RIETI Policy Discussion Paper Series 23-P-004

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RIETI Policy Discussion Paper Series 23-P-004
April 2023

Impact of Trade Sanctions against Russia: Analysis using international input-output tables*

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Abstract

Immediately after Russia launched its invasion of Ukraine on February 24, 2022, the G7, the EU, and others imposed economic sanctions, including trade measures, against Russia. The sanctions were expected to have a serious impact on the Russian economy. However Russia's real economic growth rate in 2022 was only down by 2.1%, leaving doubts about the effectiveness of the sanctions.

Therefore, in this paper I conducted a simulation using the OECD "Inter Country Input-Output Table" (ICIO) to analyze the impact of the trade sanctions against Russia on the production activities of each country.

If sanctions and countermeasures reduce trade between OECD member countries and Russia by 20%, Russian production will fall by 4.76%, mainly in the mining and petroleum and coal product manufacturing industries. This figure is close to the rate of decline in Russia's GDP during the chaotic period of the late 1990s, meaning that it will have a certain impact.

However, based on the actual trade trends after the sanction, I analyzed the case where only OECD countries cut their exports to Russia and Russia does not restrict exports to sanctioned countries. In this case, even if exports decreased by 20%, Russia's production value would only decrease by 0.02%. This result can be attributed to Russia's trade structure, which mainly exports raw materials and imports final goods.

Based on the analysis in this paper, the trade sanctions seem to be largely ineffective in the current situation where the number of countries implementing sanctions is small and Europe, Japan and other countries imposing sanctions are accepting imports from Russia.

Keywords: trade sanction, Russia, Inter Country Input‐Output Table (ICIO)
JEL classification: F10, F13

* The author is grateful for helpful comments and suggestions by Makoto Yano (Chairman, RIETI), Masayuki Morikawa (CRO, RIETI), Masataka Saburi (Director of International Coordinator/ PR Strategy) and other participants of the PDP meeting. All errors in this paper are my responsibility. Also, the opinions expressed in this article are those of the author and do not represent the views of the organization to which the author belongs.

1. Introduction

On February 24, 2022, Russia began its invasion of Ukraine. [1] Immediately after the invasion, countries including the G7 and the European Union (EU) condemned Russia's aggression and supported Ukraine. Economic sanctions followed, including financial sanctions such as freezing accounts and the exclusion of certain Russian banks from the Society for International Interbank Telecommunications (SWIFT).[2] Table 1 shows the measures taken by the Japanese government in light of Russia's aggression against Ukraine as of March 7, 2023.

Last month, a year had passed since the invasion began; however, there is no prospect of an end to the fighting. The Russian army, initially heading for Kyiv, the capital of Ukraine, stopped advancing towards Kiev due to the fierce resistance of the Ukrainian army. It shifted its main military forces to the eastern and southern regions of Ukraine, and is

[1] The relations between Russia and Ukraine have been strained since Russia occupied Crimea shortly after the 2013-2014 Maidan Revolution, when large-scale anti-government protests led to the establishment of a new government. Tensions rose further in 2021 as Russian troops deploy more frequently to the Ukrainian border, with some governments expressing strong concerns when Russia and Belarus launched joint military exercises in February 2022. Since around this time, the G7 countries, the EU and other countries have made diplomatic efforts, including summit meetings, to dissuade Russia from the aggression. However, they have failed to stop the aggression.

[2] The G7 held a telephone summit on February 25, 2022, to condemn Russia's military aggression and announced in a summit statement that they would "implement severe and coordinated economic and financial sanctions." Regarding trade sanctions, the G7 Leaders' Statement announced on March 11 stated that they would "seek to take actions that deny Russia's most-favoured-nation status with respect to important products in a manner consistent with the procedures of each country." Countries have taken steps to cancel the most-favoured-nation status for Russia. On April 20, Japan enacted the revised Temporary Tariff Measures Law and the revised Foreign Exchange Law, revoking Russia's most-favoured-nation status.

planning to increase the amount of territory it is occupying. Nevertheless, even now, fierce battles are still being fought with the Ukrainian army, mainly in the eastern Donetsk region, and at present the outcome is completely unknown.

As pointed out by OECD (2022) and the Ministry of Economy, Trade and Industry (2022), Russia is one of the world's leading exporters of energy and food, despite its share of world GDP not being very large, and the economic sanctions were expected to have a heavy impact on the Russian economy. However, the real economic growth rate for 2022 announced by the Russian government was actually - 2.1%. If this announcement is true, the Russian economy has not suffered serious damage, and doubts remain about the effectiveness of the sanctions.

Therefore, this paper analyzes why trade sanctions have not been effective through a simulation using an international input-output table.[3]

2. Previous research

When trade sanctions are implemented, it is expected that the trade between the countries implementing the sanctions and the countries subject to the sanctions will decrease.

[3] Among the economic sanctions against Russia, reports have indicated that financial sanctions, such as the exclusion of certain Russian banks from SWIFT, have been highly effective. However, due to the nature of the international input-output table, this paper only analyzes trade sanctions and excludes the impact of financial sanctions.

However, now that the division of production processes has been realized on a global scale and the global value chain (GVC) has been formed, the impact seems to extend to other regions as well. For this reason, in the analysis for this paper, we use an international input-output table developed to analyze GVCs and examine what changes occur in the value of production at the industrial level of countries around the world if trade declines under several scenarios.

The Inter-Country Input Output Table (ICIO) developed by the OECD and the World Input-Output Database (WIOD) developed by the University of Groningen are typical international input-output tables that include multilateral trade flows. This paper uses ICIO, the input-output table that connects data from the largest number of countries/regions (66 countries/regions) and that is based on the most recent data (2018).

There are several analyses of the impact of the current trade sanctions against Russia such as Takayama (2022) and Kumagai et al. (2022). The former is a calculation result as of March immediately after the invasion of Ukraine, and shows the value added included in exports from Russia to countries around the world and the value added included in exports from countries around the world to Russia from ICIO in 2018 and indicates separately the impact of a complete suspension of Russian exports and a complete suspension of world exports to Russia. The latter is an estimate based on the economic geography simulation

model of the Institute of Developing Economies in the event that trade between Russia and the rest of the world is cut off for one year.

However, according to statistics released after the invasion began, Russia's trade was far from completely cut off. According to the Kiel Trade Indicator (2022), which collects and estimates trade statistics for countries around the world, Russia's exports and imports declined significantly in March 2022 after the start of the invasion, but sharply recovered in April. Since then, exports have largely remained at 2019 levels, while imports have largely remained at pre-invasion levels (Figure 1). [4]

In a way, it makes sense that Russia can continue to maintain its trade levels, as the number of countries implementing sanctions remains small. According to Reuters (2022), as of July 2022, the sanctions imposed on Russia are limited to only a few countries including the United States, Canada, the United Kingdom, the EU, Japan, South Korea, Australia, New Zealand, etc., while many countries, including China, India and Brazil, have not imposed sanctions. Russia has significantly increased its natural gas and oil exports to neighboring countries such as China and India, weakening the effectiveness of any sanctions. [5]

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[4] The Russian government stopped publishing trade statistics after the invasion began.

[5] According to JETRO (2023), China's exports to Russia increased by 12.8% year-on-year to $76.3 billion, while its imports increased by 43.2% to $112.2 billion, both hitting record highs. https://www.jetro.go.jp/biznews/2023/02/3c6b1c08ea4b8bfd.html

According to Nikkei Asia dated February 17, 2023, India's total imports from Russia from April

In addition, despite the implementation of sanctions, imports to countries implementing sanctions from Russia have remained relatively strong. Figure 2, which compares the rate of change in trade of the G7 countries excluding France, and the EU with Russia in 2022, shows that the exports to Russia have decreased by 40-80% compared to 2021 whereas the overall rate of imports decreases only by 8.1%. Considering this situation, the simulations conducted in this paper limit the countries which impose trade sanctions to the OECD member countries and set modest trade reduction rates of 5%, 10%, 15%, and 20%.

Similar to this paper, some research analyzes the impact of supply constraints due to natural disasters. These analyses assume the reduction of capital stock and constraints on substitutability between industries. For example, Tokui et al. (2012) analyzed the impact of the Great East Japan Earthquake. Since natural disasters damage capital stock, this study estimates the impact assuming that capital stock has decreased under certain assumptions in addition to supply constraints. Similarly, Okada et al. (2012) and Shimoda and Fujikawa (2012), who analyzed the impact of the Great East Japan Earthquake using an input-output table, assume that substitutability between industries was constrained by

2022 to January 2023 totaled $37.3 billion, a 3.4-fold increase over the $7.7 billion in the same period in the same period of the previous fiscal year.
https://asia.nikkei.com/Economy/Trade/India-s-Russian-imports-soar-400-as-U.S.-offers-little-resistance

the impact of the earthquake when analyzing the forward linkage effect. Since there is no direct impact on capital stock or substitutability between industries in the case of trade sanctions, this paper only considers the impact of the pure reduction of trade.

3. Analytical method

Trade sanctions reduce trade in final goods and intermediate goods between the sanctions-implementing and target countries (the reduction in trade due to sanctions is referred to as “the first-order effect” hereinafter). The impact is not limited to the implementing and target countries, but spreads to the global economy through cross-border GVCs. These indirect effects can be classified into (1) the indirect effect caused by the decrease in exports for final demand, and (2) the indirect effect caused by the decrease in inter-industry trade in intermediate inputs. The latter indirect effect can be classified into two categories: a “forward linkage effect” and “backward linkage effect”. A “forward linkage effect” is the sum of the indirect effects of a decrease in production in a certain industry and its downstream industries due to a decrease in trade in intermediate goods in a certain industry. In contrast, a "backward linkage effect" is the total of the indirect effect of a decrease in production in a certain industry and its upstream industry due to the decrease in intermediate imports of the industry.

