry sector is less attractive to foreign investors. This needs to be considered by the government, especially the Investment Coordinating Board (BKPM) as an institution that deals with investment issues, to investigate the causes because investment in the steel industry is a capital-intensive category that requires a large amount of investment value. Therefore, Indonesia needs investors from abroad, so that the domestic steel industry can develop more rapidly. If it only relies on domestic investors, it will take a longer time to make the structure of the steel industry stronger. Currently, there are still many types of steel with certain specifications and qualities, especially those used as raw material for the defense industry which are still imported because they cannot be produced domestically.

Table 1. Percentage age of steel industry companies according to investment status

Investment Status	%
Domestic Investment Facility	38.29
Overseas Investment Facility	12.57
Non Facility	49.14
Total	100.00

Source: BPS, 2019, processed by the Authors

Other information related to the characteristics of the steel industry is the ownership of the Indonesian National Standard (SNI). It turns out that of the 310 steel industry companies, only 13.87% already have SNI, while the rest (86.13%) do not have the SNI (Table 2).

This fact is quite apprehensive because not having an SNI label means that the quality of the steel products produced does not meet the standards. There are four kinds of SNI given to industrial companies, namely SNI for Products, Management, Test Method, and Process. The types of SNI that are mostly owned by steel industry companies are SNI Products, and only a few have SNI Management, SNI Test Method, and SNI Process.

Table 2. Percentage of steel industry companies according to SNI ownership

Ownership of SNI	%
Have SNI	13.87
Have no SNI	86.13
Total	100.00

Source: BPS, 2019, processed by the Authors

Meanwhile, seen from the sources of raw and auxiliary materials used in the production process of the steel industry, of the 310 steel industry companies that were respondents to the 2017 Manufacturing Industry Survey, only 22.58% of which raw and supporting materials are 100% from domestic production (Table 3). Most (73.23%) of the steel industry companies using raw and auxiliary materials are a mixture of domestic and imported products, while 100 % of raw and auxiliary materials originating from imports is only 4.19 %.

Table 3. Percentage of steel industry companies according to the source of raw and auxiliary materials

Source of Raw and Supporting Materials	%
100 % Domestic	22.58
100 % Imported	4.19
Mix	73.23
Total	100.00

Source: BPS, 2019, processed by the Authors

Another indicator of the performance of the steel industry is the company's ability of companies to export the steel it produces. It turns out that of the 310 steel industry companies in Indonesia, only about 3.87% have ever exported their products, while the

rest (96.13%) have never exported their products (Table 4).

There are at least two reasons that might cause only a few steel industry companies to be able to export their products. First, because the quality of the steel produced cannot compete with the same products from other countries. Second, most of these companies are more oriented towards meeting domestic steel demand, and rarely export-oriented because the profits will be greater if they sell their products domestically.

Table 4. Percentage of steel industry companies exporting products

Exporting Production Products	%
Yes	3.87
No	96.13
Total	100.00

Source: BPS, 2019, processed by the Authors

The performance of steel industry companies can also be seen from the utilization or the utilization of the steel industry's installed production capacity. Table 5 exhibits that almost 70% of all steel industry companies in Indonesia only produce less than 50% of their installed capacity and only about 30% of steel industry companies have an installed capacity utilization of more than 50%. This fact is certainly very apprehensive. If all steel industry companies can produce at full capacity, then Indonesia's dependence on imported steel can be reduced.

One of the reasons why steel industry companies cannot produce at full capacity is alleged because the steel products produced are unable to compete with imported steel products which are cheaper, especially steel from China. The Chinese government's policy of providing incentives and conveniences for imported steel from China has caused the imported steel prices to be cheaper. Therefore, the Ministry of Industry can make policies that can protect the domestic steel industry.

Table 5. Percentage of steel industry companies according to the ratio of production to installed capacity

The ratio of Production to Installed Capacity	%
< 50 % of Installed Capacity	69.35
≥ 50 % of Installed Capacity	30.65
Total	100.00

Source: BPS, 2019, processed by the Authors

Competitiveness of Indonesian Steel Products

The competitiveness of Indonesian steel products is measured using the Trade Specialization Index (ISP) indicator, during the 2014-2019 period. ISP values range from (-1) to (+1). If the ISP is negative, it means that the value of steel imports is greater than the value of exports, conversely, if the value of the ISP is positive, it means that the value of steel exports is greater than the value of imports (Kementerian Perdagangan RI, 2009).

Table 6 shows that during the 2014-2019 period, Indonesian steel products were less competitive than imported steel products. This can be seen from the negative ISP value during the 2014-2019 period. Even though the ISP value is still negative, the figure continues to increase almost every year from -0.73 in 2014 to -0.31 in 2019, except in 2016 it appeared to have a decrease to -0.75.

