Economic Assessment of Indonesia's Trade Policy Using Input-Output Analysis: A Study of Export Banning of Raw Mineral Commodities

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Rini Novrianti Sutardjo Tui

Akita University

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Economic Assessment of Indonesia's Trade Policy Using Input-Output Analysis: A Study of Export Banning of Raw Mineral Commodities

Department of Geosciences, Geotechnology, and Material Engineering for Resources

Graduate School of International Resource Sciences

D6517107

Rini Novrianti Sutardjo Tui

Supervisor Professor Tsuyoshi Adachi

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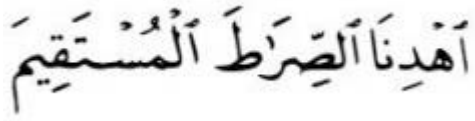

"Guide us to the straight path"

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Abstract

The Republic of Indonesia is a natural resource country that relies economically on its mining commodities. During the year 2000 – 2018, the mining sector of Indonesia contributes on average 10% towards its GDP. Therefore, as an intention to better maximize benefit from the mineral commodities, the government of Indonesia releases an export ban policy as a subset of the current mining law. This policy bans the exporting raw mineral, except coal, copper, iron ore, lead, and zinc. All minerals have to be fully processed and refined before they can be exported. The regulation states that export ban is intended to increase and optimize the main value of products, the supply of industrial raw materials, worker absorption, and state revenues.

Since Indonesia has a high dependency on its mining sector, any change in policy regarding mining commodities needs to be analyzed in order to see how the change will affect the overall economy. The analysis determines how this policy would affect the economy, whether it will bring the expected change or will it drive the country into a resource nationalism's trap. This study is among the first few analyses conducted to empirically prove the real benefit of the export ban.

As most of the previous researchers explained the international trade in term of import dependency, this study confirms that domestic dependency holds a more prominent role within the natural resource country that sits in the early stage of the global supply chain. Therefore, it will be more beneficial to assess the domestic dependency for the policy analysis. This study also examines the competence of the input-output approach in assessing trade policy. There are plenty of researches that utilize the input-output model in analyzing the public policy. This study is among the handful analyses linking the input-output model and mining resource trade policy, particularly in assessing an export ban as a form of export restriction.

This study assesses the composited input-output table of Indonesia of the year 2010, consisted of 26 sectors. This composited input-output table emphasizes on the 13 mining-related sectors, 11 of these sectors are mining commodities sectors. Analyzing the input-output table indicates that to fully implement the export ban, the government needs to put extensive effort to improve the domestic performance of the mining commodities. Apparently, the mining-related sectors are not significantly influential within the intermediate industries of Indonesia. It also indicates that these commodities mostly are being exported and apparently could provide more benefit as exported commodities.

However, as the government of Indonesia seemingly intends to fully embrace the nationalist policy, this study determines the potential benefit of the mining commodities. Focusing particularly on the mining commodities, the forward linkage shows that in term of providing boost for the overall economic growth, there is no particular mining commodities that stands out as prominent force. In term of backward linkage, the iron sand and iron ore sector has the highest backward linkage, indicates that compared to other mining commodities, this sector uses most of the output from the other sector. Further, the multipliers analysis is utilized to pinpoint the economic performance ability of the mining commodities. The mining commodities evidently have moderately ability to increase the revenue from change in demand, and enormous ability to increase the value of their outputs. However, in term of employment, these sectors cannot be relied on to improve the employment, either physically or monetary.

Further, the simulation on the domestic content indicates that the government needs to be careful in setting commodities that are excluded from export bans. The iron sand and iron ore that is currently excluded from the export ban evidently brings more positive impact than the nickel ore that is included in the export ban. This finding is verified by the panel data analysis. The calculation incorporates the export value of iron ore, copper, and nickel as well as the GDP value of Indonesia. The nickel represents the commodities that are affected by the export ban, and iron and copper as the commodities that are excluded of the export ban. The result indicates that for the mining export group of ores and metals, those three ores

evidently affect the gross export value of their mining group, which is the ores and metals group. Consequently, when the government fully implements the export ban policy, and includes those commodities into the export ban, decreasing of the gross export value for the particularly mining group is expected.

Keywords: input-output analysis, domestic content, export policy, mineral commodities

Chapter 1 Introduction

1.1. Introduction

As a policy, export restrictions are the way of government to interpose the management of the non-renewable natural resources. These export restrictions come in several forms, the most widely used are through the implementation of taxes and quota. Export restrictions often act as barriers to trade. Implementation of the export restrictions within a raw material rich countries frequently indicate the government's intention to protect the domestic industries, to provide competitive advantages for the downstream industries, or to gain more benefit from the raw commodities.

The important impact of the export restrictions is even more pronounced in the globalized trade flows. The globalization is often defined as ongoing process of greater economic interdependence among countries reflected in the increasing amount of cross-border trade in goods and services, the increasing volume of international financial flows and increasing flows of labor (Fischer, 2003). The globalization brings along internationalization of supply chain. A global supply chain is not much different from the typical supply chain. Therefore, as in typical supply chain, raw materials are the base of all production process. Among the raw materials, sufficient supply of certain raw minerals and metals play important role within the global supply chain for several reasons: the commodities are geographically concentrated in a few countries, many are used in the production of high-technology goods in strategic sectors and there are few substitutes for these raw materials given the present state of technology (Korinek & Kim, 2010). Consequently, international trade reflects regional and national advantages and specializations along the value chain, and export contribution of minerals and metals reflects the scale of mining in relation to other sectors, particularly in low and middle income countries (Ericsson & Löf, 2019). For each country that plays role in different stage of the global supply chain, the export restrictions will bring different impacts upon national economy.

One of the prominent supplier and exporter country of raw mineral materials is Republic of Indonesia. Republic of Indonesia is a Southeast Asian country, located in the intersection of the Pacific and Indian Oceans. As one of its economic primary movers, Indonesia relies heavily on its mineral resources, and as a mine producing country, the mineral resources are mainly traded as export commodities. Figure 1.1 highlights the contribution of mining sector towards Indonesia's overall export. During 2000 – 2017, mineral commodities on average contributed 26.25%, or approximately USD 41.43 billion. In addition to the mineral commodities, there are metal and stone commodities that also constructed export sector of Indonesia. Metal commodities are accounted for some part in the export sector, albeit small. During the year of 2000 to 2017, metal commodities contributed on average 4.79% towards the export sector. Similar case happened to stone industry as well. Stone industry contributed 2.19% averagely during those years. Together, these three commodities of mining, contributed on average 33.22% towards the economy.

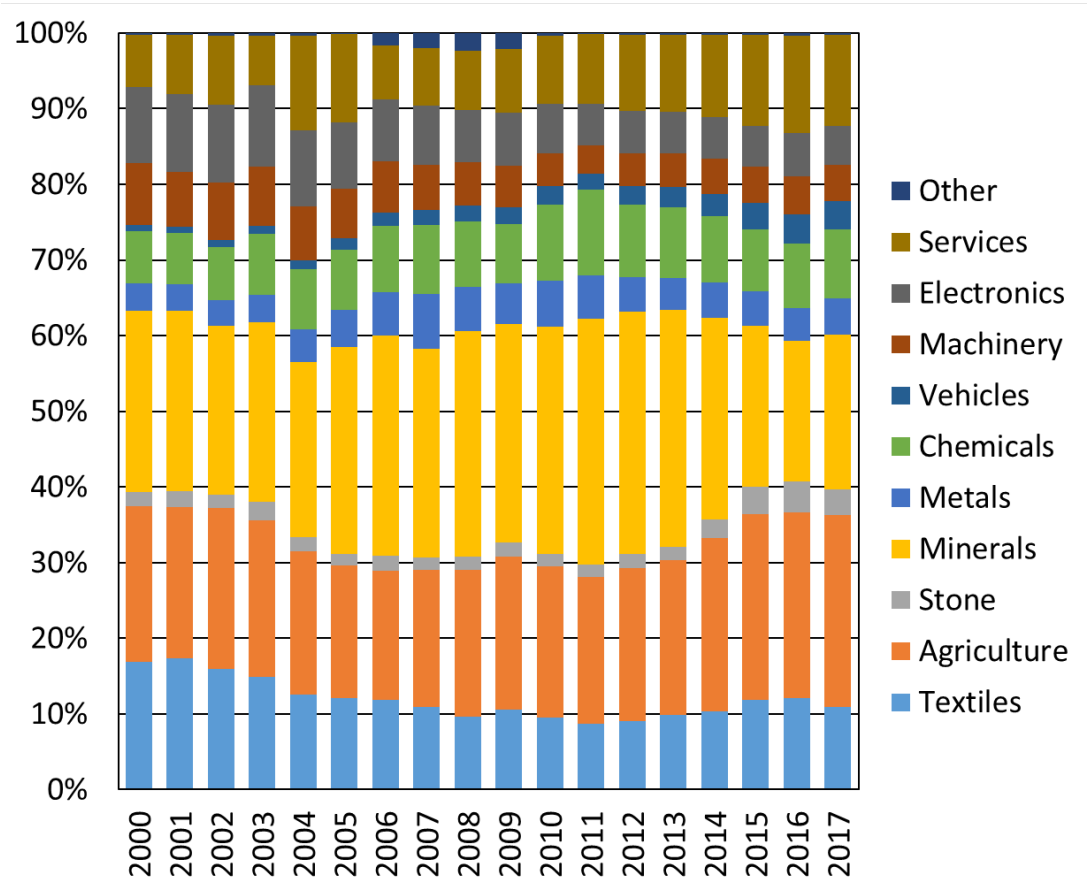

Figure 1.1 Distribution of export of Indonesia during 2000 – 2017 (Center of International Development at Harvard University, n.d.)

Indonesia's economic dependence on mining sector is not only exhibited through its export value, but also through the sector's contribution on GDP. As shown in Figure 1.2, on average, from the year 2000 to 2017, the sector contributes 10% towards the GDP, based on data from Indonesia's Central Bureau Statistics (Badan Pusat Statistik).

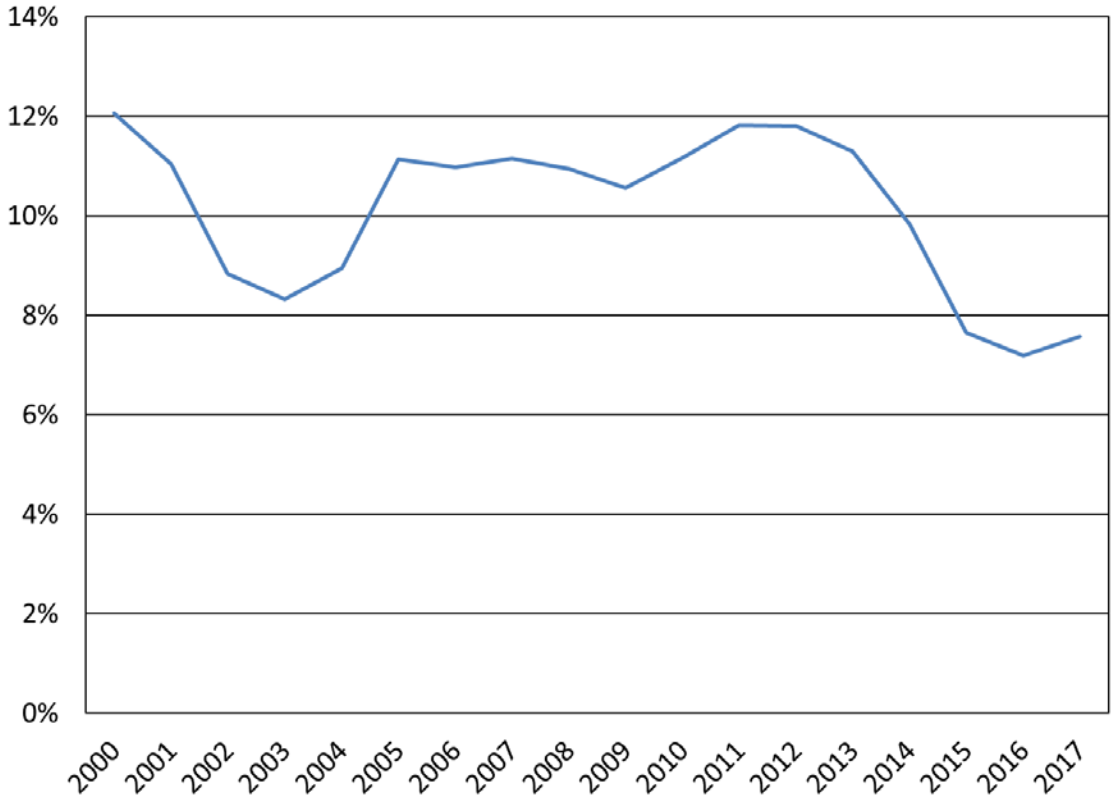

Figure 1.2 Contribution of Indonesia's mining sector towards its GDP during 2000 – 2017 (Badan Pusat Statistik, 2019)

Further, Indonesia's valuable raw mining commodities also put Indonesia as one of the top mine producing countries. Ericsson and Löf (2019) provided list of top 10 mine producing countries, shown in Table 1.1. Based on this table, there are three countries that have the highest increasing of mine value between the year 1996 and 2016. Ghana has 743% increasing of mine value, Indonesia has 739% increasing, and Peru has 725% increasing. However, among those three countries, Ghana and Peru experience leap of income group, from low to lower-middle income group, and lower-middle to upper-middle income group respectively. In other hand, although having huge increasing of mine value, Indonesia apparently could not use it as leverage to increase its income, as between 1996 to 2016, Indonesia is sitting still in the lower-middle income group.

Table 1.1 Top 10 mine producing country (Ericsson & Löf, 2019)

Country	Mine Value 2016	2016	Mine Value 1996	1996	Increasing rate, 1996 - 2016	Income Group 2016	Income Group 1996
	(Billion USD)	(%)	(Billion USD)	(%)			
China	304.3	30%	69.8	22%	436%	UM	L
Australia	108.5	11%	24.9	8%	436%	H	H
India	62.2	6%	15.3	5%	407%	LM	L
Indonesia	38.6	4%	4.6	2%	839%	LM	LM
Brazil	36.5	4%	7.2	2%	507%	UM	UM
Chile	28.6	3%	6.8	2%	421%	H	UM
Peru	23.1	2%	2.8	1%	825%	UM	LM
Mexico	16.4	2%	3	1%	547%	UM	UM
Colombia	8.8	1%	1.6	1%	550%	UM	LM
Ghana	5.9	1%	0.7	0%	843%	LM	L
Total Top 10	633	62%	137	44%	462%	-	-
Total	1029	100%	311.9	100%	330%	-	-

Nevertheless, as a determined attempt to better utilize the value of the raw mining commodities, the government of Indonesia releases an export restriction policy as a subsequent policy of the mining law of the year of 2009. The Mining Law of The Republic of Indonesia Number 4 of 2009-Concerning Mineral and Coal Mining states that per January 12th 2014, the government of Indonesia bans exporting raw mineral, except coal. All minerals should be fully processed and refined before they could be exported. However, this ban does not cover metal minerals of copper, iron ore, lead, and zinc. These minerals could still be exported in concentrated form. As the raw mining commodities hold important role within the economy of Indonesia domestically and globally, the export ban policy needs to be economically assessed to estimate its potential impact.

1.2. Literature Review

A mineral can be defined as a natural substance with distinctive chemical and physical properties, composition, and atomic structure, while an economic mineral includes minerals,

metals, rocks and hydrocarbons, both as solid and liquid, that are extracted from the earth by mining, quarrying and pumping (Minerals UK, 2019). For Indonesia, the Mining Law Number 4 of 2009 has brought official definition of mineral and coal. According to the law, mineral means any naturally occurring inorganic compound that has a definite chemical composition and specific physical properties as well as an ordered crystal structure, or a combination thereof that forms rock, either separated or embedded (The Government of Indonesia, 2009). Coal, is defined as any sedimentary organic carbon compound that is formed naturally from the remains of plants. These definitions are used in the law and in its derived regulations as well. As difference of raw and processed minerals, raw or unprocessed minerals come in form of ores and concentrates. While, processed minerals come in form of refined minerals.

Export restrictions come as a part of barriers-to-trade, often set by the government as a protection of the environment, preservation of natural resources, protection of downstream industries, or as a response to a number of different market imperfections (Korinek & Kim, 2010). In this research, Korinek and Kim points out that the export restrictions come in a variety of forms, include quantitative export ban or quota, export taxes, duties and charges and mandatory minimum export prices. Export taxes also work as barrier to trade as a form of export restrictions (Parra, et al., 2016). Nevertheless, this study is one of the handful researches on export restriction in term of completely banning certain type of materials. This study is also one that is specifically focusing on raw mining commodities.

The implementation of the export restrictions as an export tax or quota in a large raw materials producing country implies a shift in welfare and in profits from domestic raw materials producers and foreign downstream producers to domestic downstream producers and foreign raw materials producers (Fung & Korinek, 2013). Korinek and Kim (2010) also further point out that some of the expected impacts of export restrictions are inability to fulfill objective of environmental protection, additional pressure for other exporters for applying similar export restrictions, and additional investment risk that could hinder the investment decision. Therefore, because Indonesia relies a large part of its economy on the raw mining

commodities, it is important to analyze how the implementation of the export ban brings impact towards the economy.

Further, this study highlights the position of Indonesia in the early stage of global supply chain. Even though the supply of the non-renewable raw materials are the base of the production process, the importance of this early stage of global supply chain is often left out behind the processing stage. There are plenty of researches that are focusing on trading of the processing stage. There is study on the domestic content of the processing trade (Ma, et al., 2015). There is also study on the CO_2 emissions embodied in the processing trade (Su, et al., 2013), as well as study that focuses on the value-added content (Johnson & Noguera, 2012). The similar interest has not been found in regards of the raw materials supplying stage. However, as the important role of the raw mineral materials has been established, this study intends to assess the impact of the export restrictions from that early stage of production chain's point-of-view, focuses on raw mining materials.

1.3. Purposes of The Study

Implementation of the Mining Law of The Republic of Indonesia Number 4 of 2009-Concerning Mineral and Coal Mining reflects the intention of the Indonesian government to enhance the benefits from mining commodities. The export policy derived from the Mining Law has gained public support and deemed beneficial for the country. Since Indonesia has a high dependency on its mining sector, any change in policy regarding mining commodities needs to be analyzed in order to see the potential effect on the domestic economy. As this study has pointed out, the export ban policy is mainly intended to bring economic advantages towards national economy. It is important to put into perspective how this policy would affect the economy, particularly the mining industries of Indonesia.

In light of the pre-implemented policy of raw mineral export ban, this study proposes work that addresses the gaps observed in the previous literature: 1) lack of applicable input-output analysis on export ban policy, and 2) unavailable economic assessment on the export

ban of the raw mining commodities. The export ban threads on a thin line between beneficial and unrewarding. This research one of the handful researches that provides empirical assessment on the economic potential of the domestic sectors and to determine the possible benefit of the policy, emphasizing on the mining-related sectors, before the export ban is fully implemented.

This study assess the mining commodities as sectors of economy. The input-output analysis is applied to assess the economic impacts of the export ban upon domestic sectors. The input-output model provides advantages as a tool to assess plenty of policy, but not yet widely used in especially analyzing export policy. This study intends to also contribute in corroborating the advantage of the input-output analysis not only to the public policy analysis but to the trade policy analysis as well. Within this study, 13 major mining-related sectors are set, 11 of which are based on their type of mining commodities. Then, the original input-output table of 185 intermediate sectors is aggregated into 26 sectors, and use the aggregated input-output table to assess the current performance of each sector to pinpoint and to determine the mining commodity that can be further optimized and can contribute more significantly to the overall economy of Indonesia. This study also analyzed which commodity sector that can amplify the positive potential impact of the export ban.

This study also develops a simulation on how the implementation of the export ban would affect the domestic content. In analyzing how change on the trade policy affects a country economy, plenty of previous researches have focused on the imported dependency. However, as Indonesia is a country that relies on the raw materials export, this study focuses on the domestic dependency.

This study mainly focuses on the economic assessment of the export ban policy, based on the sectoral economic structure of Indonesia. This study utilizes the sectoral economic structure provided in the Input-Output Table of Indonesia of the year 2010. Due to limited time and available data, any other area aside from the sectoral economic structure is not assessed. This study is particularly concentrating on the mining-related sectors.

1.4. Structure of Chapters

This chapter 1 covers introduction of the background of this research, and sets the purposes we intend to achieve. Supported by historical data, this chapter examines the ground for the export ban. In this chapter the current economic condition of the mining sector of Indonesia is determined as well.

Followed by Chapter 2 which enfolds the mining law, as well as the other regulations derived from the mining law, and impact it brings on trade policy. This chapter also assesses the resource nationalist nature of the policy.

In Chapter 3, the focus is on analysis of the mining export potential as the base of the releasing of the export ban policy. Since Indonesia relies largely on the mining export, the export ban is deemed to affect the international trade of the mining commodities

In Chapter 4, input-output model is develop in analyzing the current economic performance of the domestic sectors, focusing particularly on mining-related sectors. This input-output model is based on Indonesia's input-output table of the year 2010. Interrelation among sectors within the economy is analyzed by incorporating multipliers analysis and linkages analysis in evaluating the input-output model. The input-output table is also used in calculating the trading balance of industries of Indonesia. The benefit of using the input-output model is further examined to assess how the intermediate sectors utilize the domestic outputs, through the domestic intensity analysis.

In Chapter 5, in addition to the assessment towards the intermediate industries, investigation on the potential impacts of the new policy is broaden by using case study to highlight the effect of the export ban. The case study investigates the change on the domestic content of the domestic production outputs, as well as on the gross mining export value.

In Chapter 6, it covers conclusions based on all the analysis.

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Chapter 2 Resource Nationalist Policy

2.1. Introduction

Within the last ten year, trade of mining commodities in Indonesia has been marked notably by one particular regulation. The Mining Law of The Republic of Indonesia Number 4 of 2009-Concerning Mineral and Coal Mining was released on January 12th of 2009. This mining law rules management of the mining industries from upstream to downstream. One remarkable component of the law is the statute that regulates the trade of mining commodities. One of the main concern in this mining law is exhibited through Article 103 where Production Operation Mining Permit holders and Special Mining Permit holders have to process and refine or smelt mining products domestically (The Government of Indonesia, 2009). In other words, this mining law has mining commodities to be banned to export in raw form. As the article further explains, the obligations to process and refine domestically are intended to increase and optimize the main value of products, the supply of industrial raw materials, worker absorption, and state revenues. There are also exceptions for this export ban. The exceptions are applied for coal, copper, iron ore, lead and zinc.

Article 103 is then explicated by Article 170. Article 170 has stated that holders of mining permits that have made production must conduct refining or smelting as intended by Article 103 at the latest five years of the promulgation of the Law. It meant that by at least January 12th 2014, this export ban should be implemented. As shown in Figure 2-1, this policy affects the mining export value and share, as they drop in 2009 when the government releases the mining law, increases again as the full implementation of the ban is delayed, then decreases towards 2014.

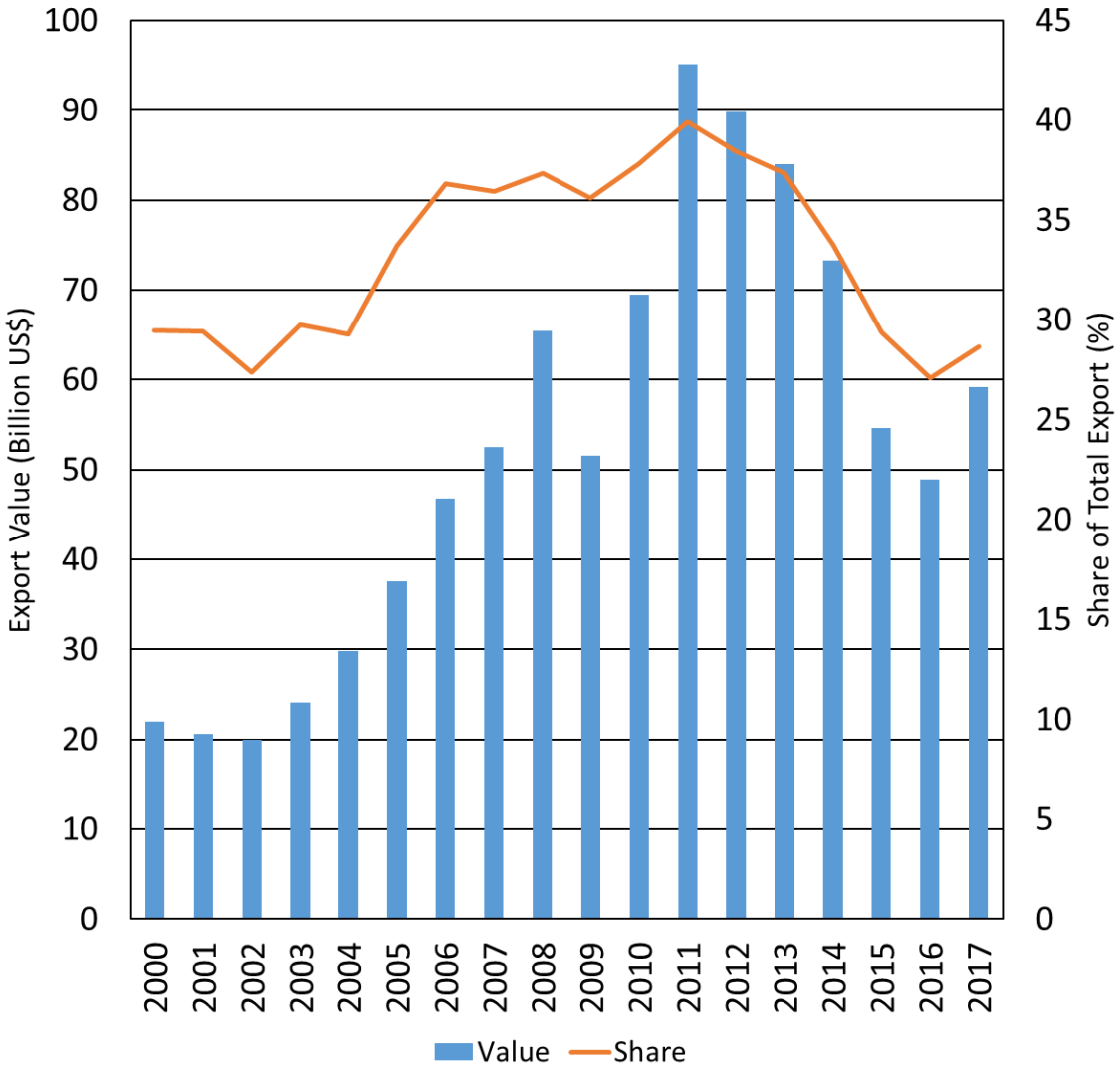

Figure 2.1 Value and share of export of mining commodities for the year 2000 – 2017 (Center of International Development at Harvard University, n.d.)