Following on from Miller and Blair (2009) first, the indirect effect caused by the decrease in exports for final demand can be derived from equation (1), which expresses the sum of supply (horizontal total) for ICIO.

$$\boldsymbol{X} = \boldsymbol{Z}\mathbf{i} + \boldsymbol{FD} \quad (1)$$

$\boldsymbol{X}$ is the production vector for countries and $\boldsymbol{Z}$ is the input coefficient matrix. $\mathbf{i}$ and $\boldsymbol{FD}$ represent a unit vector and a vector of final demand, respectively. This equation can be expressed as follows by using the matrix $\mathbf{A} = \mathbf{Z}\ \mathbf{diag(X)^{-1}}$ where $\mathbf{diag(X)^{-1}}$ is a diagonal matrix whose diagonal elements are the reciprocals of the production values of each country.

$$\boldsymbol{X} = \mathbf{A}\boldsymbol{X} + \boldsymbol{FD} \quad (2)$$

Rearranging equation (2) yields equation (3).

$$\boldsymbol{X} = (\mathbf{1} - \mathbf{A})^{-1}\,\boldsymbol{FD} \quad (3)$$

By using the vector of decrease of final demand $\boldsymbol{\Delta FD}$, the indirect effects caused by a decline in final demand $\boldsymbol{\Delta X\_FD}$ can be expressed as in (4).

$$\boldsymbol{\Delta X\_FD} = (\mathbf{1} - \mathbf{A})^{-1}\,\boldsymbol{\Delta FD} \quad (4)$$

The backward linkage effect associated with the decrease in intermediate input trade can be expressed as follows, where $\boldsymbol{\Delta X\_1}$ is the vector representing the amount of decrease in intermediate input trade due to trade sanctions.

$$\boldsymbol{\Delta X_B = \mathrm{A}\,\Delta X\_1}$$

The forward linkage effect associated with the decrease in trade of intermediate inputs is calculated using the formula for vertically summing the input-output table. The vertical sum of the input-output table is

$$\boldsymbol{X' = \mathrm{i}'\mathrm{Z} + V'} \tag{5}$$

where $\boldsymbol{V'}$ is a vector of value added. By using the matrix $\mathbf{B} = \mathbf{diag(X)^{-1}}\,\boldsymbol{Z}$, equation (5) can be transformed into equation (6).

$$\boldsymbol{X' = X'\mathrm{B} + V'} \tag{6}$$

The rearrangement yields

$$\boldsymbol{X' = V'(I - \mathrm{B})^{-1}} \tag{7}$$

The forward linkage effect $\boldsymbol{\Delta X\_F'}$ caused by the decrease in value added included in intermediate inputs due to trade sanctions $\Delta\boldsymbol{V'}$ can be expressed in the following equation.

$$\boldsymbol{\Delta X\_F'} = \boldsymbol{\Delta V'}(\boldsymbol{I} - \mathbf{B})^{-\mathbf{1}} \quad (8)$$

By assuming that the ratio of added value included in production is constant, I calculate the change of value added caused by the first-order effect, $\boldsymbol{\Delta V'}$, as follows,

$$\boldsymbol{\Delta V} = \mathbf{C}\,\boldsymbol{\Delta X\_1} \quad (9)$$

where $\mathbf{C}$ is a vector of value added – production ratio.

4. Scenarios

The following scenarios were assumed for the analysis. Trade sanctions are enforced by OECD member countries and the country subject to sanctions is Russia. [6]

(1) Scenario 1: OECD member countries impose trade sanctions while Russia retaliates by reducing trade with sanctioning countries

In this case, both exports and imports between OECD member countries and Russia will decrease. Here, I assume that exports and imports between OECD member countries and Russia have decreased by 5%, 10%, 15%, and 20%, and calculate direct effects and

[6] Belarus is also subject to trade sanctions, but the ICIO does not include Belarus, so the estimates in this paper do not include Belarus. Trade between Ukraine and Russia and Belarus is also likely to be disrupted, but Ukraine is also not included in the ICIO. Hence, I do not consider the impact here.

indirect effects.

(2) Scenario 2: Exports from OECD member countries to Russia decrease, while exports from Russia to OECD member countries do not decrease

The scenario is similar to the current situation. By assuming that only exports from OECD countries to Russia decreased by 5%, 10%, 15% and 20%, I calculate direct and indirect effects.

5. Overview of Russian trade using ICIO 2018

Before presenting the analysis results, let's confirm Russia's trade trends using ICIO in 2018. Figure 3 summarizes Russia's exports and imports by classifying partner countries into OECD member countries and non-member countries. The value of exports is US$512billion and the value of imports is US$349.3 billion, recording a large export surplus. Russia's large export surplus is not just a phenomenon of 2018. It has been constant since the 2000s. OECD countries account for nearly 60% of both Russia’s export and import partners. Looking at the top exporters and top importers, China has the highest weight, but OECD member countries such as Germany, the United States, and Italy occupy other top positions (Table 2).

Looking at the composition of exports by industry, the weight of mining items is high (Figure 4 (1)). Minerals, such as crude oil, coal, and natural gas, account for nearly 30%, and they exceed 40% when refined petroleum and coal products are included. As for imports, machinery industries such as general machinery, computer/electronic/optical product and automobile industries account for a large volume of imports, but they are not as skewed as exports (Figure 4 (2)). From the perspective of OECD member countries, exports to Russia account for 2.1% of total exports, and imports from Russia account for only 0.6% of total imports, meaning Russia's weight as a trade partner is rather small (Figure 5). The exports mainly consist of wholesale/retail service, automobiles, and general machinery products, while main imports are coal/petroleum products, wholesale/retail service, and mining (energy) products (Figure 6).

In this way, Russia's trade structure shows a bias in export partners and export products, so if the OECD countries all impose trade sanctions on Russia's exports simultaneously, a serious impact on the Russian economy would be expected.

6. Result of analysis

(1) Scenario 1

Table 3 shows the impact of this scenario on production values around the world and in

major countries. [7] As the rate of decline in trade between OECD member countries and Russia increases to 5%, 10%, 15%, and 20%, the decrease in production decreases roughly proportionally. Figure 7 summarizes the impact of a 20% decrease in trade on production values. While the value of global production declines by 0.17%, the value of Russian production declines by 4.75%, which is close to the rate of decline in Russia's GDP during the period of turmoil in the late 1990s, indicating that trade sanctions will have a certain effect.

Among OECD member countries, countries geographically close to Russia, such as Lithuania, Estonia, Latvia, Slovakia, and Finland, have seen the largest declines. In contrast, the impact on the United States, Canada, and Japan, which originally had relatively small trade volumes with Russia, is minor. The impact on non-OECD countries that are not participating in the sanctions, such as China and India, is close to zero, and it can be evaluated as maintaining the status quo.

Looking at the breakdown of the effects, in countries with a large impact, including Russia, the effect of decreasing trade in intermediate goods exceeds the effect of decreasing final goods trade. As for the impact of a decline in trade in intermediate goods, in many countries the forward linkage effect greatly exceeds the backward linkage effect and the

[7] I omit the impact on the production value of other countries. Provided if requested.

first-order effect. Perhaps this is due to the fact that Russia's main exports are materials used in a wide range of industries such as oil and natural gas.

Figure 8 indicates the impact by industry in Russia. While the production value of Russia as a whole falls by 4.76%, the production value of major export industries such as mining, petroleum and coal product manufacturing, food, and fisheries is well below the average. In terms of non-manufacturing industries, the impact on the transportation industry, such as the aircraft transportation industry and the water transportation industry, is relatively large.

Although the impact on Japan's production value is minor, with a decrease of 0.79%, a slightly larger impact is observed in industries that supply major exports to Russia, such as the transportation machinery manufacturing industry and the mining support service industry (Figure 9).

(2) Scenario 2

Table 4 reveals the impact of Scenario 2 on global and major country production values. In this scenario, trade sanctions against Russia would have little effect. [8] Even if exports from OECD member countries to Russia decreased by 20%, the value of Russian

[8] As in Scenario 1, the impact on the production value of other countries is large, so I will omit it. Provided if requested.

production would still only fall by 0.02%, a level that is lower than the global rate of decline of 0.07%. On the other hand, neighboring countries such as Estonia, Latvia, and Finland, whose exports to Russia account for a large proportion of their exports, would see large declines in production (Figure 10). For these countries, Russia is a relatively large overseas market for final goods, and the direct and indirect effects of reduced exports of final goods due to trade sanctions would be remarkable. Trade sanctions would hurt final consumption in Russia, but allow production to continue almost free of any effects of the sanctions.

Figure 11 shows the impact by industry in Russia. Overall, the impact would be minor, but the rate of decrease in production value in mining, petroleum/coal product manufacturing, chemical manufacturing, metal manufacturing, and aircraft transportation would be slightly larger.

The impact on Japan's production value is the same as in Scenario 1, and a slightly larger impact is observed on industries that supply major exports to Russia, such as the transport equipment manufacturing industry and the mining support service industry (Figure 12).

7. Conclusion

This paper examines why the effects of trade sanctions against Russia have not manifested

through simulations using ICIO. In response to the sanctions against Russia's invasion against Ukraine, Russia did not impose trade bans and continues to export oil, natural gas, etc. to countries that are imposing sanctions. Some countries which have imposed sanctions have increased imports from Russia year-on-year. The analysis in this paper shows that Russia's so-called “clinch” strategy works to reduce the effects of sanctions.