The improvement in the ISP value of Indonesian steel products shows that the competitiveness of Indonesian steel products seems to be getting better against world steel products. The pattern of increasing ISPs is expected to continue so that in the next few years the value of ISPs for Indonesian steel products can be positive, which means that the value of Indonesian steel exports can exceed the value of imports.

It can also be seen from Table 6 that the value of Indonesian steel exports continues to increase every year from US$ 1.4 million in 2014 to US$ 5.05 million in 2019. Using

Table 6. Trade Balance and Trade Specialization Index (ISP)
Steel 2014-2019

Year	Export (Million US$)	Import (Million US$)	Trade Balance (Million US$)	ISP
2014	1.40	8.88	-7.48	-0.73
2015	1.69	7.13	-5.44	-0.62
2016	0.92	6.57	-5.65	-0.75
2017	2.17	7.80	-5.63	-0.57
2018	4.82	9.35	-4.53	-0.32
2019	5.05	9.57	-4.52	-0.31
Growth (%/year)	29.5	1.7	-	-

Source: Indonesian Iron Steel Industry Association, 2020, processed by the Authors

the Geometric Mean method, the average growth of steel export value in Indonesia is 29.5% per year. Meanwhile, the import value of steel also appeared to have increased from US$ 8.88 million in 2014 to US$ 9.57 million in 2019 or only grew by an average of about 1.7% per year, or much smaller than the growth in export value. In line with the growth in the value of steel exports which is much greater than the growth in import value, the deficit in the trade balance for steel commodities also continued to decline from around -7.48 million US$ in 2014 to -4.52 million US$ in 2019.

In the article on the Analysis of the Competitiveness of the Steel Industry in Encounter the ACFTA (ASEAN-China Free Trade Area), using the Revealed Comparative Advantage (RCA) method and the Constant Market Share (CMS) analysis, Cahyani (2014) concluded that China's competitiveness appears to be in the first rank with an average RCA of 1,276. Meanwhile, the competitiveness of Indonesian steel products in the ASEAN and China markets is in fifth place with an average RCA of 0.5193 smaller than Malaysia with an average RCA of 0.6528, Thailand (average RCA 0.6354), and Vietnam (average RCA 0.6292).

Meanwhile, the results of the CMS analysis show that the effect of market distribution is more dominantly influenced by imports from ACFTA countries on the growth of national steel industry exports. The influence of competitiveness during the 2003-2012 period was mostly negative,

while the periods which had a positive effect were only in 2003, 2006, and 2009. This indicates that most of Indonesia's market share has been taken over by competing countries. The positive effect given by the effect of commodity composition exhibits that Indonesia is concentrating its exports on commodities that are experiencing an increase in demand.

Another research conducted by Prasetyo (2010) states that the opportunity for the development of the Indonesian national steel industry is still wide open because the level of per capita steel consumption is still very low, namely only 33 kg per capita per year. Even though the national steel consumption tends to increase, its production is always below the level of consumption required. Various factors that cause this problem, namely a) the raw material supply industry is underdeveloped, b) the lack of availability and the increase in energy prices of the upstream steel industry, c) the permanent dependence of the national steel industry on imported raw materials, d) the low amount of investment in the development of the steel industry and related industries or derivatives, e) low growth in consumption of the national steel industry, f) low competitiveness from various other sides, (g) ineffective regulatory policies, so that restructuring is required, especially in terms of supervision, etc.

Meanwhile, research conducted by Darmayanti (2007) on the market structure of the iron and steel base metal industry in

Indonesia using the concentration ratio method of the four largest companies (Concentration Ratio, CR, 4) concluded that the iron and steel structure of the Indonesian base metal industry is a strict oligopoly with CR4 of 71.15%. This means that the four largest steel industry companies in Indonesia dominate the steel market share in Indonesia by around 71.15%.

The Role of the Steel Industry in Supporting the Defense Industry
The analysis of the role of the steel industry in supporting the defense industry is carried out based on data on the use of steel obtained from two defense industry companies, namely PT. PAL produces warships, submarines, and others, and PT. Pindad produces various types of main weapons systems (defense equipment). Data on the use of steel were collected during the 2015-2019 period, based on the type of steel used and the source of the steel, both from imports and domestic production, both in volume and value.

