Journal of Asset Management and Public Economy (JAMPE)
Vol. 2, No. 1, page 1-16
http://journal2.uad.ac.id/index.php/jampe/index

Policy Scenario to Boost East Java Economic Recovery: Interregional Input-Output Analysis (IRIO)

Doddy Purwoharyono[1], Fathia Khairunnisa[2], Achmad Rifa'i[3,4*]

Email: [1]doddyono@gmail.com, [2]fathia.khairunnisa@gmail.com, [3*]achmadrifai186@gmail.com
[1,2,3] Ministry of National Development Planning/Bappenas, Indonesia; [4]Learning-Up Institute, Indonesia
* ***Corresponding Author***

Abstract
Economic recovery post-COVID-19 is the major development agenda of the government at the central and regional levels. The contribution of this study is to identify, analyze, and provide strategic policy recommendations on the progress of economic recovery in East Java using Input-Output (IO) model. As one of the provinces with the 2nd highest economic contribution to the nation, East Java needs to develop a comprehensive economic recovery strategy to lift its economy to a higher position than the pre-pandemic level. First, the recommended policy scenario is based on the results of the calculation of the recovery index for the Province and Regency/City of East Java. Hereafter, using the 2016 Interregional Input-Output (IRIO) Table, this study recommends a stimulus policy scenario for investment and government spending in all sectors as a game changer that will accelerate East Java's economic recovery. Meanwhile, by sector, information and communication will be the main sectors that encourage the acceleration of economic recovery in East Java Province. Nevertheless, the stimulus in each policy scenario can be considered by the East Java Provincial Government according to the focus and objectives of economic recovery.

Article history
Received 2022-09-06
Revised 2022-11-01
Accepted 2023-01-27

Keywords
Economic Recovery
Government Expenditure
Information and Communication
Investment
IRIO

JEL Classification*:
H53, H54, C67

Introduction

In 2020, the COVID-19 pandemic become an unprecedented shock that causes a contraction of the global economy due to disruption on the supply and demand sides simultaneously (Brodeur et al., 2020). This economic contraction started from supply chain disruptions in industrialized countries such as China due to regional lockdowns which then pushed the scarcity of supply materials to other countries, including developing countries such as Indonesia (Maria del Rio-Chanona et al., 2020). In addition, the lockdown policy to prevent the spread of the virus also pressured the industry to reduce the number of workers while causing a decline in people's purchasing power. Consequently, other social indicators are also deteriorating such as increased unemployment and poverty (Baldwin & Mauro, 2020).

Furthermore, at the domestic level, Indonesia has become one of the countries experiencing economic contraction due to COVID-19. This is reflected in the economic growth which contracted to 2.07% in 2020 (BPS, 2021a). On the supply side, most of the economic sectors experienced a slowdown in growth, especially the labor-intensive sectors. Meanwhile, on the expenditure side, most of the components also showed the same thing, i.e., household consumption, investment, and exports-imports contracted. This has implications for a significant increase in unemployment and poverty rates, thus hampering the progress of the national development targets that have been set (Bappenas, 2021).

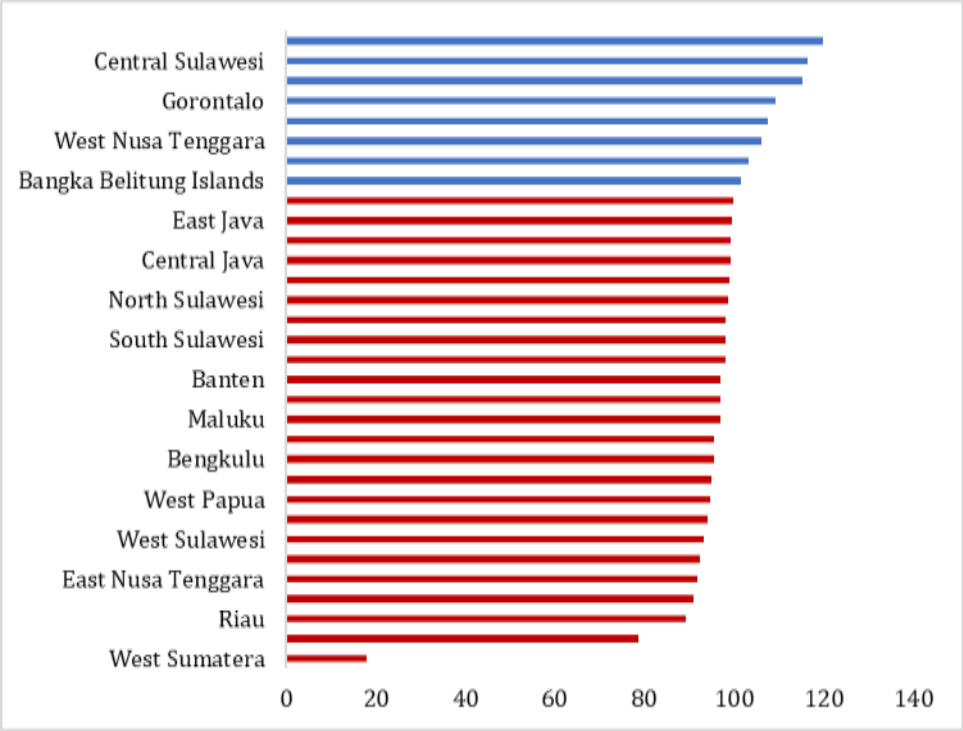
At the provincial level, almost all provinces in Indonesia experienced economic growth contractions with varying depths. East Java Province is one of the provinces that also experienced contractions but was in the moderate category. Nevertheless, the economic slowdown in East Java will have implications for the national economy because of its contribution which reaches almost 15% to the national level or the 2nd highest after DKI Jakarta. Therefore, the contraction of the East Java economy needs special attention. In addition, the economic slowdown experienced by East Java will also have an impact on economic activity in surrounding areas such as Bali and Central Java due to the linkage of economic sectors such as trade and tourism.

Meanwhile, in 2021, economic growth will slowly rebound, with the Indonesian economy growing by 3.69% driven by the recovery of people's purchasing power, improvement in investment, and high exports which support the economy. Meanwhile, at the regional level, almost all provinces have shown positive growth, except for West Papua and Bali, which are still experiencing contractions. Furthermore, East Java's economy again recorded positive growth of 3.57% (BPS East Java, 2021). Although it has succeeded in growing into the positive zone, this achievement has not been evenly distributed both sectoral and spatially to the district/city level.

Optimization of recovery momentum is very important so that a comprehensive evaluation mapping is needed so that policymakers can formulate policies comprehensively and help formulate policy directions more sharply in line with the priority needs of the districts/cities in question. This will also encourage a better understanding of the post-COVID-19 economic recovery. The policy of economic recovery is very crucial because learning from previous experiences, at the national level it took 10 years to recover and return to the trajectory of economic growth after the Asian Financial Crisis (AFC) in 1998.