In addition, due to the fact that exports from Russia to China, India, and other countries that are not imposing sanctions have increased significantly compared to last year, it is almost impossible to expect the effect of sanctions to reduce exports and production. The Russian government gradually came to understand this point and improved its economic growth forecasts for 2022. The government originally forecast that the economic growth rate would have dropped sharply by 7.8% as of May 17, but it raised the forecast by 4.2% on September 11 and by 2.9% on November 25, and the actual growth rate ended up dropping by only 2.1%. [9]

Russia is by nature a country that does not depend on foreign countries for energy or food, and while the decline in final goods imported from sanctioning countries forces Russian consumers to sacrifice luxuries, it is difficult to imagine that they could fall into a serious

[9] International organizations also underestimated Russia's economic growth rate in 2022 as follows.
IMF “World Economic Outlook” (19 April 2022): - 8.5%
World Bank “War in the region ~ Europe and Central Asia economic update” (10 April 2022): -13.2%

situation where a lack of food and fuel would affect their daily lives. Regarding the decrease in imports of intermediate goods, substitute goods may be secured from countries that are not participating in the sanctions, and countries that are imposing sanctions may continue to indirectly export to Russia via countries that do not participate in sanctions. Hence the impact of trade sanctions on Russia may be less than the impact calculated in Scenario 2. However, since security-related goods are strictly controlled, in principle they are not indirectly exported to Russia from the sanctioned countries. For this reason, medium- to long-term impacts on production activities, including the production and maintenance of weapons and equipment, are inevitable.

The purpose of trade sanctions is to deter actions such as military aggression by the target country if other deterrence measures fail. To that end, sanctions are meaningless unless they are effective. For them to succeed here, there is an urgent need for countries implementing sanctions to secure alternative supply sources for imports from Russia on one hand and to increase the number of countries participating in sanctions on the other.[10]

The current trade sanctions against Russia should be taken as a matter of course, since

[10] As shown in Table 2, "other" countries in the ICIO account for a certain percentage of trade with Russia (15.5% of exports and 14.9% of imports) and are encouraged to participate in trade sanctions. As the number of participating countries increases, the effect of sanctions is expected to increase.

Russia's aggression is a violation of international rules. However, from the perspective of effectiveness, the sanctions to date have- been an example of efforts that are “too little too late.” Considering that tensions between Ukraine and Russia have continued since Russia's invasion of the Crimean Peninsula in 2014, and that tensions were even higher in 2021, neighboring countries and the G7 should have been able to determine the impact of the imposition of sanctions and measures to increase the effectiveness of sanctions in advance (securing alternative sources of oil and natural gas procured from Russia in times of emergency).

However, in peacetime, people tend to put off making emergency preparations and assume that peacetime will continue until it’s too late. This is a lesson that must also be taken as a warning for many countries. Regarding Japan, it is an important political issue during peacetime to anticipate the possibility of a military conflict erupting around Japan, to understand the effects of trade sanctions implemented in an emergency, and to prepare measures to increase their effectiveness.

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Table 1 Measures taken by the Japanese government in light of Russia's aggression against Ukraine (As of 24 February, 2023)

Assistance related to Ukraine

- Provide Ukraine with drones, bulletproof vests, helmets, winter battle dress uniforms, tents, cameras, hygiene products, emergency rations, binoculars, lighting devices, medical supplies, civilian vehicles (van) and other resources
- Provide Ukraine and its neighboring countries with emergency humanitarian assistance (health and medical care, food, protection): US$ 200 million, and decide to provide with them assistance of supplementary budget as humanitarian assistance and recovery cost: approximately US$ 500 million
- Response to global food security effects of the Situation in Ukraine: US$ 200 million, including support for promotion of grain exports from Ukraine: US$ 17 million
- Provide assistance for transportation to and distribution in Somalia of wheat donated by the Ukrainian government: US$ 14 million
- Provide Ukraine with financial support: US$ 600 million
- Provide Ukraine with generators and solar lanterns: US$ 2.57 million, reflective materials and heat packs: US$ 0.55 million, as winterization support through international organizations.
- Provide approximately 1,500 generators, including 4 donated from “Overwintering support initiative JAPAN to send generators to Ukrainian people”. (including generators provided through the international organization mentioned above)
- Provide assistance in the area of mine action including training programmes for the personnel of the State Emergency Service of Ukraine (SESU) in cooperation with Cambodia • Provide broadcasting equipment to the Public Broadcasting Company of Ukraine (PBC)
- Decided debt service suspension to Ukraine worth approximately ¥ 7.8 billion (approximately US$ 70 million) • Offer visa extensions to Ukrainian residents in Japan • Accept evacuees from Ukraine into Japan
- Provide in-kind contributions and air-lifting of UNHCR’s humanitarian relief items using JSDF aircraft as well as personnel contribution in the fields of medical care, health, etc. to assist evacuees

Financial measures

- Prevent financing to Russia from the leading multilateral financial institutions, including IMF, the World Bank and the European Bank for Reconstruction and Development
- Respond to sanction evasion by Russia, including through digital assets

- Restrict transactions with Russia's central bank
- Impose sanctions that include the freezing of assets of persons related to the Government of Russia, including President Putin, and Russian business oligarchs
- Freeze assets of twelve Russian banks (Sberbank, Alfa-Bank, VEB.RF, Promsvyazbank, Bank Rossiya, VTB Bank, Sovcombank, Novicombank, Bank Otkritie, Credit Bank of Moscow and Russian Agricultural Bank (Rosselkhozbank) and Rosbank) and their subsidiaries in Japan
- Join in with efforts to isolate Russia from the international financial system and the global economy such as excluding selected Russian banks from the SWIFT messaging system
- Prohibit the issuance or transaction of new Russian sovereign debt in the primary and secondary market. In addition, for certain designated Russian banks already prohibited from issuing or offering securities in Japan, imposition of sanctions on securities with a shorter fixed maturity.
- Introduce measures to prohibit new investment in Russia
- Prohibit the provision of certain services to Russia, including trust services and accounting services, Implement a price cap on Russian oil (prohibit import and provision of related services which enable maritime transportation of Russian crude oil and petroleum products that are purchased above the price cap)

Trade measures

- Revoke Russia's "most-favoured-nation" status
- Prohibit imports of machinery, some wood, vodka, gold and others
- Prohibit exports of luxury goods
- Impose sanctions on a) exports to Russian military-related entities; b) exports to Russia of i) controlled items listed on the internationally agreed list, ii) other dual-use goods such as semiconductors, iii) cutting-edge products, iv) equipment for refining petroleum etc., v) goods which could contribute to the enhancement of Russian industrial capacities, and vi) items related to chemical and biological weapons.
- Reduce reliance on Russia for energy, which includes phasing out and banning Russian coal and oil imports

Visa measures

- Suspend visa issuance to Japan for designated individuals related to Russia

Belarus

- Freeze assets of four Belarusian banks (Belagroprombank, Bank Dabrabyt, Development Bank of the Republic of Belarus and Belinvestbank) and their subsidiaries in Japan
- Suspend visa issuance to Japan for designated individuals related to Belarus

• Impose sanctions that include the freezing of assets of designated individuals and entities related to Belarus, including President Lukashenko

• Impose sanctions on exports to Belarusian military-related entities and on exports of controlled items listed on the internationally agreed list and of other dual-use goods such as semiconductors

＊“Donetsk People's Republic“ and “Luhansk People's Republic“

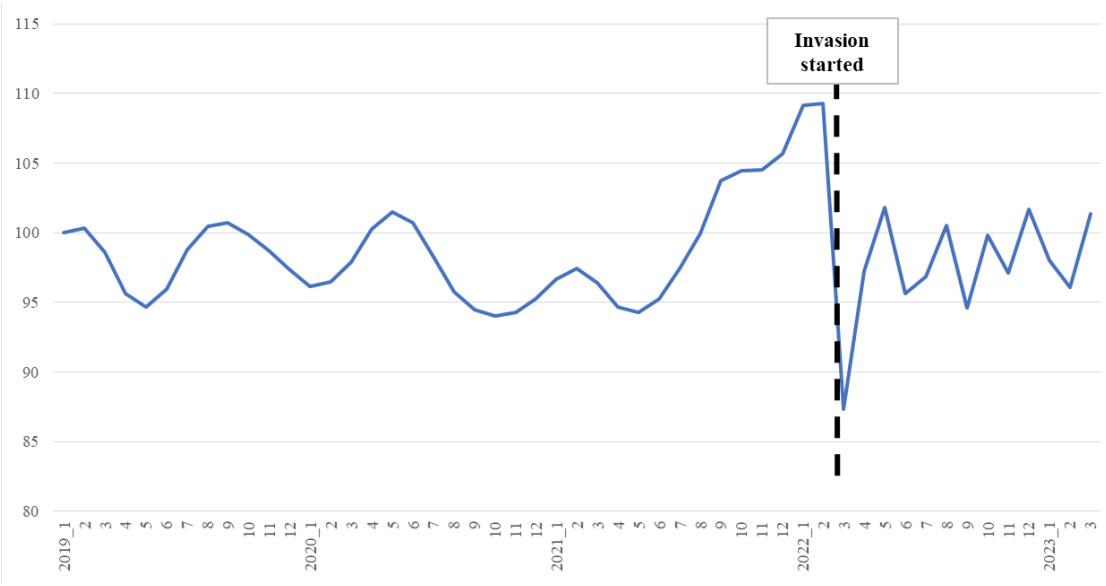
• Suspend visa issuance to Japan for individuals from the "Donetsk People's Republic" or the "Luhansk People's Republic" and freeze the assets held by these individuals in Japan