Table 7 shows that about 60-80 types of steel are used by PT. Pindad to produce various types of defense equipment comes from imports with increasing import values starting from IDR. 6.5 trillion in 2015 to IDR. 23 trillion in 2019 or more than 95% of the total value of steel used. It seems that all the steel must be imported by PT. Pindad because it has not been produced domestically. Observed from the import volume of various types of steel used for defense equipment production, the import volume is very small, most of which are less than 1 ton per year, but the import value is very expensive. Due to the need for this type of imported steel being small but very expensive, the specifications of these types of steel should be very specific with very high quality. Therefore, the main reason these steels is not produced domestically might be because of high production costs, using high technology and specific raw materials. In addition, due to very small needs and very expensive prices, it does not meet economies of scale if produced in Indonesia, unless subsidized by the government.

Therefore, it can be concluded that until now, the domestic steel industry has not contributed much in supporting the defense industry in Indonesia, because most of the steel needed to produce various types of defense equipment, still has to be imported.

Meanwhile, to determine the use of steel at PT. PAL can be seen from Table 8 which shows the volume and value of steel used by PT. PAL for the 2015-2019 period, both from domestic production and from imports. It can be seen from Table 8 that PT. PAL only uses 3 types of steel products during the 2015-2019 period, and only imports one type of steel that is not produced domestically, namely the unequal angle type.

The import value of imported steel appeared to fluctuate during the 2015-2019 period, from IDR 10.9 billion in 2015, then decreased in 2016 and 2017, but increased again in 2019 to IDR 16.6 billion. Meanwhile in 2018, PT. PAL did not use imported steel for shipbuilding at all. It can also be seen from Table 8 that the %age of steel import value to the total

Table 7. Domestic and Imported Steel Usage Value at PT. Pindad 2015-2019
(Billion Rupiah)

Type and origin of steel	2015	2016	2017	2018	2019
Domestic					
10-20 Types	343	52	82	123	173
Import					
60-80 Types	6.494	9.952	10.079	21.399	22.824
Total	6.837	10.004	10.161	21.522	22.997
% Import Value	95.0	99.48	99.19	99.43	99.25

Source: PT. Pindad, 2020, processed by the Authors

Table 8. The Use of Domestic and Imported Steel Production at PT. PAL Indonesia (Persero) By Type, Volume, and Value in 2015-2019

Type and Origin of Steel	Volume (Ton)					Value (Million Rupiah)				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Domestic										
Steel Plate	4.920	297	4.279	202	11.575	37.981	2.298	35.405	2.122	116.127
Equal Angle	101	1.539	54	38	221	875	653	465	334	2.262
Import										
Unequal Angle	1.254	18	630	-	1.618	10.896	158	5.478	-	16.590
Total	6.275	1.853	4.963	240	13.414	49.753	3.109	41.348	2.456	134.979
% Import Value						21.90	5.08	13.25	0.00	12.29

Source: PT. PAL, 2020, processed by Authors

Table 9. List of 10 Biggest Steel Users in 2010

No.	List of Steel Users and Downstream Industry Using Steel	Intermediate Input Value (Million IDR)	**%**
1	Residential Buildings (TT) & Non- TT	31,902,479	18.58
2	Building and Electrical Installation, Gas, etc	26,199,682	15.26
3	Road, Bridge, and Harbor	20,866,199	12.16
4	Non-Ferrous Base Metal Industry	19,067,953	11.11
5	Other Metal Goods Industry	15,024,021	8.75
6	Metal Building Materials Industry	14,350,576	8.36
7	Basic Industry of Iron and Steel	14,342,154	8.36
8	Agricultural Infrastructure Industry	11,681,815	6.81
9	Other Buildings	3,894,798	2.27
10	Non-metal Goods Industry	3,359,209	1.96
11	**The weapon, Ammunition, and Metallurgy Industries**	**247,438**	**0.14**
12	Other Downstream Industries	10,703,301	6.24
13	Intermediate Total Demand	171,639,625	100.0
14	Total Final Requests	21,681,673	-
15	Total Requests	193,321,298	-
16	Total Steel Exports	15,000,000	-
17	Total Steel Import	64,900,000	-

Source: BPS, 2015, processed by the Authors

cost of using steel at PT. PAL, which was 21.90% in 2015, then decreased in 2016 and 2017 and increased again to 12.29% in 2019. Thus, the largest %age of steel import value was in 2015 namely 21.90%.

The Linkage between the Steel Industry and the Defense Industry

The 2010 Input-Output Table published by the Central Statistics Agency (BPS, 2015)

shows that around 53 types of end-demand and downstream industry activities use steel as a raw material (intermediate demand), with a total demand value of IDR 171.64 trillion. Meanwhile, the final demand value for the steel industry was IDR 21.68 trillion, most of which (69.2%) was for export (Table 9).