To analyze the recovery progress, it can be done by measuring using the recovery index indicators such as the economy, employment and welfare against pre-pandemic conditions (Zandi et al., 2020) and (Murray & Zyryanova, 2021). Furthermore, the results of the analysis as seen in Figure 1 show that in general, the East Java regional recovery index has not returned to pre-pandemic levels (red means not recovered yet to pre-pandemic conditions and blue

indicates recovered to pre-pandemic conditions). Based on its components as seen in Table 5 (see Appendix), economic indicators have shown a recovery to pre-pandemic levels, while employment and welfare indicators have not recovered to pre-pandemic levels mainly due to the high unemployment rate, informal labor, and gini ratio and low average labor wages compared to pre-pandemic levels.

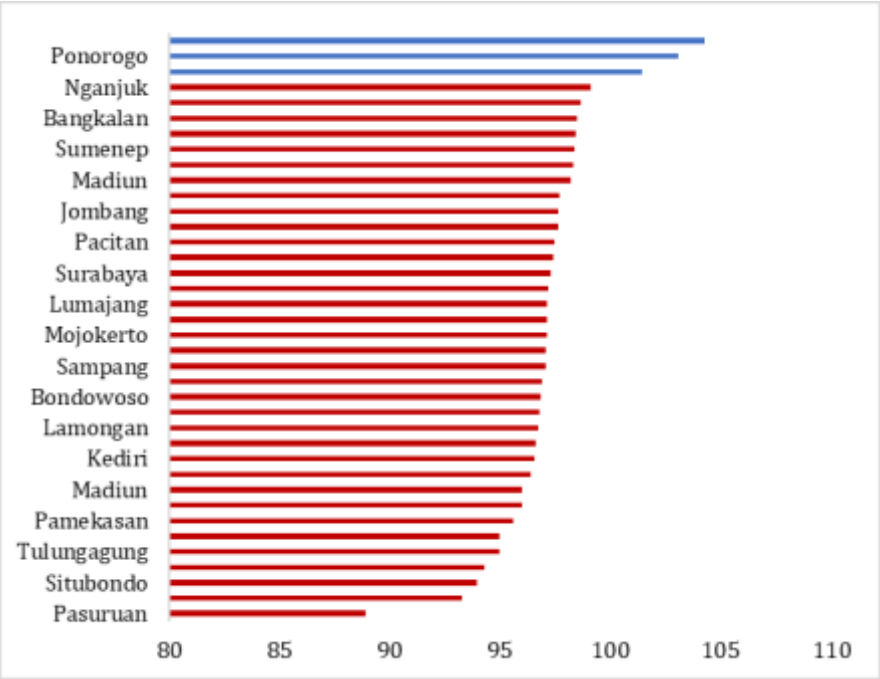


Source: The calculation refers to the recovery index by Zandi et al. (2020) and Murray and Zyryanova (2021)
Figure 1. Average Provincial Recovery Index 2021

Meanwhile, based on Table 6 (see Appendix) shows that the regional recovery index at the district/city level has not recovered compared to pre-pandemic levels, especially in employment and welfare indicators. Figure 2 shows that some regencies/cities that are still far from recovering include Mojokerto City, Sidoarjo Regency, Pacitan Regency, Batu City, Malang City, and Tuban Regency, especially influenced by the still very high unemployment rate compared to pre-pandemic levels.

East Java needs strategic policy recommendations to restore its economy as a whole. Furthermore, the role of the government is very vital in formulating policies that can accelerate economic recovery. Therefore, this study aims to identify existing economic conditions and provide strategic policy recommendations for economic recovery efforts in East Java. It also provides a new approach to assess existing economic condition by building an index followed by policy recommendations to improve economic performance. The preparation of policy scenarios

is carried out in a bottom-up manner by inventorying the priority sectors of recovery at the district/city level as well as scenarios based on the existing conditions of economic indicators of East Java Province which then produces assumptions of policy scenarios as well as implications for output at the national level.



Source: The calculation refers to the recovery index by Zandi et al. (2020) and Murray and Zyryanova (2021)

Figure 2. Average Recovery Index of Regencies/Cities of East Java 2021

Literature Review

East Java is one of the provinces that has the second largest economic contribution to the Indonesian economy. The magnitude of this contribution reflects the East Java economy as one of the important pillars of the Indonesian economy. However, East Java is also still facing various structural issues such as poverty and equitable development (Rifa'i & Listiono, 2021). With the COVID-19 pandemic, the East Java economy is increasingly depressed and has hampered existing development progress. Therefore, it is necessary to conduct an assessment of East Java's economic recovery efforts and find the driving factors to accelerate economic recovery efforts by providing strong policy recommendations and in accordance with the characteristics of the existing recovery in East Java.

Several methods for formulating policy scenarios are carried out to get an approximate picture of output with and without intervention (Resosudarmo et al., 2011). The study of impact analysis methods is still one of the options that are highly considered to be used in drafting policy scenarios. Weisbrod & Duncan (2016) describes 3 main forms of economic impact

analysis that are most commonly used in conducting evaluations such as projects, programs, and proposed policies, namely benefit-cost analysis (BCA), economic impact analysis (EIA), and financial impact analysis (FIA).

As for the 3 methods, the EIA method is often used to measure the pattern and extent to which a project, program, or policy leads to changes in the economic development of a particular region, which is measured in terms of income and the effect of work on economic elements (industry, households and other economic actors). Furthermore, the formal modeling method for forecasting the impact of economic development commonly used is the Input-Output (IO) analysis model. Furthermore, IO analysis is used to describe impacts such as inter-industry.

Some previous studies, especially during the COVID-19 pandemic, have applied the IO model to calculate the impact of COVID-19 mitigation policies on the economy, such as (Fadinger and Schymik 2020; Yu et al. 2020; Osotimehin and Popov 2020). However, there are still not many who use IO analysis to compile a scenario or simulation of policy interventions, especially in the post-COVID-19 economic recovery period. Along with the development of IO analysis, it then encouraged the preparation of a bottom-up IO Table where the IO Table at the regional level became the basis for IO aggregation at the national level which was later called the Input-Output Interregional Table (IRIO).