However, the implementation just keeps delayed. In the year of 2014, the government of Indonesia has released a government regulation. The Government Regulation Number 1 of 2014 rules implementation of mineral and coal mining activities. In this regulation, an article, Article 112c has been added. In this article, the mining permit holder is allowed to export its production within a certain amount, and further provisions regarding processing

and refining will be regulated in ministerial regulation (The Government of Republic of Indonesia, 2014). In addition to the government regulation, there is also a ministerial regulation. Energy and Mineral Resource Ministerial Regulation Number 1 of 2014 manages criteria for increasing added value. Article 12 of this regulation rules that mineral commodities has to be carried out at least three years since the release of the regulation (The Government of Republic Indonesia, 2014). It means that instead of in 2014, the ban of exporting raw mining commodities would take place in 2017. During 2014 to 2017, the mining commodities could be exported in raw form in limited amount. Both of the regulations mandate development of smelter is carried out no longer than 2017. Mining companies that could not achieve the target are prohibited from exporting their mining products. However, until the deadline on January 12th of 2017, a lot of the mining companies have not finished the development of their smelters. There are three types of smelters commonly used in Indonesia, the integrated smelter, the independent smelter, and the small smelter. The integrated smelter is operated by the same company in the same location. The independent smelter consists of multiple smelters and multiple ore sources. The small smelter takes the low quality products of mostly artisanal mining.

Facing dilemmatic situation, the government of Indonesia released another regulation. Released merely one day before the deadline, in January 11th 2017, the Government Regulation Number 1 of 2017 states that the mining companies have to change status of their operation permits if the companies want to export concentrate. The regulation also allows the concentrate export to be taken place for five years, until the companies finish the development of the smelters. If within those five years, the companies are not able to finish the smelter development, then the concentrate export permit will be revoked. In addition to the Government Regulation Number 1 of 2017, the Ministry of Energy and Mineral Resources again released two ministerial regulations, Number 6 and Number 7 of 2017, which also loosen up the export ban again. These regulations allow mining companies to export unrefined minerals when the companies have obtained government recommendation and paid certain export duty. This export duty is inflicted at a progressive rate of 20% in 2014, and increasing to 60% in 2017, depends on the mineral contents.

By the regulations, in 2022, there is supposedly no longer raw mining commodities export from Indonesia. However, in 2019, the government has announced an acceleration of the export ban especially for raw nickel ore. In January 1st 2020, the raw and low content nickel ore is prohibited to be exported. We put the timeline of the released related regulation to the export ban policy in Figure 2.2.

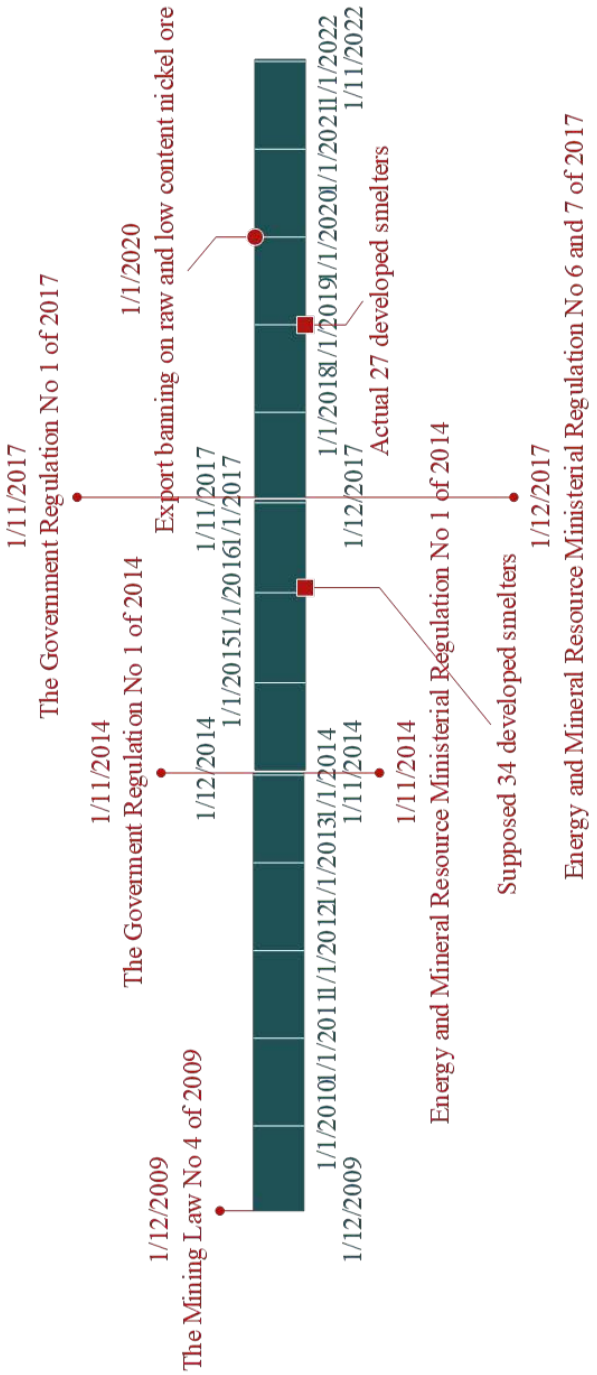

Figure 2.2 Timeline of the regulation related to the export ban policy

2.2. Literature Review

The very basic word definition defines policy as course or principle of action adopted or proposed by a government, party, business, or individual (Oxford, n.d.). Policy design involves the effort to more or less systematically develop efficient and effective policies through the application of knowledge about policy means gained from experience, and reason, to the development and adoption of courses of action that are likely to succeed in attaining their desired goals or aims within specific policy contexts (Howlett, 2014).

Public policy is often defined as tools used by the government to modify certain aspects of behaviour to reach some arranged purposes. Domestic public policy can be classified into four major groups, which are distributive, competitive regulatory, protective regulatory, and redistributive type of public policy (Buck, 2013). Distributive type is policy that supports private activities that are beneficial to society but that would not usually be undertaken by the private sector. Competitive regulatory policy limits the provision of specific goods and services to certain and regulated companies. Protective regulatory policy protects the public by regulating private activities. Redistributive policy changes the allocation of valued goods or services among social classes, racial groups, or genders. Based on this explanation, the new mining law of Indonesia, which rules mineral trade policy and then develops export ban on raw mineral commodities, can be classified into distributive and protective regulatory type. Stages of policy making start by identification and definition of an issue. The next step is formulation of the policy, followed by legitimation of the policy, and implementation of the policy (Buck, 2013; Gilardi, et al., 2019).

There is a close relationship between implementation and the success of a policy, the literature on policy design also emphasizes that a policy may fail due to an invalid theory connecting policy actions and desired outcomes (Tosun & Treib, 2018). Tosun and Treib (2018) also have identified the decisions involved in the policy design. The first decision is regarding the aims and instruments that are helpful to achieve the aims. The second decision is the procedure for implementing the policy. In other words, we can presume that in order

to develop a sound and achievable policy, the policy maker should pay attention to the aims of the policy and how the policy be implemented.

The raw mining commodities export ban as a subsequent of the current mining law has the aims of increasing and optimizing the mine value of products, supplying industrial raw materials, absorbing more labor, and increasing the state revenues. The aims are set carefully, intended to gain more benefit from the mining commodities. However, considering how the export ban keeps delayed, the government apparently has not decided suitable procedure on implementing the policy.

On the other hand, regardless the government's righteous intentions to better utilize the mining commodities through the export ban, this policy is often classified as a resource nationalist policy. A resource nationalist policy is a part of protective regulatory that is applied specifically upon natural resource. A releasing of a resource nationalist policy emphasizes that a country has ventured into resource nationalism. A characteristic of resource nationalism is the tendency for states to take (or seek to take) direct and increasing control of economic activity in natural resource sectors (Ward, 2009). Further, this characteristic is explained that established resource nationalism is an occurrence where a natural-resource endowed country uses its legal jurisdiction over these resources to achieve some set of national development goals that would otherwise not obtain if their exploitation were left to international market processes (Wilson, 2009). In the other hand, resource nationalism also could be explained as development and introduction of new policy by the government that is directed, among others, towards controlling natural monopolies and exerting macro-economic policy influence (Solomon, 2012). Resource nationalism is essentially mandatory government intervention in natural resources business by political or economic means in order to benefit the nation and the people it on behalf of (Li & Adachi, 2017). Therefore, it can be concluded that the export ban basically is treading upon the resource nationalism.

2.3. Export Restrictions

Export restrictions upstream can be used to give a competitive advantage to domestic manufacturing sectors downstream (Wichmann, 2017). Both Government regulation no 1 of 2014 and Energy and Mineral Resource Ministerial Regulation Number 1 of 2014 have mandated the operated mining companies in Indonesia to build smelter facilities. These policies are expected to evoke down-streaming of domestic mineral production. The down-streaming then will increase the gross added-value of the mineral commodities, and indirectly the growth of domestic industries. When the mineral commodities has to be processed first domestically before it can be exported, the domestic industries will eventually absorb that production of raw mineral commodities. Then, as the processing and refining take place within the industries, therefore the increasing gross value-added also can be expected.

On the other hand, the implementation of the export ban brings a drop on the quantity of produced minerals. Some of the minerals experience significant decrease, and other minerals have just slight drop pf production. There are several factors as causes of this decreasing (United States Geological Survey, 2016). One notably factor is lack of downstream processing capacity and poor integration between mines and processing capacity such as refineries and smelters. Another factor is legal disputes between the local government and mining companies, often resulted in temporary shutdowns of the companies. There is also shifting to alternative source of raw mineral commodities provided by other countries, which further driving the mining companies to lower their productions. This situation could lead into employment issues within the mining industries. However, as indicated by objectives of the export ban stated in the mining law, the government insists on implementing the export ban as a way to increase and optimize the worker absorption. Therefore, it becomes necessary to empirically assess the current state of the domestic industries, particularly the mining industries, and the potential impact brought by the export ban towards the domestic economy and employment.

2.4. Resource Nationalist Policy

As early researches have indicated, a plentitude of natural resource often becomes curse for the producing countries. More often than not, extractive economies have strong connection with low standards of living, poverty, and income inequality (Ross, 2001). The phenomenon is known as natural resource curse. This resource curse refers to poor growth performance of natural resource-intensive economies (Auty, 2001; Neumayer, 2004). This condition indicates that possession of valuable mineral deposits or natural resources does not necessarily confer economic success (Frankel, 2010). Bearing this concept, more producing countries try to maximize benefits from their natural resources. The efforts often come in form of resource nationalist policies. One of the most commonly used of the resource nationalist policies is export restriction.

The release of the Mining Law Number 4 has been classified as an occurrence of resource nationalism in lower middle and low income countries (Li & Adachi, 2017). Further, some researches also shows how Indonesia has become an exemplar of resource nationalism in this decade (United States Geological Survey, 2016; Warburton, 2017).

The resource nationalist policy is often driven from the global commodity boom. As the boom increases commodity prices, the government then will try to use this increasing as a leverage and increase revenue from the mineral resources. In the case of Indonesia, the government released the resource nationalist policy of the export ban in 2009, somewhat in the middle of the commodity boom, intended the ban to be implemented in 2014. However, when the commodity boom was replaced by inevitable bust in 2013, and the commodity prices went down, the government was forced to revise the implementation of the export ban. Nonetheless, the revision did not waver the government's intention to embrace the nationalist position. This resource nationalist policy often gain much public support as an ideological economic project, despite the potential problem that may arise and practical operational dispute (Warburton, 2017). This public support bases our reasoning that it highlights the importance of the mining commodities as the driving force for Indonesia's economic development. On the other hand, the public support also often leads to no one questions

whether the ban will really succeed. Thus, it highlights the importance of this research in providing economic impact assessment on the export ban of raw mining commodities.

Another notable effect of the resource nationalist nature of the Mining Law Number 4 is the accelerated divestment requirement (Scott & Tan, 2014). The Mining Law Number 4 allows foreign investment in mining industries. However there is an obligation for the foreign shareholders to progressively divest its shareholding to a minority stake over time. The permitted composition of the foreign investment is maximum 75% for a company holding an exploration IUP (Mining Permit), and maximum 49% for a company holding a production IUP. Previously, based on Government Regulation Number 23 of 2010, a company owned a production IUP could be 100% foreign investment, with the obligation to progressively divest its shares.

The Mining Law Number 4 also covers environmental aspect, stating that the mineral and coal mining to be managed and sought in independent, reliable, transparent, competitive, efficient and environmentally sound manners to sustainably assure national development. However, this law apparently leaves out the detailed procedures and order for managing the environmental aspect, as well as several other aspects such as waste management, and social aspect, to be dealt later by other ministerial regulations. Unfortunately, as there is no clear direction of implementation of the export ban, there is still sparse data on how the export ban affects these aspects. Particularly, there is still no specific environment management requirement designed to adjust with the export ban.

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Chapter 3 The Export Potential of Mining Commodities

3.1. Introduction

The export ban is released as a form of export restriction acts as government intervention towards the Indonesia's trade of commodities. The object of this export ban is the raw form of the mining commodities. As described in previous chapter, implementing the export ban faces potential loss in export revenue, and export revenue volatility is strongly linked to growth volatility (United Nations Development Programme, 2010), so significant fluctuations in export earnings result in fluctuations in economic growth. Further, losses in export revenues and growth slowdown reflects how an economy may be vulnerable to external economic shocks, but the scale of impact depends largely on the degree of concentration of a country's export portfolio. Despite how resource abundance can positively affect growth, export concentration in resource hurts growth (Lederman & Maloney, 2003). Therefore, in order to determine how export ban can affect the economy growth, it is necessary to investigate the mining export concentration.

As vulnerability of a country to the economic shocks indicates the dependence of the country to its export, another tool to determine mining export dependence is by measure the export value as percentage of the GDP (Butkiewicz & Yanikkaya, 2010).

3.2. Literature Review

A country's export portfolio represents diversification of its exports. This diversification makes the country less vulnerable to adverse terms of trade shocks by stabilizing export revenues (Ghosh & Ostry, 1994). The issue is not that exports are concentrated but that they are usually concentrated on homogeneous products. These individual exporting countries are facing a highly inelastic demand curve such that changes in global supply are translated into significant price volatility, and when these countries are

low income countries, they are often suffering terms of trade shocks that adversely affect investment and even consumption (Jansen, 2004; Brenton, et al., 2007).

The degree of export concentration partially can be analyzed using Herfindahl Hirschman (HH) Index and the revealed comparative advantage (RCA) index. Herfindahl Hirschman (HH) Index is originally developed based on trade partner concentration as an indicator of national economic and political vulnerability. Basically, this index can be used to measure various contexts of concentration. This index prominently has been used in the context of export concentration, for example when analyzing export partners (Kentor & Boswell, 2003; Babones & Farabee-Siers, 2012), and when assessing the export concentration for developed, developing, and transition countries as well (Dumičić, et al., 2018). The index is calculated as:

$$RCA_{ij} = \frac{x_{ij}/X_{it}}{x_{wj}/X_{wt}} \quad \text{..... (3.1)}$$

Where x_{ij} and x_{wj} are the values of country *i*'s exports of product *j* and world exports of product *j* and where X_{it} and X_{wt} refer to the country's total exports and world total exports. The result of the calculated values of HH Index can be classified as:

Table 3.1 Concentration level based on HH Index value (Dumičić, et al., 2018)

HH Index Value	**Concentration Level**
< 0.01	Perfect equality
0.01 – 0.15	Low
0.15 – 0.25	Moderate
> 0.25	High

Another useful tool to analyze export concentration is the index of revealed comparative advantage (RCA). The RCA Index is originally based on trade flows. The concept of RCA is that a country holds the ability to produce some trade goods or services, with higher productivity as well as higher product differentiation than other producing

country in a trade area (Stellian & Danna-Buitrago, 2019). Stellian & Danna-Buitrago also point out that the assumption used is that the trade flows can reveal the comparative advantage of product that is being traded between two entities. Basically, the RCA Index is equal to the proportion of the country's exports divided by the proportion of world exports (Granabetter, 2016). A country is said to have a revealed competitive advantage for a commodity or an industry when the RCA Index is > 1.

Additionally, a country's vulnerability of trade shock is also often indicated through its degree of economic openness. This economic openness is measured as the ratio of international trade to GDP, therefore the transmission channels by which economic openness impact vulnerability can be import- or export-related (United Nations Development Programme, 2010). This study particularly focuses on export-related economic openness.

3.3. Mining Commodities Export Values

Comparison of the GDP value with the total natural resource rent and industry value added, both are calculated as percentage of the GDP, is necessary in analyzing how much Indonesia relies on its natural resources. The mining resource rent includes mining product sales, royalties, and fixed fees. The industry value added includes value added from coal, fossil fuel, nuclear fuel, metals, non-metals, and processed metals. The comparison is shown in Figure 3.1.

The focus of the analysis starts in 2009. As the government released the mining law in 2009, and the related regulations were released in 2014 and 2017, apparently, the regulations did not affect them negatively. The value added of the mining industries experienced slight drop up until 2011, and started increasing from that point forward. On the other hand, the mining resource rents went relatively steady from 2009 to 2014, then experienced slight drop up until 2017. The export ban is supposed to increase the value added of the mining industries. Also as the ban is applied to the majority of mining export commodities, the mining resource rents are estimated to decrease following the decreasing of mining sales. It indicates that the

export ban regulations bring expected changes towards both of industry's value added and mining resource rents.

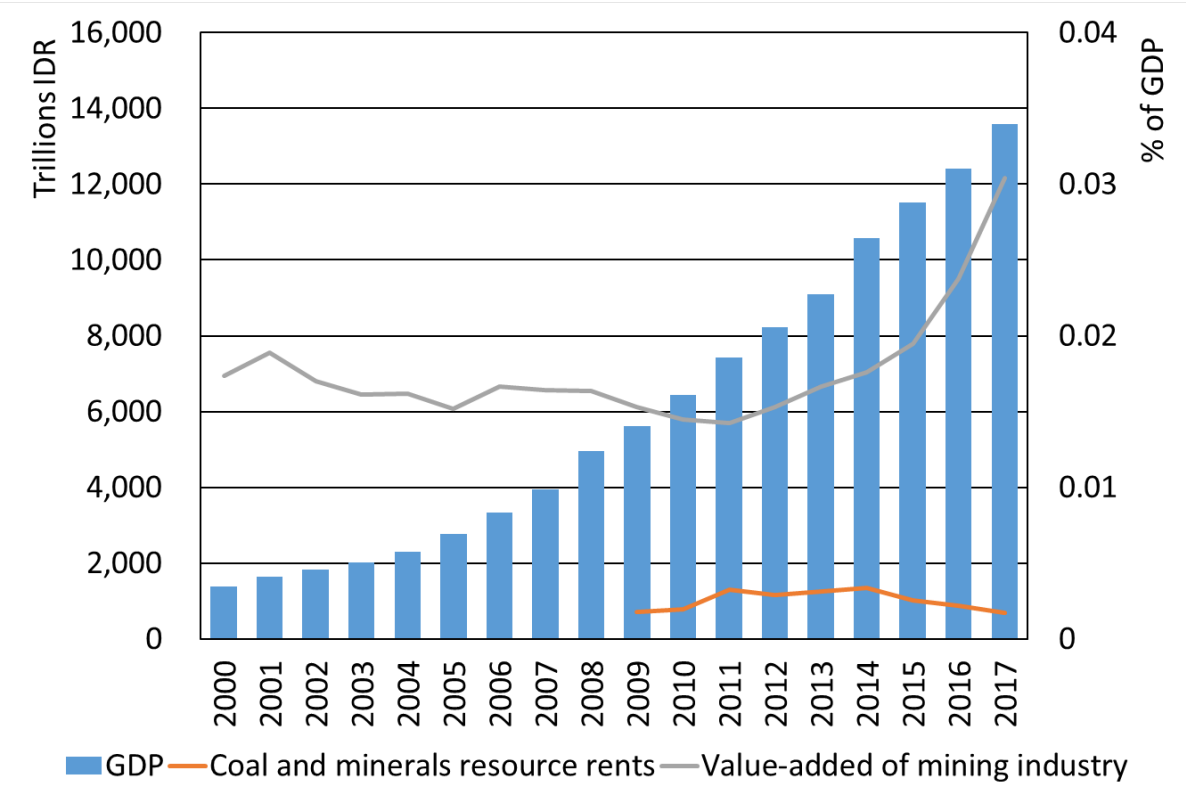

Figure 3.1 Comparison of Indonesia's GDP, coal and mineral resource rent, and industry value added (calculated from (Badan Pusat Statistik, 2019) and (Direktorat Jenderal Mineral dan Batubara, 2017))

The next step is assessing the value of international trade as apparently Indonesia is a country that relies largely on its export. Figure 3.2 shows both of the export and import value. On average between the year of 2000 to 2018, the export value is USD 127 billion, compared to the average import value of USD 110 billion.

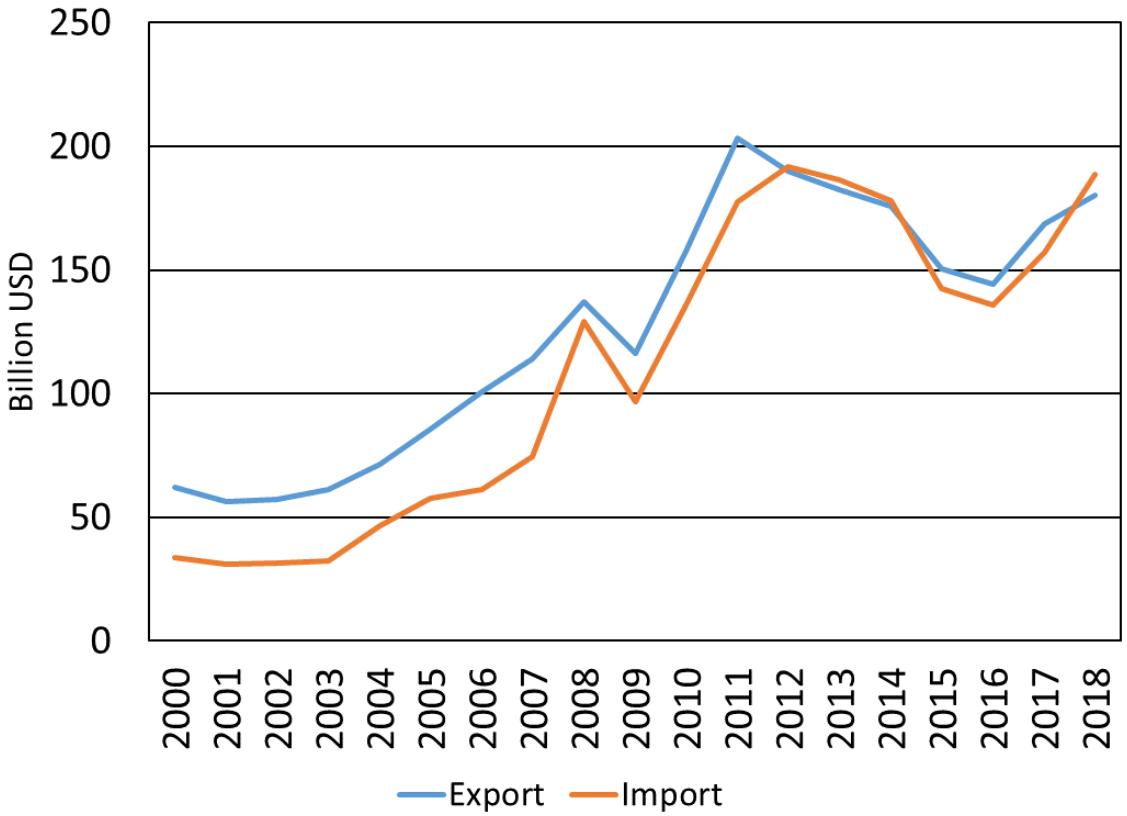

Figure 3.2 Indonesia's export and import value of the year 2000 – 2018 (World Integrated Trade Solution, 2020)

Our findings show that the export of raw mining commodities configures a large part of the export of Indonesia. The high contribution of the raw mining commodities plays dual sides of a coin. First, it is seemingly more beneficial to increase the value of the raw commodities by processing and refining them first domestically. Then, as the raw commodities contribute largely, banning the export surely will bring a change towards the economy. Therefore, it becomes more important to assess the potential impacts that the export ban brings to the economy of Indonesia.

Previously, the export ban policy has been determined as indeed a resource nationalist policy, and as a resource nationalist policy, the export ban is deemed beneficial and therefore

it gains huge public support. As the policy released, the people and the government of Indonesia presume that this policy definitely is profitable for the nation. This study is among the first few analyses conducted to academically and empirically prove the potential benefit of the export ban if any.