• Prohibit imports from and exports to the "Donetsk People's Republic" and the "Luhansk People's Republic"

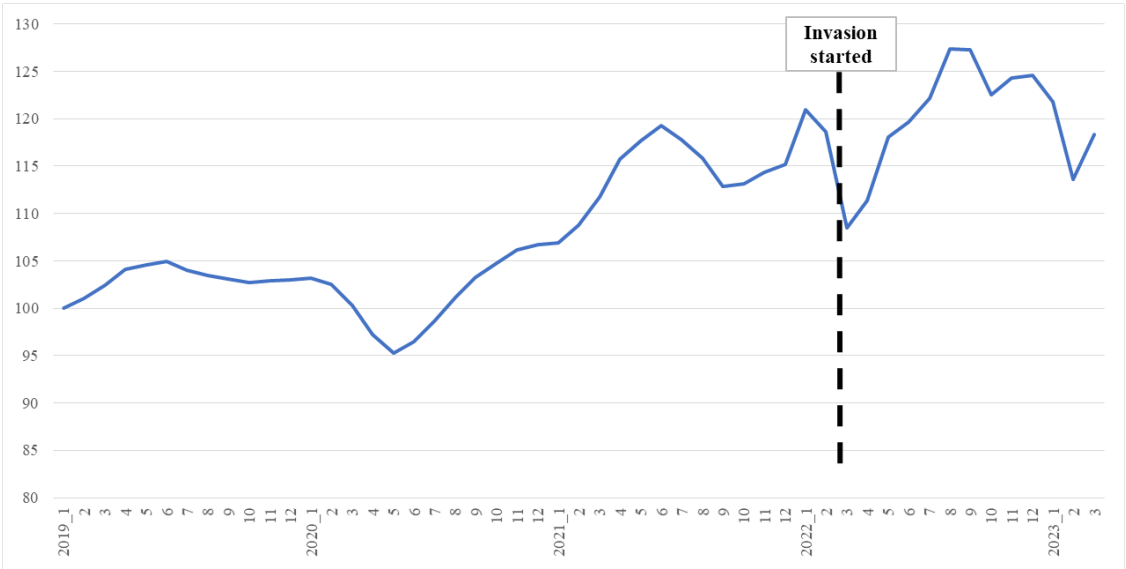
Source: Homepage of Prime Minister’s Office of Japan.
https://japan.kantei.go.jp/ongoingtopics/pdf/jp_stands_with_ukraine_eng.pdf

Figure1　Russian Trade trends

Exports (Jan 2019 = 100, based on seasonally-adjusted monthly growth)



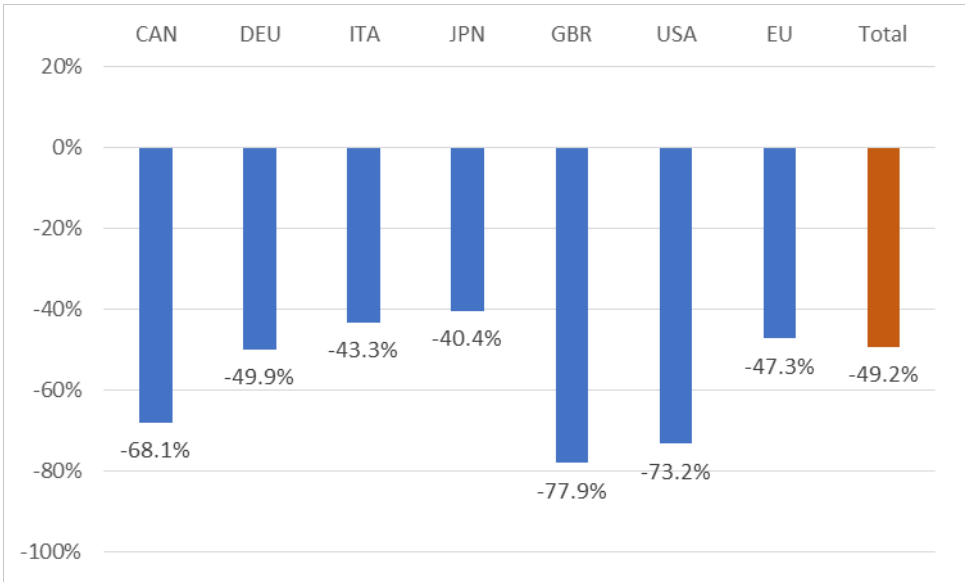
Imports (Jan 2019 = 100, based on seasonally-adjusted monthly growth)



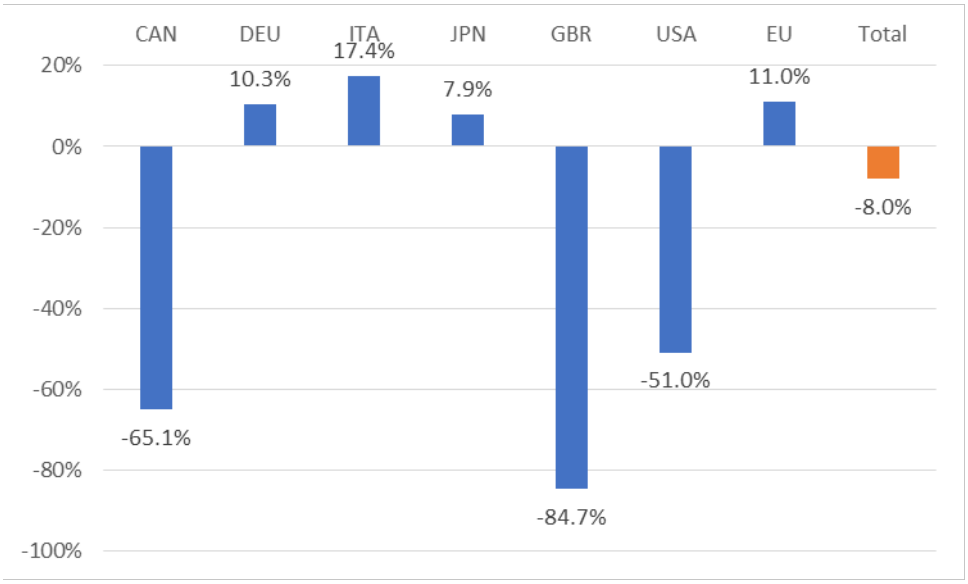
Source: Institute for World Economy “Kiel Trade Indicator”.
(https://www.ifw-kiel.de/topics/international-trade/kiel-trade-indicator/)

Figure 2 Trade trends of G7 countries (except France) and EU with Russia in 2022

Export (year-on-year change, %)

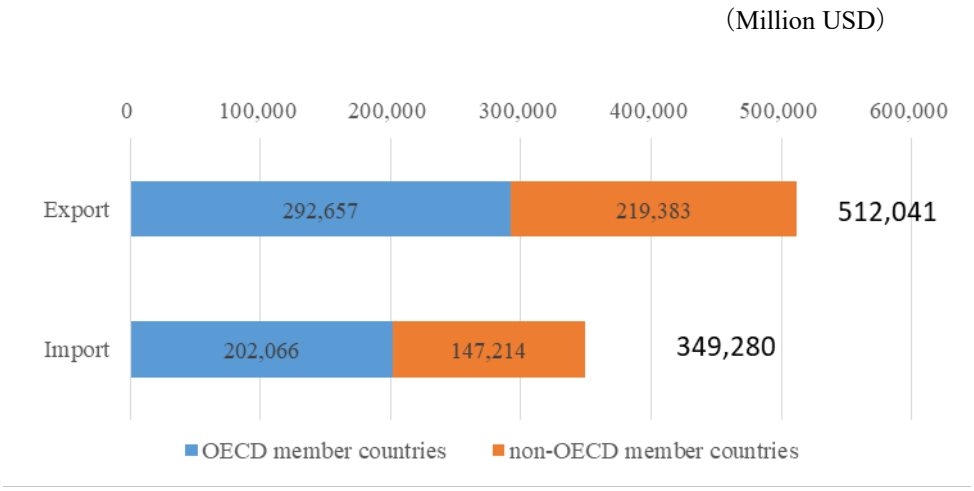


Import (year-on-year change, %)



Source : UN Comtrade Database.

Figure 3 Regional composition of trade of Russia based on ICIO 2018



Source: Author's calculation based on OECD “ICIO 2018”.