Indonesia is one of the countries that has an IO Table up to the provincial level which is then called the IRIO Table. The advantages of the IRIO model will be seen from the policy simulations that are compiled bottom-up or from bottom-up so that the scenarios carried out are more precise and accurate. Some policy simulations use a regional approach such as (Bonet-Morón et al., 2020) who simulated the impact of COVID-19 on the economy in Colombia. For the rest, the regional IO model or IRIO is widely applied through the Computable General Equilibrium (CGE) analysis approach (Horridge et al., 2016; Amir, 2013; (Resosudarmo et al. ,2021). Furthermore, there are still not many previous studies that use IRIO to develop comprehensive policy scenarios. Thus, this research will add to the latest literature related to the preparation of scenarios or policy simulations using IRIO as a calculation base.

Method

The Input-Output (IO) model was developed by an economist named Wassily Leontief in the 1930s (Miller & Blair, 2009). Furthermore, IO is an analytical tool that captures economic activity in a particular economy. IO analysis uses the IO Table as a representation of the economic structure in a country. The IO table consists of 3 main parts namely the intermediate quadrant, the final request quadrant, and the value-added quadrant. This study uses the IRIO 2016 Table which was last published by (BPS, 2021b). The IRIO Table is an aggregation of io tables from 34 provinces in Indonesia. By implementing the IRIO model, this study can provide a

bottom-up policy at the provincial level and arrange scenarios based on the existing conditions of economic indicators of East Java Province and analyze their impact on the Economy of East Java and the national level.

Conceptually, there are 3 basic assumptions underlying the IO model framework and the economic model derived into the IO Table. First, homogeneity requires that each sector produce only one type of output with a single input structure and no automatic substitution between sectors. Secondly, the proportionality that requires the relationship of the production process between input and output is a linear function. This means that for each type of input absorbed by certain sectors, the increase or decrease will be proportional to the increase or decrease in the output of the resulting sector. Thirdly, additives are assumptions that explain that the total effect of production in each sector will be generated from each sector separately. Thus, any issues outside the IO Table system will be ignored.

With these assumptions, the IO model has several constraints. Because the input-output ratio is constant throughout the analysis period due to manufacturers not being able to adjust their input changes and change the production process. Next, the constant relationship assumes if a particular sector is doubled, then its output is likely to also double. This kind of assumption ignores technological changes or productivity. Therefore, the change in the quantity and price of inputs is proportional to the change in the quantity and price of output.

Policy Scenario Simulation

Based on the identification of economic recovery at the provincial and district/city levels in East Java, an economic recovery stimulus is needed to restore the economy of East Java so that it can return to pre-pandemic conditions. In this study, the provision of economic stimulus was carried out by considering several things that were used as policy scenarios that referred to the existing constituents of the East Java economy (see Table 1). This consideration is carried out by considering the components or sectors and districts/cities that are most affected or far below the pre-pandemic level.

The first scenario, based on the 2021 Provincial Recovery Index in Table 5 (see Appendix), can be identified that based on its components, government investment and consumption need to get policy intervention because it shows that it is still not recovering as in the pre-pandemic in 2021. It will take Rp15.7 trillion to restore the value of government investment and consumption to return to 2019 levels.

The second scenario is based on the 2021 East Java Regency/City Recovery Index as shown in Table 6 (see Appendix). Economic recovery needs to be focused on districts/cities that have a GRDP index far from the 2019 level, namely Bangkalan Regency (92.46), Bojonegoro Regency

(94.08), Tuban Regency (96.98), Kediri City (96.09) and Batu City (97.33). Meanwhile, to restore the economy of East Java at the regency/city level, Rp10.7 trillion is needed.

The third scenario assumes a policy by prioritizes recovery in the processing industry. Furthermore, the processing industry was recorded to contribute 30.7% to the GRDP of East Java. The stimulus scenario is given to districts/cities that have not recovered to the 2019 level, namely Bangkalan Regency, Blitar Regency, Pacitan Regency, Sampang Regency, Tuban Regency, Kediri City, Madiun City, Mojokerto City, Pasuruan City, and Probolinggo City. It will take Rp5.1 trillion to return the processing industry to 2019 levels in districts/cities.

As a comparison, this study also added three additional simulations as follows. The fourth scenario involves encouraging household consumption and expenditure by the East Java Provincial Government on the processing industry sector. The fifth scenario is to encourage the processing industry sector in the districts/cities whose economies are in the deepest slump. The sixth scenario is by providing stimulus to all sectors as much as the recovery needs of the processing industry sector in the districts/cities that have fallen the deepest. Detailed scenarios can be seen in Table 7 (see Appendix).

Table 1. Summary of Economic Recovery Stimulus Scenario of East Java Province

Scenario	(Rp Trillion)	Economic Recovery Stimulus Direction
1	15.7	Recovery of the investment component and government spending assuming stimulus is provided to all sectors.
2	10.7	Economic recovery of districts/cities assuming stimulus is provided to all sectors).
3	5.1	Recovery of the district/city processing industry sector.
4	15.7	Recovery in household consumption and government spending on the manufacturing sector.
5	10.7	The recovery of the district/city processing industry has been most affected.
6	5.1	The economic recovery of all sectors according to the needs of the processing industry sector of the districts/cities is most affected.

Result and Discussion

The table below describes the various impacts of the simulated economic recovery scenario in East Java. Each simulation produces a different impact. For more details, the simulation results can be seen in Table 2.

Table 2 shows that all policy simulation results show an increase in value added to the baseline. In general, simulation 1 can provide the highest added value reaching 0.69% of the baseline. The policy scenario through economic recovery stimulus on the investment and government expenditure components assuming that the stimulus provided to all sectors can

increase added value the highest among other simulations. The information and communication sector in simulation 1 experienced the highest increase reaching 1.19% from the baseline. Meanwhile, the simulation that had the least relative impact on the baseline occurred in simulation 3. The relative added value only increased by 0.20% against the baseline. Furthermore, the construction sector in simulations 3 and 4 experienced the smallest increase in relative added value among all sectors in all simulations. Thus, the policy scenario through economic recovery stimulus on the investment and government expenditure components assuming that the stimulus provided to all sectors is able to accelerate east Java's economic recovery relatively faster than other policy scenarios.