It can also be seen from Table 9 that the details of the value and percentage of the

largest use of steel products are used as an intermediate input, final demand, as well as export and import values of steel. Nearly 50% of steel products are used for residential buildings, electrical installations, gas, roads, bridges, and other buildings. While the rest is used as raw materials (intermediate input) by various downstream industries, including those used by weapons, ammunition, and other industries.

It can be seen from Table 9 that in 2010 the value of steel products used as raw material by the domestic weapons, ammunition, and metallurgy industries was only around IDR. 247.44 billion or only 0.14% of the total domestic use of steel. This fact also proves that the products of the domestic steel industry have not contributed much in supporting the domestic defense industry, as described in the previous section. This is because the need for steel as a raw material for the defense industry is actually of much greater value. During the 2015-2019 period, the total value of steel used by PT. Pindad and PT. PAL was around IDR. 6.9 trillion - IDR. 23.1 trillion, not to mention being used by other defense industry companies, such as PT. Dirgantara Indonesia, etc.

CONCLUSIONS, RECOMMENDATION AND LIMITATION

Steel is one of the important components for the production of various defense equipment produced by the defense industry, such as PT. Pindad, and PT. PAL. Nevertheless, the results of this study indicated that the domestic steel industry was not yet fully prepared to support the defense industry. From steel usage data, PT. Pindad for example, more than 95% of the steel value used as raw material for producing defense equipment during the 2015-2019 period came from imports. Meanwhile, the import value of steel used by PT. PAL for the 2015-2019 period was in the range of 5-21%. This is because the

type of imported steel has not been produced domestically.

In addition, the Input-Output Table also shows that in 2010 the value of domestic steel products used as raw material by the domestic weapons, ammunition, and metallurgy industries was only around IDR. 247.44 billion or only 0.14% of the total domestic use of steel. This fact proves that the products of the domestic steel industry have not contributed much to supporting the domestic defense industry.

The dependence of the defense industry on imported steel could endanger the domestic defense system, because Indonesia could be pressured by countries producing imported steel, both in terms of price and quality. In addition, these countries could also find out the production capacity and volume of various types of defense equipment produced by Indonesia.

One of the reasons that certain types of steel cannot be produced domestically is because the need for those types of steel is very small, and does not meet economies of scale if produced domestically. Several types of steel were imported by PT. Pindad for example, the volume of imports was even less than one ton per year. Thus, if it is still produced domestically, the steel industry company that produces it will suffer losses, unless it is given a subsidy by the government.

The results of the research also showed that from the processing of the 2017 Manufacturing Industry Survey data, the characteristics of the steel industry in Indonesia had not shown satisfactory performance. More than 86% of all steel industry companies did not have Industrial National Standards (SNI). In the absence of SNI, it can be assumed that the quality of the steel produced did not meet international quality standards.

Based on the conclusions obtained from the results of this study, several recommendations for developing a better steel industry that can support the defense industry in Indonesia are as follows:

1. There must be good coordination between the defense industry and the steel industry companies that can be represented by the Indonesian steel industry association regarding types of steel that are needed by the defense industry, specifications and quality of steel required, and prices. With this coordination, it is hoped that the domestic steel industry can produce all types of steel needed by the defense industry, to reduce dependence on imports, save foreign exchange, employ many laborers and increase the added value of domestic steel. In addition, the most important thing is to prevent other countries from knowing the availability of defense equipment and defense equipment production capacity of Indonesia.

2. It is better if the Ministry of Defense and the Ministry of Industry can facilitate coordination between the defense industry and the Indonesian steel industry association. Thus, if the cost of producing steel to produce defense equipment is too expensive, and does not meet the economies of scale to be produced, the Ministry of Defense and the Ministry of Industry can coordinate and provide solutions for how the mechanism should be carried out so that the steel needed by the defense industry can be produced domestically, for example by providing subsidies so that the price is affordable by the domestic defense industry.

The Ministry of Industry as a supervisor for manufacturing industrial companies in Indonesia is expected to be able to encourage the steel industry to improve the quality of steel produced to have SNI, so that it can compete in the international market, both in quality and prices. Moreover, with the increase in the quality of domestically produced steel, the prices can compete with similar imported steel products, which in turn can reduce the dependence of Indonesia on imported steel.

In carrying out this research, several limitations that must be encountered, among others, are as follows:

1. With the Covid-19 pandemic, research can only be carried out by requesting written data on the use of steel from PT. Pindad and PT. PAL. Qualitative data and information from the Indonesian Iron and Steel Industry Association can only be obtained through online Focus Group Discussion (FGD) activities.

2. Data on steel industry companies from the Manufacturing Industry survey conducted by BPS in 2017 is incomplete, so the steel industry data analysis can only be done descriptively.

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