3.4. Export Penetration of Mining Commodities

The next step is examining the export market penetration. This market penetration measures the extent to which a country's exports reach already proven markets. It is calculated as the number of destination countries to which the exporting country exports a particular product divided by the number of countries that the exporting country importing the product that year. Figure 3.3 shows that from the year 2000 to the 2017, the market penetration index of Indonesia on average is 13.02. As to compare to the world' average market penetration index of 83.37, the Indonesia's value is considered relatively low.

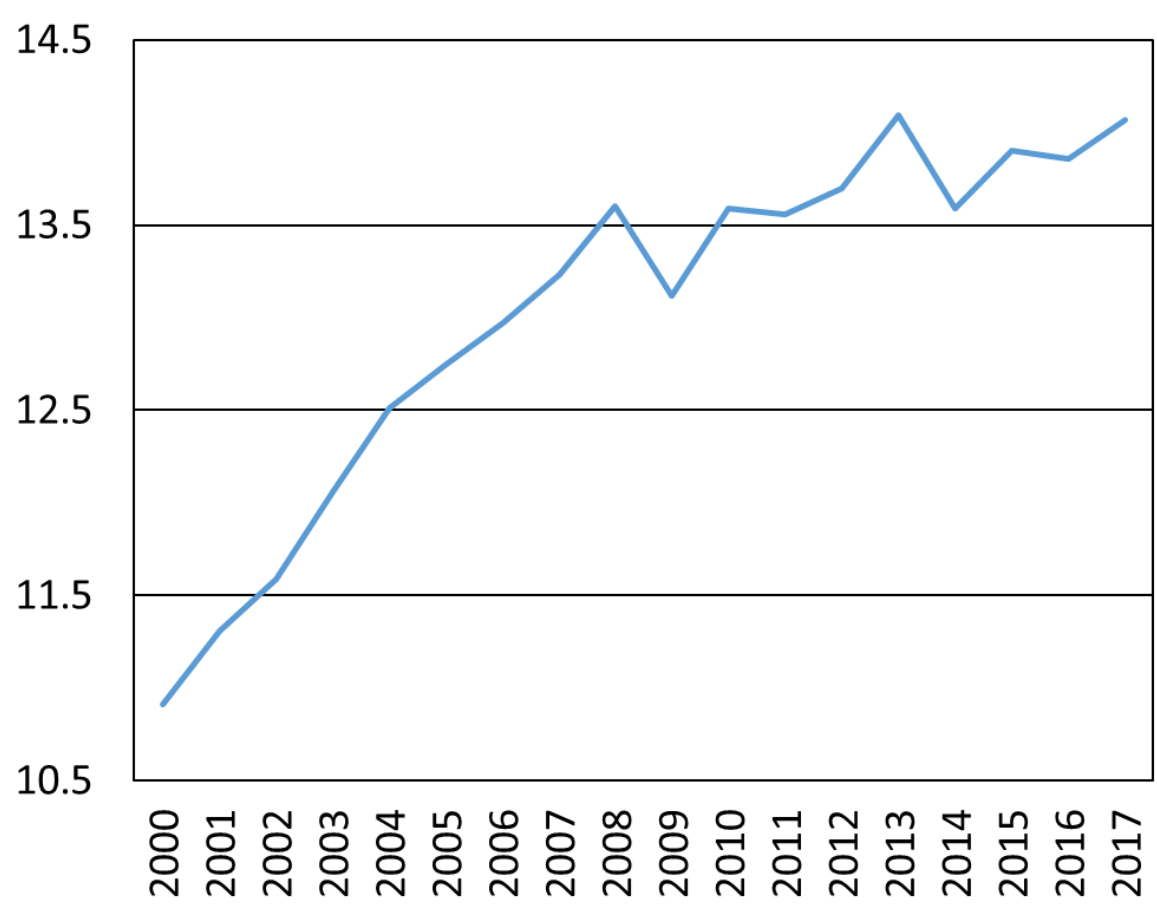

Figure 3.3 Indonesia's export market penetration index (WITS)

Then, using the HH Index, the market portfolio of the export of Indonesia is examined. The HH Index measures of the dispersion of trade value across an exporter's partners. A country with a preponderance of trade value concentrated in a very few markets will have an index value close to 1.

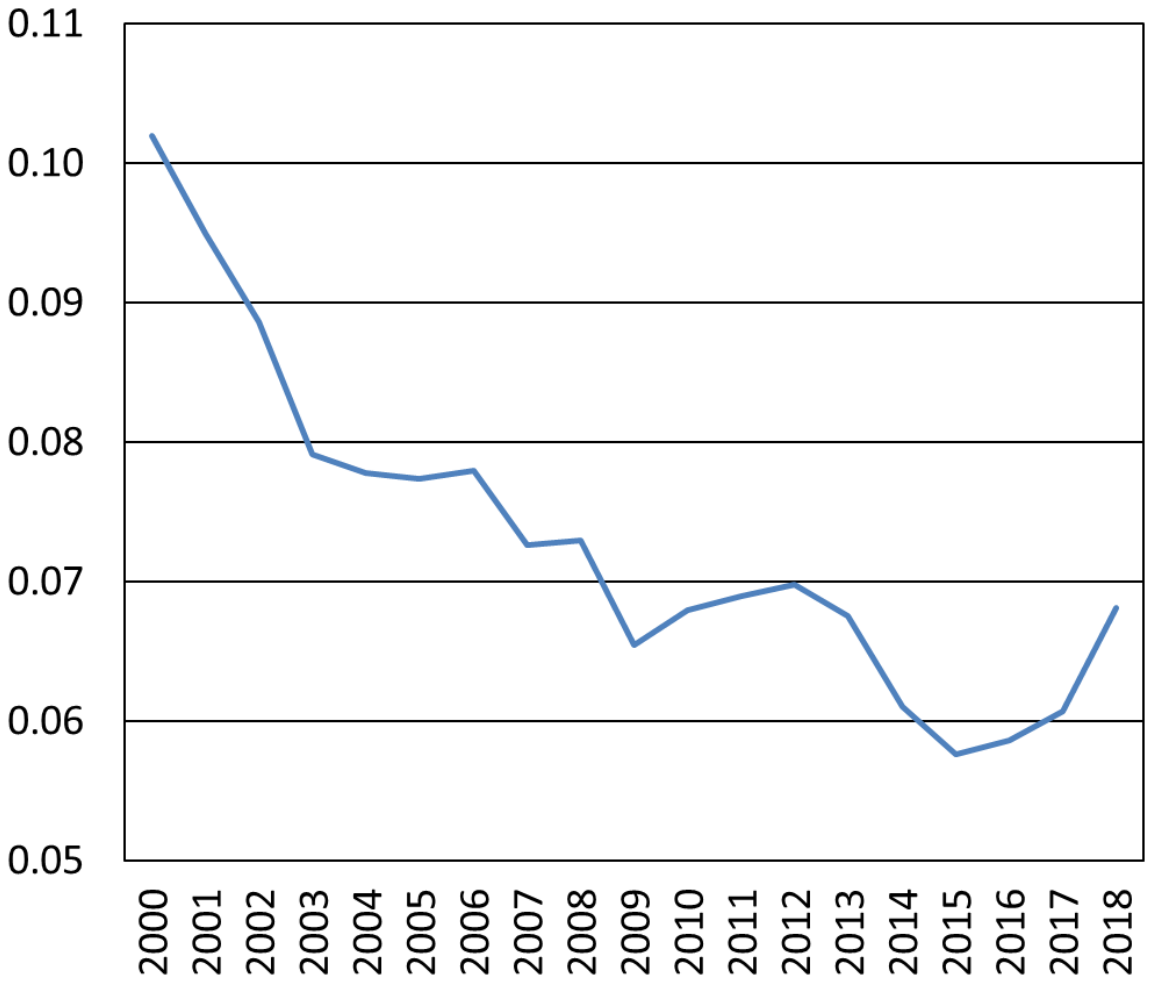

Figure 3.4 HH market concentration index for Indonesia 2000 – 2017 (WITS)

Figure 3.4 shows the change of the HH Index for Indonesia for the year 2000 to 2017. Apparently, the HH Index is in decreasing trend, indicates that through the years, Indonesia has growing independency on its trading partners. The trading partners as destination countries for the export of Indonesia is shown in Figure 3.5.

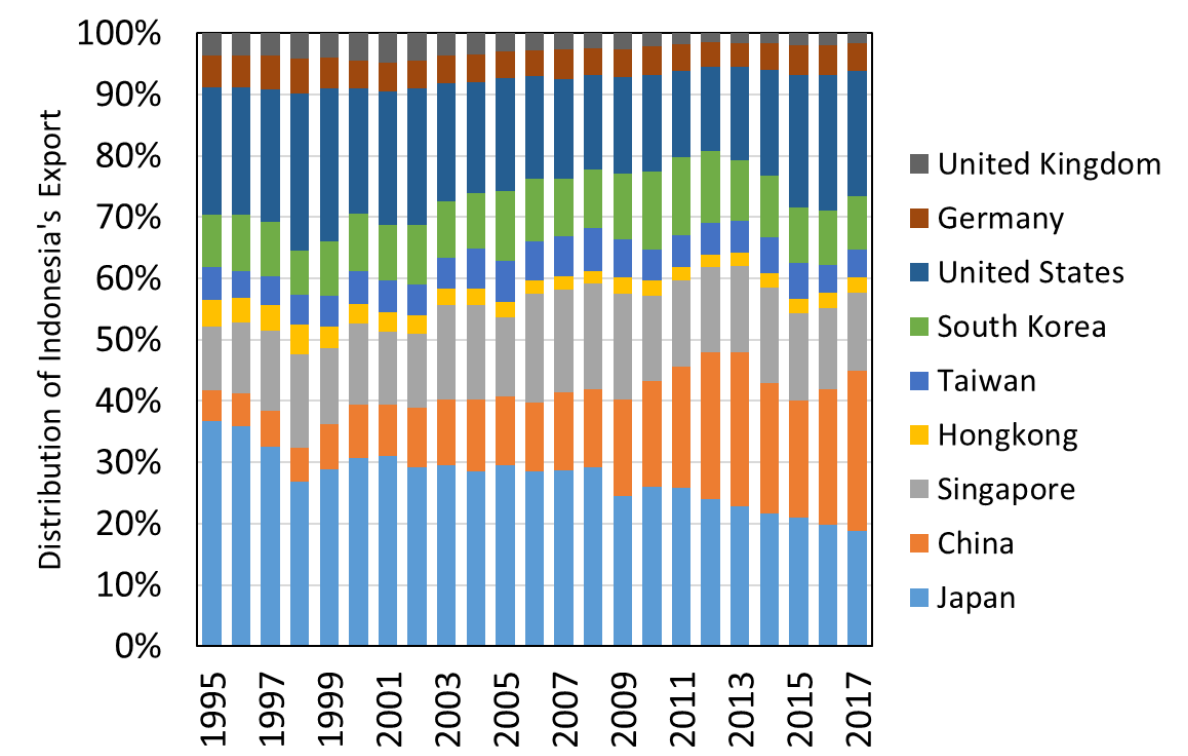

Figure 3.5 Indonesia's export destination countries 2000 – 2017 (Center of International Development at Harvard University, n.d.)

3.5. Export Concentration of Mining Commodities

One of the components that contributes to the export value is the export of raw materials. Data from the World Integrated Trade Solution shown in Figure 3.6 gives average share of the raw materials export is 26%. This value highlights the contribution of the export of raw materials towards the economy of Indonesia.

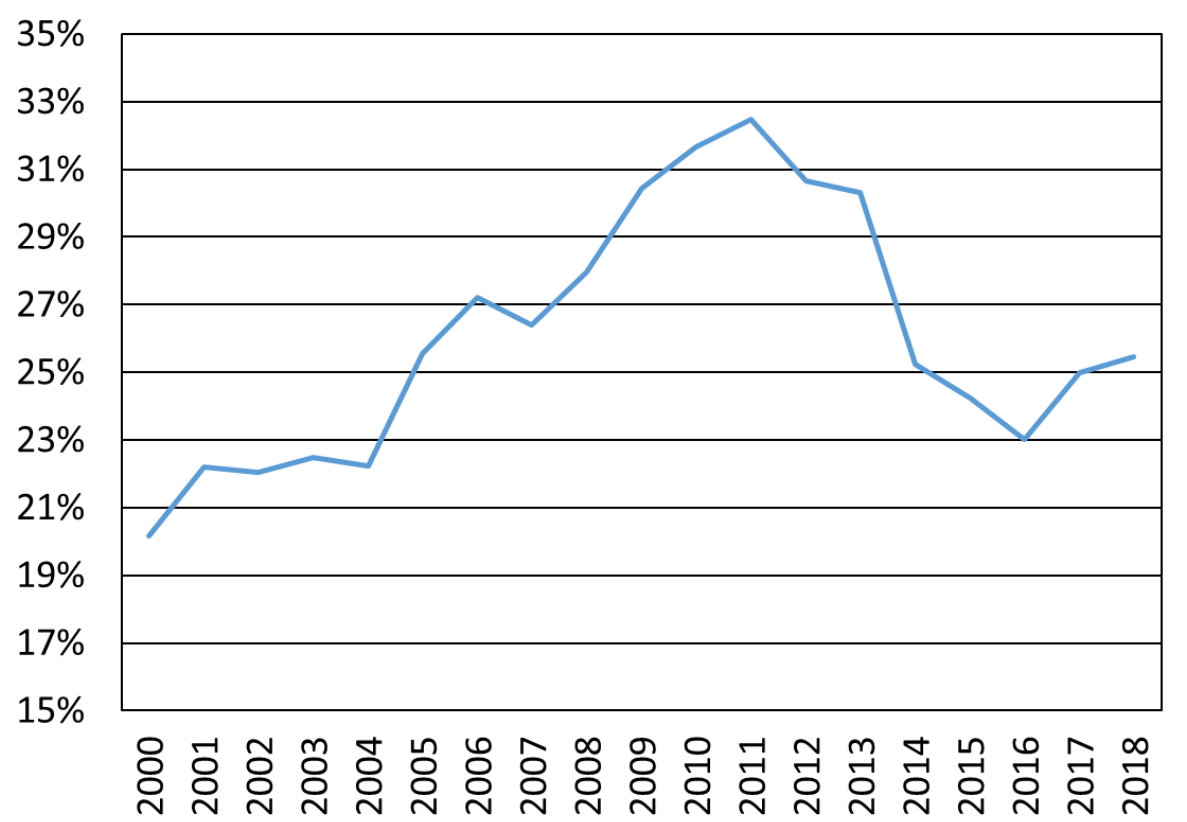

Figure 3.6 Indonesia's raw materials export share of the year 2000 – 2018 (World Integrated Trade Solution, 2020)

Therefore, to assess the potential of economic impact of the export ban, calculation of the revealed comparative advantage (RCA) index is needed. The focus of this study is particularly on mineral commodities, and ore and metals commodities. The revealed comparative advantage index indicates whether a country is in the process of extending the products in which it has a trade potential, as opposed to situations in which the number of products that can be competitively exported is static. Comparing the comparative advantage indexes of the commodities against the world trade is carried out by using the WITS software provided by the World Bank.

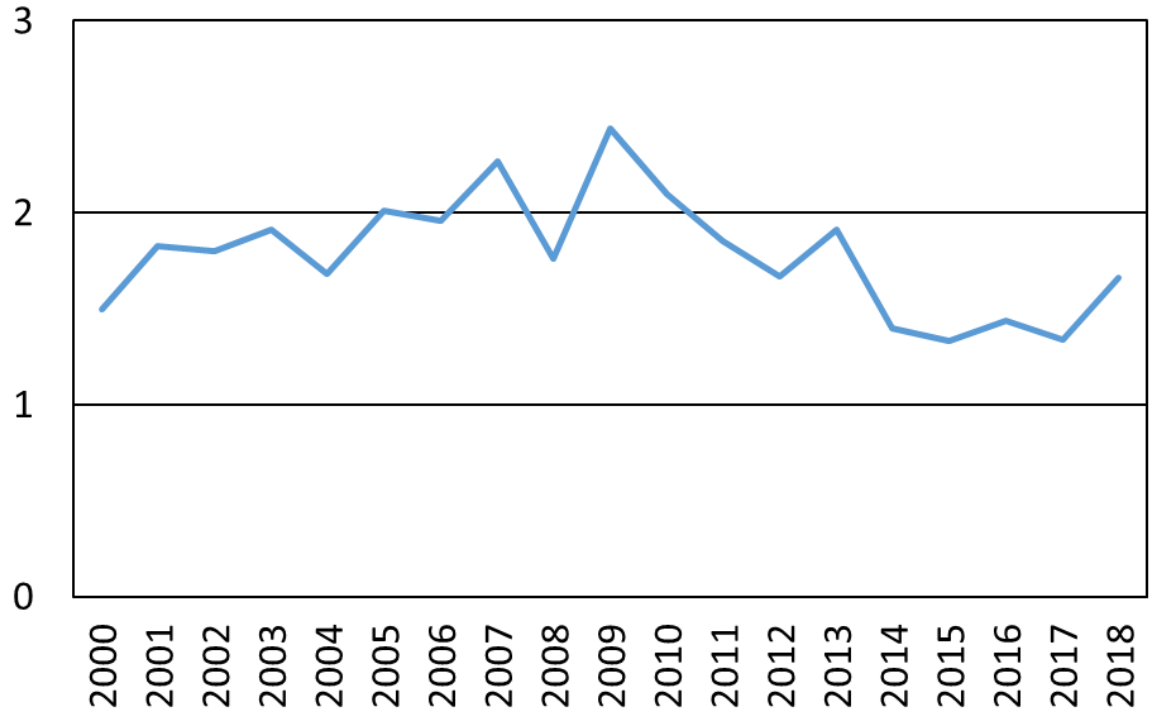

Figure 3.7 RCA Index for Indonesia's ore and metal commodities against the world value (WITS)

Figure 3.7 shows that despite the volatility, the ore and metal commodities of Indonesia evidently have a revealed comparative advantage. On average, during the period of 2000 to 2018, the RCA Index value for the ore and metal commodities is 1.8. In the year 2009, the RCA Index even reached the highest value, indicates that the release of the export ban does not affect Indonesia's position as a competitive producer and exporter of ore and metal commodities.

However, as the export ban covers raw mineral commodities, then the ores are isolated from the metals to further examine the export potential of the commodities.

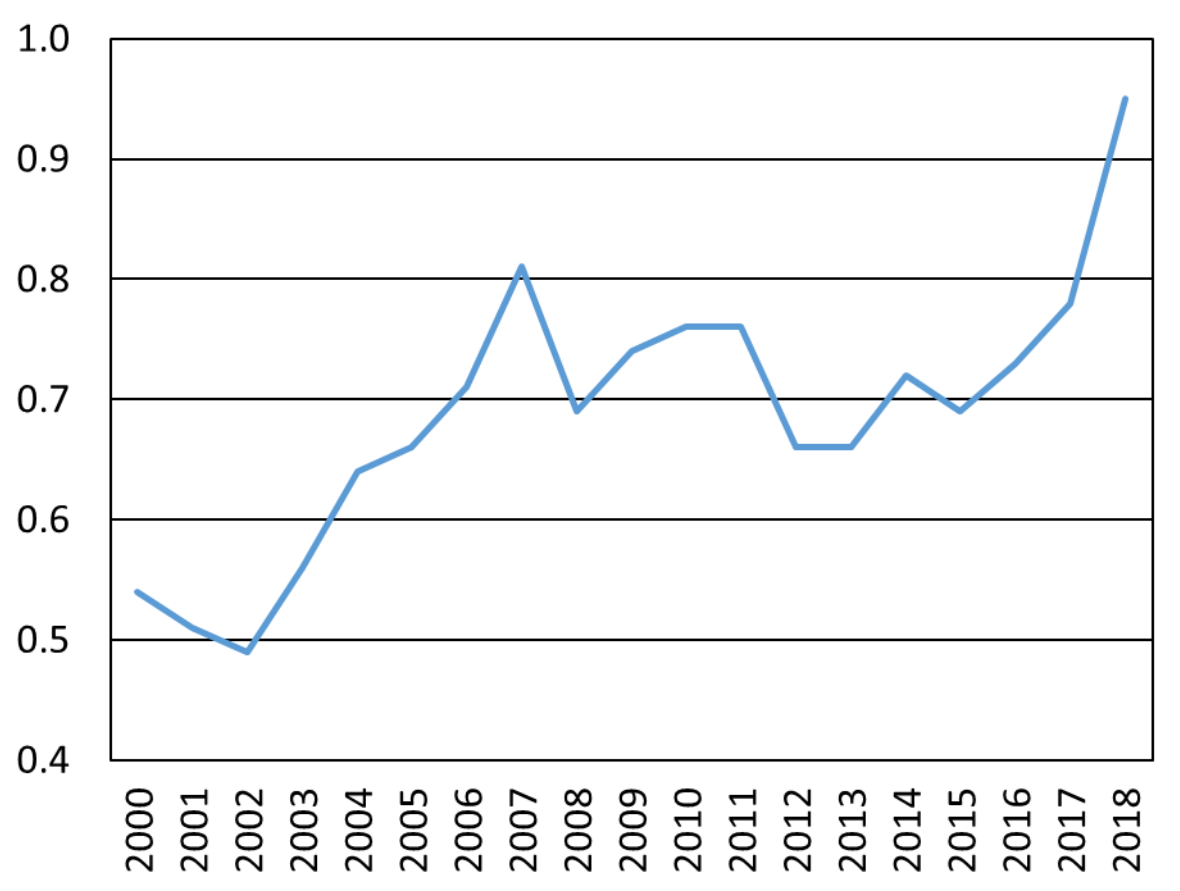

Figure 3.8 RCA Index for Indonesia's metals commodities against the world value (WITS)

The average RCA Index for metals commodities during the year of 2000 to 2018, is 0.7. Shown in Figure 3.8, that albeit the increasing trend, this value shows that separated from the ore commodities, metals commodities evidently are not prominent export commodities. Therefore, when the export ban is applied and largely it covers ores as raw mining commodities, the export ban seemingly will bring huge impact on the overall export value.

Calculation for the RCA Index for mineral commodities is shown in Figure 3.9. The average RCA Index value for mineral commodities during the period 2000 to 2018 is 3.0. Apparently, Indonesia is also a prominent exporter for mineral commodities. The mineral commodities also act as more prominent commodities than the ore and metal commodities.

However, since the year of 2009, the RCA Index value for the mineral commodities keeps decreasing. Comparing this value to the index value of ore and metal, evidently the release of the export ban policy brings more impact on the mineral commodities than on the ore and metal commodities. It also indicates that the larger the RCA Index value of a commodity, it will experience bigger impact of economic shock.

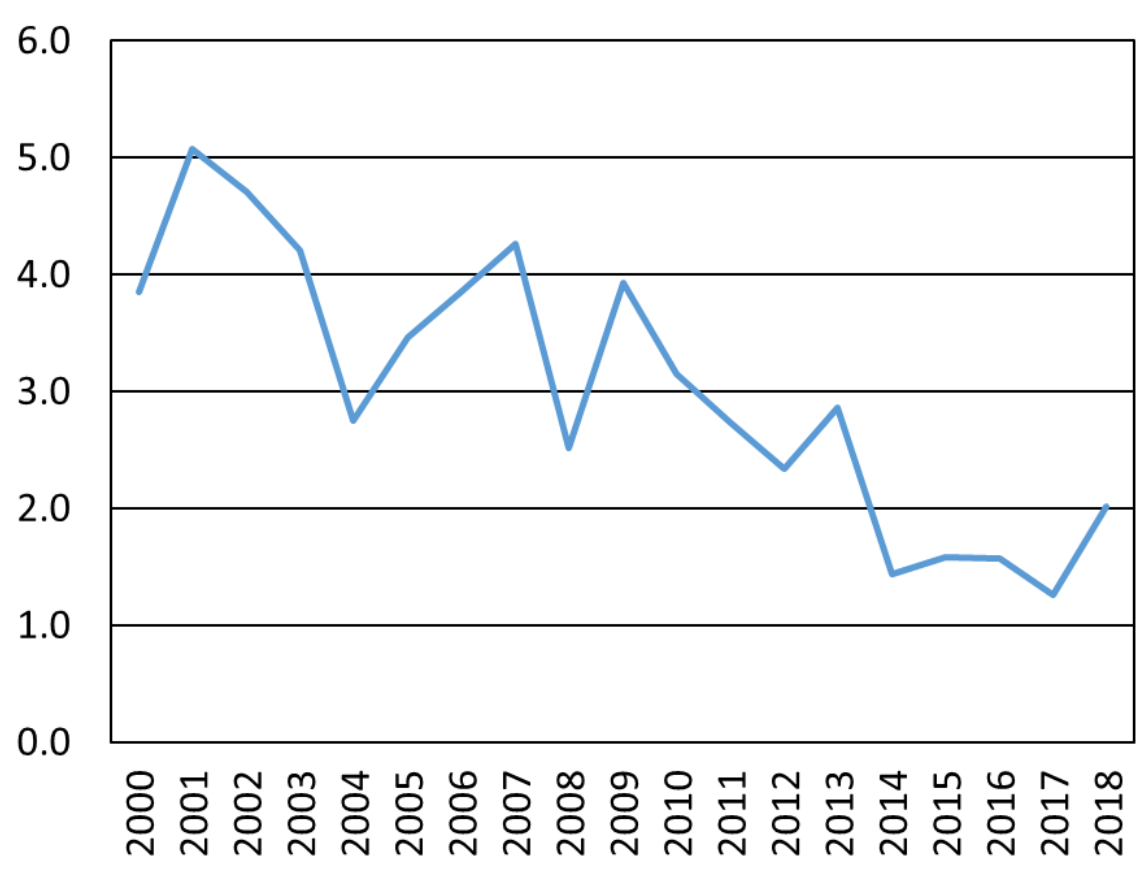

Figure 3.9 RCA Index for Indonesia's minerals commodities against the world value (WITS)

In analyzing the impact of the export ban, the very basic foundation is examining the export potential of the mining commodities. Analyzing the ores, metals, and minerals as export commodities, the ores and minerals seemingly are the prominent export commodities.