Table 2. Results of The Economic Recovery Stimulus Policy Simulation on East Java Total Value-Added (% of baseline)

Selected Key Sectors	SIM 1	SIM 2	SIM 3	SIM 4	SIM 5	SIM 6
Agriculture, Forestry, and Fisheries	0.84	0.57	0.18	0.56	0.38	0.27
Manufacturing	0.56	0.38	0.52	1.59	1.09	0.18
Construction	0.40	0.27	0.00	0.01	0.00	0.13
Wholesale and Retail Trade	1.00	0.68	0.11	0.33	0.23	0.33
Information and Communication	1.19	0.81	0.03	0.09	0.06	0.39
Total Value Added	**0.69**	**0.47**	**0.20**	**0.62**	**0.42**	**0.23**

Table 3. Results of The Economic Recovery Stimulus Policy Simulation on National Value-Added (% of baseline)

Selected Key Sectors	SIM 1	SIM 2	SIM 3	SIM 4	SIM 5	SIM 6
Agriculture, Forestry, and Fishing	0.15	0.10	0.04	0.13	0.09	0.05
Manufacturing	0.13	0.09	0.02	0.07	0.05	0.04
Construction	0.12	0.08	0.10	0.31	0.21	0.04
Wholesale and Retail Trade	0.06	0.04	0.00	0.00	0.00	0.02
Information and Communication	0.18	0.12	0.02	0.07	0.05	0.06
Total Value Added	**0.12**	**0.08**	**0.04**	**0.11**	**0.08**	**0.04**

Table 3 shows that the increase in added value in East Java Province using simulation 1, namely the policy scenario of encouraging economic recovery in the investment and government expenditure components assuming that stimulus is provided to all sectors is also followed by the highest increase in added value at the national level reaching 0.12% against the baseline compared to other simulations. Furthermore, the large trade and retail sectors in simulation 1 experienced the highest increase reaching 0.18% from the baseline. Meanwhile, the relatively smallest policy scenario to increase the baseline occurred in simulations 3 and 6. The simulation

scenario was only able to lift the added value of 0.04% each against the baseline. In line with the simulation results at the East Java Province level, the construction sector in simulations 3, 4, and 5 at the national level is also a sector that has experienced a relatively small increase compared to other sectors.

Table 4. Results of The Economic Recovery Stimulus Policy Simulation on Other Provinces Added-Value (% of baseline)

Province	**SIM 1**	**SIM 2**	**SIM 3**	**SIM 4**	**SIM 5**	**SIM 6**
Aceh	0.00	0.00	0.00	0.00	0.00	0.00
North Sumatra	0.01	0.01	0.01	0.03	0.02	0.00
West Sumatra	0.01	0.01	0.01	0.02	0.01	0.00
Riau	0.02	0.01	0.00	0.01	0.01	0.01
Jambi	0.02	0.01	0.01	0.03	0.02	0.01
South Sumatra	0.03	0.02	0.01	0.04	0.03	0.01
Bengkulu	0.00	0.00	0.00	0.01	0.00	0.00
Lampung	0.01	0.01	0.00	0.01	0.01	0.00
Bangka Belitung Islands	0.01	0.01	0.01	0.03	0.02	0.00
Riau Islands	0.00	0.00	0.00	0.00	0.00	0.00
Jakarta	0.01	0.01	0.00	0.01	0.01	0.00
West Java	0.01	0.01	0.00	0.01	0.01	0.00
Central Java	0.02	0.01	0.01	0.03	0.02	0.01
Yogyakarta	0.01	0.01	0.00	0.01	0.01	0.00
Banten	0.01	0.01	0.00	0.01	0.01	0.00
Bali	0.01	0.00	0.00	0.01	0.01	0.00
West Nusa Tenggara	0.02	0.01	0.01	0.03	0.02	0.00
East Nusa Tenggara	0.01	0.01	0.01	0.02	0.01	0.00
West Kalimantan	0.01	0.01	0.01	0.02	0.01	0.00
Central Kalimantan	0.08	0.06	0.05	0.15	0.11	0.03
South Kalimantan	0.01	0.00	0.00	0.01	0.00	0.00
East Kalimantan	0.04	0.02	0.01	0.04	0.03	0.01
North Kalimantan	0.03	0.02	0.01	0.04	0.03	0.01
North Sulawesi	0.02	0.01	0.01	0.03	0.02	0.01
Central Sulawesi	0.03	0.02	0.03	0.08	0.06	0.01
South Sulawesi	0.01	0.00	0.00	0.01	0.01	0.00
Southeast Sulawesi	0.02	0.01	0.01	0.03	0.02	0.01
Gorontalo	0.01	0.00	0.00	0.01	0.01	0.00

Province	SIM 1	SIM 2	SIM 3	SIM 4	SIM 5	SIM 6
West Sulawesi	0.00	0.00	0.00	0.00	0.00	0.00
Maluku	0.02	0.02	0.02	0.05	0.04	0.01
North Maluku	0.02	0.01	0.01	0.05	0.03	0.01
West Papua	0.01	0.01	0.01	0.03	0.02	0.00
Papua	0.04	0.03	0.04	0.12	0.09	0.01

Furthermore, Table 4 captures the impact of value-added changes on the baseline due to a simulation of the economic recovery policy stimulus in East Java Province. However, areas around East Java such as Central Java, D.I. Yogyakarta, and Bali did not experience a significant increase in added value to the baseline. Uniquely, central Kalimantan experienced an increase in added value quite significantly against the baseline in all simulations 1 to 6 which were sequentially 0.08%, 0.06%, 0.05%, 0.15%, 0.11%, and 0.03% respectively.

Conclusion

This study aims to identify the existing provincial economic recovery up to the level of East Java regencies/cities. Based on the results of the identification, an analysis of the sector or economic components of East Java was then carried out using the calculation of the provincial and district/city recovery indexes following Murray & Zyryanova (2021) and Zandi et al. (2020). The contribution of this study is to compile recommendations for stimulus policy scenarios to accelerate the comprehensive economic recovery of East Java. Based on the results of identification, analysis, and preparation of policy scenarios through economic recovery stimulus, it can be conveyed as follows. If the focus of the East Java Government is to accelerate recovery at the provincial level, the stimulus that can be done by increasing government investment and consumption in all sectors as simulated in simulation 1 but spillover to other provinces is relatively limited. Furthermore, if the focus of the East Java Government is to accelerate the processing industry sector as the main sector, then simulation 4 can be considered considering the spillover to other provinces which is relatively higher. Next, if the East Java Government focuses on restoring the economy of the regency/city with a more efficient stimulus, then simulation 2 can be considered. Despite this, spillover to other provinces is relatively limited. With the same stimulus, if the focus is on the processing industry as done in simulation 5, the spillover to other provinces is relatively higher. Finally, if the East Java Government focuses on restoring the processing industry in districts/cities that have not recovered so that the stimulus can be given in a more focused manner, then simulation 3 can be considered. Although the impact is relatively limited, spillover to other provinces is relatively better than simulation 6.

References

Amir, H. (2013). Economic Impact Analysis of the 2012 Indonesia Mineral-Export Tax Policy: A CGE Approach. *International Journal of Economic Policy Studies*, *8*(1), 1–22. https://doi.org/10.1007/bf03405742

Baldwin, R., & Mauro, B. W. di. (2020). *Economics in the Time of COVID-19*. www.cepr.org

Bappenas. (2021). *Pemutakhiran Rencana Kerja Pemerintah Tahun 2022*.