(Million USD)

Table 2　Russia - Main trade partners

(1) Export partners

	Export value (million USD)	Share
Other	79,522	15.5%
China	69,930	13.7%
Germany	40,098	7.8%
United States	26,962	5.3%
Italy	19,764	3.9%
Poland	18,698	3.7%
Republic of Korea	18,370	3.6%
Japan	18,035	3.5%
Kazakhstan	16,463	3.2%

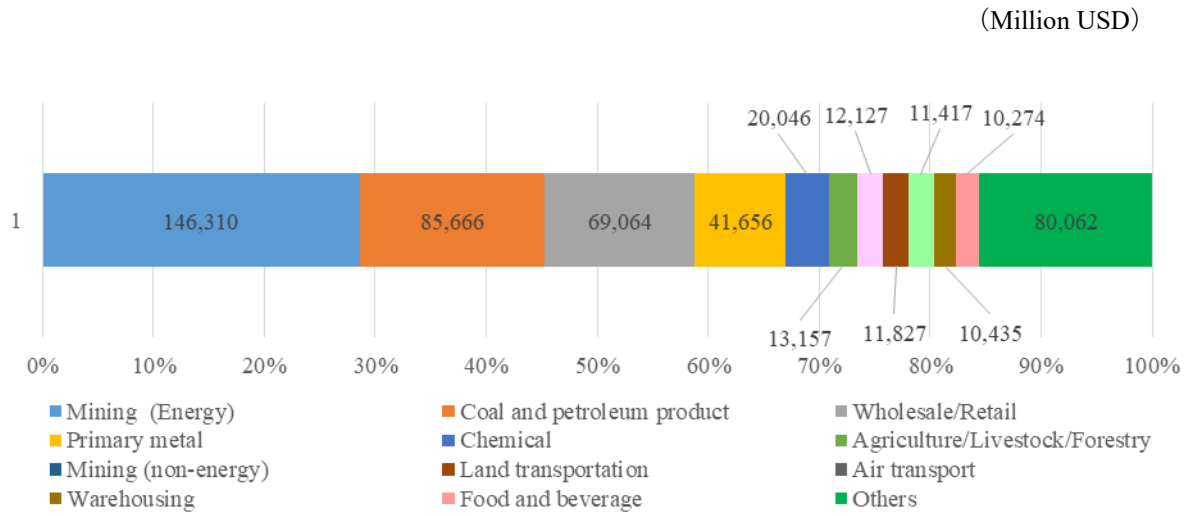
(2) Import partners

	Import value (million USD)	Share
China	56,450	16.2%
Other	51,913	14.9%
Germany	31,552	9.0%
United States	22,840	6.5%
France	20,804	6.0%
Italy	15,619	4.5%
Japan	14,153	4.1%
Turkey	10,079	2.9%
United Kingdom	9,507	2.7%

Source: Author's calculation based on OECD “ICIO 2018”.

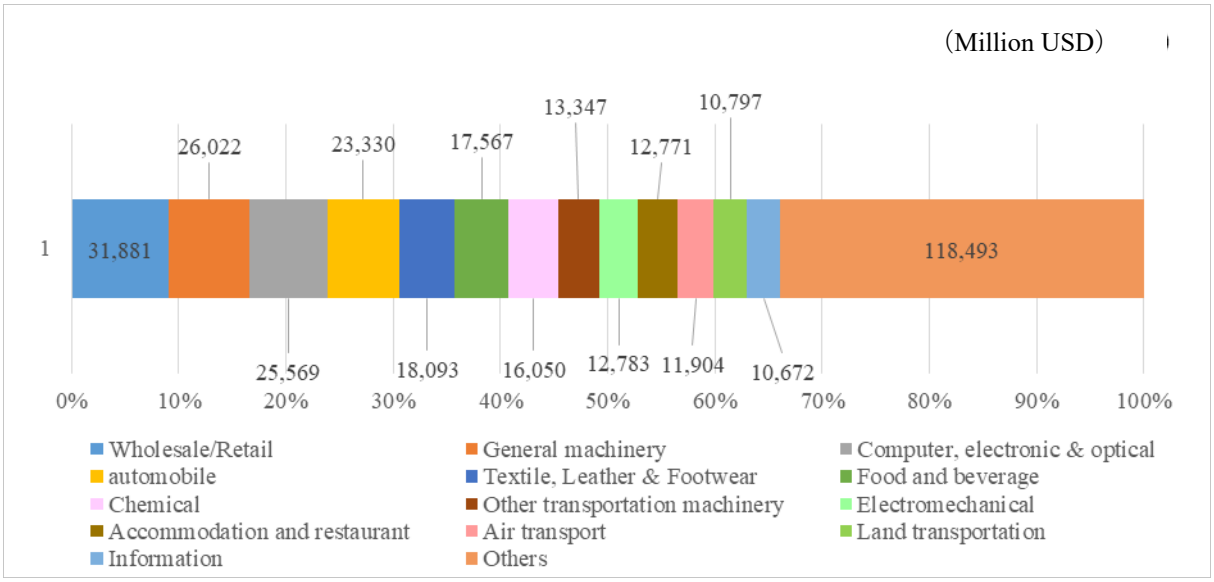
Figure 4 Russia's export and import composition by industry (2018)

(1) Exports



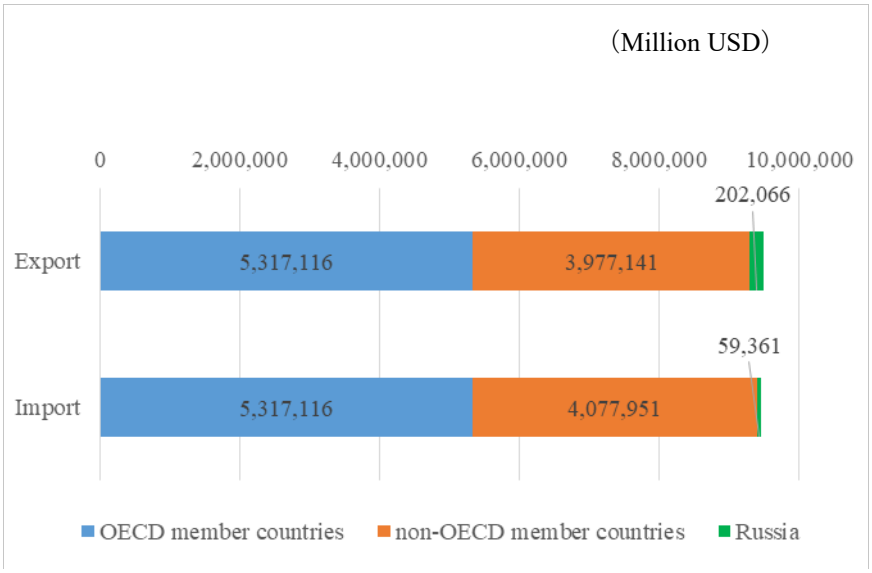
Source: Author's calculation based on OECD “ICIO 2018”.

(2) Import



Source: Author's calculation based on OECD “ICIO 2018”.

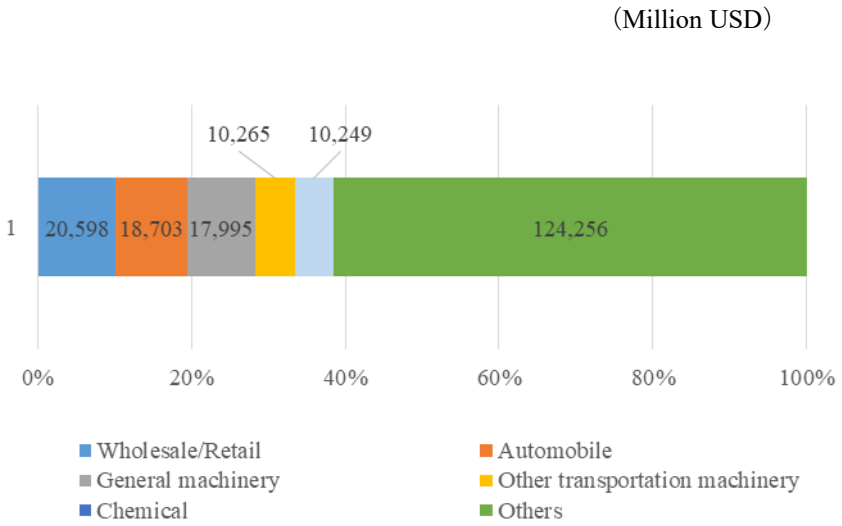
Figure 5 Regional composition of Trade of OECD member countries at ICIO 2018



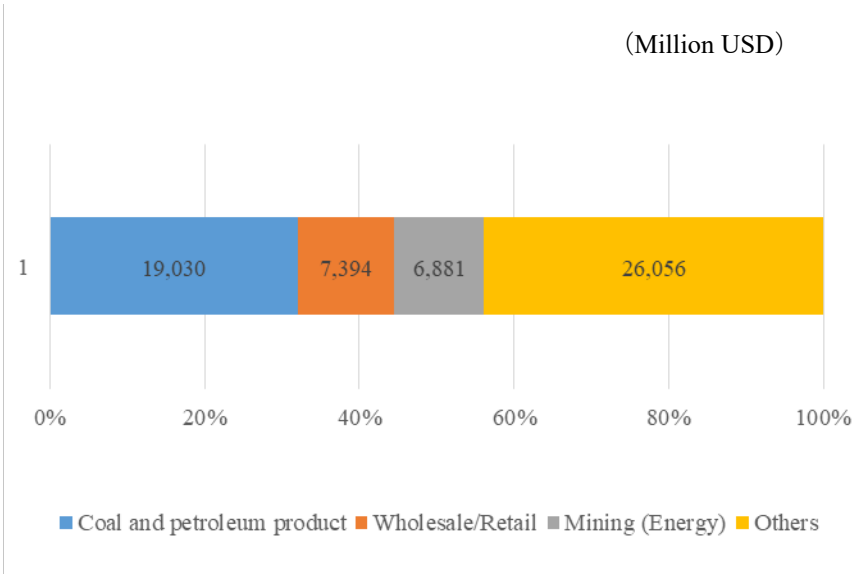
Source: Author's calculation based on OECD “ICIO 2018”.

Figure 6 OECD member countries' export and import composition by industry (2018)

(1) Export



(2) Import



Source: Author's calculation based on OECD "ICIO 2018".