Proved by the RCA index value, the government of Indonesia has a strong foundation to release the export ban. Additionally, the HH Index of market concentration indicates that the export trade of Indonesia is relatively independent towards its trading partner. Therefore, as the government of Indonesia sets to implement the export ban policy, this change in trade barriers is unlikely will disrupt the trade relations between Indonesia and its trading partners.

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Chapter 4 Input-Output Analysis

4.1. Introduction

In assessing the effect of a policy, it is necessary to determine the best suited methodological approach. The choice of a methodology is not necessarily straightforward. It involves choosing between descriptive statistics and modelling approaches, between econometric estimation and simulation, between ex ante and ex post approaches, between partial and general equilibrium (World Trade Organization, 2012). However, as the globalization affects the international trade, especially in term of the gains and the costs of doing trade, as well as distribution consequences, the importance of the quantitative analysis is more conspicuous. There are several methods in quantitatively analyzing the impact of policy change; in this analysis, we incorporate one of the widely used tools, which is input-output analysis. Input-output (I-O) analysis has several strengths that made it a useful tool in analyzing such changes (Rose, 1995). First, the I-O table is based on measurable quantities that could be verified empirically. Second, Leontief multipliers and overall I-O table could analyze the potential impact of public-sector policies and private-sector decisions. Third, I-O is considered neutral, far from political influences, and could be used in any economic system. Fourth, I-O is accountable for all inputs that were used into production. Based on the four factors, input-output is deemed proper for analyzing the impact on policy changes. Since its development in the 1930s, the input-output model has been widely accepted and used in analyzing public policy. However, albeit has been widely accepted and used in analyzing public policy, the use of input-output model seems severely scarce in analyzing trade policy. This study intends to show that the nature of this model which has been proven advantageous in analyzing public policy, is also beneficial to assess the trade policy.

An input-output model maps a region, or a country, economic structure into a table based on measured quantities of interconnections between economic sectors. However, how the map structured is often influenced by the direction of economic development, not by

economic dependency. Indonesia has been putting a lot of effort to shift its economic development towards the processing and service sectors. Therefore, most of the previous researches on Indonesia's economic structure utilize input-output model often heavily focus on secondary and tertiary industries.

Nonetheless, as determined by our early findings, the natural resources sectors, particularly the mining sectors still play an important role within the economy of Indonesia. Hence, it is necessary to develop an input-output table emphasizing on the mining-related sectors. This mining-focused input-output table is exceptionally important when assessing the export ban of the raw mining commodities.

4.2. Literature Review

The input-output analysis is the term used for analytical framework developed by Professor Wassily Leontief in the late 1930s, which is based on structure of economic system. This analysis was developed as an analytical framework to analyze the interdependence of industries in an economy (Miller & Blair, 2009). Miller and Blair also has introduced that the information flows in an input-output model is contained in an inter-industry transactions table, shown in Table 4.1.

Table 4.1 Input-output transaction table (Miller & Blair, 2009)

		PRODUCERS AS CONSUMERS								FINAL DEMAND			
		Agric.	Mining	Const.	Manuf.	Trade	Transp.	Services	Other	Personal Consumption Expenditures	Gross Private Domestic Investment	Govt. Purchases of Goods & Services	Net Exports of Goods & Services
PRODUCERS	Agriculture												
	Mining												
	Construction												
	Manufacturing												
	Trade												
	Transportation												
	Services												
	Other Industry												
VALUE ADDED	Employees	Employee compensation								GROSS DOMESTIC PRODUCT			
	Business Owners and Capital	Profit-type income and capital consumption allowances											
	Government	Indirect business taxes											

The similar flow is adopted by the government of Indonesia when developing the country's input-output table. Table 4.2 shows the Indonesia's input-output table, along with the code numbers.

Table 4.2 Structure of Indonesia's input-output table (Badan Pusat Statistik, 2015)

Output		DEMAND										SUPPLY				
		Intermediate Demand		Final Demand												
		Homogenous Industry														
Input structure		1 ... 185	1800	3011	3012	3020	3030	3040	3070	3090	3100	4090	5090	6090	7000	8000
Commodity	1 ... 185	Intermediate transaction (Quadrant I)	Intermediate demand	Household consumption	Consumption of non-profit institution serving for household	Government consuption	Gross fixed capital formation	Change in inventory	Exports of goods and services	Total final demand	TOTAL DEMAND	Imports of goods and services	Margin of trading and transporting	Tax of net products	TOTAL OUTPUT	TOTAL SUPPLY
	1900	Intermediate consumption														
	1950	Tax minus subsidy of products														
	2000	Import														
Primary input	2010	Labour compensation														
	2020	Gross business surplus														
	2030	Tax minus other subsidy of production														
	2090	Gross value-added														
2100		TOTAL INPUT														

The components of the input-output table can be put into equations as:

Based on row, with x_{ij} is the intermediate demand, F is the final demand, and M is the import value

$$X_i = \sum_{j=1}^{n} x_{ij} + F_i - M_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.1)$$

Based on column, with the x_{ij} is the intermediate demand, and V_j is the primary input

$$X_j = \sum_{i=1}^{n} x_{ij} + V_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.2)$$

The input-output table of Indonesia contains detailed information illustrating the interconnection among sectors within the economy. Developing the table, there are several assumption used, which are:

1. Homogeneity

   Based on this assumption, each economic sector produces just one type of product or service, with single input structure, and there is no automatic substitution of input from output of different sector
2. Proportionality

   This assumption describes that the relationship between input and output of each production sector is a linear function.
3. Additivity

   This assumption puts the total effect of production of every sector is addition of each production.

Based on these assumptions, the input-output analysis do have certain limitation, that is technical coefficients are assumed to be constant during the analytical period. However, the input-output analysis is still very useful in conducting complex and comprehensive analysis. According to the government of Indonesia, the usages of the input-output analysis are:

1. To describe the supply and use of goods and services, especially for imports and the possibility of substitution.
2. To determine the dominant sectors as well as the susceptible sectors towards the economic development.
3. To estimate the impact of the final demand towards the output, added-value, import, tax revenue, and recruitment of labour.
4. To establish projection and evaluation of macroeconomic variables.

There are some previous researches in analyzing how implementation of certain public policy could affect overall economy. For example, a novel, hybrid input-output analysis is used to quantify impacts of energy policies such as feed-in tariffs and power purchase agreement in Portugal (Behrens, et al., 2016). Another research is using Japanese input-output table and Asian international input-output table in evaluating the policy of the Joint Crediting Mechanism (JCM) proposed by the Japanese government to reduce greenhouse emissions, resulted in which industries and power generator produced more impact (Sugino, et al., 2016). Other research implements GRIT technique in adapting regional input-output model to local model in analyzing impact of coal industry expansion towards regional economy and even smaller communities in Queensland, Australia (Ivanova & Rolfe, 2011).

Another notorious applicable method of using input-output analysis was proposed by Hummels, et al. and then was adopted by Koopman, et al. When releasing the export ban, one intended effect is increasing of gross value-added. Koopman, et al. point out that value-added components could be broken down as domestic and import value added. This value-added accounting would especially be important in intermediate goods. An intermediate good was defined as an input to the production process that had itself been produced and used up in production (Thambi, 2014). In other words, the intermediate goods had been transformed and incorporate in final goods. This intermediate goods especially would be affected when there was a new policy which enforced more utilization of intermediate industries.

4.3. Input-Output Table 26-Sectors

Basic Transaction Table used in this research is the Input-Output Table of Indonesia of 2010. The year of 2010 table is the latest available one. The original input-output table used in this research includes 185 intermediate sectors (Badan Pusat Statistik, 2015). Analyzing the 185 sectors individually is presumed to be deterring from the intended purposes of this study, one of which is to determine the mining commodity that can be further optimized and can contribute more significantly to the overall economy of Indonesia.

The basic transaction table is aggregated into 26 intermediate sectors for the analysis. These 26 sectors are consisted of the economic sectors of Indonesia, cover primary, secondary, and tertiary sectors. Since this input-output table's intended utilization is in assessing economic impacts of the export ban on Indonesia's economy, this 26 sectors' table particularly emphasizes on sectors related to mining industry. The aggregation of the mining-related sectors is by combining the HS 2017 nomenclature and the commodities covered by the export ban policy, as well as the data available from the original input-output table. This result in 13 major groups, covering from trade goods to processing, and service. The HS 2017 nomenclature is the harmonized system of 2017 edition released by the World Customs Organization and has worldwide utilization as export and import classifications (World Customs Organization, n.d.). Other variables that is taken into consideration is the results of RCA Index and separation of the ore commodities from the other metals commodities to get a more in-depth result when assessing the input-output table.

The mining commodities groups are coal, oil and gas, iron sand and iron ore, tin ore, bauxite ore, copper ore, nickel ore, gold ore, silver ore, other metals, and other minerals. However, the stone is not put as a particular commodity group, instead putting it into the other minerals group, since stone contributes relatively very small towards the overall export value. The mining service sector covers services particularly provided to cater to the mining industries. The miscellaneous processed mining products sector gathers up sectors that use raw minerals to produce intermediate and final goods. The sector consists of sectors that use inputs of raw minerals, such as metalwork, gun and ammunition, machinery, and other similar sectors. This sector is important in this input-output table, and particularly important in determining the imported and domestic value-added. This 26 sectors table is then modified to accommodate several additions: intermediate exports and final exports, also intermediate imports and final imports. The modification is necessary to estimate domestic value-added embedded in the exports, especially the mineral exports. Table 4.3 shows code classification for sectors used in the 26 sectors table.

Table 4.3 Code of sectors of the aggregated Input-Output 26 sectors table

Original Sectors	Name of Sectors	Code of Sectors
1-36	Agriculture, forestry, fishery	1
37	Coal	2
38-39	Oil and Gas	3
40	Iron sand and iron ore	4
41	Tin ore	5
42	Bauxite ore	6
43	Copper ore	7
44	Nickel ore	8
45	Other metals	9
46	Gold ore	10
47	Silver ore	11
48-50	Other minerals	12
51-52	Mining Services	13
53-110, '121-144	Manufacturing industry	14
111-120	Miscellaneous processed mining products	15
145-148	Utility	16
149-153	Construction	17
154-156	Wholesale and retail trade, repairing	18
157-163	Transportation and warehousing	19
164-165	Accommodation service, food and beverage	20
166-169	Information and communication	21
170-173	Financing and insurance	22
174	Real estate	23
175-176	Company services	24
177	Governance	25
178-185	Education, health, and other services	26

4.4. Analysis of Input-Output Table

4.4.1. Trading Balance

The input-output table of 26 sectors shows that only sectors related to the mining industry that show positive trading balance value. The trading balance is calculated as the difference between the export value and the import value of each sectors. As shown in Figure

4.1, all of the mining commodities sectors have positive trading values, with the exception on iron sand and iron ore, gold ore, and other minerals sectors, which have negative value. This positive value means that export value of these sectors is bigger than the import value. These findings are in line with eagerness of the government of Indonesia to maximize benefit of the mining industry. However, for other mining-related sectors, miscellaneous processed mining products still has negative trading balance value, which is 31 trillion IDR (Indonesia Rupiah), and mining services has zero trading balance.

For other sectors, the manufacturing sector has the largest negative trading balance value. It indicates that this sector's import value is bigger than its export value. This use of import evidently important in creating the gross value added, as this sector also produce the highest gross added-value among the 26 sectors.

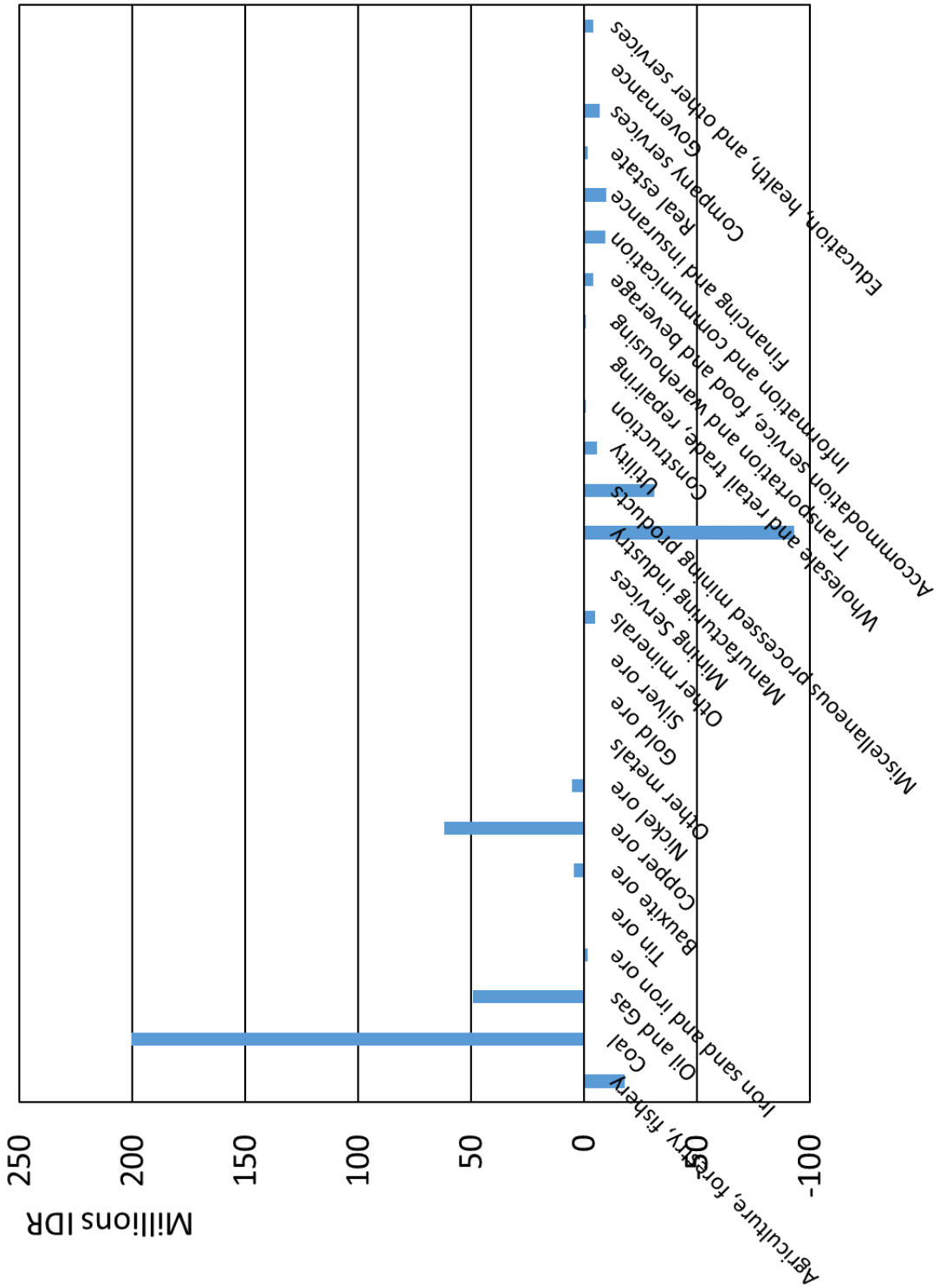

Figure 4.1 Trading balance of the 26 sectors

4.4.2. Gross Value-added

Further investigation on the input-output table of 26 sectors shows that the manufacturing sector holds the largest gross added-value of 1,396 trillion IDR, compared to the average 257 trillion IDR of the whole intermediate industries.

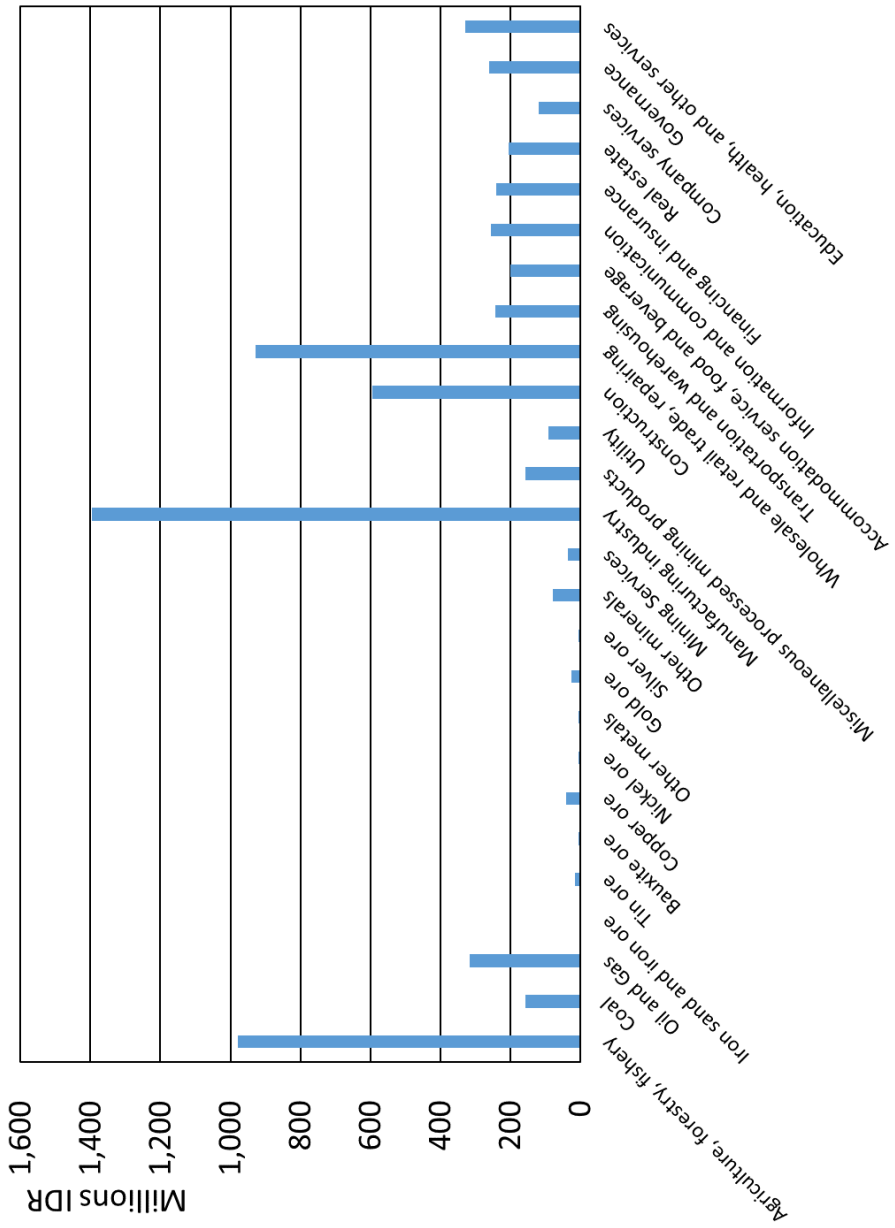

Figure 4.2 Gross value-added of the 26 sectors

However, the large trading values of the mining-related sectors do not occur in their gross added-value. Figure 4.3 shows that among mining commodities sectors, oil and gas industry produced the highest gross added-value, of 316 trillion IDR. In spite of that, in Indonesia, oil and gas sector is often treated as separate entity from the mining sectors. Therefore, the gross added-value of coal sector, although comes second after the oil and gas, becomes more significant, with the value of 156 trillion IDR.

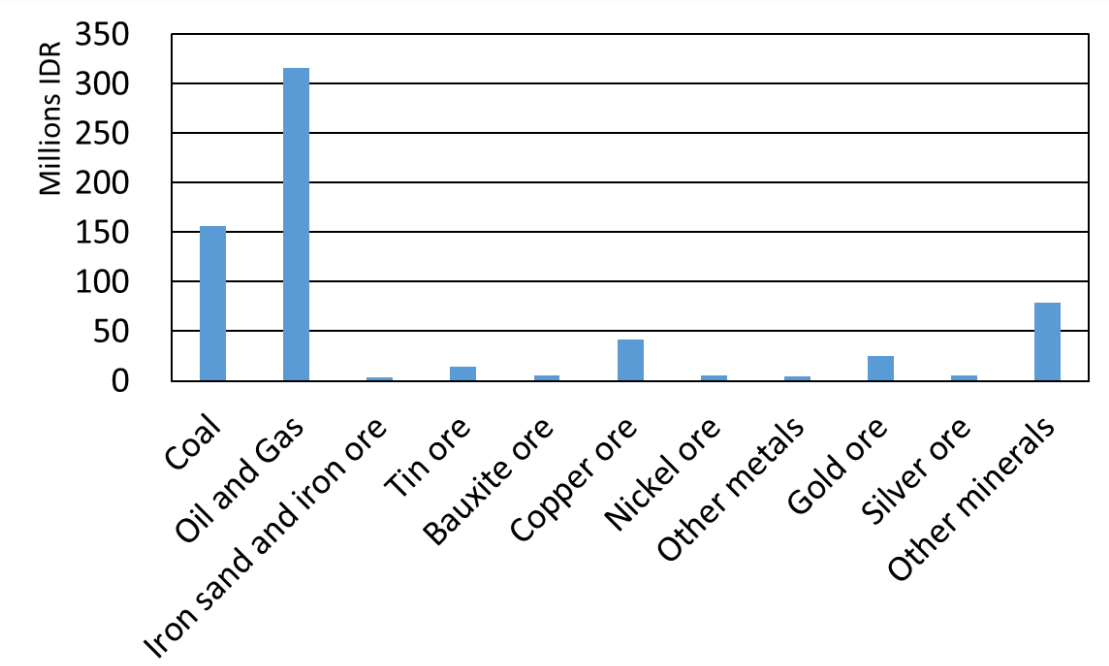

Figure 4.3 Gross value-added of the mining commodities

4.4.3. Linkages

One commonly used tool in analyzing the input-output table is linkages, which consist of forward and backward linkages. Forward linkage β, or degree of sensitivity, indicates total gross output in an industry *i* required to produce a unit of final demand in every industry *j*. In other words, increased output in sector *i* also means that additional amounts of product *i* are available to be used as inputs to other sectors for their own production – that is, there will be increased supplies from sector *i*, as a seller, for the sectors that use good *i* in their

production (Miller & Blair, 2009). It is defined as the ability of a sector to increase the growth of other sectors that is using input from this particular sector. Forward linkage is calculated as:

$$FL_j = \frac{n\sum_{i=1}^{n} b_{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} \quad \text{(4.3)}$$

In the other side, backward linkage α, or power of dispersion, shows total gross output required to produce a unit of final demand in industry *j*. In this case, if sector *j* increases its output, this means there will be increased demands from sector *j*, as a purchaser, on the sectors whose goods are used as inputs to production in *j* (Miller & Blair, 2009). Backward linkage is the ability of a sector to increase growth of upstream industries, and it is calculated as:

$$BL_j = \frac{n\sum_{j=1}^{n} b_{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} \quad \text{(4.4)}$$

The results of calculation of forward linkage is shown in Figure 4.4. The calculation shows that on average the intermediate industries of Indonesia have forward linkage value of 1.00. Among the 26 sectors, manufacturing industry holds significantly the highest ability to increase the growth of other sector, indicated by the highest forward linkage value of 4.97. When the government strives to boost the growth of overall economy, the manufacturing sector should be the priority sector to be developed.

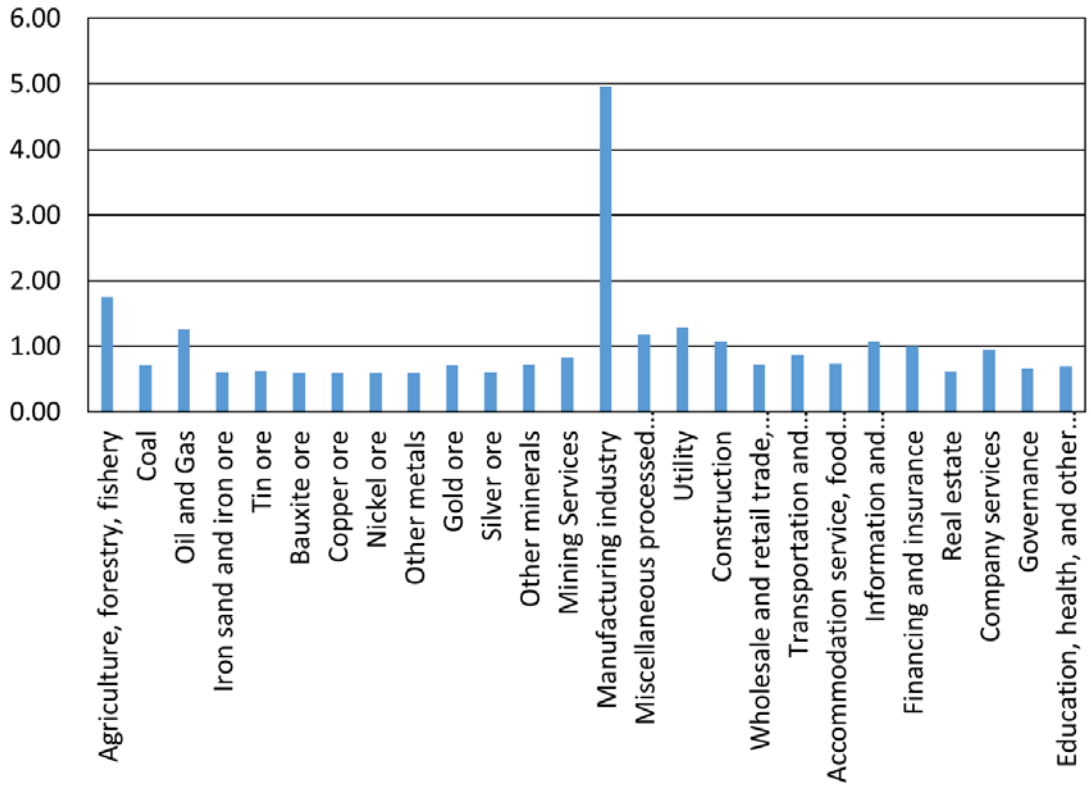

Figure 4.4 Forward linkage of 26 sectors

When isolating the mining commodities, as shown in Figure 4.5, on average the forward linkage value decreases to 0.7. This value indicates that the mining trade commodities apparently performs below the economy's average, despite their high contribution towards domestic economy and export. The oil and gas sector has the highest value of forward linkage of 1.25., making it the only commodity that performs better than the economy's average. It indicates that when supported and developed, this sector can provide driving force for the economy. However, in Indonesia, this sector statistically often is treated separately from the other mining commodities. Therefore, the other minerals sector becomes more prominent as a mining-related sector that can boost the growth of other intermediate sectors. In the other hand, with similar value of 0.59, the bauxite ore, copper

ore, nickel ore, and other metals are mining trade commodities that can provide the least boost to the growth of overall economy.