Bonet-Morón, J., Ricciulli-Marín, D., Pérez-Valbuena, G. J., Galvis-Aponte, L. A., Haddad, E. A., Araújo, I. F., & Perobelli, F. S. (2020). Regional economic impact of COVID-19 in Colombia: An input–output approach. *Regional Science Policy and Practice*, *July*, 1–28. https://doi.org/10.1111/rsp3.12320

BPS. (2021a). Pertumbuhan Ekonomi Indonesia Triwulan IV-2020. In *Badan Pusat Statistik* (Issue 13). https://www.bps.go.id/pressrelease/2021/02/05/1811/ekonomi-indonesia-2020-turun-sebesar-2-07-persen--c-to-c-.html

BPS. (2021b). *Tabel Interregional Input-Output Tahun 2016*.

BPS Jawa Timur. (2021). Pertumbuhan Ekonomi Jawa Timur Tahun 2021. In *Berita Resmi Statistik* (Vol. 13, Issue 02).

Brodeur, A., Gray, D., Islam, A., & Bhuiyan, S. J. (2020). A Literature Review of the Economics of COVID-19. *IZA Discussion Paper*, *13411*.

Fadinger, H., & Schymik, J. (2020). The Effects of Working from Home on Covid-19 Infections and Production A Macroeconomic Analysis for Germany. *C.E.P.R. Covid Economics*, *April 2020*.

Horridge, M., Yusuf, A. A., Ginting, E., & Aji, P. (2016). Improving Indonesia's domestic connectivity: an inter-regional CGE analysis. *ADB Papers on Indonesia*, *17*, 1–31.

Maria del Rio-Chanona, R., Mealy, P., Pichler, A., Lafond, F., & Doyne Farmer, J. (2020). Supply and demand shocks in the COVID-19 pandemic: An industry and occupation perspective. *Oxford Review of Economic Policy*, *36*, S94–S137. https://doi.org/10.1093/oxrep/graa033

Miller, R. E., & Blair, P. D. (2009). *Input-Output Analysis: Foundations and Extensions*.

Murray, Ne., & Zyryanova, N. (2021). *Tracking the Post-COVID-19 Economy: The COVID-19 Economic Recovery Index*.

Osotimehin, S., & Popov, L. (2020). Sectoral Impact of COVID-19 : Cascading Risks. *Opportunity and Inclusive Growth Institute Working Paper*, *31*.

Resosudarmo, B. P., Abdurohman, Yusuf, A. A., & Hartono, D. (2021). Spatial impacts of fiscal stimulus policies during the 2009 global financial crisis in Indonesia. *Asia-Pacific Journal of Regional Science*, *5*(1), 305–326. https://doi.org/10.1007/s41685-020-00176-2

Resosudarmo, B. P., Yusuf, A. A., Barat, J., Hartono, D., Barat, J., & Nurdianto, D. A. (2011). Regional Economic Modelling for Indonesia: Implementation of IRSA-INDONESIA5. *Journal of Indonesian Economy and Business*, *26*(3), 287–309. https://doi.org/10.22146/jieb.6259

Rifa'i, A., & Listiono, L. (2021). STRUCTURAL TRANSFORMATION AND POVERTY ERADICATION IN EAST JAVA (A PANEL DATA APPROACH OF 38 COUNTIES). *Journal of Developing Economies*, *6*(1), 114. https://doi.org/10.20473/jde.v6i1.23080

Weisbrod, G., & Duncan, C. (2016). Integrating multiple economic analysis methods for more effective decision making: Three-dimensional framework. *Transportation Research Record*, *2597*(2597), 99–107. https://doi.org/10.3141/2597-13

Yu, K. D. S., Aviso, K. B., Santos, J. R., & Tan, R. R. (2020). The Economic Impact of Lockdowns: A Persistent Inoperability Input-Output Approach. *Economies*, *8*(4), 109. https://doi.org/10.3390/economies8040109

Zandi, M., Deantonio, D., & Colyar, M. (2020). *Business Back-to-Normal Index*.