Table 3 Scenario 1: Impact on production values around the world and major countries

(1) The world

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	16,967	24,072	8,160	73,615	16,647	139,461	0.0844%	165,301,439
Trade －10%	33,934	48,144	16,319	15,538	33,294	147,230	0.0891%	165,301,439
Trade －15%	50,901	72,216	24,479	23,307	49,941	220,845	0.1336%	165,301,439
Trade －20%	67,868	96,288	32,639	31,076	66,588	294,460	0.1781%	165,301,439

(2) Russia

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	11,665	10,690	4,684	2,968	5,433	35,440	1.1893%	2,980,039
Trade －10%	23,330	21,381	9,369	5,936	10,865	70,880	2.3785%	2,980,039
Trade －15%	34,994	32,071	14,053	8,904	16,298	106,320	3.5678%	2,980,039
Trade －20%	46,659	42,762	18,737	11,872	21,730	141,761	4.7570%	2,980,039

(3) G7 countries

(i) Japan

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	254	502	164	250	595	1,766	0.0198%	8,929,266
Trade －10%	507	1,004	329	501	1,191	3,531	0.0395%	8,929,266
Trade －15%	761	1,506	493	751	1,786	5,297	0.0593%	8,929,266
Trade －20%	1,014	2,008	658	1,002	2,382	7,063	0.0791%	8,929,266

(ii) United States of America

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	612	1,067	373	530	1,173	3,756	0.0105%	35,896,389
Trade －10%	1,225	2,135	747	1,059	2,346	7,511	0.0209%	35,896,389
Trade －15%	1,837	3,202	1,120	1,589	3,519	11,267	0.0314%	35,896,389
Trade －20%	2,449	4,269	1,494	2,119	4,692	15,023	0.0419%	35,896,389

(iii) Canada

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	39	90	27	30	83	270	0.0090%	3,004,814
Trade －10%	77	181	55	61	166	540	0.0180%	3,004,814
Trade －15%	116	271	82	91	249	809	0.0269%	3,004,814
Trade －20%	155	362	109	121	333	1,079	0.0359%	3,004,814

(iv) United Kingdom

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	285	452	164	187	419	1,506	0.0309%	4,867,905
Trade －10%	570	903	327	374	837	3,012	0.0619%	4,867,905
Trade －15%	855	1,355	491	561	1,256	4,518	0.0928%	4,867,905
Trade －20%	1,140	1,807	654	748	1,675	6,024	0.1238%	4,867,905

(v) Germany

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	858	1,223	509	720	1,555	4,865	0.0675%	7,208,105
Trade －10%	1,716	2,445	1,019	1,439	3,111	9,730	0.1350%	7,208,105
Trade －15%	2,574	3,668	1,528	2,159	4,666	14,595	0.2025%	7,208,105
Trade －20%	3,432	4,890	2,038	2,878	6,221	19,460	0.2700%	7,208,105

(vi) France

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	418	556	241	363	766	2,345	0.0477%	4,917,614
Trade －10%	835	1,113	482	726	1,532	4,689	0.0954%	4,917,614
Trade －15%	1,253	1,669	723	1,090	2,298	7,034	0.1430%	4,917,614
Trade －20%	1,671	2,225	965	1,453	3,064	9,378	0.1907%	4,917,614

(vii) Italy

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	310	632	205	397	867	2,412	0.0606%	3,978,694
Trade －10%	621	1,264	410	794	1,735	4,823	0.1212%	3,978,694
Trade －15%	931	1,895	615	1,191	2,602	7,235	0.1818%	3,978,694
Trade －20%	1,242	2,527	820	1,589	3,469	9,647	0.2425%	3,978,694

(4) China

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	0	2,602	127	0	425	3,153	0.0090%	35,015,787
Trade －10%	0	5,204	253	0	849	6,307	0.0180%	35,015,787
Trade －15%	0	7,806	380	0	1,274	9,460	0.0270%	35,015,787
Trade －20%	0	10,408	507	0	1,699	12,614	0.0360%	35,015,787

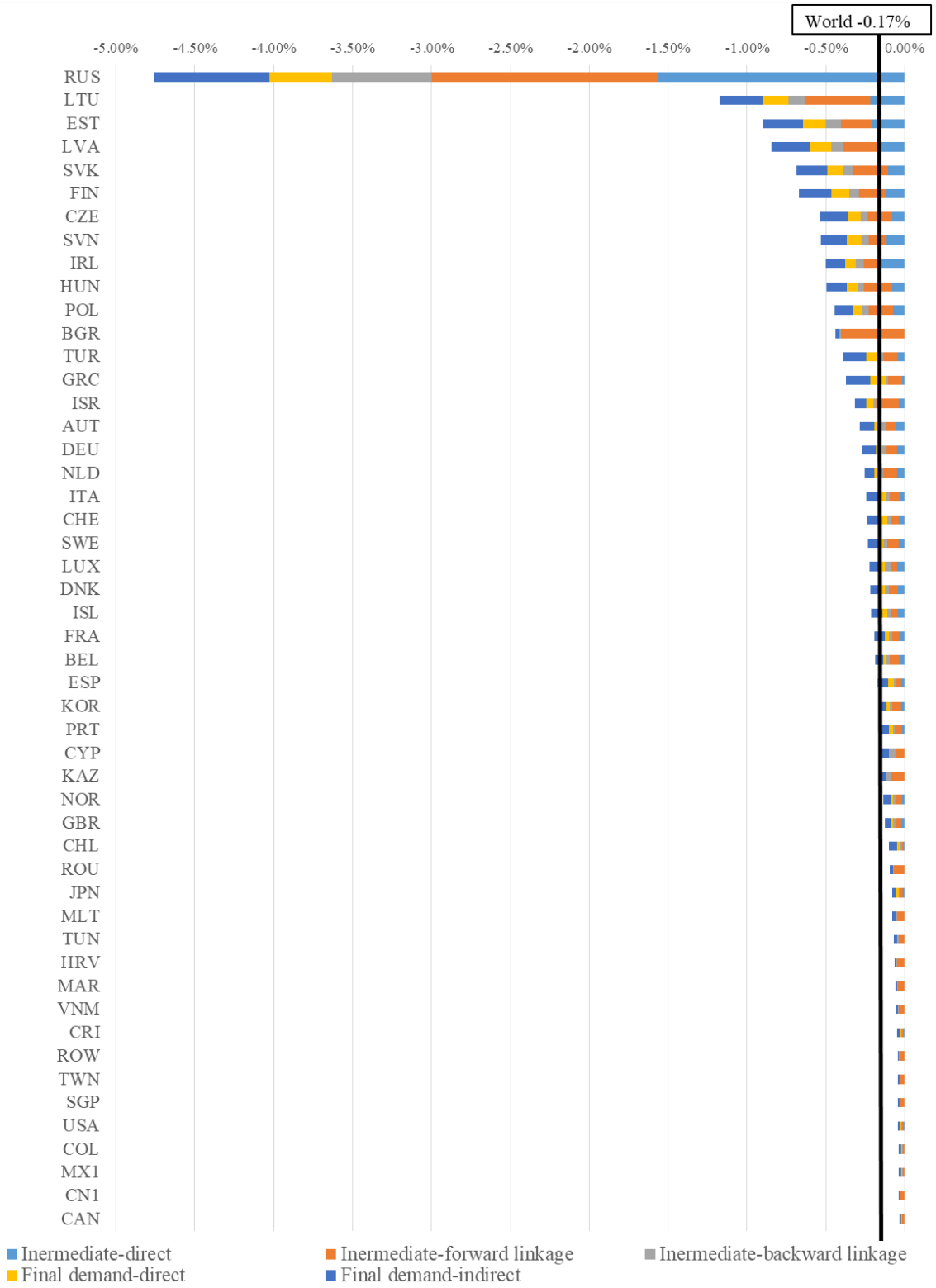
(5) India

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	0	151	20	0	49	219	0.0043%	5,119,277
Trade －10%	0	302	39	0	98	438	0.0086%	5,119,277
Trade －15%	0	452	59	0	146	657	0.0128%	5,119,277
Trade －20%	0	603	78	0	195	876	0.0171%	5,119,277

Source: Author's calculation based on OECD “ICIO 2018”.

Note: All numbers are units of USD million.

Figure 7 Scenario 1: Impact on production value of each country (trade value decrease 20%)