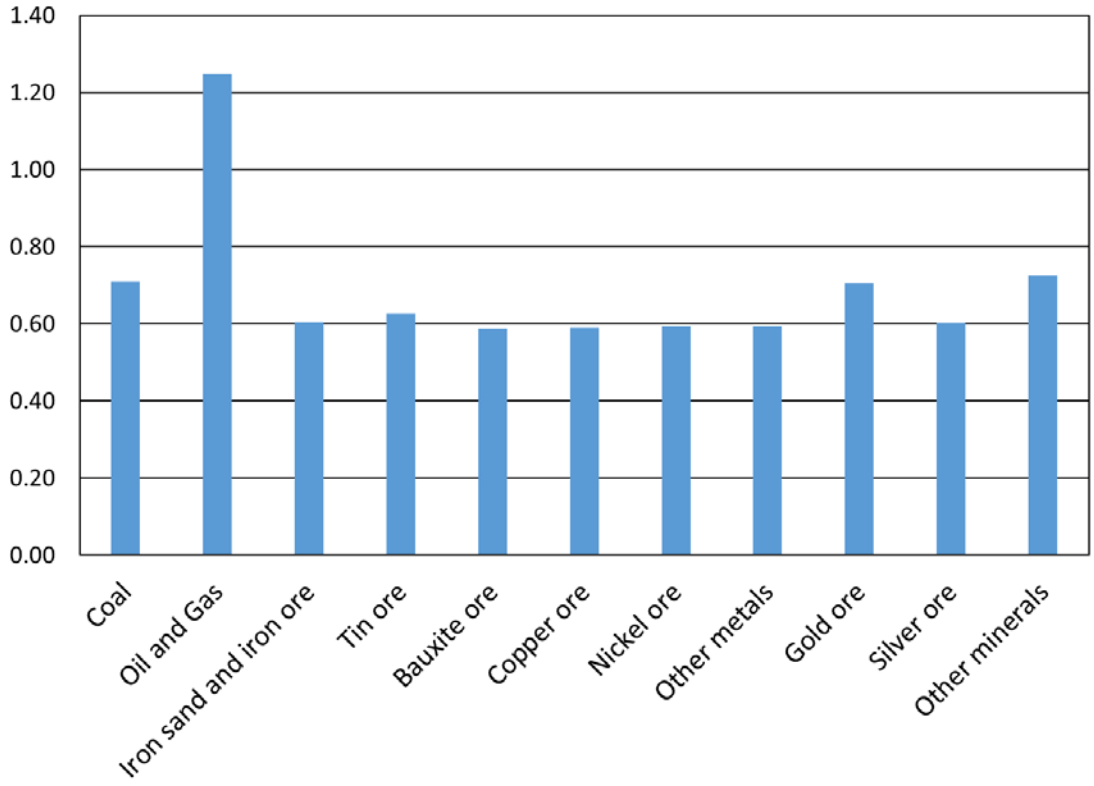

Figure 4.5 Forward linkage of mining commodities

Backward linkage shows the ability of a sector to adsorb the output from upstream industries. Figure 4.6 shows that for overall the 26 sectors, the average backward linkage value is similar to the average forward linkage value, which is 1.0. With the value of 1.59, the utility sector have the highest backward linkage value. This sector is absorbing more output than other sectors. When there is increasing in its output, it will need more input from the other sectors. On the other hand, with the value of 0.66, the bauxite ore sector has the lowest backward linkage. It indicates that this sector absorbs the least of the output from the other sectors.

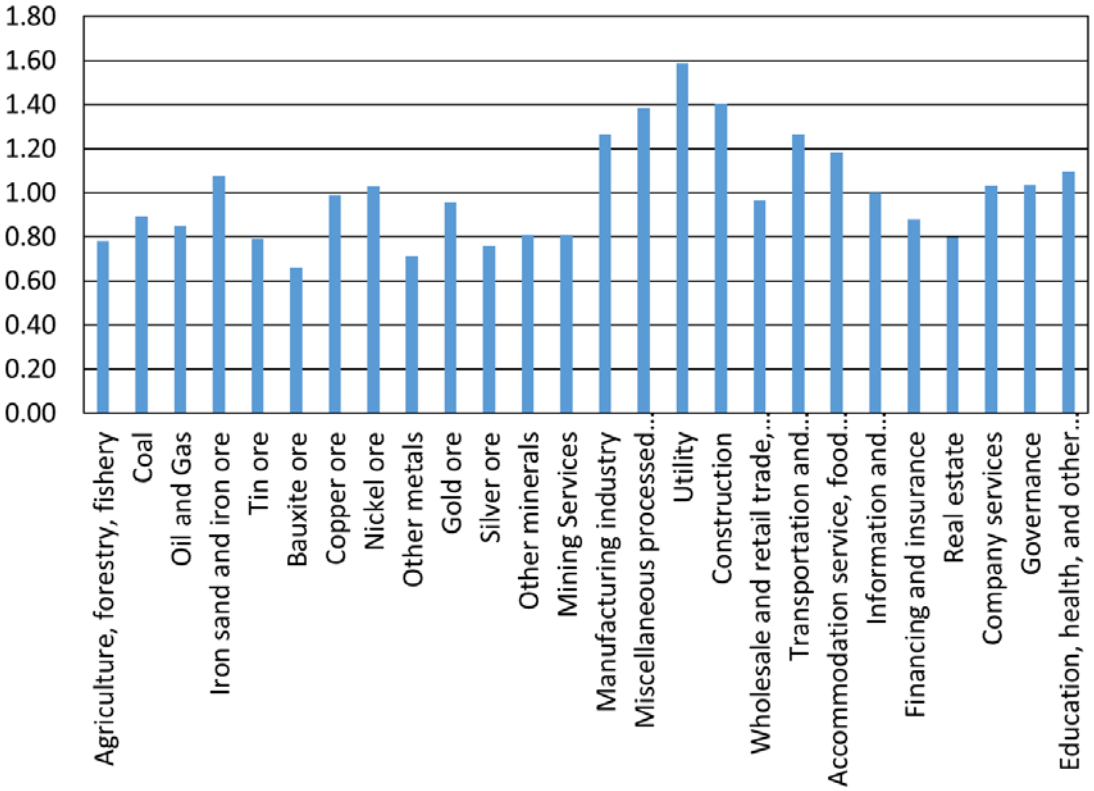

Figure 4.6 Backward linkage of 26 sectors

Figure 4.7 shows that the mining trade commodities sectors have an average value of backward linkage of 0.87. The iron sand and iron ore sector has the highest backward linkage value of 1.07, while, as shown before, the bauxite ore sector has the lowest backward linkage.

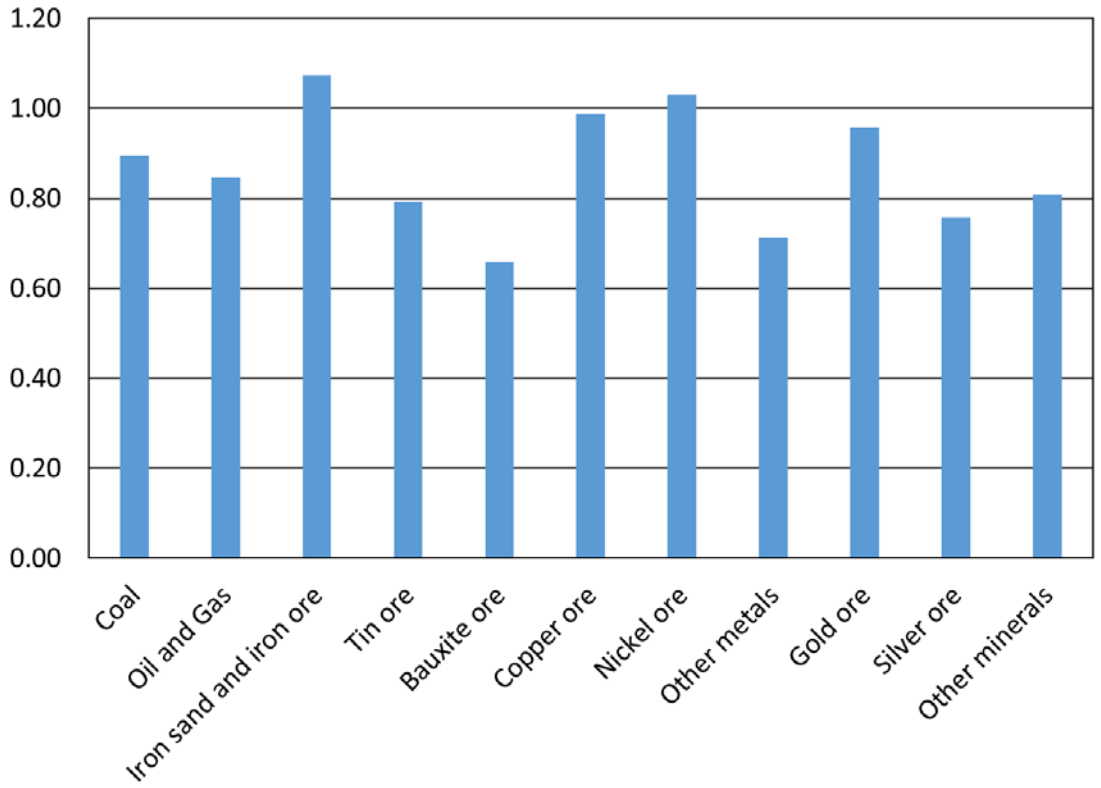

Figure 4.7 Backward linkage of mining commodities

In order to do better comparison of the linkages, the results are put in graphs in Figure 4.8. Figure 4.8 shows the differences of both linkages among the 26 sectors. Comparing the linkages, the forward linkage values of manufacturing and agriculture sectors are exceptionally high, whilst aside from the high value of utility's backward linkage, there is nothing highly notable in term of backward linkages.

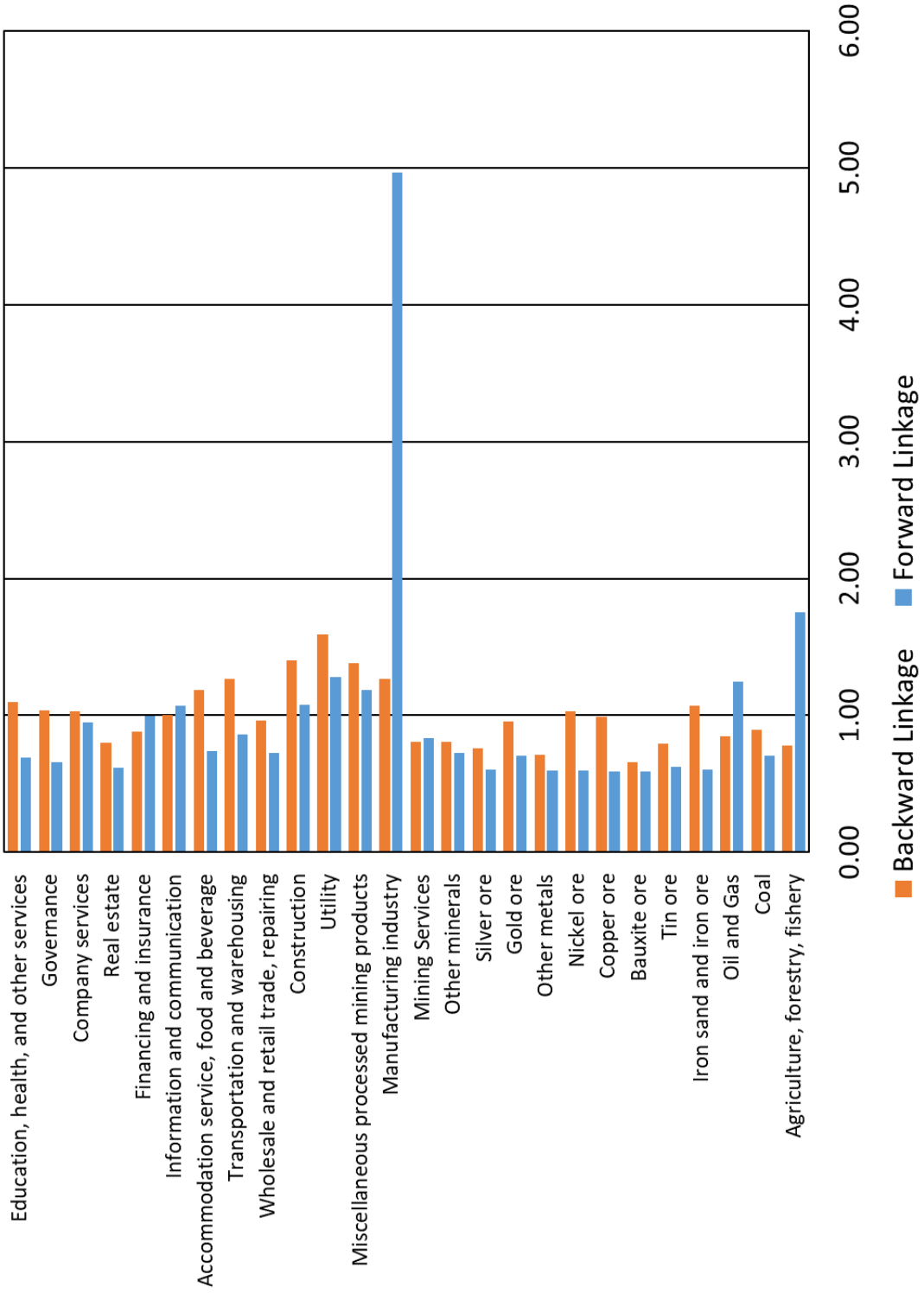

Figure 4.8 Comparison of the forward and backward linkages

When singled out the mining sectors, the results are presented in Figure 4.9. The oil and gas sector has the largest forward linkage, while other mining commodities contribute relatively equivalent towards the other sectors. In term of backward linkage, iron sand and iron ore sector absorbs the most output of the other sectors compared to any other mining commodities.

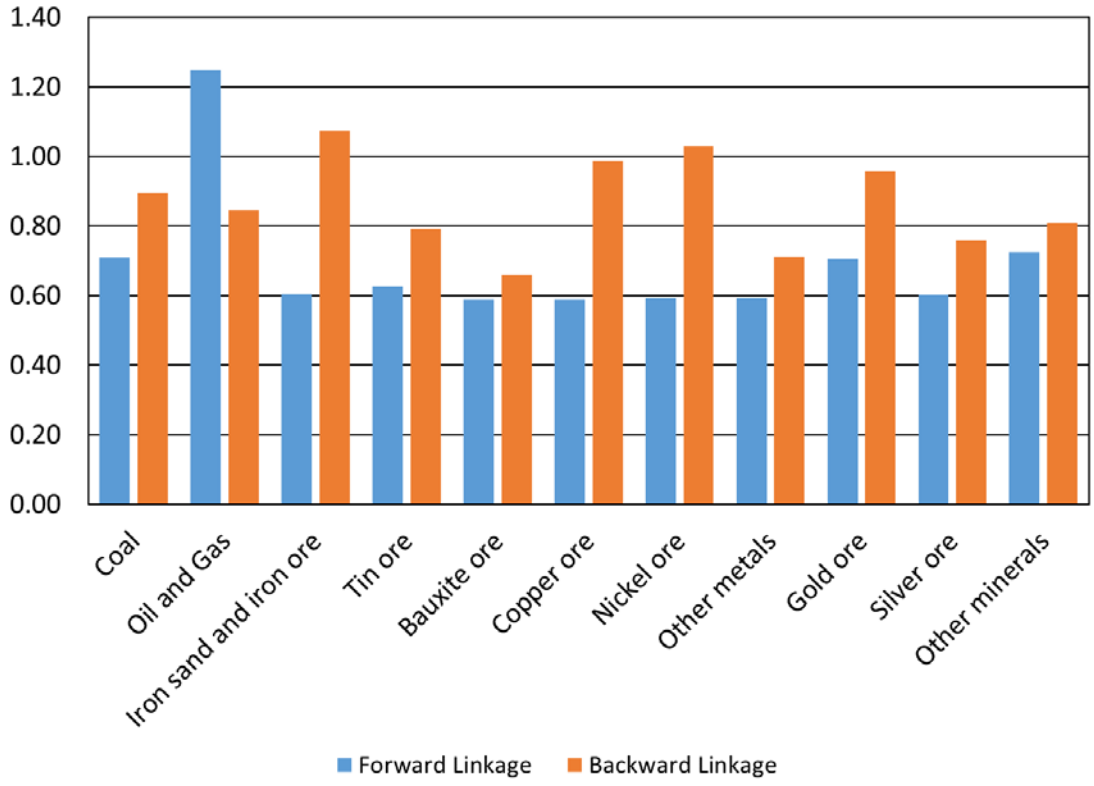

Figure 4.9 Forward and backward linkages of mining commodities

4.4.4. Multipliers

Another use of the input-output model is the multiplier effects. The input-output model provides multipliers that can be used to estimate the economy-wide effects that an initial change in economic activity has on a regional economy (Bess & Ambargis, 2011). The multipliers measure possible effects of changes on the economy. The multipliers resulted

from the input-output analysis is utilized in the economic impact assessment on how the export ban of the raw mining commodities brings changes the economic. There are several type of multipliers, which are output multiplier, income multiplier, employment multiplier, and value-added multiplier.

Output multiplier indicates total output of all industries that is needed to produce one additional output when there is one unit increase in final demand. An output multiplier for sector j is defined as the total value of production in all sectors of the economy that is necessary in order to satisfy a dollar's worth of final demand for sector j's output. This multiplier is calculated as column sum of the Leontief inverse matrix:

$$OM_j = \sum_i L_{ij} \quad \text{.....} \quad (4.5)$$

Table 4.4 Output multiplier

Sectors	Output Multiplier
Agriculture, forestry, fishery	1.33
Coal	1.53
Oil and Gas	1.45
Iron sand and iron ore	1.84
Tin ore	1.35
Bauxite ore	1.13
Copper ore	1.69
Nickel ore	1.76
Other metals	1.22
Gold ore	1.64
Silver ore	1.30
Other minerals	1.38
Mining Services	1.38
Manufacturing industry	2.17
Miscellaneous processed mining products	2.37
Utility	2.72
Construction	2.40
Wholesale and retail trade, repairing	1.65
Transportation and warehousing	2.17
Accommodation service, food and beverage	2.03
Information and communication	1.71

Sectors	Output Multiplier
Financing and insurance	1.50
Real estate	1.36
Company services	1.76
Governance	1.77
Education, health, and other services	1.87

Table 4.4 shows the calculation result for the output multiplier. The average value of the 26-sectors output multiplier is 1.71. The utility sector has the largest output multiplier value of 2.72, and bauxite ore sector has the smallest value. While for the mining commodities sectors, iron sand and iron ore sector has the largest value.

Another multiplier is income multiplier. This multiplier shows how one monetary unit change of income from employment in each industry increases the total income from employment. This multiplier is calculated as:

$$IM_j = {\sum_i v_i L_{ij}}\Big/{v_j} \quad \text{(4.6)}$$

where, v is calculated as the ratio of labour compensation and total output for each industry.

Table 4.5 Income multiplier

Sectors	Income Multiplier
Agriculture, forestry, fishery	0.21
Coal	0.10
Oil and Gas	0.07
Iron sand and iron ore	0.21
Tin ore	0.10
Bauxite ore	0.12
Copper ore	0.57
Nickel ore	0.08
Other metals	0.11
Gold ore	0.21
Silver ore	0.27
Other minerals	0.29

Sectors	Income Multiplier
Mining Services	0.28
Manufacturing industry	0.11
Miscellaneous processed mining products	0.09
Utility	0.06
Construction	0.14
Wholesale and retail trade, repairing	0.20
Transportation and warehousing	0.16
Accommodation service, food and beverage	0.16
Information and communication	0.17
Financing and insurance	0.22
Real estate	0.05
Company services	0.18
Governance	0.55
Education, health, and other services	0.40

Table 4.5 shows the result of the income multiplier. On average, the income multiplier value of 26 sectors is 0.20. The copper ore sector has the highest income multiplier value, followed closely by the governance sector. Evidently, these sectors bring more employment monetary impact. On the other hand, the real estate sector has the lowest income multiplier of 0.05. Also, apparently, most of the mining commodities sectors have some of the lowest income multiplier values, way below the average value.

Another multiplier used is employment multiplier. Basically, the income and employment multiplier use similar approach which is measuring the economic impact on households. The difference is the income multiplier measures the impact in term of monetary that is earnings, and the employment multiplier measures the impact in term of physical that is jobs (Miller & Blair, 2009). It is calculated based on full-time employment, as following:

$$EM_j = {\sum_i w_i L_{ij}}\Big/{w_j} \quad \text{(4.7)}$$

where, w is calculated as fulltime equivalent of employment per IDR (Indonesian Rupiah) of total output of each industry. It measures total increase in employment when there is a unit increase in final demand.

Different from the output multiplier and income multiplier, the employment multiplier is calculated using fulltime employment data, in addition to the input-output table. However, since the fulltime employment data is not broken down similarly to the sectors of the input-output table, the employment multiplier is calculated according to the fulltime employment data. Table 4.6 shows that in term of employment multiplier, agriculture sector provides the most for employment. On average, the employment multiplier value is 0.041. In the other hand, the mining sector comes second as the smallest employment multiplier, with 0.001. It indicates that the mining sector does not create much impact in employment area, regardless its significant effect in income and output areas of the economy of Indonesia.

Table 4.6 Employment multiplier

Number of employment	Employment multiplier
Agriculture, forestry, hunting, fishery	0.285
Mining and digging	0.001
Manufacturing	0.003
Utility	0.001
Construction	0.003
Trade, accommodation, food and beverage	0.010
Transportation, warehousing, communication	0.051
Financing, real estate, leasing, company services	0.002
Social services, humanity	0.016

In further utilizing the input-output table in analyzing the mineral export restriction, a gross-added value could be calculated using similar approach with the income multiplier. In this research, the gross value added multiplier is calculated as:

$$VM_j = {\sum_i g_i L_{ij}}\Big/{g_j} \quad \text{(4.8)}$$

where, g is calculated as the ratio of gross-added value and total output for each industry.

Table 4.7 Value-added multiplier

Sectors	Value-added
Agriculture, forestry, fishery	0.82
Coal	0.71
Oil and Gas	0.73
Iron sand and iron ore	0.61
Tin ore	0.82
Bauxite ore	0.94
Copper ore	0.66
Nickel ore	0.62
Other metals	0.89
Gold ore	0.68
Silver ore	0.85
Other minerals	0.82
Mining Services	0.81
Manufacturing industry	0.36
Miscellaneous processed mining products	0.31
Utility	0.28
Construction	0.34
Wholesale and retail trade, repairing	0.68
Transportation and warehousing	0.44
Accommodation service, food and beverage	0.45
Information and communication	0.62
Financing and insurance	0.72
Real estate	0.83
Company services	0.59
Governance	0.62
Education, health, and other services	0.56

Table 4.7 shows the value-added multiplier for the 26 sectors. The average value is 0.64. With the value of 0.94, the bauxite ore sector apparently has the largest value. On the other hand, the utility sector has the smallest value-added multiplier, indicates that this sector does not much transform the value of its inputs.

Omitting the employment multiplier, the output multiplier, income multiplier, and value-added multiplier are put into a comparison, shown in Figure 4.10. Overall, the mining-related sectors apparently have better economic performance in term of value-added.

