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Website : lppm.unusa.ac.id

Email : lppm@unusa.ac.id

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# Paper 2

*by* Ubaidillah Zuhdi 2

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# The Applications of Multiplier Analyses in Analyzing the Roles of Industrial Sectors:

The case of Indonesia

Ubaidillah Zuhdi\*

Department of Management<sup>1</sup>, Department of Economic Sciences<sup>2</sup>

University of Nahdlatul Ulama Surabaya<sup>1</sup>, Gdansk University of Technology<sup>2</sup>  
Surabaya, Indonesia<sup>1,2</sup>

\*ubaidillah.zuhdi@unusa.ac.id

Teguh Herlambang

Department of Information Systems<sup>1</sup>, Center of Excellence for Mechatronics and Industrial Automation<sup>2</sup>

University of Nahdlatul Ulama Surabaya<sup>1</sup>, Institut Teknologi Sepuluh Nopember<sup>2</sup>  
Surabaya, Indonesia<sup>1,2</sup>

teguh@unusa.ac.id

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**Abstract**—The purpose of this study is to analyze the roles of industrial sectors in the Indonesian national economy by using simple output multiplier, and simple household income multiplier, the analysis tools in Input-Output (IO) analysis. The analysis period of the study is 2010. The results show that, on the period of analysis, electricity and gas sector had the highest simple output multiplier value. Therefore, one can argue that an additional final demand for the sector would generate the most attractive effect to the Indonesian economy by using the multiplier on the period of analysis. On the contrary, the lowest value of the multiplier was owned by the water supply, sewerage, waste management, and remediation activities sector in 2010. On the other hand, from the point of view of simple household income multiplier, the highest value was owned by the public administration and defence; compulsory social security sector on the analysis period. This result indicates that an additional rupiah of final demand for the sector would generate the highest household income on the analysis period. Conversely, the real estate activities sector had the lowest simple household income multiplier value in 2010.

**Keywords**—industrial sectors; national economy; IO analysis; Indonesia

## I. INTRODUCTION

There is no doubt that industry is an important aspect in the economy. Service sector, for example, generates a direct and significant contribution to GDP and job creation, and provides critical inputs for the rest of the economy, thus having a significant effect on the overall investment condition, which is a substantial factor of growth and development [1]. Not only is the service sector now a large component of the economy, but it has also been a huge donor to overall growth [2]. Besides, the sector is the biggest and fastest growing industrial sector in the economy of the world, accounting the biggest in terms of sharing in total output and employment in the most developed countries [3]. The endowment of service sector to GDP of India is 59.29%, higher than primary (13.68%) and secondary sectors (27.03%) [4].

Manufacturing, on the other hand, has a position as an engine of growth until now [5]. It has traditionally played a vital role in the development of economy of developing countries [6]. In Romania, after 2000, the intensity of the process of deindustrialization shrank and this circumstance permitted manufacturing to remain the backbone of the Romanian industry and the overall economy [7].

Above explanations show the examples of previous study that investigate the roles of industrial sectors. The research focuses on overall industrial sectors especially in one particular country, however, is still needed. The research will generate a comprehensive insight regarding the roles of industrial sectors in the economy of specific country. The current study is done in order to fulfil the gap on the industrial topic.

The purpose of the study is to analyse the roles of industrial sectors in the Indonesian national economy. The study employs Input-Output (IO) analysis as an analysis device. More specifically, the study uses simple output multiplier, and simple household income multiplier as analysis tools. The analysis period of the study is 2010. The rest of this paper is explained as follows. Section 2 scientifically shows the methodology of the study. Section 3 describes the results of calculations. The discussions for the results are also conducted on the section. The next section, section 4, explains the conclusions of the study, and suggestions for the future researches.

## II. METHODOLOGY

This section scientifically describes the methodology of the current study. The first step of the methodology is to explain the data used. The study uses the Indonesian IO table for 2010 as data. The source of the table is [8]. The table consists of seventeen economic sectors, and uses basic prices. The second step is to explain the Indonesian industrial sectors used in this study. Table 1 shows those sectors.

The third step is to conduct the calculations using simple output multiplier, and simple household income multiplier. Miller and Blair explains the equations of both multipliers as follows [9].

$$m(o)_j = \sum_{i=1}^n l_{ij} \tag{1}$$

$$m(h)_j = \sum_{i=1}^n a_{n+1,i} l_{ij} \tag{2}$$

The former model describes the simple output multiplier while the latter one shows the simple household income multiplier. More specifically,  $m(o)_j$ ,  $m(h)_j$ ,  $a_{n+1,i}$ ,  $n$ , and  $l_{ij}$  are simple output multiplier for sector  $j$ , simple household income multiplier for sector  $j$ , labour-input coefficients, the number of analysed industries, and a matrix of sector-to-sector multipliers, respectively. The next step is to analyse the roles of industrial sectors in the Indonesian economy on the period of analysis. Conclusions of the study, and suggestions for further researches are explained on the final step.