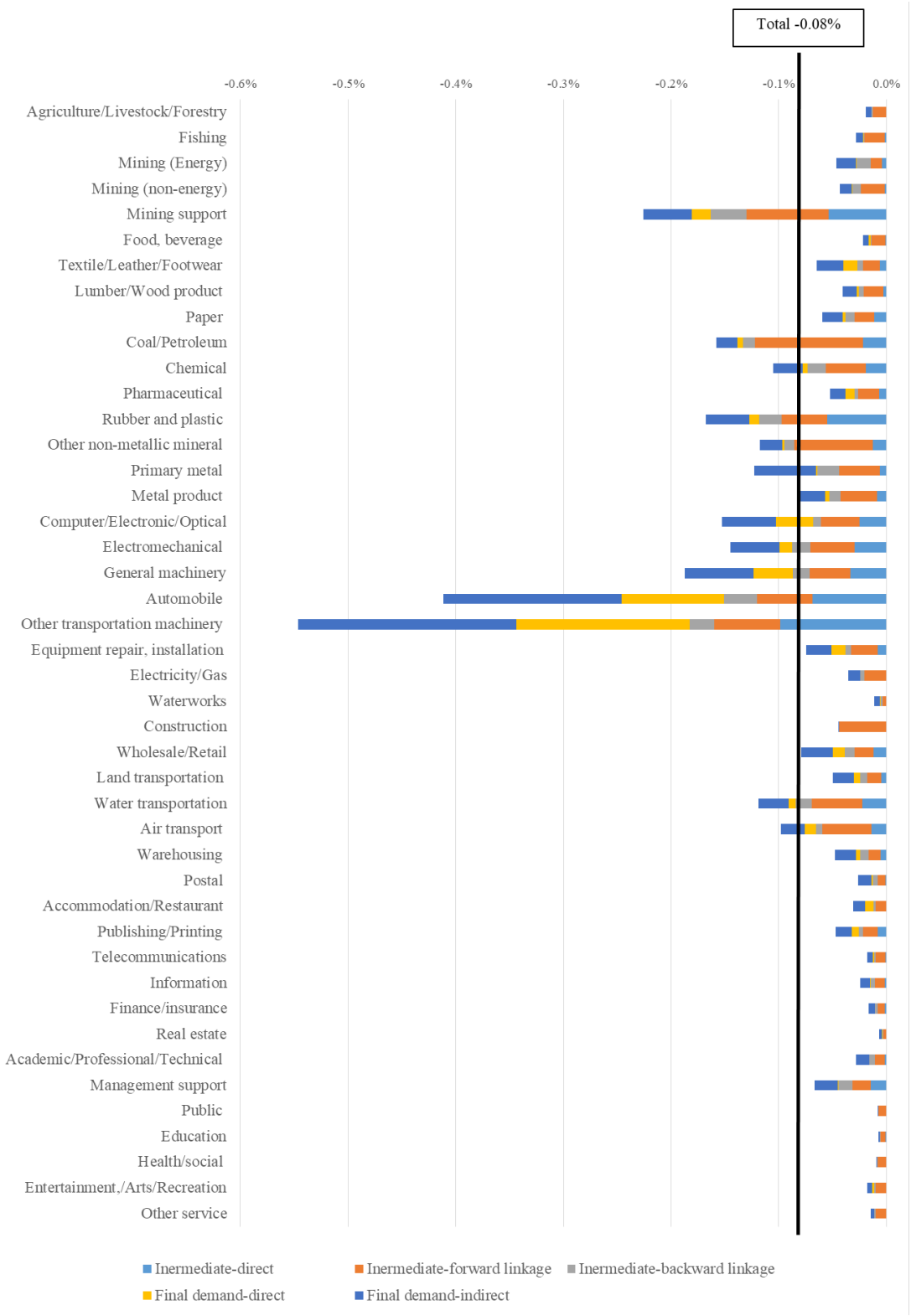


Source: Author's calculation based on OECD “ICIO 2018”.

Figure 8 Scenario 1: Impact on production value of Russia (trade value decreases by 20%)

Source: Author's calculation based on OECD “ICIO 2018”.

Figure 9 Scenario 1: Impact on production value of Japan (trade value decreases by 20%)



Source: Author's calculation based on OECD “ICIO 2018”.

Table 4 Scenario 2: Impact on production values in the world and major countries

(1) The world

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	5,302	4,867	3,037	28,679	10,672	52,556	0.0318%	165,301,439
Trade －10%	10,605	9,734	6,073	9,602	21,344	57,357	0.0347%	165,301,439
Trade －15%	15,907	14,601	9,110	14,403	32,016	86,036	0.0520%	165,301,439
Trade －20%	21,209	19,468	12,146	19,204	42,688	114,715	0.0694%	165,301,439

(2) Russia

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	0	35	38	0	93	166	0.0056%	2,980,039
Trade －10%	0	71	75	0	186	332	0.0112%	2,980,039
Trade －15%	0	106	113	0	279	498	0.0167%	2,980,039
Trade －20%	0	142	151	0	372	665	0.0223%	2,980,039

(3) G7 countries

(i) Japan

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	254	220	152	250	575	1,451	0.0163%	8,929,266
Trade －10%	507	439	305	501	1,150	2,902	0.0325%	8,929,266
Trade －15%	761	659	457	751	1,726	4,353	0.0488%	8,929,266
Trade －20%	1,014	878	609	1,002	2,301	5,804	0.0650%	8,929,266

(ii) United States of America

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	612	696	341	530	1,122	3,301	0.0092%	35,896,389
Trade －10%	1,225	1,391	682	1,059	2,244	6,601	0.0184%	35,896,389
Trade －15%	1,837	2,087	1,023	1,589	3,366	9,902	0.0276%	35,896,389
Trade －20%	2,449	2,782	1,364	2,119	4,487	13,202	0.0368%	35,896,389

(iii) Canada

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	39	54	25	30	79	227	0.0076%	3,004,814
Trade －10%	77	107	50	61	159	454	0.0151%	3,004,814
Trade －15%	116	161	75	91	238	681	0.0227%	3,004,814
Trade －20%	155	215	100	121	318	908	0.0302%	3,004,814

(iv) United Kingdom

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	285	298	150	187	399	1,319	0.0271%	4,867,905
Trade －10%	570	596	299	374	799	2,638	0.0542%	4,867,905
Trade －15%	855	893	449	561	1,198	3,956	0.0813%	4,867,905
Trade －20%	1,140	1,191	599	748	1,597	5,275	0.1084%	4,867,905

(v) Germany

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	858	654	462	720	1,500	4,194	0.0582%	7,208,105
Trade －10%	1,716	1,309	924	1,439	2,999	8,387	0.1164%	7,208,105
Trade －15%	2,574	1,963	1,386	2,159	4,499	12,581	0.1745%	7,208,105
Trade －20%	3,432	2,617	1,848	2,878	5,999	16,775	0.2327%	7,208,105

(vi) France

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	418	311	219	363	735	2,045	0.0416%	4,917,614
Trade －10%	835	621	437	726	1,470	4,091	0.0832%	4,917,614
Trade －15%	1,253	932	656	1,090	2,206	6,136	0.1248%	4,917,614
Trade －20%	1,671	1,242	874	1,453	2,941	8,182	0.1664%	4,917,614

(vii) Italy

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	310	242	188	397	846	1,984	0.0499%	3,978,694
Trade －10%	621	484	377	794	1,691	3,967	0.0997%	3,978,694
Trade －15%	931	726	565	1,191	2,537	5,951	0.1496%	3,978,694
Trade －20%	1,242	968	753	1,589	3,383	7,934	0.1994%	3,978,694

(4) China

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	0	174	65	0	306	545	0.0016%	35,015,787
Trade －10%	0	348	130	0	612	1,090	0.0031%	35,015,787
Trade －15%	0	522	195	0	918	1,635	0.0047%	35,015,787
Trade －20%	0	696	260	0	1,224	2,180	0.0062%	35,015,787

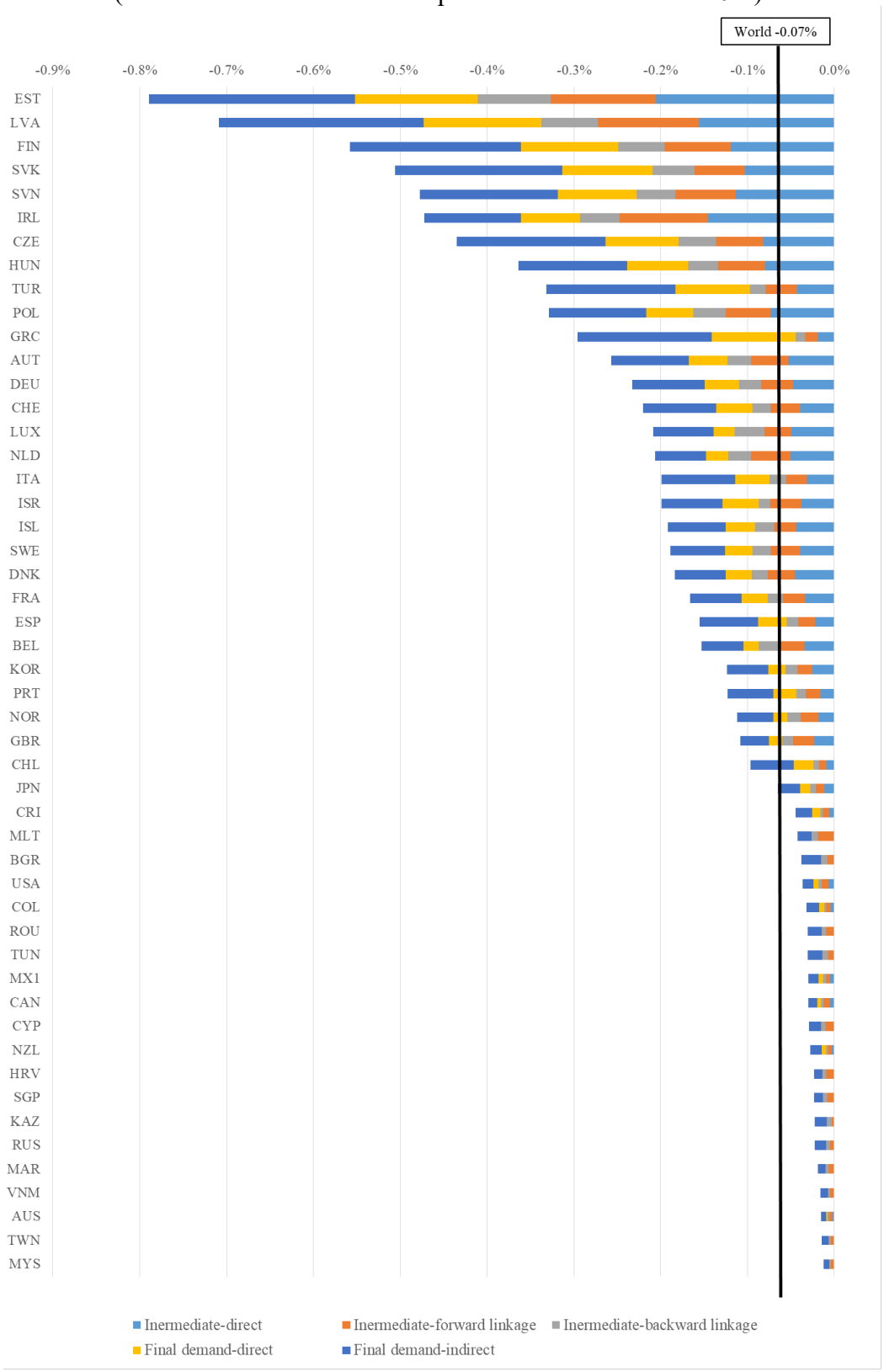
(5) India

	Effect of Intermedeiate input			Effect of final demand		Total	Rate of decrease	Producion value (2018)
	Direct effect	Forard linkage	Bakward linkage	Direct effect	Indirect effect			
Trade －5%	0	23	14	0	40	76	0.0015%	5,119,277
Trade －10%	0	46	28	0	80	153	0.0030%	5,119,277
Trade －15%	0	68	42	0	119	229	0.0045%	5,119,277
Trade －20%	0	91	56	0	159	306	0.0060%	5,119,277

Source: Author's calculation based on OECD “ICIO 2018”.