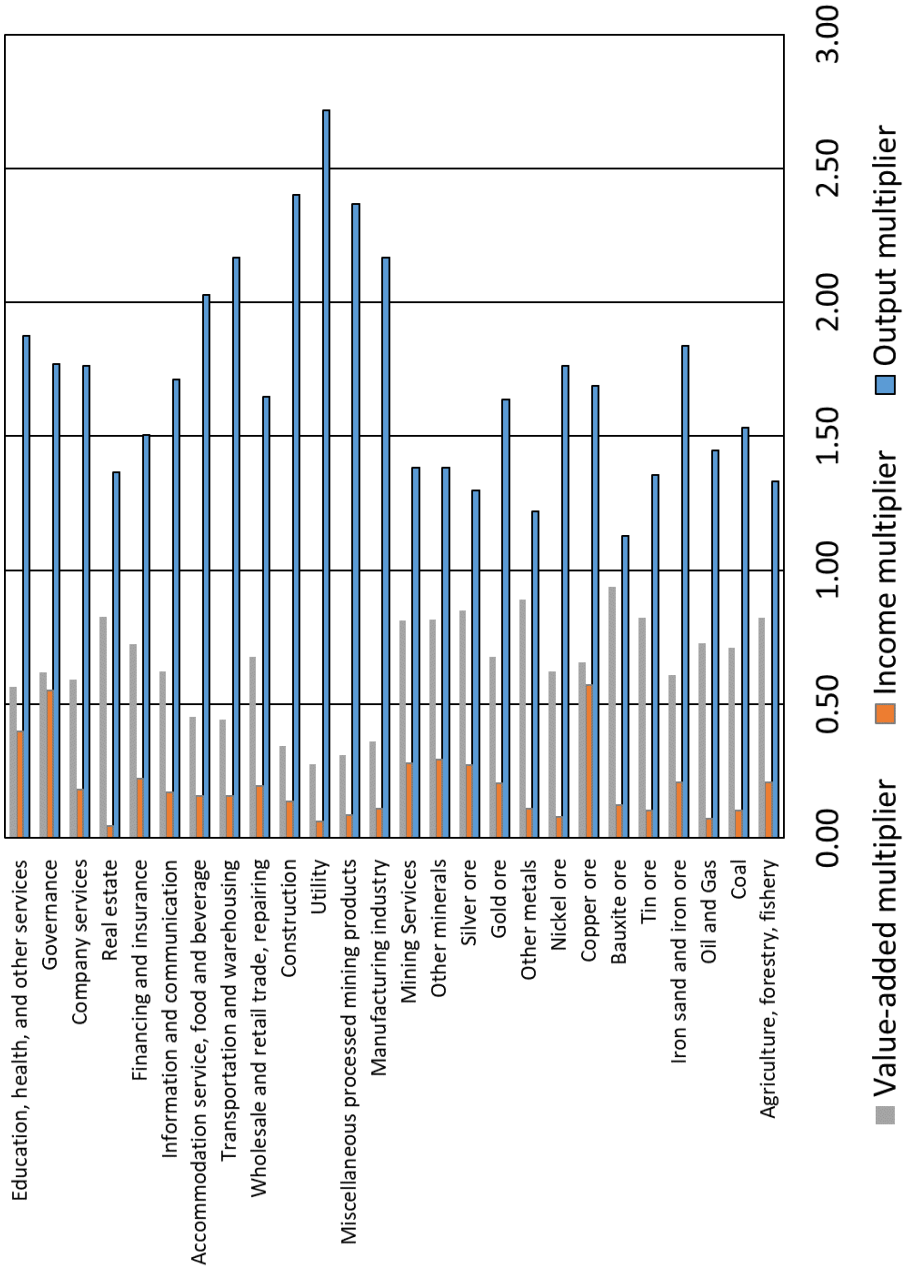

Figure 4.10 Comparison of multipliers for 26 sectors

However, as the government of Indonesia is intending to better utilize the mining sector in boosting the economic growth, it is necessary to take an in-depth analysis upon the mining sectors. Focusing on the mining commodities, the multipliers are put into Figure 4.11. Based on this figure, apparently the ore commodities have relatively high output multiplier, with bauxite ore being the smallest one.

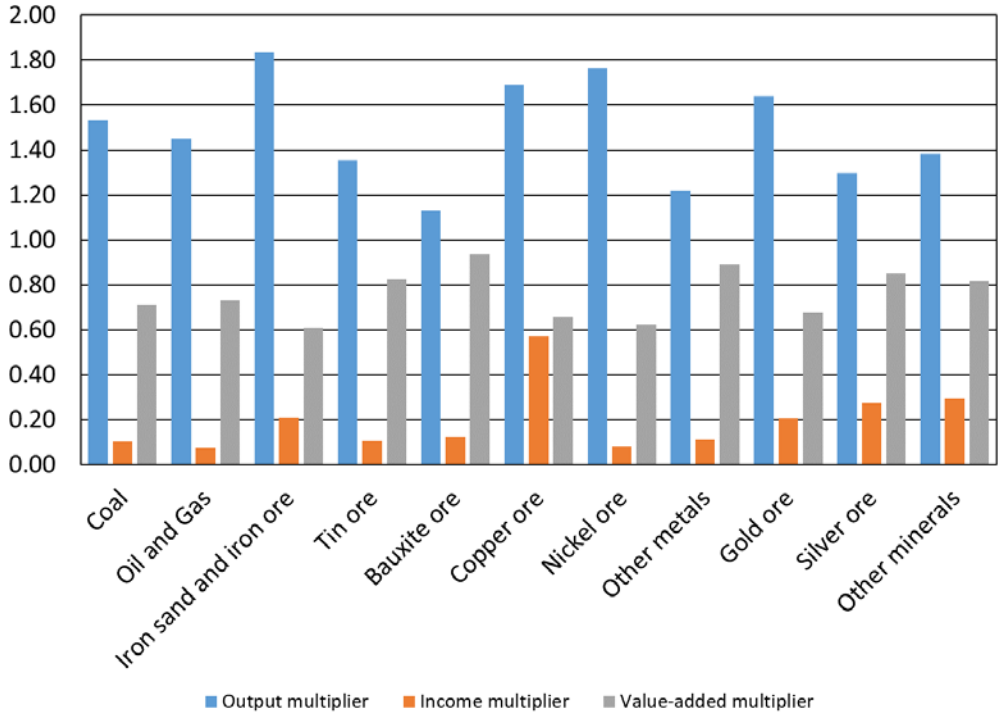

Figure 4.11 Multipliers for mining commodities

4.4.5. Domestic Intensity

A more in-depth analysis on the input-output model is carried out using the domestic intensity methods.

The term of domestic intensity is a match of import intensity. Domestic intensity can be defined as domestically produced inputs that embodied in goods and services produced by a country. Domestic intensity also determines how much intermediate industries of a

country rely on its domestic input. In term of export, domestic intensity of export indicates domestically produced inputs that subsequently get exported.

Most of the previous researches measure the value of the imported inputs embodied in goods that are produced, since more countries are working in the middle stages of the global production chain, and therefore more dependent towards their import. However, as Indonesia operates in the early stage, it is pertinent to analyze the value of domestic inputs instead of the imported inputs.

Therefore, this study develops the domestic intensity equation using the Leontief's basic model:

$$X_i = \sum X_{ij} + F_{ij} \quad \text{(4.9)}$$

where, X_i shows sectoral output, ΣX_{ij} shows quantity of sectoral output which is demanded as intermediate input, and F_j shows final demand to outputs of sector. Based on this equation, the Leontief Inverse Matrix can be calculated as:

$$\mathrm{X} = (\mathrm{I} - \mathrm{A})^{-1}\mathrm{F} \quad \text{(4.10)}$$

X is the vector of output, F is the final demand, A is a matrix of input coefficients and I is the identity matrix.

The intermediate sectors written in equation as:

$$\sum X_{ij} = D_{ij} + M_{ij} \quad \text{(4.11)}$$

where, X_{ij} is the intermediate sectors, D_{ij} is the domestic content for each sector and M_{ij} is the imported content for each sector. Domestic input coefficients are obtained by dividing their domestic input quantity to their total output.

By the equation 4.11, the domestic input coefficients can be calculated as:

$$d_{ij} = \frac{D_{ij}}{X_{ij}} \quad \text{(4.12)}$$

This domestic input coefficients therefore were used in determining domestic inverse coefficients. The domestic inverse coefficients showed domestic intensity of sectors. Domestic Inverse Matrix coefficients measure dependency of the economy on domestic input and can be calculated as follows:

$$DC_{ij} = \left(I - d_{ij}\right)^{-1} \quad \text{(4.13)}$$

The column of the domestic input coefficients indicates utilization of domestic production by each intermediate sectors. In other words, this coefficient shows how each sector uses goods and services that are domestically produced as inputs in its production process. Figure 4.12 shows the results of our calculation. It represents the distribution of the domestically produced outputs that are used as inputs in each sector. Apparently, the primary sectors do not rely very much on others' domestically produced outputs. On the other hand, the outputs of the sectors are used across the intermediate industries. It is in line with the role of the primary sectors as the provider of raw materials in the early stage of production process. The tertiary sectors utilize more of the domestically produced outputs as their inputs. Then, the secondary sectors as processing sectors use the most of the domestically produced outputs of other intermediate sectors.

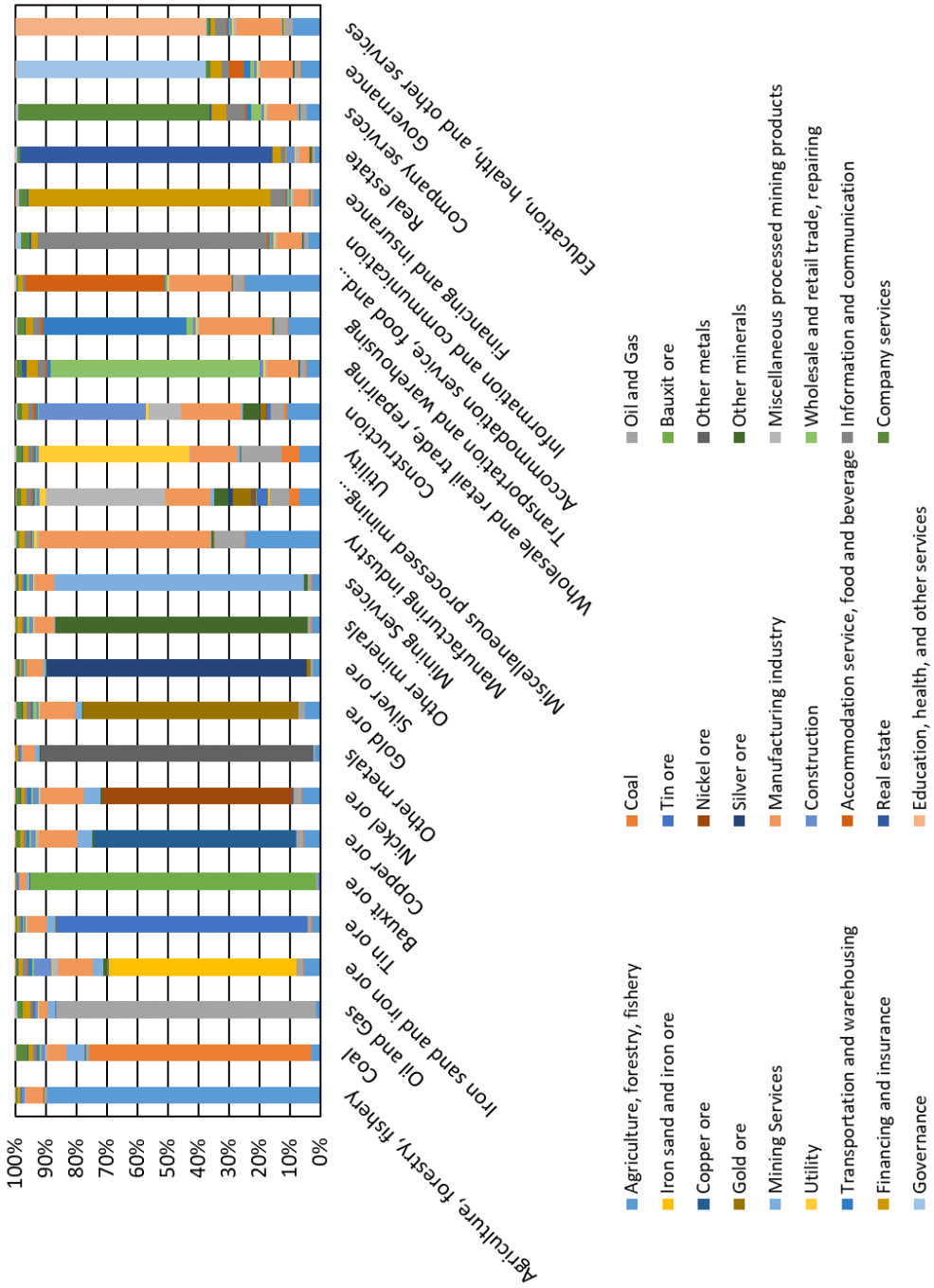

Figure 4.12 Domestic intensity

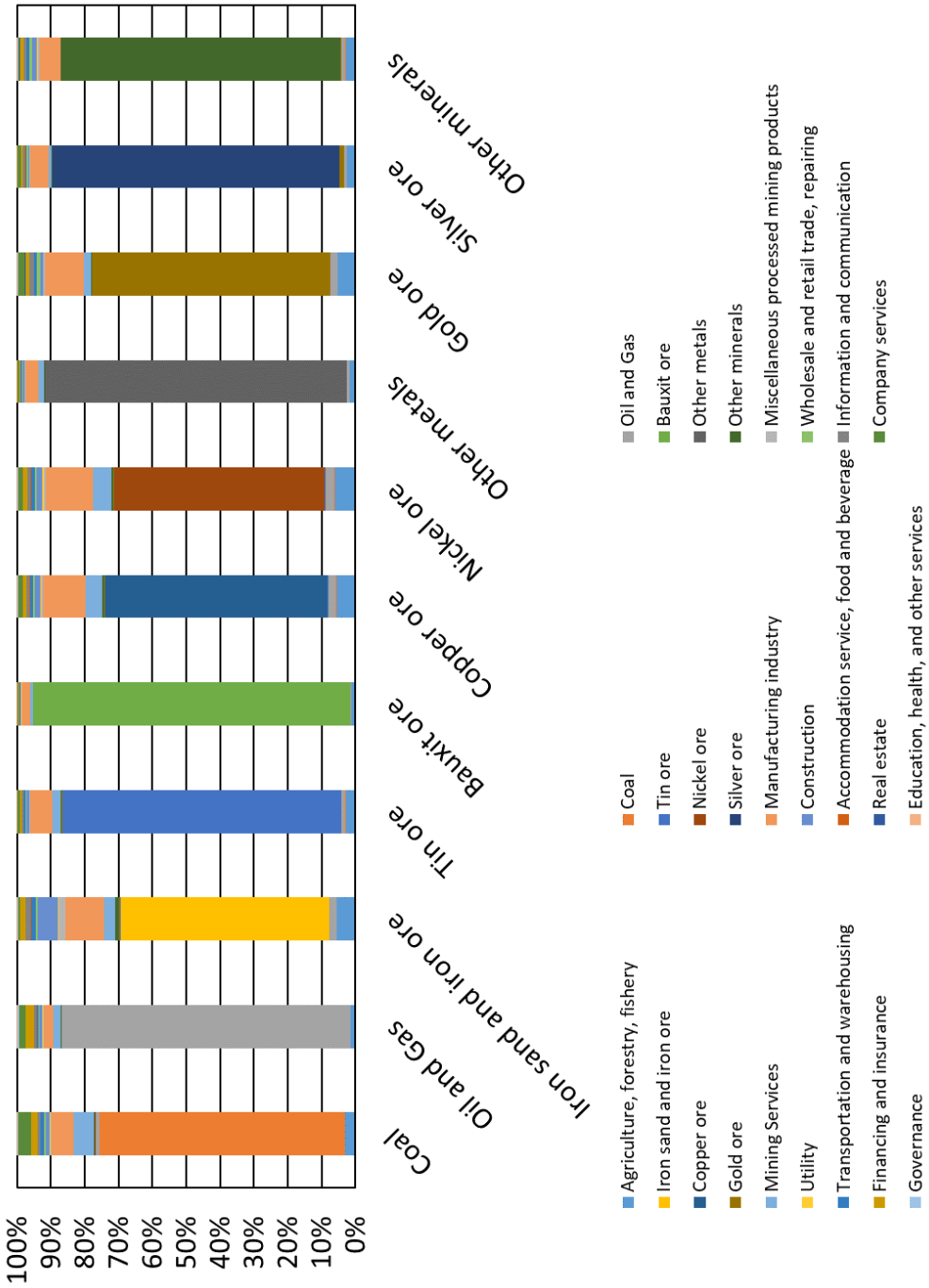

Figure 4.13 Domestic intensity of the mining commodities

When single out the mining-related sectors, as shown in Figure 4.13, it becomes very apparent that the mining commodities sectors, as a part of the primary sectors, do not utilize much of the domestically produced outputs as their inputs. An exception is the miscellaneous processed mining products, since it is actually one of the processing sectors. Another important notion is the output from the oil and gas apparently is utilized in all of the 26 intermediate sectors. The output of the miscellaneous processed mining products sector is also used in majority of the sectors.

4.5. Economic Multiplier-based Impact Assessment

Essentially, economic impact assessment investigates the economic effects of a business, a project, a governmental policy, or an economic event on the economy of a geographic area (McNay, 2013). The input-output model provides multipliers that can be used to estimate the economy-wide effects that an initial change in economic activity has on a regional economy (Bess & Ambargis, 2011). The multipliers resulted from the input-output analysis is utilized in the economic impact assessment on how the export ban of the raw mining commodities brings changes the economic.

The impact is determined based on how the export ban affects the GDP, and it is calculated as:

$$IO_{GDP} = \sum_i a_{ij} \times d_{ij} \times OM_j \quad \text{(4.14)}$$

$$II_{GDP} = \sum_i a_{ij} \times d_{ij} \times IM_j \quad \text{(4.15)}$$

$$IV_{GDP} = \sum_i a_{ij} \times d_{ij} \times VM_j \quad \text{(4.16)}$$

IO_{GDP} is the output impact on GDP, II_{GDP} is the income impact on GDP, IV_{GDP} is the value-added impact on GDP, a_{ij} is the technical coefficient based on the 26-sectors input-output table, d_{ij} is the additional demand resulted from the implementation of the export ban, and OM_j is the output multiplier, IM_j is the income multiplier, VM_j is the value-added multiplier.

In assessing the economic multiplier-based impact, a hypothetical situation is implemented. As the government implements the export ban, it is mandatory to have the raw mining commodities to be processed domestically. It means the processing sectors and the other intermediate sectors have to absorb the raw mining commodities, therefore increases the intermediate demand. On average within 2000 – 2017, the GDP of Indonesia is USD 573 billions, and the average GDP growth is 5% (The World Bank, 2018). The mining commodities contributes 10% towards the GDP. Suppose the value, which is USD 3 billions, reflects the additional demand that occurs when the government implements the export ban.

The impact of the export ban to the GDP contains output impact, employment impact, and value-added impact. The additional demand is contributed through the intermediate sectors based on the technical coefficients, and we use the multipliers to calculate the impact on the GDP. Therefore, when there is USD 3 billions additional demand resulted from the implementation of the export ban, the total output impact on the GDP for the 26 sectors is USD 15 billions, the total employment impact is USD 5 billions, and the total value-added impact is USD 53 billions.

Figure 4.14 shows the economic-wide effects of the export ban policy for each of the 26 economic sectors of Indonesia. Apparently, in term of output, the export ban policy brings the highest impact on the GDP of the utility sector, processed mining products sector, and construction sector. In term of value-added, the export ban policy affects the GDP of the accommodation service sector, and transportation and warehousing sector. In term of income, the GDP of the governance sector, and the copper ore sector are the ones that highly affected by the export ban policy.

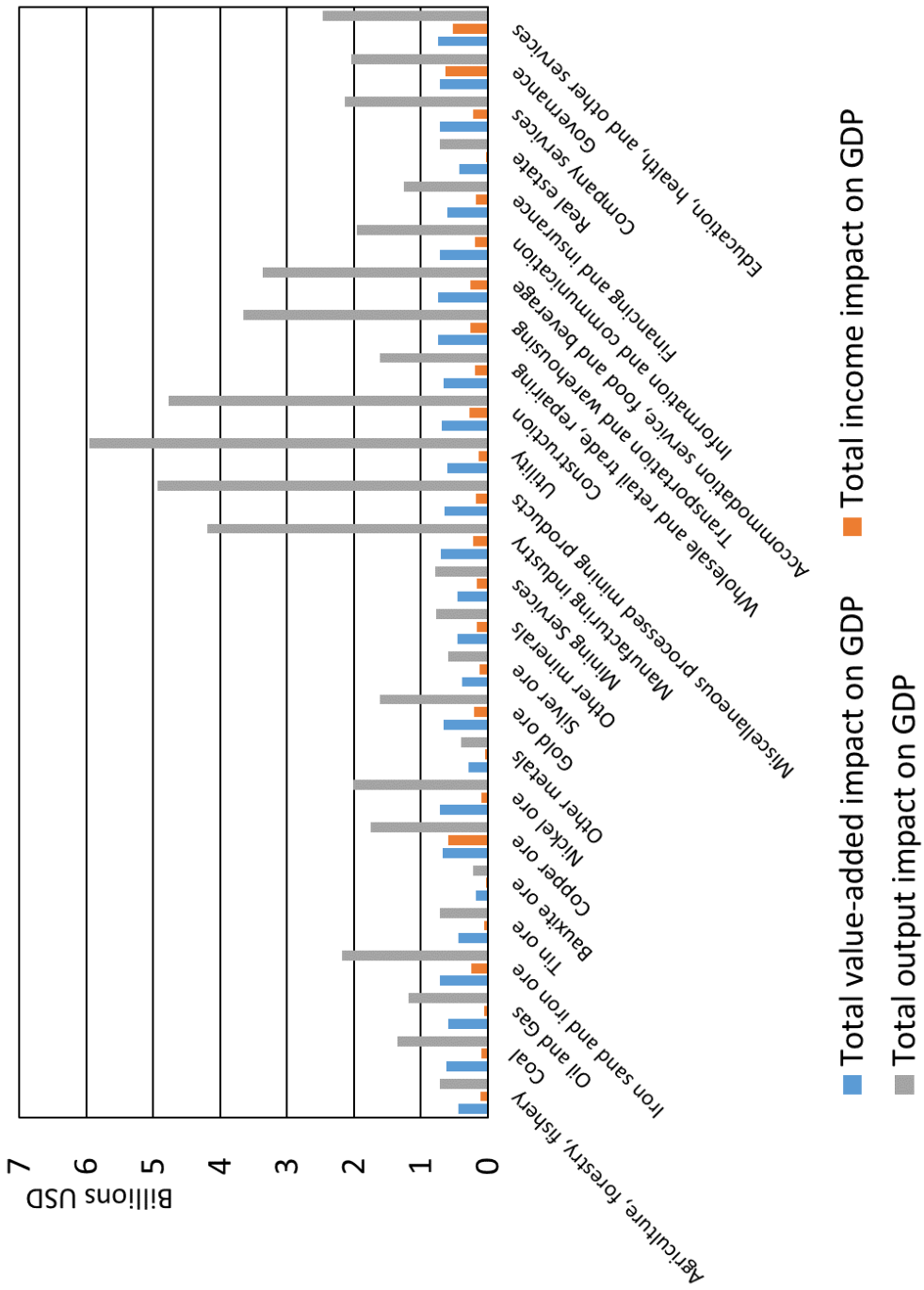

Figure 4.14 Economic impact on the 26 sectors

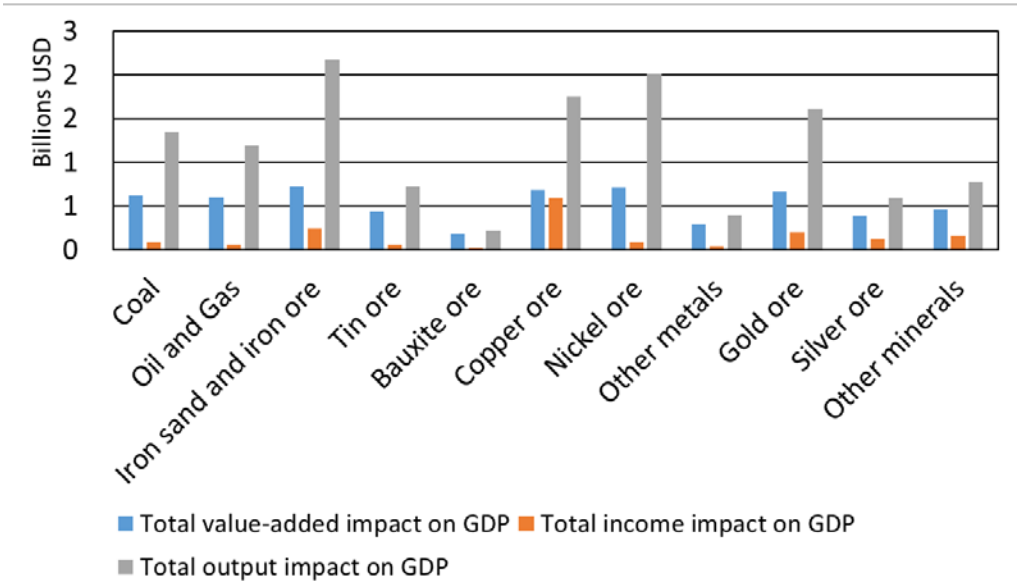

Figure 4.15 Economic impact on mining commodities

Isolating mining commodities in Figure 4.15 shows that in term of output, the GDP of the iron sand and iron ore sector, along with copper ore sector and nickel ore sector are sectors that highly affected by the export ban policy. Similarly, in term of value added, the export ban policy brings the highest impact on the GDP of the iron sand and iron ore sector, nickel ore sector, and copper ore sector as well. While in term of income, the GDP of the copper ore sector is the particular sector that has the highest impact of the export ban policy.

4.6. Highlights

Assessing the endogenous point of view of the export ban shows the performance and the relation among the intermediate sectors of the economy of Indonesia. The forward linkages analysis of the input-output table shows that manufacturing sector holds the highest influence within the intermediate industries. On the other hand, as the potential impact of the export ban is established, bauxite ore, copper ore, nickel ore, and other metals sectors evidently have the similarly lowest forward linkage value. Backward linkages analysis

indicates that the utility sector has the highest values. Also, similar to its forward linkage value, the bauxite ore has the smallest backward linkage value. Other mining commodities apparently have relatively small backward linkage value as well. Starting with these analyses, apparently, the mining-related sectors are not significantly influential within the intermediate industries of Indonesia. It also indicates that these commodities mostly are being exported and apparently could provide more benefit as exported commodities.

However, to further investigate the economic potential of the mining commodities when facing the export ban policy, the mining-related sectors are separated from the other intermediate sectors, focusing on the potential mining commodities. When isolated, the mining commodities sectors evidently have similar forward linkage values, except the oil and gas sector that has the highest value. This finding shows that in term of providing boost for the overall economic growth, there is no particular mining commodities that stands out as prominent force. In term of backward linkage, the iron sand and iron ore sector has the highest backward linkage, indicates that compared to other mining commodities, this sector uses most of the output from the other sector.