Appendix

Table 5. Provincial Recovery Index 2021

Province	Economics													Labor			Welfare						Average Index
	GRDP	HH Cons	NPIH	GDFC	Gov Cons	Export	Import	Net Export	Agriculture	Mining	Manufacture	Utility	Services	Unemployment	Wages	% of Informal Labor	Povert Rate	Gini Ratio	Average Years of Schooling	Expected Years of Schooling	Purchasing Power Parity	Expected Life	
Aceh	102.41	100.51	92.70	104.14	99.40	126.38	19.31	116.60	103.12	107.19	97.99	109.94	100.29	93.46	98.83	89.24	98.23	98.77	102.07	100.42	99.68	100.13	98.22
North Sumatera	101.51	98.81	93.49	102.25	101.71	119.36	97.08	3.07	105.89	99.57	100.58	98.85	100.23	84.03	95.06	88.87	95.40	101.91	101.38	100.91	98.59	100.41	94.95
West Sumatera	101.62	99.44	97.32	99.05	91.50	148.44	73.64	-1690.77	103.37	96.95	103.12	99.19	101.45	80.22	99.27	93.75	93.94	101.31	101.68	100.57	98.76	100.40	17.92
Riau	102.19	101.02	93.66	102.00	93.51	156.20	96.62	-191.27	108.77	90.31	106.06	99.53	98.45	124.02	93.32	92.60	97.99	101.23	101.77	101.07	95.39	100.27	89.30
Jambi	103.20	102.94	101.18	110.41	95.01	79.51	44.56	6604.40	105.30	99.95	101.39	108.95	103.13	75.96	96.98	88.97	93.35	99.69	101.78	100.85	99.96	100.23	391.71
South Sumatera	103.47	99.96	95.95	98.07	89.67	116.08	96.02	91.55	104.71	101.05	103.04	100.17	106.14	86.77	96.54	92.55	96.41	96.77	101.47	101.21	97.49	100.47	98.89
Bengkulu	103.22	102.90	91.02	102.30	103.90	86.25	10.56	97.75	102.84	105.12	99.87	102.48	103.71	87.22	101.94	92.65	98.79	104.29	101.60	100.59	100.75	100.30	95.46
Lampung	101.07	100.02	99.32	98.80	97.04	133.63	73.52	290.46	100.28	91.20	99.06	104.62	103.26	83.40	96.30	93.47	98.13	102.17	102.02	100.79	99.25	100.31	107.64
Bangka Belitung Islands	102.63	102.24	100.93	96.53	98.29	133.72	106.47	140.29	109.34	97.15	99.51	102.00	103.14	70.11	90.11	82.70	94.04	105.47	101.25	101.93	98.92	100.33	101.69
Riau Islands	99.49	101.31	96.61	98.09	95.69	111.52	128.00	-17.84	93.08	95.12	109.91	98.10	88.01	67.02	96.67	81.89	88.92	99.13	101.90	101.17	97.62	100.46	92.36
DKI Jakarta	101.09	101.32	95.99	94.03	125.29	75.41	95.18	105.83	104.63	89.77	99.54	94.04	102.51	77.15	90.89	82.05	72.83	95.35	100.99	100.77	99.96	100.30	95.68
West Java	101.13	98.40	97.76	98.08	101.46	109.48	103.65	14.62	103.64	96.67	99.68	100.43	102.60	79.40	92.84	91.84	81.02	97.09	102.87	101.04	98.05	100.52	94.19
Central Java	100.59	100.38	97.48	99.40	96.71	118.93	108.12	99.51	103.23	103.57	98.43	103.41	100.69	72.53	94.60	93.75	91.08	96.77	102.92	100.71	99.39	100.32	99.21
D.I. Yogyakarta	102.70	98.97	93.80	93.69	99.34	105.98	91.34	-12.28	104.89	88.33	95.98	93.74	105.29	67.16	98.48	88.52	88.55	95.24	102.77	100.39	98.03	100.16	90.96
East Java	101.16	101.84	102.29	96.95	97.41	111.95	113.80	119.77	102.78	92.15	101.23	99.41	102.16	65.17	95.29	94.28	89.93	98.93	103.82	101.52	99.73	100.28	99.63
Banten	100.90	100.34	90.13	103.33	91.39	112.42	98.20	88.18	104.13	92.19	100.02	107.03	99.88	87.11	98.32	84.59	75.47	101.37	102.17	101.09	98.09	100.26	97.12
Bali	88.43	96.50	98.94	84.44	98.54	6.95	3.79	11.73	99.27	95.79	93.64	96.75	84.53	28.33	80.14	84.13	81.13	97.88	102.49	100.98	97.70	100.35	78.75
West Nusa Tenggara	101.67	98.81	98.84	98.07	101.68	241.84	53.46	131.39	100.72	127.46	99.64	93.68	96.66	103.64	89.52	95.68	98.57	99.74	101.51	103.12	97.53	100.62	106.08
East Nusat Tenggara	101.66	99.92	102.30	96.09	87.16	39.73	52.78	87.63	105.97	88.32	89.76	96.78	101.20	77.21	99.03	91.18	98.03	104.05	101.85	100.38	97.23	100.45	91.76
West Kalimantan	102.87	101.35	98.27	103.29	99.30	129.05	50.93	68.87	105.49	123.30	102.58	103.92	99.17	72.57	95.64	90.00	102.86	105.43	101.92	100.56	99.11	100.28	98.03
Central Kalimantan	101.94	102.11	103.77	99.05	110.20	107.39	84.13	109.71	103.15	92.25	104.02	98.17	105.12	86.85	95.92	87.67	96.11	105.26	101.53	101.35	99.52	100.14	99.79
South Kalimantan	101.60	100.53	98.67	99.33	100.90	102.77	40.73	118.11	100.21	99.72	102.37	102.13	102.90	81.18	91.89	95.18	92.49	100.00	101.71	102.32	99.10	100.50	97.02
East Kalimantan	99.54	100.71	99.31	106.88	100.03	92.60	107.34	115.03	98.83	97.55	99.36	103.02	103.96	84.76	94.48	90.03	90.96	98.80	101.44	100.88	98.03	100.53	99.28
North Kalimantan	102.84	102.37	99.63	97.59	116.17	119.52	153.36	91.77	107.88	99.45	98.56	99.77	105.40	92.84	97.71	90.35	92.28	102.74	101.90	100.78	97.13	100.15	103.19
North Sulawesi	103.13	102.07	102.35	101.39	94.98	108.96	70.42	96.14	103.89	103.88	113.50	102.47	101.05	85.82	93.81	85.48	97.63	101.37	102.01	101.65	97.90	100.25	98.64
Central Sulawesi	117.13	98.65	95.82	137.19	101.66	174.62	189.68	180.04	103.39	123.96	147.94	106.96	103.02	79.15	104.91	90.64	101.46	104.43	101.60	100.68	97.65	100.88	116.43
South Sulawesi	103.90	101.41	94.59	106.85	100.97	98.17	55.68	113.28	105.64	99.94	98.31	105.87	104.66	77.98	94.64	91.53	97.81	102.09	102.42	101.20	100.59	100.33	98.08
Southeast Sulawesi	103.43	101.75	97.29	103.83	100.13	249.52	165.64	306.55	103.09	95.79	113.24	108.70	104.42	85.01	98.21	97.97	94.94	102.56	102.47	100.96	99.42	100.42	119.79
Gorontalo	102.39	102.49	99.95	101.81	95.63	341.50	30.55	104.25	100.12	101.64	106.54	101.16	104.17	124.63	91.91	90.18	99.86	100.49	102.73	100.38	100.81	100.38	109.25
West Sulawesi	100.09	102.38	97.68	98.29	94.08	89.38	3.58	72.55	101.68	103.73	102.17	96.95	98.45	91.35	99.58	96.41	96.32	103.93	102.98	101.90	99.11	100.66	93.33
Maluku	102.10	99.88	101.30	100.77	92.34	102.12	61.15	92.76	102.47	96.98	98.15	104.36	102.22	91.29	90.89	90.01	98.72	101.91	102.24	100.22	98.68	100.41	96.86
North Maluku	122.62	102.78	94.21	128.39	97.11	541.98	196.19	411.22	103.30	168.61	288.34	101.65	101.15	99.08	106.24	77.26	97.06	103.33	101.00	100.37	97.98	100.40	151.83
West Papua	98.73	101.69	89.44	94.89	91.66	94.07	76.75	60.81	98.55	100.52	99.52	90.57	100.74	100.02	96.76	86.58	96.54	102.63	103.36	103.22	97.59	100.36	94.77
Papua	117.87	95.93	97.04	116.75	103.55	309.68	105.07	145.86	100.88	164.20	94.79	103.06	97.36	100.23	98.00	90.50	100.64	98.24	101.65	100.54	94.81	100.43	115.32

Source: authors' calculation

Note: red means not recovered yet to pre-pandemic conditions and gray indicates that recovered to pre-pandemic conditions