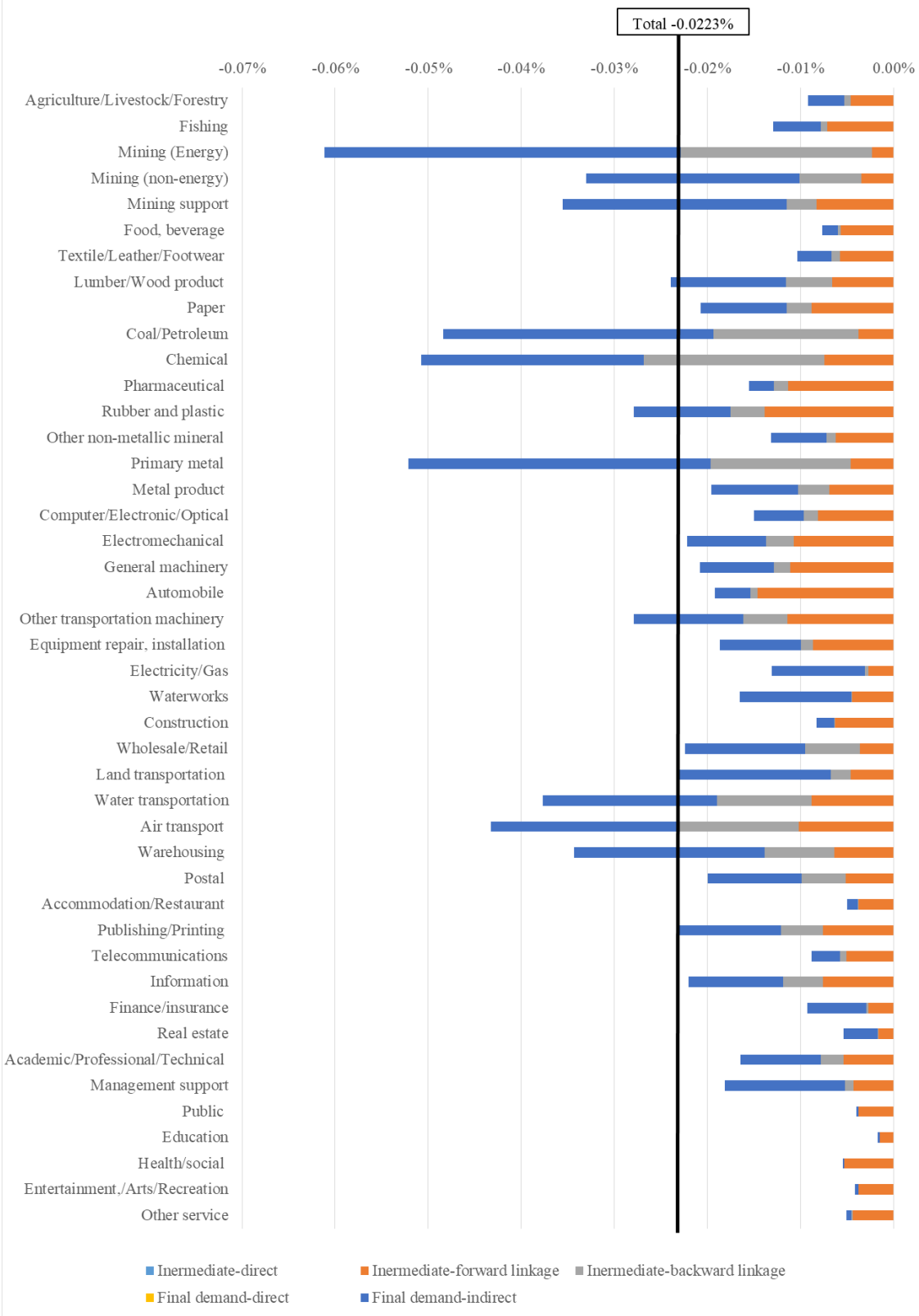
Note: All numbers are units of USD million.

Figure 10 Scenario 2: Impact on production value of each country
(OECD member countries' exports to Russia decrease 20%)



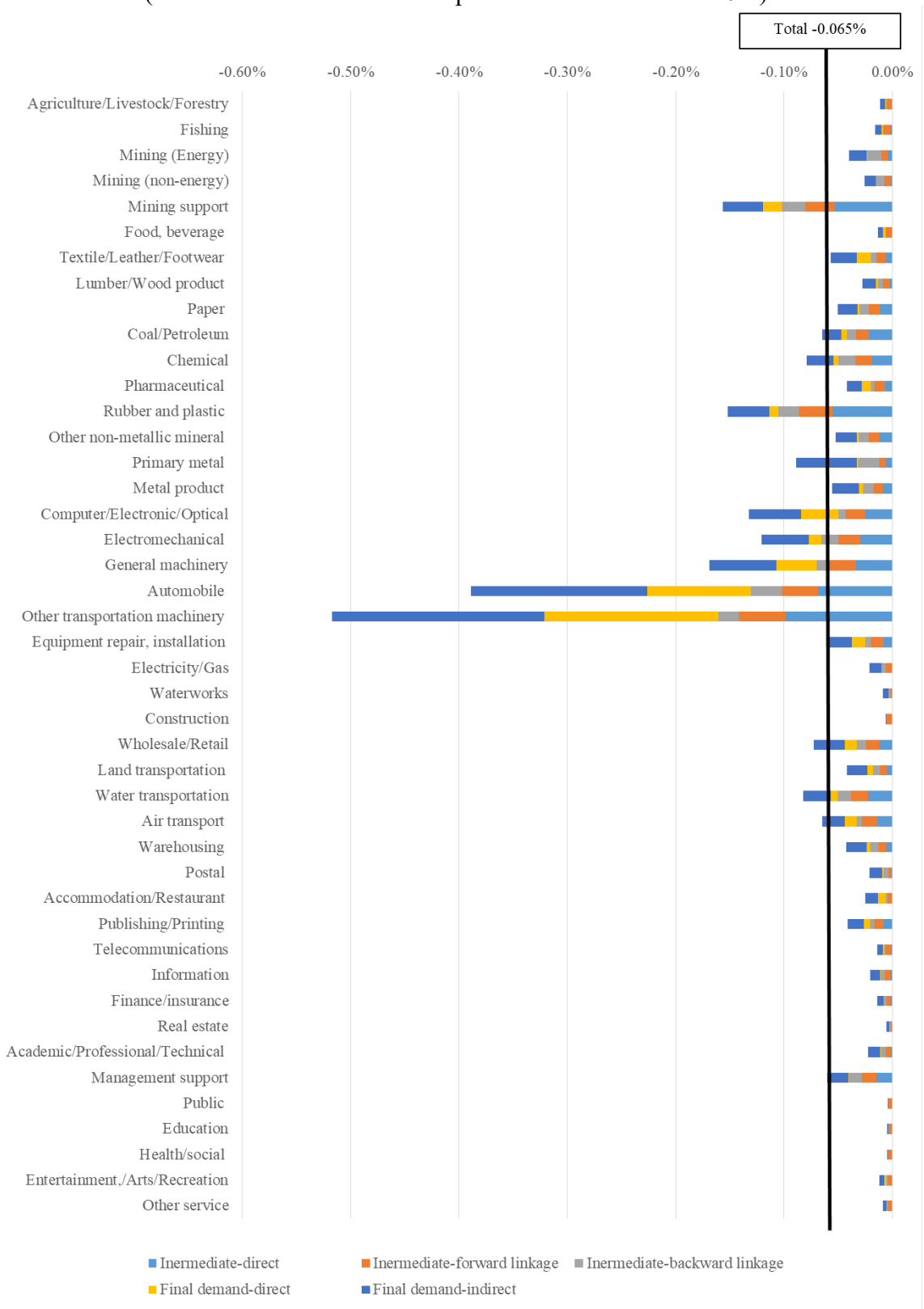
Source: Author's calculation based on OECD "ICIO 2018".

Figure 11 Scenario 2: Impact on production value of Russia
(OECD member countries' exports to Russia decrease 20%)



Source: Author's calculation based on OECD "ICIO 2018".

Figure 12 Scenario 2: Impact on production value of Japan
(OECD member countries' exports to Russia decrease 20%)



Source: Author's calculation based on OECD "ICIO 2018".