The multiplier analysis apparently provides interesting findings. When the bauxite ore sector has the smallest output multiplier value, it has the highest value-added multiplier value. Also, nickel ore sector has one of the highest output multiplier, but it also one of the smallest input multiplier value. These findings show that which commodity to be developed first is highly depends on what the government is trying to achieve. The mining commodities evidently have moderately ability to increase the revenue from change in demand, and enormous ability to increase the value of their outputs. However, in term of employment, these sectors cannot be relied on to improve the employment, either physically or monetary.

Additionally, trading balance analysis shows that the government of Indonesia holds ground on insisting to further utilize the mining-related sectors to boost the economy of Indonesia. The trading balance shows that among the 26 sectors, only the mining-related sectors have positive values, indicates that those sectors have higher export value than the import value. This situation is sharpened by the fact that the gross value-added analysis shows

that the mining-related sectors have smaller gross value-added compared to other sectors, meaning that most of the export value comes from the raw commodities. These initial analyses show the potential of the export ban in increasing and optimizing the value of the mining commodities.

The assessment upon the input-output model using several methods allows this study to examine the current economic performance of each intermediate sectors, and the inter-relation among the sectors as well. Also, when focusing the analysis on the mining commodities sectors, evidently the export ban policy has the potential to achieve the intended purposes to gain increase and optimize the value of mining commodities. Another conclusion is that the exception of export ban that covers copper, iron ore, lead, and zinc should be reconsidered. Particularly for the iron ore and copper ore, since these commodities have the potential to utilize the change in demand that is resulted from the export ban.

When the government insists on applying the export ban for other raw mining commodities, the government needs to ensure that the processing and refining of bauxite ore, nickel ore, and other metals will be able to provide to optimal added value for these commodities. Also, developing the iron sand and iron ore sector would bring more benefit to the economy, since it would generate more productivity of the other sectors.

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Chapter 5 The Potential Impact of Export Ban

5.1. Introduction

The input-output analysis has been a pertinent tool in analyzing the performance of an economic structure. It is also useful in investigating a comparative advantage of an economic sector against the rest of the economy. Using the tool, the performance and the comparative advantage of each major sector within the economy of Indonesia has been determined. Then, the input-output model is further utilized to investigate further into the economic structure and determine how each sector utilizes the outputs from other intermediate sectors. The results of these analyses confirm that advantages of the input-output analysis is proven beneficial for assessing trade policy, particularly analyzing the export ban as a form of export restrictions.

Stepped away from the potential impact of the export ban on the economic structure, further investigation on the potential exogenous impacts of the export ban is needed. The assessment covers several factors based on the previous findings.

5.2. Domestic Content

To better analyze the dependency of the intermediate sectors on the domestically produced inputs, the analysis of the domestic intensity is prolonged to an analysis of the domestic content. The domestic intensity analyzes how the outputs from the intermediate industries are used among the sectors, and the domestic content indicates the share of those the domestically produced inputs that are embodied within those outputs, compared to the imported content

The implementation of the export ban policy will affect the domestic content through the intermediate sectors. When the mineral commodities can not be exported in raw form, particularly the intermediate sectors would play an important role to absorb these

commodities. Therefore, the export ban also will bring impacts towards the domestic content of the output. The domestic and imported contents can be examined through the intermediate sectors of an economy. This intermediate sectors produce goods and services that are used domestically and exported. These goods and services contain both domestic and imported contents. The value of goods exported by a country may thus be divided into imported and domestic value-added. When the contribution of exports to the exporting country's growth, the employment and balance of trade depends solely on the content in domestic value-added.

Shares of domestic and import value-added components can be estimated by using a certain approach of a conceptual framework (Koopman, et al., 2012). Koopman's conceptual framework is based on a modified input-output table. The value-based input-output table is designed to accommodate prevalent processing exports. Further, the input-output analysis needs to put into account the value-added behind the gross trade flows (Muradov, 2015).

As some researchers have pointed out, vertical specialization affects international trade flow. It is also especially important for exports from the processing sector. Numerous researchers have followed footsteps set by Koopman, et al. in 2012 in analyzing the vertical specialization. Most of those researches also agree on how the global value chain will affect the trade-in value-added. For example, China's engagement in global value chains would cause increasing in its domestic content in export (Kee & Tang, 2015). Another example suggests how skill-and technology-intensity of China's exports would increase the domestic contents of its exports (Upward, et al., 2013). However, most of the researches put the focus on the last section of the global production chain and treat processing trade as pervasive within the economy.

One of the basic assumption used in this research is that the domestic value-added the content of Indonesia mineral export to be significantly higher than the import content. There are also several prominent notions to be investigated in this research. As Koopman, et al. (2012) have developed in their research, it is particularly important to differentiate between normal exports – domestic exports, and processing exports, when the processing trade was pervasive. However, regarding the Mining Law of Indonesia, processing trade is still

underrated, and the government is willing to drive the processing of mineral commodities more. When processing is something to be implemented, there is not necessary to differentiate between normal exports and processing exports.

The composited input-output table 26 sectors provide the following data value:

x_i = gross output of sector *i*

z_{ij} = goods *i* used as intermediate inputs in sector *j*

v_j = gross value-added in sector *j*

m_i = total imports of sector *i*

y_i = total final demand excepts for exports of goods *i*

Then, we use those data from the input-output model along with the export and import data from Indonesia's Central Agency on Statistics (Badan Pusat Statistik, 2010) to determine value of:

m_{ij} = imported goods by sector *i* that were used by sector *j*

e_{ij} = exported goods by sector *i* that were contributed by sector *j*

The x_{ij}, m_{ij}, and e_{ij} are stated as within-industry transactions.

Using those data, we calculate the value of final demand parameters as:

y_{mi} = final demand of goods of sector *i* from imports

y_{di} = final demand of goods of sector *i* provided by domestic production

The gross output of sector *i* has to equal to the sum of domestic intermediaries, final demand, and export in that sector. This condition also applies to the total imports, which has to equal to the imported intermediate inputs plus imports delivered to final users.

$$\sum_{j=1}^{K}(z_{ij}) = x_i - e_{ij} - y_{di} \quad \text{(5.1)}$$

$$\sum_{j=1}^{K}(m_{ij}) = m_i - y_{mi} \quad \text{..... (5.2)}$$

Based on these equations, exported goods by sector *i* that are contributed by sector *j* can be calculated as:

$$e_{ij} = \sum_{j=1}^{K}(z_{ij} + m_{ij}) - v_j \quad \text{..... (5.3)}$$

Then, domestic share for domestically produced goods of sector *i* can be determined using:

$$\sum_{j=1}^{K}(DD_{ij}) = (z_{ij} - e_{ij}) - m_{ij} \quad \text{..... (5.4)}$$

This domestic share for domestically produced goods is then used further to determine the domestic content. The domestic content shows domestic value contained in the output of domestically produced goods. The domestic content is calculated based on the ratio of value added to gross output and the domestic content for the domestically produced goods.

$$DVS = A_v(DD_{ij}) \quad \text{..... (5.5)}$$

where A_v is the ratio of the value-added to the gross output, and DD_{ij} is the domestic content for the domestically produced goods.

As previously pointed out, the role Indonesia has played in the earlier stage of the global supply chain shows tremendously in the composition of the domestic content. The earlier stage of the global supply chain suggests a high level of domestic content. It is shown in the industrial sectors of Indonesia, that the domestic content is higher than the imported content. Averagely, the domestic content for the 26 sectors of the economy of Indonesia is 62%. As predicted, agriculture and mining-related industries, as primary sectors, have very high domestic content. Table 5.1 shows the bauxite ore sector, with the 93% domestic content, has the highest domestic content. It shows that in doing its production process, this sector mostly uses domestic inputs.

Other high domestic content sectors are the mining-related sectors, which are other metals sector with 88%, and silver ore sector with 84% domestic content. These values show

that these sectors contain most of the domestic content since these sectors produce natural resource-based goods. Moreover, there is an interesting finding which shows how tertiary sectors, which are service-based, also contain high domestic content. With the largest values being 82% the real estate sector has even higher domestic content than the agriculture sector as natural resource-based industries.

On the other hand, with merely 26%, the utility sector has the lowest domestic content among all other industries within the economy. This shows the ability of the construction sector to utilize the imported content to generate its output.

Table 5.1 Domestic content of 26 economic sectors for domestically produced trade goods

Sectors	Domestic Content
Agriculture, forestry, fishery	81%
Coal	69%
Oil and Gas	72%
Iron sand and iron ore	59%
Tin ore	81%
Bauxite ore	93%
Copper ore	63%
Nickel ore	59%
Other metals	88%
Gold ore	65%
Silver ore	84%
Other minerals	80%
Mining Services	80%
Manufacturing industry	31%
Miscellaneous processed mining products	29%
Utility	26%
Construction	31%
Wholesale and retail trade, repairing	66%
Transportation and warehousing	36%
Accommodation service, food and beverage	39%
Information and communication	61%
Financing and insurance	72%
Real estate	82%
Company services	58%

Sectors	Domestic Content
Governance	60%
Education, health, and other services	53%

Isolating the mining-related sectors, the domestic content is put into Figure 5.1. Within mining-related industries, with 59% domestic content, the iron sand and iron ore sector utilizes the least domestic content. It shows that this sector relies heavily on imported goods in its production process. In addition to the low domestic content, the sector's gross added value is relatively low as well. It also indicates that most of the outputs are exported, and exported in raw form.

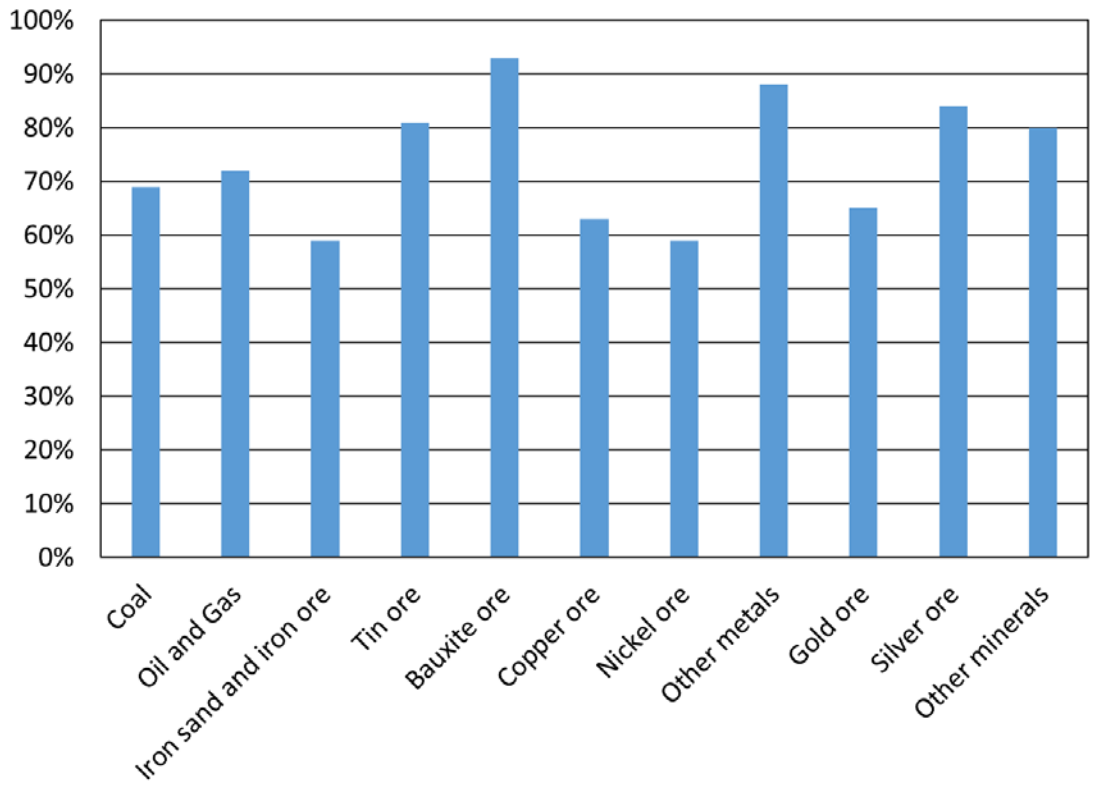

Figure 5.1 Domestic content of the mining commodities

5.2.1. Simulation: Nickel Ore

In utilizing the input-output approach in quantifying the impact of the export ban, instead of using change in demand quantity, simulation of the change in value-added is used as the base of the calculation. The assumption is that as the export ban is implemented, it will drive the growth of the downstream industries, therefore the increasing of the value-added. Also, determining change in demand quantity will be difficult since there is no available data on the capacity of each of the developed smelter, therefore there will not be any basis for the calculation.

The nickel ore is used as the case study. There are two reasons to choose nickel ore: current development progress of smelters shows that out of 27 developed smelting plants, 17 plants are nickel smelting facilities; also, nickel ore is the only commodity that faces the fast track implementation of the export ban. Based on this acceleration regulation, per January 2020, nickel can not be exported in raw form. Therefore, it is assumed that the export ban will drive 50% increasing of its value-added. As the export ban is applied to this particular commodity, there is increasing of the gross added-value of its sector. The increasing of the gross added-value is then reflected to the increasing demand of the intermediate industries. The increasing is then distributed accordingly through the whole intermediate sectors, based on the input-output's technical coefficients. It is assumed that there is 50% increasing, since there is not any available data regarding the actual capacity of the smelters. Then, the domestic content after the implementation of the export ban can be calculated. The result is shown in the Table 5.2.

Table 5.2 Domestic content of economic sectors for domestically produced trade goods after the implementation of the export ban (simulation: nickel ore)

Sectors	Domestic Content
Agriculture, forestry, fishery	82%
Coal	61%
Oil and Gas	71%
Iron sand and iron ore	61%
Tin ore	82%

Sectors	Domestic Content
Bauxite ore	93%
Copper ore	65%
Nickel ore	62%
Other metals	88%
Gold ore	67%
Silver ore	85%
Other minerals	81%
Mining Services	81%
Manufacturing industry	36%
Miscellaneous processed mining products	29%
Utility	26%
Construction	34%
Wholesale and retail trade, repairing	67%
Transportation and warehousing	44%
Accommodation service, food and beverage	45%
Information and communication	62%
Financing and insurance	72%
Real estate	82%
Company services	59%
Governance	61%
Education, health, and other services	56%

Raw mineral export ban predictably will lead to increasing demand in intermediate industries, as the government urges the raw mineral to be absorbed within industries before it can be exported to external demand. This increasing demand will set in a change of domestic content, and the expected change will cover both decreasing and increasing of the domestic content. The scheme of the domestic content, however, does not change dramatically with the implementation of the raw mineral export ban. Figure 5.2 shows the change of before and after the implementation of the export ban. As expected, there is indeed an increasing of the domestic content, from averagely 62% to averagely 63%, or 3% change after the export ban. Isolating the mining commodities sectors, there is apparently no notable change before and after the export ban, the average domestic content is 74%.

The increasing domestic content may be a positive signal that the export ban has the potential to be successful in increasing the economic growth. On the other hand, there is not apparent increasing on the miscellaneous processed mining products sector. It means that the additional raw mining commodities are mostly absorbed by other intermediate sectors, and there is not any noticeable growth on the processing and refining industries. For a shorter period, this situation may work fairly well. However, for a long term benefit, the government should focus on developing the processing and refining industries.

Another notable point is the export ban evidently increase the imported content as well. There are three sectors that experience decreasing of domestic content, which indicates there is increasing of imported content. The sectors are coal, oil and gas, and utility. High domestic content and decreasing of it when there is an additional supply of raw mineral material goes into the intermediate industries, shows high use of raw mineral within coal, and oil and gas sectors, and that to further utilize the raw mineral, these sectors need more imported goods. On the other hand, the utility sector begins with relatively low domestic content, and it also has relatively low decreasing value. It indicates that this sector utilizes more imported content than domestic content and that it is relatively not linked with natural resource-based industries, particularly the mining-related industries.

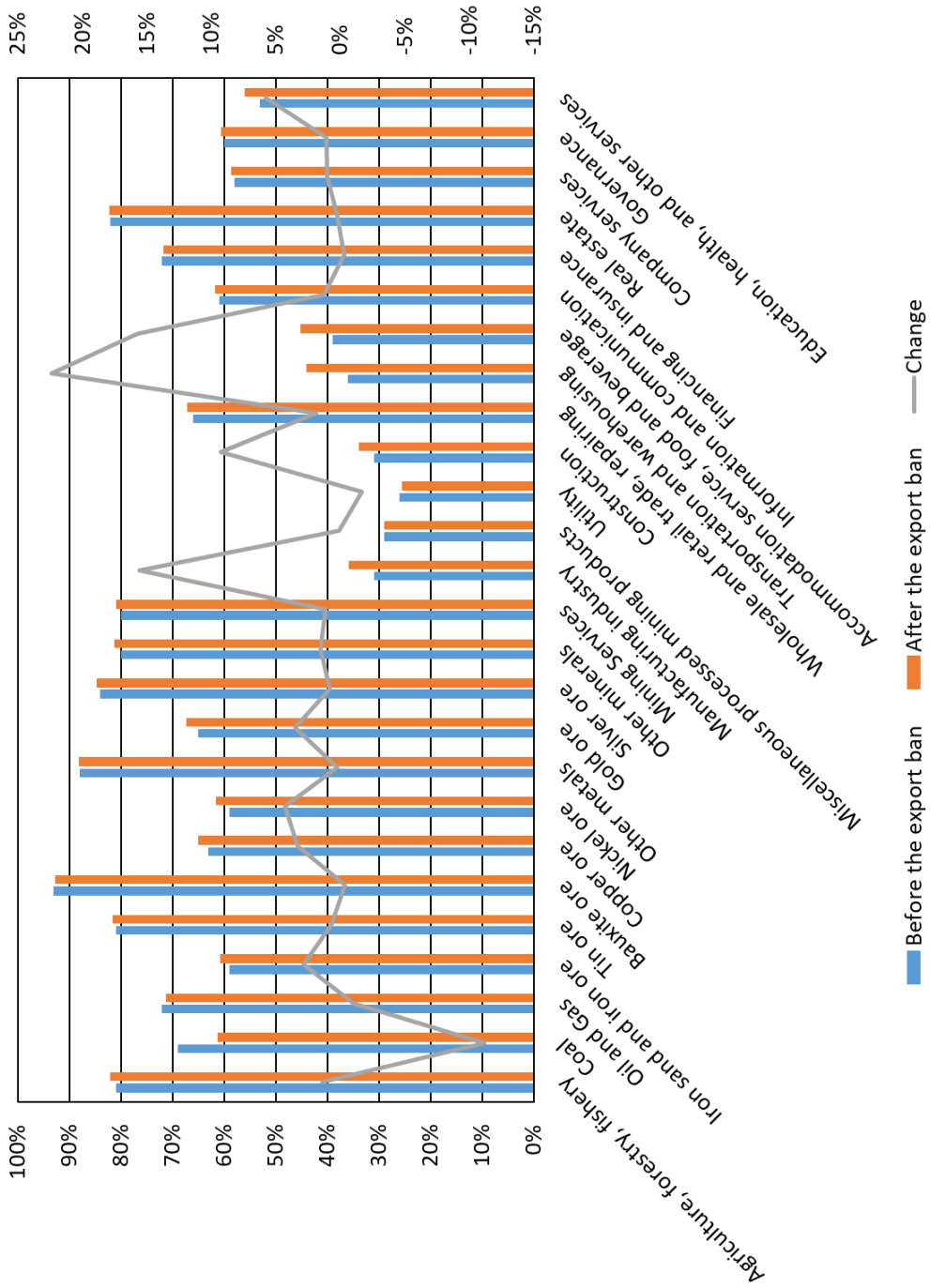

Figure 5.2 Comparison of the domestic content before and after the export ban (simulation: nickel ore)

Focusing on the mining commodities sectors, Figure 5.3 shows that with 11% change, the coal sector experiences the highest decreasing domestic content. The oil and gas sector also experience similar decreasing of the domestic content, but only 1% change. This decreasing domestic content shows that these sectors do not have the capacity to absorb raw mining commodities, and when it is mandatory, these sectors have to increase their imported content in order to be able to absorb the raw mining commodities. One of the reasons is the current production process of the coal, and the oil and gas, does not equipped to absorb the raw nickel ore. To do so, these sectors have to change equipment or tool, which consists imported content.

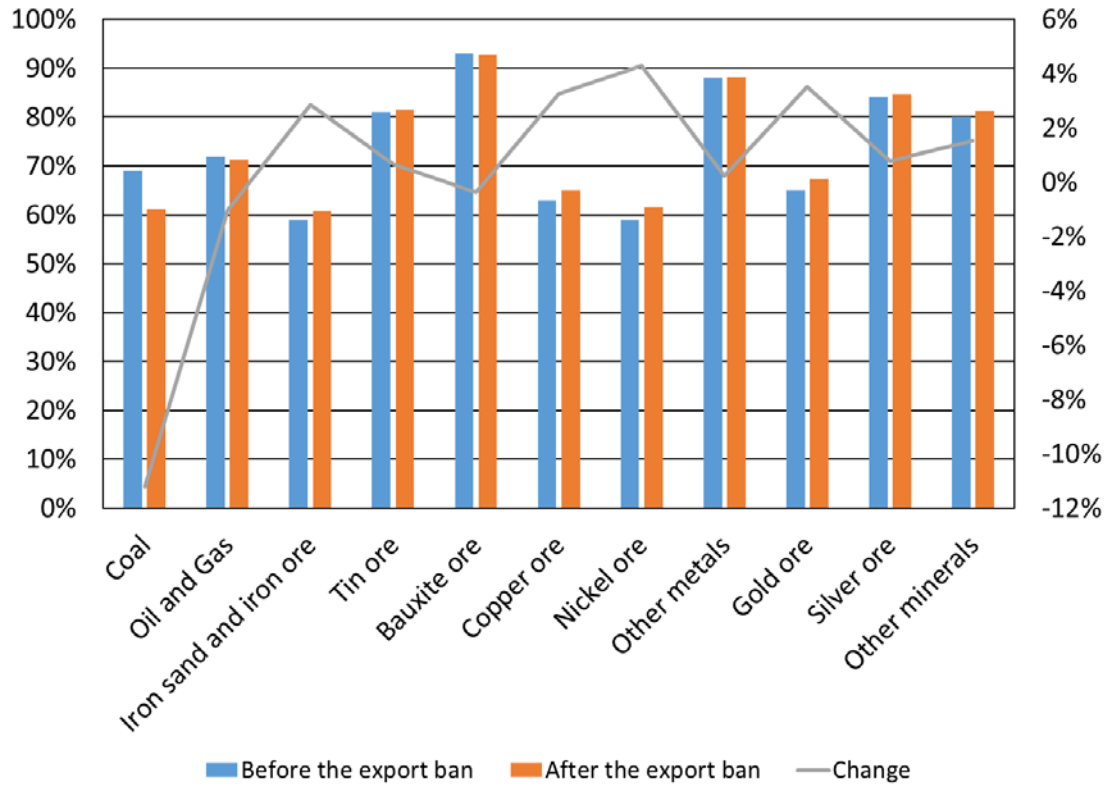

Figure 5.3 Change of the domestic content within the mining commodities (case study: nickel ore)

5.2.2. Simulation: Iron Sand and Iron Ore

To verify the findings from the domestic content analysis, the iron sand and iron ore sector is used as another case study. The iron sand and iron ore are significant commodities basically for two reasons: it is the mining commodity sector that has the highest backward linkage value, indicates that this sector utilizes considerable amount of intermediate outputs as its inputs and when it grows, it will also foster the growth of other sectors; on the other hand, it is one of the excluded commodities from the export ban, means it loses its opportunity to further contribute for the economy. The similar assumptions as in the nickel ore case is applied, that is 50% increasing of the value-added.

The calculation for the iron sand and iron ore is shown in Table 5.3. When shifts the analyzed raw commodity to iron sand and iron ore, there is similar increasing of the domestic content to the nickel ore case study, from average rate of 62% to average rate of 64%, or 4% change after the export ban. For the mining commodities sectors, there is a slight increasing, from on average 74% domestic content before the export ban, to 75% after the export ban.

Table 5.3 Domestic content of economic sectors for domestically produced trade goods after the implementation of the export ban (simulation: iron sand and iron ore)

Sectors	Domestic Content
Agriculture, forestry, fishery	82%
Coal	70%
Oil and Gas	72%
Iron sand and iron ore	61%
Tin ore	82%
Bauxite ore	94%
Copper ore	66%
Nickel ore	62%
Other metals	89%
Gold ore	67%
Silver ore	85%
Other minerals	81%
Mining Services	81%
Manufacturing industry	36%

Sectors	Domestic Content
Miscellaneous processed mining products	30%
Utility	27%
Construction	34%
Wholesale and retail trade, repairing	68%
Transportation and warehousing	44%
Accommodation service, food and beverage	45%
Information and communication	62%
Financing and insurance	72%
Real estate	83%
Company services	59%
Governance	62%
Education, health, and other services	56%

For the iron sand and iron ore, the result of before and after the export ban takes effect is shown in Figure 5.4.