Table 6. East Java Regency/City Recovery Index 2021

Regency/City	Economics											Labor		Welfare					Average Index
	GRDP	HH Cons	NPIH	GDFC	Gov Cons	Net Export	Agriculture	Mining	Manufacture	Utility	Services	Unemployment	Wages	Povert Rate	Average Years of Schooling	Expected Years of Schooling	Purchasing Power Parity	Expected Life	
Bangkalan	92.46	98.43	100.17	96.58	95.69	185.28	99.34	74.22	92.71	95.16	101.75	63.00	88.44	86.17	105.30	101.21	99.48	100.16	98.64
Banyuwangi	100.36	101.99	102.13	95.71	95.32	79.56	98.69	94.42	107.62	98.70	101.16	71.82	101.43	92.70	104.07	102.50	99.62	100.26	97.11
Blitar	100.67	101.35	101.31	96.08	95.16	78.49	100.07	96.69	99.91	95.89	102.78	85.34	89.29	92.12	102.88	101.45	99.04	100.30	96.60
Bojonegoro	94.08	102.48	102.43	99.61	97.14	87.17	99.43	88.41	102.17	101.39	103.92	72.55	92.63	92.87	104.09	102.59	99.57	100.50	96.84
Bondowoso	102.08	104.14	102.30	94.51	95.55	90.46	103.76	95.44	104.15	94.45	101.72	65.20	104.71	89.71	104.03	100.15	100.23	100.51	97.39
Gresik	99.97	102.19	103.34	97.40	96.74	100.44	96.20	88.44	103.04	95.68	101.23	62.43	87.85	89.34	102.91	100.36	99.89	100.08	95.97
Jember	100.90	102.92	102.39	96.39	94.28	106.31	98.82	94.46	100.76	95.42	104.09	65.23	101.40	88.13	105.02	101.59	98.79	100.42	97.63
Jombang	101.20	101.74	103.42	97.36	96.19	90.41	99.16	93.67	105.64	97.72	100.85	59.86	95.90	91.47	100.23	104.38	98.79	100.30	96.57
Kediri	100.58	101.87	102.71	96.50	96.19	93.25	101.27	95.01	102.82	94.54	100.71	71.03	90.74	88.87	100.87	104.35	99.83	100.15	96.74
Lamongan	100.69	100.14	102.18	94.69	95.92	80.12	98.47	101.35	104.97	96.75	102.17	76.82	95.74	94.18	101.90	102.23	99.46	100.30	97.12
Lumajang	100.27	103.08	109.01	97.84	96.50	76.03	100.13	94.86	102.54	96.99	100.34	77.12	111.23	93.95	107.23	100.68	99.23	100.39	98.19
Madiun	101.60	102.48	102.32	96.50	96.71	90.14	102.78	93.62	105.98	94.87	101.87	72.72	93.01	88.11	100.26	100.23	100.07	100.39	96.87
Magetan	101.36	101.63	102.26	96.96	95.30	78.09	102.32	96.91	103.16	97.52	101.26	75.38	101.53	89.20	105.03	100.29	100.46	100.22	97.16
Malang	100.35	101.58	103.27	97.86	95.77	98.51	98.42	91.76	101.88	98.93	100.69	69.00	98.68	89.16	102.20	100.53	98.96	100.22	97.10
Mojokerto	102.96	101.47	104.79	95.89	97.12	125.59	101.62	100.44	105.52	92.07	101.88	63.04	96.92	90.27	101.77	102.70	99.88	100.22	99.12
Nganjuk	101.84	103.13	106.47	101.41	101.18	98.83	103.26	95.21	104.52	96.93	101.55	65.39	95.37	94.41	101.97	100.16	99.77	100.22	98.42
Ngawi	100.82	101.25	101.76	96.41	97.50	84.08	100.50	96.22	100.99	95.36	102.16	83.33	96.89	91.30	104.01	101.10	99.92	100.35	97.44
Pacitan	100.60	100.55	105.06	97.17	97.46	94.10	102.33	95.16	99.25	95.50	102.28	43.84	93.82	90.11	104.53	100.24	98.38	100.42	95.60
Pamekasan	100.78	100.15	99.96	94.73	97.60	86.49	102.23	93.03	101.11	95.49	101.67	74.20	115.47	89.29	104.69	100.15	99.66	100.33	97.61
Pasuruan	102.22	102.20	103.94	96.22	97.55	184.25	98.58	93.13	104.93	95.67	99.88	84.93	97.58	88.30	104.22	102.19	99.19	100.11	103.06
Ponorogo	102.26	101.77	105.32	95.71	95.62	79.21	104.40	95.32	108.15	94.54	102.22	77.69	97.58	93.36	104.72	100.15	99.68	100.28	97.66
Probolinggo	101.15	103.24	103.18	94.95	97.23	86.28	101.06	92.47	105.23	96.69	99.92	76.58	89.45	92.79	106.07	100.16	99.97	100.54	97.05
Sampang	99.93	100.01	98.22	97.11	97.30	89.15	102.86	92.30	99.08	98.32	102.25	72.92	97.10	85.24	106.81	102.48	100.34	100.16	96.75
Sidoarjo	100.36	101.01	102.47	98.43	96.75	105.38	102.66	64.85	105.93	89.02	95.73	41.42	95.73	86.98	104.59	100.20	99.79	100.11	93.97
Situbondo	100.85	102.27	104.96	94.75	92.51	105.50	99.57	94.59	107.04	92.52	100.84	75.03	104.73	87.91	108.17	100.15	99.00	100.39	98.38
Sumenep	101.45	99.74	103.82	97.95	99.05	128.13	102.87	97.47	103.97	96.92	103.27	88.64	99.21	94.33	108.42	101.06	99.10	100.48	101.44
Trenggalek	101.41	99.70	102.52	95.40	95.08	37.71	99.37	95.12	111.78	93.18	100.97	95.60	111.97	90.05	103.85	101.80	98.76	100.37	96.37
Tuban	96.98	98.66	105.37	95.43	96.85	88.24	99.96	95.33	91.19	95.47	102.50	53.06	96.36	88.69	105.43	100.16	98.87	100.42	94.94
Tulungagung	100.33	100.48	102.88	96.42	95.77	61.27	100.67	94.40	101.86	95.15	100.94	64.42	101.76	89.08	103.35	101.29	99.23	100.28	94.98
Blitar	101.90	101.21	102.54	95.96	95.84	52.34	101.97	90.90	101.25	95.22	102.57	69.51	93.62	89.14	102.48	100.14	99.75	100.35	94.26
Kediri	96.09	104.20	101.55	95.14	93.45	94.75	102.98	91.40	95.04	96.66	100.58	61.64	99.60	91.09	102.32	102.00	99.35	100.11	96.00
Madiun	101.18	101.96	104.32	98.01	98.01	256.90	103.47	90.47	92.77	95.13	103.65	48.11	94.71	84.88	102.16	100.14	100.34	100.11	104.24
Malang	101.86	98.54	113.41	96.89	96.88	24.67	101.03	93.52	102.56	100.53	101.90	58.76	96.19	87.12	102.36	102.21	99.98	100.29	93.26
Mojokerto	99.82	100.06	102.46	96.26	96.07	90.12	105.55	0.00	99.32	94.79	100.56	36.49	96.65	79.21	102.25	101.30	99.27	100.25	88.91
Pasuruan	99.16	101.17	108.67	96.51	96.29	128.77	107.51	90.30	94.88	93.92	100.60	73.31	83.38	92.48	102.41	100.22	99.71	100.28	98.31
Probolinggo	100.27	102.56	102.73	95.71	96.25	218.30	94.46	0.00	98.59	95.13	101.54	58.49	92.91	91.40	102.99	100.22	99.71	100.23	97.31
Surabaya	99.23	98.07	104.90	94.36	95.28	131.34	96.15	93.73	102.71	98.94	98.36	60.13	88.23	85.61	100.29	100.14	100.04	100.07	97.09
Batu	97.33	100.49	102.14	95.40	94.68	131.93	102.95	94.05	105.42	96.36	95.93	34.80	95.52	91.43	102.76	100.28	100.13	100.15	96.76