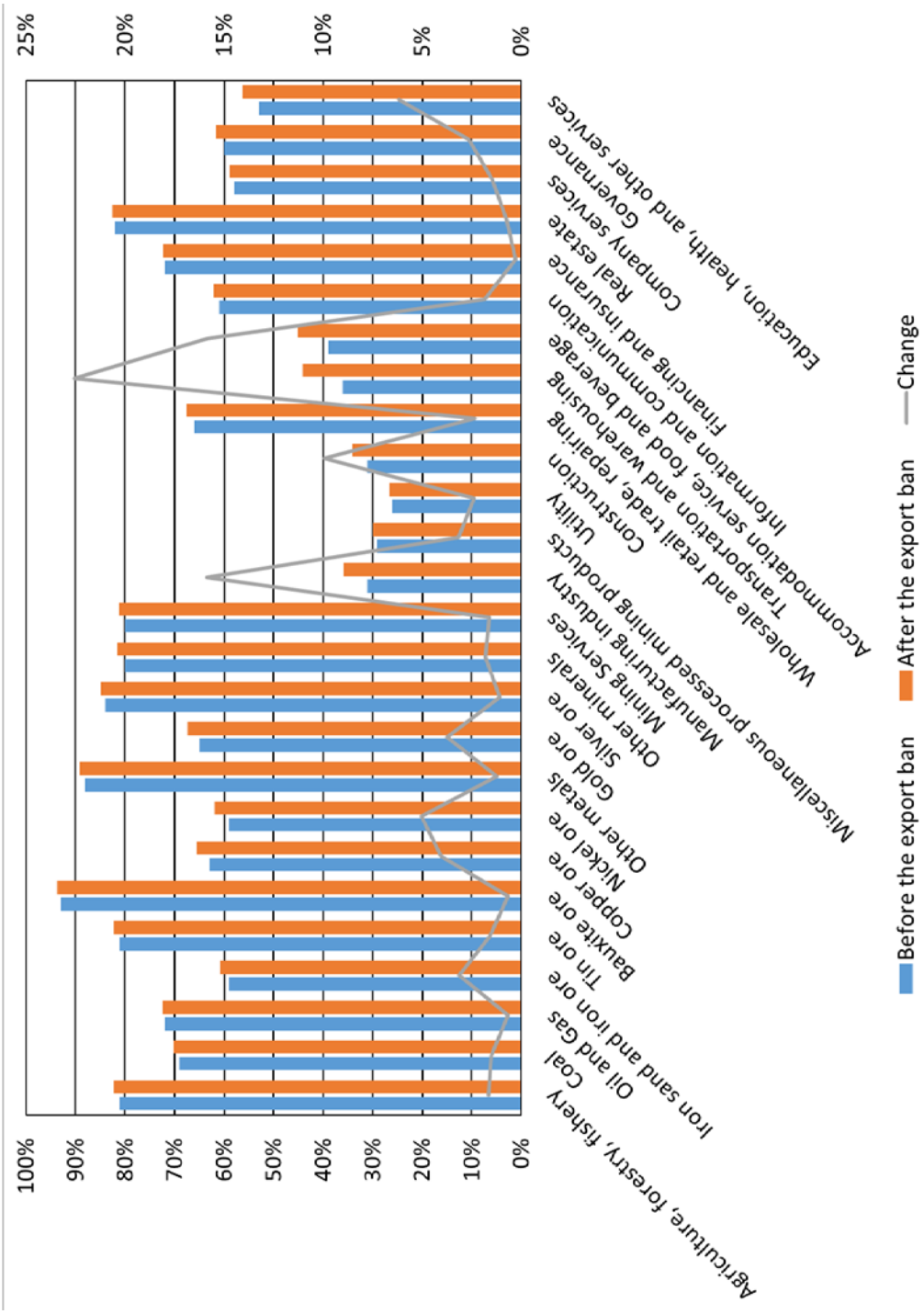

Figure 5.4 Comparison of the domestic content before and after the export ban (simulation: iron sand and iron ore)

The highlight for the mining commodities is then shown in Figure 5.5.

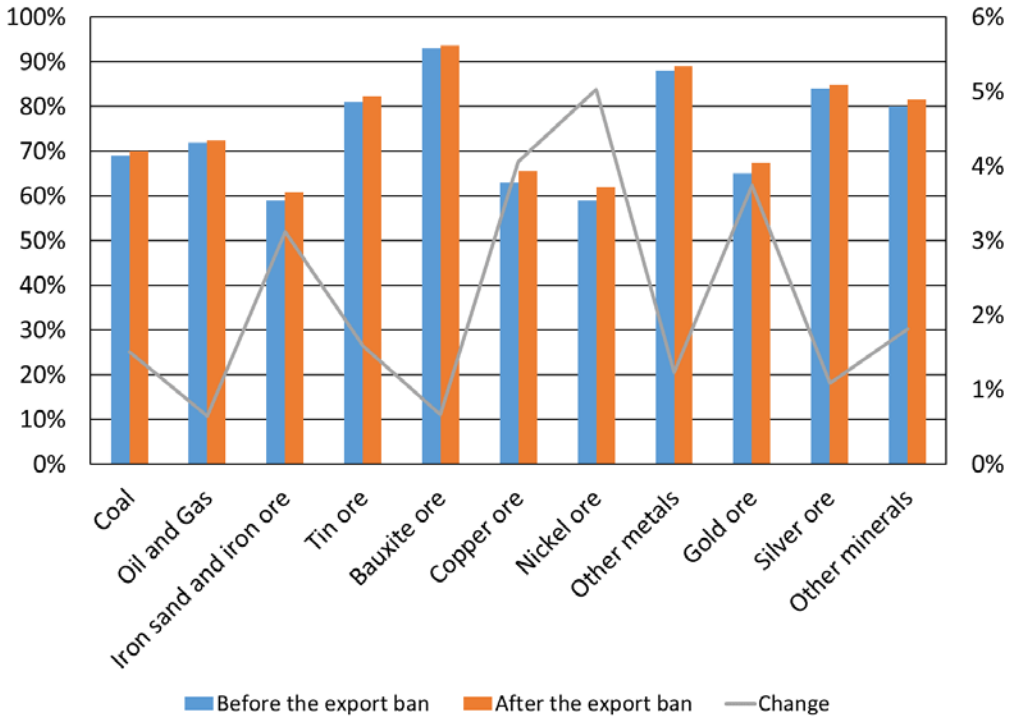

Figure 5.5 Change of the domestic content within the mining commodities (simulation: iron sand and iron ore)

5.2.3. Simulation: Copper Ore

As the economic multiplier-based impact assessment shows, copper ore sector is the one the particular sector that has the highest impact on GDP caused by the export ban policy. The copper ore is used as another case study, still by using similar assumption of 50% increasing of the value-added.

The result of the calculation for the copper ore is shown in Table 5.4.

Table 5.4 Domestic content of economic sectors for domestically produced trade goods after the implementation of the export ban (simulation: copper ore)

Sectors	Domestic Content
Agriculture, forestry, fishery	82%
Coal	70%
Oil and Gas	72%
Iron sand and iron ore	61%
Tin ore	82%
Bauxite ore	94%
Copper ore	66%
Nickel ore	62%
Other metals	89%
Gold ore	67%
Silver ore	85%
Other minerals	81%
Mining Services	81%
Manufacturing industry	36%
Miscellaneous processed mining products	30%
Utility	27%
Construction	34%
Wholesale and retail trade, repairing	68%
Transportation and warehousing	44%
Accommodation service, food and beverage	45%
Information and communication	62%
Financing and insurance	72%
Real estate	83%
Company services	59%
Governance	62%
Education, health, and other services	56%

The result of before and after the export ban takes effect for the copper ore is shown in Figure 5.6.

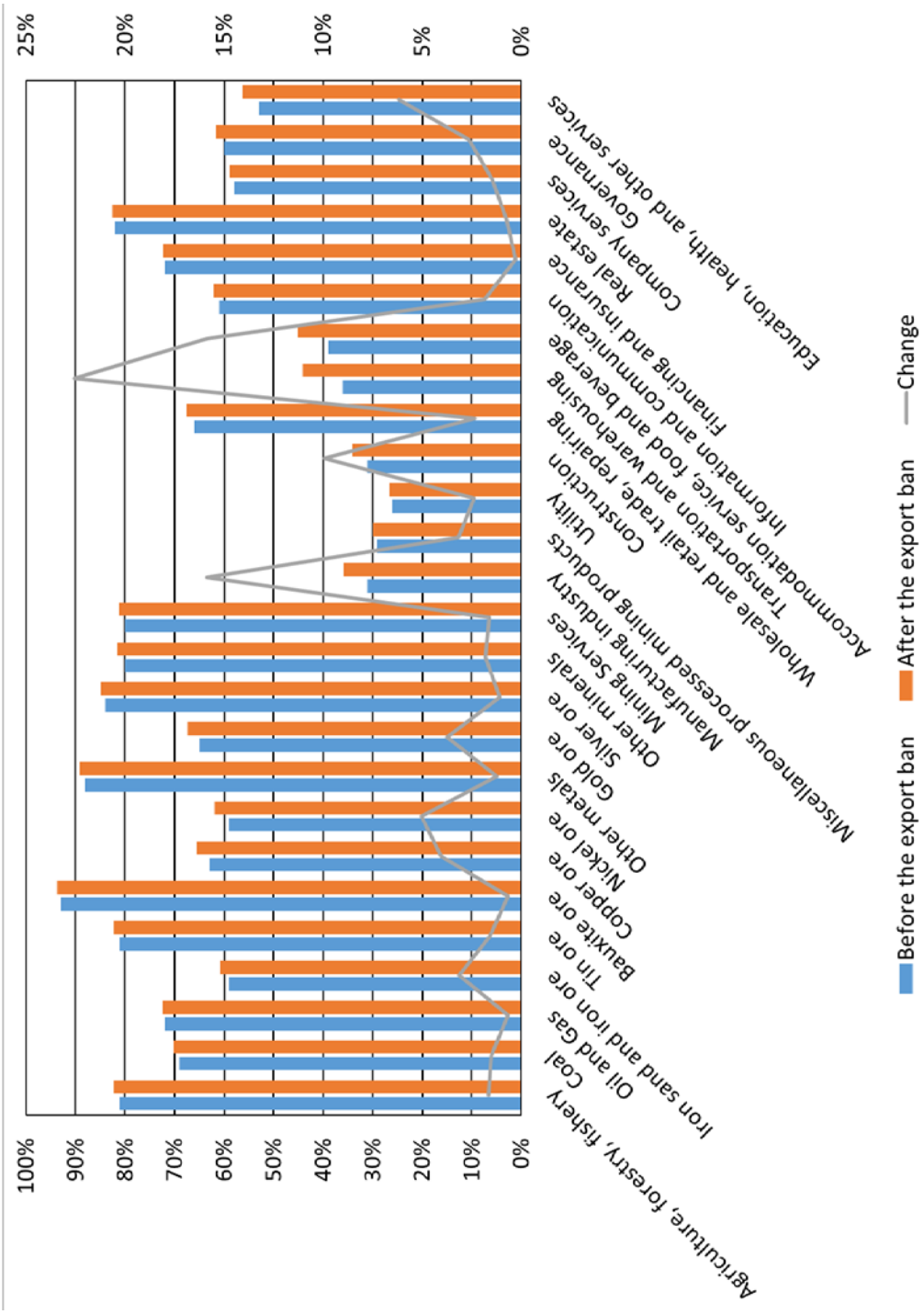

Figure 5.6 Comparison of the domestic content before and after the export ban (simulation: copper ore)

The highlight for the mining commodities is in Figure 5.7.

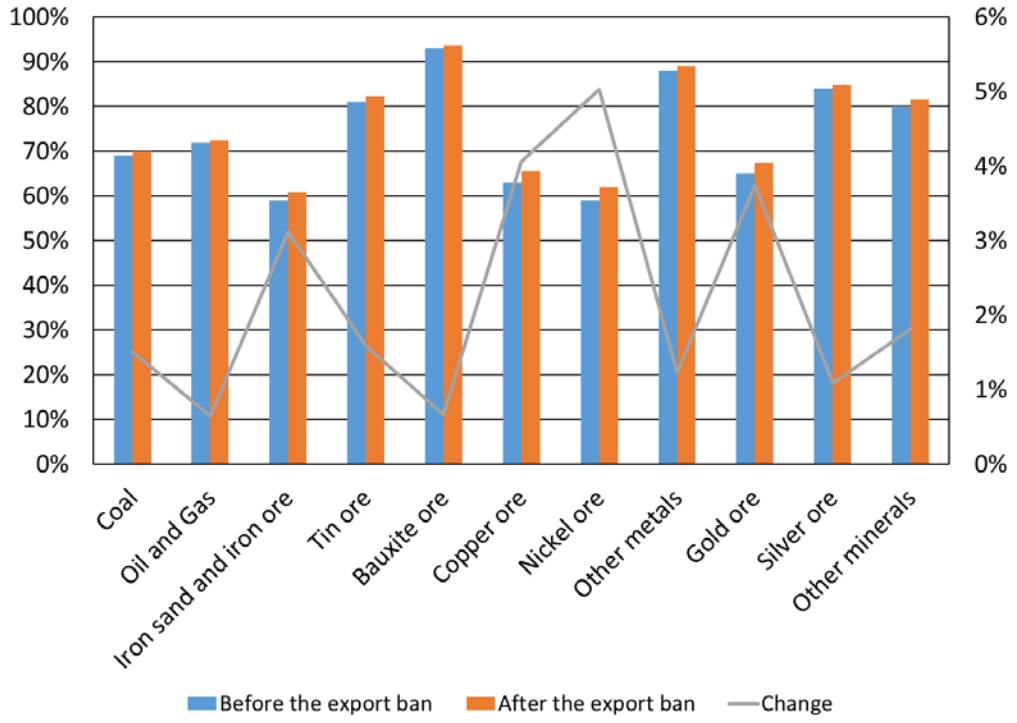

Figure 5.7 Change of the domestic content within the mining commodities (simulation: copper ore)

The copper ore is another commodity excluded from the export ban policy. However, as the results for the copper ore are very similar with the results of the simulation of the iron sand and iron ore, it is indicated that at least for these two excluded commodities, they can bring more impact on the domestic content, compared to the nickel ore case which is included in the export ban. There is similar increasing of the domestic content to the iron sand and iron ore simulation, from average rate of 62% to average rate of 64%, or 4% change after the export ban. For the mining commodities sectors, there is a slight increasing, from on average 74% domestic content before the export ban, to 75% after the export ban.

The similar results of the copper ore to the iron sand and iron ore simulation is most likely caused by the almost similar values of multipliers of both commodities. However, one

important notion is although the export ban seemingly will result in the similar impact when it is implemented on the iron sand and iron ore, as well as on the copper ore, the economic impact assessment has indicated that the GDP of the copper ore would experienced more impact when the export ban is applied.

5.3. Gross Ore and Metal Export Value

As the input-output based analyses have indicated, the export ban policy will unequivocally affect the gross mining export value. The case studies of nickel ore, iron sand and iron ore, and copper ore have indicated that these commodities play important role in the domestic contribution to the economy of Indonesia. This study intends to have a better understanding of the role of those commodities, also to investigate their effect on the gross mining export value.

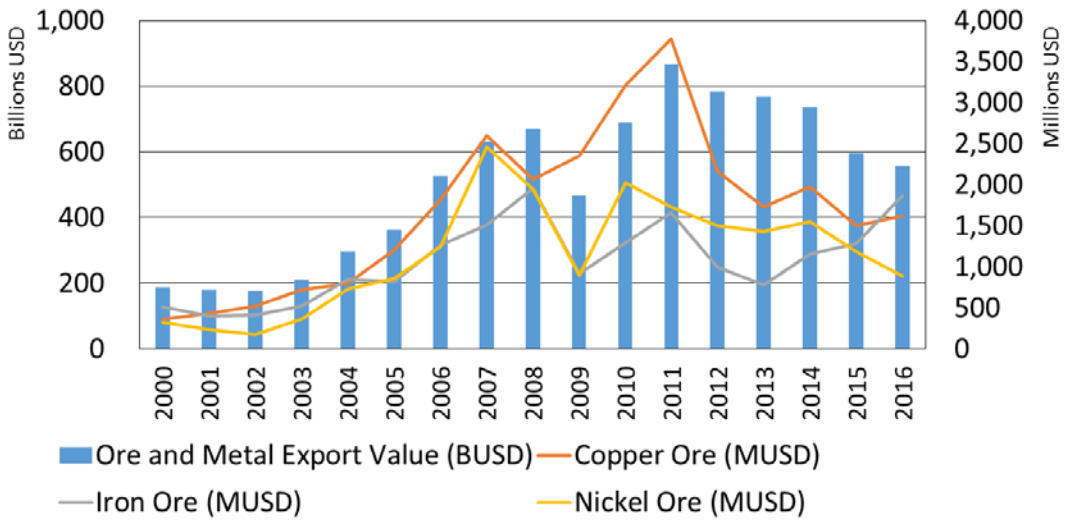

Figure 5.8 Export value for the nickel, iron, and copper (in USD, (World Integrated Trade Solution, 2020))

As shown in Figure 5.8, on average, from 2000 to 2016, the nickel ore contributes 0.21% towards the overall export value of ore and metal commodities. The iron ore

contributes slightly higher of 0.22%, and the copper ore contributes the highest among the three commodities with the average rate of 0.32%.

In assessing the role of the nickel ore, the iron ore, and the copper ore, this study incorporate the panel data analysis approach. Panel data analysis is an econometric method that involves at least two dimensional observations: a cross-sectional dimension, and a time-series dimension, often denotes with *i* and *t*, respectively (Hsiao, 2007). In other words, panel data analysis observes the behavior of entities across time. There are several econometrics advantages to use panel data approach. It allows for individual heterogeneity, provides more informative data, more variability, less collinearity among the variables, more degrees of freedom, and more efficiency, and it also allows the assumptions stated in the cross-sectional analysis to be relaxed and tested (Maddala, 2001; Baltagi, 2005).

In using the panel data regression analysis, the panel-structured data is used, and the calculation is using the EViews version 9.5. This study implements pooled least square, or common effect model. This method is similar to the simple regression using cross-section data or time-series data. This pooled analysis combines time-series data with several cross-sections data, therefore this method can achieve a higher degree of freedom.

The model for the gross ore and metal export value is set as:

$$y_t = c + \beta_{1t} mining\ export_{it} + \beta_{2t} GDP_t + \varepsilon_t \ldots \qquad (5.6)$$

where, y_t is the gross ore and metal export value, i represents nickel ore, iron ore, and copper ore. This study incorporates the annual export data of those commodities, provided by the World Integrated Trade Solution, from the year 2000 to 2016. The nickel ore, iron ore, and copper ore are chosen as they are the mining commodities that have been analyzed previously.

The result is presented in Table 5.5.

Table 5.5 Result for the pooled least square analysis

Dependent Variable: ORMETEXP				
Method: Panel Least Squares				
Sample: 2000 2016				
Periods included: 17				
Cross-sections included: 3				
Total panel (balanced) observations: 54				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.10E+11	2.87E+10	3.848	0.000
MINEXP	91.894	19.293	4.763	0.000
GDP	0.500	0.050	9.984	0.000
R-squared	0.835			
S.E. of regression	9.40E+10			
Prob(F-statistic)	0.000			

Albeit the small contribution of the nickel ore, iron ore, and the copper ore towards the overall ore and metal export value as shown in Figure 5.8, the relatively high value of the R-squared indicates that these commodities evidently affect the gross export value of the ore and metal commodities. Further, the value of the probabilistic of F-statistic also indicates that those commodities have statistical impact towards the gross export value of the overall ore and metal commodities. Consequently, when the government fully implements the export ban policy, and includes those commodities into the export ban, decreasing of the gross export value for the particularly mining group is expected.

The simulation on domestic content shows that in order to achieve the intended purposes of the export ban, the government needs to carefully assess which commodities to be included and excluded within the export ban. This finding is further verified by the panel data analysis, indicates that two of the currently excluded commodities, which are copper ore and iron ore, actually affect the gross mining export value of their commodities group.

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Chapter 6 Conclusions

As a subset of the current mining law, the export ban policy threads on a thin double-edge sword of resource nationalism. The recent rise of nationalism among the people of Indonesia, and the intention of the government to increase the benefit from the mining sector, this export ban acquires bustling public support. However, public support does not guarantee that the policy will be successful when implemented. A more crucial point is to ensure that this policy can realize the intended purposes. The regulation states that export ban is intended to increase and optimize the main value of products, the supply of industrial raw materials, worker absorption, and state revenues. As resource nationalist policy, the advantage of the export ban is taken for granted. This study is among the first few analyses conducted to empirically prove the real benefit of the export ban.

The assessment of the export ban policy by examining the potential problem arisen as the ban is released. Basically, there are three problems that may arise. The first problem is there is consequently decreasing in export quantity and export value, which then affect the GDP of Indonesia. Then, there is problem is regarding lack of downstream processing capacity and poor integration between mines and processing capacity such as refineries and smelters. This last problem seemingly brings greater impact to how the export ban can achieve its intended purposes.

Analyzing the GDP and the mining resource rents proves that the releasing of the export ban policy evidently does not bring negative impacts to either GDP or the mining resource rents. It indicates that the revenue of the raw mining commodities is not as much as surmised, or that the revenue from other sectors is large enough to cover the shortcomings. On the other hand, one simple explanation is the export ban has not really been implemented yet, and the implementation keeps delayed. Therefore, the immediate impact has not yet been taken place. Either way, to thoroughly determine whether the export ban can achieve its intended purposes, and to determine the potential benefit of it, further analysis is conducted on the mining export potential.

Comparing the export value to the import value, this study determines that the economy of Indonesia largely relies on its export value. Out of that export value, evidently Indonesia contributes 26% of the world's raw materials. It is in line with the fact that Indonesia is a raw material producing country that plays a role in the early stage of the global production chain. Then, as the export ban covers the raw mining commodities, the ores and metals commodities are assessed using RCA index analysis. The RCA index indicates that the ore commodities are one of the prominent raw materials for export of Indonesia. However, simply relying on the RCA index does not provide insight to the potential benefit of the implementation of the export ban. The input-output model then is used to establish the ground for the beneficial expectation of the export ban.

In this study, the input-output table of 26 sectors is developed, emphasizing on the mining commodities, especially raw commodities. The forward linkage analysis on the input-output model shows that the mining commodities have the lowest forward linkages value. Even the miscellaneous processed mining products sector performs just slightly above the average value. Further, the backward linkages analysis indicates that the mining commodities apparently have relatively small value as well. Starting with these analyses, apparently, the mining-related sectors are not significantly influential within the intermediate industries of Indonesia. It also indicates that these commodities mostly are being exported and apparently could provide more benefit as exported commodities.

The in-depth linkages analysis focusing on the mining commodities shows that mining trade commodities apparently performs below the economy's average, despite their high contribution towards GDP and export. It highlights the fact that the majority of the mining commodities is indeed exported in raw form. The trading balance and the gross added-value analysis further accentuate the fact that the substantial export value of the mining commodities indeed comes from the raw commodities. Therefore, the government needs to put extensive effort to improve the domestic performance of these mining commodities. However, even as the implementation of the export ban is keep revised, the revision apparently does not waver the government's intention to embrace the nationalist policy.

Consequently, the potential benefit of the mining commodities is determined, assuming that the policy will be fully implemented in the near future.

Focusing particularly on the mining commodities, the forward linkage shows that in term of providing boost for the overall economic growth, there is no particular mining commodities that stands out as prominent force. In term of backward linkage, the iron sand and iron ore sector has the highest backward linkage, indicates that compared to other mining commodities, this sector uses most of the output from the other sector. Further, the multipliers analysis is utilized to pinpoint the economic performance ability of the mining commodities. The mining commodities evidently have moderately ability to increase the revenue from change in demand, and enormous ability to increase the value of their outputs. However, in term of employment, these sectors cannot be relied on to improve the employment, either physically or monetary.

The input-output model also enable this study to identify the potential mining commodities to provide positive impact towards the national economy. There are five prominent commodities, which are bauxite ore, nickel ore, iron sand and iron ore, copper ore, and other metals. As the government intends to utilize and optimize the mining sector, these sectors have better prospect than the other mining commodities.

To verify those findings, the potential impact of the export ban is further assessed by calculating the domestic content and using nickel ore, iron sand and iron ore, and copper ore as case study. The nickel ore simulation presents the possible change on the domestic content as the result of the implemented export ban, and the iron sand and iron ore, as well as the copper ore simulation points out that the government needs to be careful in setting commodities that are excluded from export bans. The iron sand and iron ore, and the copper ore that are currently excluded from the export ban evidently brings more positive impact than the nickel ore that is included in the export ban.

This study thoroughly assess the export ban policy, particularly the potential impact of it when it is fully implemented. There are several areas that are possibly affected by the export ban, which are the contribution of the export mining commodities towards the economy, the

current economic performance of sectors and commodities of Indonesia, and also the possible change on the gross export mining value of the ores and metals commodities.

This study provides academically theoretical and practical contributions. Theoretically, within this study, the use of the input-output model is developed in analyzing the domestic intensity as a part of policy analysis. Previously, most of the researchers explained the international trade in term of import dependency, since the global supply chain tends to put countries in the middle of global production stage and treats the import as the first and foremost prominent variable of a country's trade. However, using the input-output model, this study confirms that domestic dependency holds a more prominent role within the natural resource country that sits in the early stage of the global supply chain. Therefore, it will be more beneficial to assess the domestic dependency for the policy analysis.

Using the input-output model, the potential of each major mining commodities is determined. Also, this study examines the competence of the input-output approach in assessing trade policy. There are plenty of researches that utilize the input-output model in analyzing the public policy. However, the nature of this model that has been proven advantageous in analyzing public policy, has not been widely recognized in assessing trade policy. This study is among the handful analyses linking the input-output model and mining resource trade policy, particularly in assessing an export ban as a form of export restriction.

Practically, this study highlights the potential economic impact of the export ban policy. The back and forth implementation of the export ban, directly and indirectly, has brought effect on the economy of Indonesia. Particular mining-related sectors and mining commodities certainly hold the potential to boost the economy. Principally, the government of Indonesia needs to develop certain industries so as the export ban policy can achieve its intended purposes.

Finally, there are several ideas for future works in this study. Generally, this study focuses on 13 major mining-related sectors, 11 of those are mining commodities. For more in-depth analysis, each raw mining commodities can be assessed to determine which commodities that are better be included on and excluded from the export ban. Further, the

prices of the mining export commodities, and more mining commodities can be incorporated within the panel data model to determine which commodity that highly affects the mining export trade.