Source: authors' calculation

Note: red means not recovered yet to pre-pandemic conditions and gray indicates recovered to pre-pandemic conditions

Table 7. Stimulus Scenario for Economic Recovery in East Java Province (Rp Million)

SECTOR	CODE	**SIM 1**	**SIM 2**	**SIM 3**	**SIM 4**	**SIM 5**	**SIM 6**
Food Crops	I-01	461.274	315.097	-	-	-	150.726
Horticultural Crops	I-02	157.343	107.481	-	-	-	51.414
Plantation Crops	I-03	256.527	175.234	-	-	-	83.823
Livestock	I-04	314.530	214.856	-	-	-	102.776
Agriculture Services and Hunting	I-05	17.181	11.737	-	-	-	5.614
Forestry and Logging	I-06	59.407	40.581	-	-	-	19.412
Fishing	I-07	316.135	215.952	-	-	-	103.301
Crude Petroleum, Natural Gas and Geothermal	I-08	579.910	396.137	-	-	-	189.492
Coal and Lignite Mining	I-09	-	-	-	-	-	-
Iron Ore Mining	I-10	4.187	2.860	-	-	-	1.368
Other Mining and Quarrying	I-11	215.411	147,147	-	-	-	70.388
Manufacture of Coal and Refined Petroleum Products	I-12	12.219	8.347	13.208	40.421	27.612	3.993
Manufacture of Food Products and Beverages	I-13	1.672.965	1.142.804	1.808.419	5.534.377	3.780.538	546.660
Manufacture of Tobacco Products	I-14	1.118.026	763.725	1.208.549	3.698.572	2.526.498	365.327
Manufacture of Textiles and Wearing Apparel	I-15	75.920	51.861	82.067	251.153	171.563	24.808
Manufacture of Leather and Related Products, and Footwear	I-16	54.777	37.418	59.212	181.208	123.783	17.899
Manufacture of Wood and Products of Wood and Cork; and Articles of Straw and Plaiting Materials	I-17	203.841	139.244	220.345	674.331	460.636	66.607
Manufacture of Paper and Paper Products; Printing and Reproduction of Recorded Media	I-18	240.006	163.949	259.439	793.971	542.363	78.425
Manufacture of Chemicals, Pharmaceuticals, and Botanical Products	I-19	329.229	224.897	355.886	1.089.131	743.987	107.579
Manufacture of Rubber; Rubber Products and Plastics Products	I-20	188.252	128.595	203,494	622.762	425.409	61.513
Manufacture of Other Non-Metallic Mineral Products	I-21	202.880	138.587	219.306	671.152	458.464	66.293

SECTOR	CODE	**SIM 1**	**SIM 2**	**SIM 3**	**SIM 4**	**SIM 5**	**SIM 6**
Manufacture of Basic Metal	I-22	233.796	159.706	252.725	773.425	528.327	76.395
Manufacture of Fabricated Metal Products; Electronic, Computer, and Optical Products; and Electrical Equipment	I-23	191.910	131.094	207.449	634.864	433.676	62.709
Manufacture of Machinery and Equipment	I-24	7.407	5.060	8.007	24.503	16.738	2.420
Manufacture of Transport Equipment	I-25	46,318	31.640	50.068	153.224	104.668	15.135
Manufacture of Furnitures	I-26	139.163	95.062	150.430	460.367	314.477	45.473
Other Manufacturing; Repair and Installation of Machinery and Equipment	I-27	38.938	26.599	42.091	128.813	87.992	12.724
Electricity	I-28	17.267	11.795	-	-	-	5.642
Manufacture of Gas and Production of Ice	I-29	26.224	17.913	-	-	-	8.569
Water Supply; Sewerage, Waste Management, and Remediation Activities	I-30	15.130	10.335	-	-	-	4.944
Construction	I-31	1.465.479	1.001.070	-	-	-	478.861
Wholesale and Retail Trade and Repair of Motor Vehicles and Motorcycles	I-32	717.624	490.210	-	-	-	234.492
Wholesale and Retail Trade Except of Motor Vehicles and Motorcycles	I-33	2.213.922	1.512.332	-	-	-	723.423
Railways Transport	I-34	3.272	2.235	-	-	-	1.069
Land Transport	I-35	172.762	118.014	-	-	-	56.452
Sea Transport	I-36	39.906	27.260	-	-	-	13.040
River, Lake, and Ferry Transport	I-37	4.314	2.947	-	-	-	1.410
Air Transport	I-38	73.912	50.489	-	-	-	24.152
Warehousing and Support Services for Transportation; Postal and Courier	I-39	168.025	114.778	-	-	-	54.904
Accommodation	I-40	98.508	67.291	-	-	-	32.188
Food and Beverage Service Activities	I-41	775.493	529.740	-	-	-	253.401
Information and Communication	I-42	925.599	632.278	-	-	-	302.450

SECTOR	CODE	**SIM 1**	**SIM 2**	**SIM 3**	**SIM 4**	**SIM 5**	**SIM 6**
Financial Intermediary Services	I-43	252.354	172.383	-	-	-	82.459
Insurance and Pension Fund	I-44	58.910	40.242	-	-	-	19.250
Other Financial Services	I-45	82.368	56.265	-	-	-	26.915
Financial Supporting Service	I-46	888	606	-	-	-	290
Real Estate Activities	I-47	271.199	185.256	-	-	-	88.617
Business Activities	I-48	125.180	85.510	-	-	-	40.904
Public Administration and Defense; Compulsory Social Security	I-49	333.587	227.873	-	-	-	109.003
Education	I-50	419.735	286.721	-	-	-	137.153
Human Health and Social Work Activities	I-51	107.537	73.459	-	-	-	35.139
Other Services Activities	I-52	225.532	154.061	-	-	-	73.695

Source: authors' calculation