### III. RESULTS AND DISCUSSION

Table 2 shows the top five Indonesian industrial sectors viewed from the values of simple output multiplier. The analysis period of the table is 2010. Miller and Blair describes that an output multiplier for sector  $j$  is the total value of production in all industrial sectors of the economy that is required in order to fulfil a currency's worth of final demand for the output of sector  $j$  [9]. They also explain that, for the simple output multiplier, the total value of production is coming from the model of households exogenous.

TABLE I. INDONESIAN INDUSTRIAL SECTORS USED IN THIS STUDY

Sector Number	Sector Name
1	Agriculture, forestry, and fishing
2	Mining and quarrying
3	Manufacturing
4	Electricity and gas
5	Water supply, sewerage, waste management, and remediation activities
6	Construction
7	Wholesale and retail trade; repair of motor vehicles and motorcycles
8	Transportation and storage
9	Accommodation and food service activities
10	Information and communication
11	Financial and insurance activities
12	Real estate activities
13	Business activities
14	Public administration and defence; compulsory social security
15	Education
16	Human health and social work activities
17	Other services activities

Source: Zuhdi [10].

TABLE II. TOP FIVE INDONESIAN INDUSTRIAL SECTORS VIEWED FROM THE VALUES OF SIMPLE OUTPUT MULTIPLIER, 2010

No.	Sector Number	Sector Name	Simple Output Multiplier
1	4	Electricity and gas	2.889
2	6	Construction	2.300
3	8	Transportation and storage	2.184
4	3	Manufacturing	2.150
5	16	Human health and social work activities	2.071

Based on the information in the table, electricity and gas sector has the highest simple output multiplier value. The value is 2.889. The value indicates that in order to satisfy a rupiah's worth of final demand for electricity and gas sector's output, all Indonesian industries need to produce the products which the total value is Rp 2.889. One can argue that, by using the calculation results of simple output multiplier, an additional final demand for the sector would make the most attractive effect to the economy of Indonesia on the analysis period.

Fig. 1 shows the values of simple output multiplier of all Indonesian industrial sectors used in this study. The figure uses 2010 as an analysis period. On the analysis period, the lowest value was owned by the water supply, sewerage, waste management, and remediation activities sector. Meanwhile, the simple output multiplier value of information and communication sector, sector number 10, on the analysis period was 1.695. This value is below the average value.

On the other hand, table 3 describes the top five Indonesian industrial sectors viewed from the values of simple household income multiplier. As with the previous table, this table analyses Indonesian industrial sectors in 2010. The multiplier is applied to describe the economic impacts of new final demand as measured by new household's income by using household's exogenous model [9].

Based on the information in the table, the highest value is owned by the sector number 14, public administration and defence; compulsory social security. The value is 0.665. The value shows that, on the period of analysis, an additional rupiah of final demand for the sector would generate Rp0.665 of new household income, when all direct and indirect impacts were changed into rupiah estimates of income.

Fig. 2 describes the values of simple household income multiplier of Indonesian industrial sectors in 2010. The interesting result can be seen on sector 16, human health and social work activities. From the points of view of both multiplier methods, the sector included in the top five sectors on the analysis period. Therefore, one can argue that the sector was the most attractive Indonesian industrial sector on the analysis period.

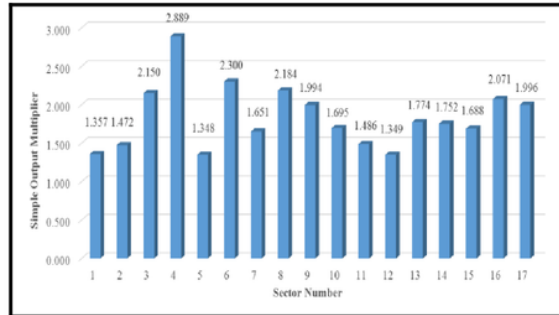


Fig. 1. The values of simple output multiplier of Indonesian industrial sectors, 2010.

TABLE III. TOP FIVE INDONESIAN INDUSTRIAL SECTORS VIEWED FROM THE VALUES OF SIMPLE HOUSEHOLD INCOME MULTIPLIER, 2010

No.	Sector Number	Sector Name	Simple Output Multiplier
1	14	Public administration and defence; compulsory social security	0.665
2	15	Education	0.642
3	17	Other services activities	0.480
4	16	Human health and social work activities	0.377
5	8	Transportation and storage	0.322

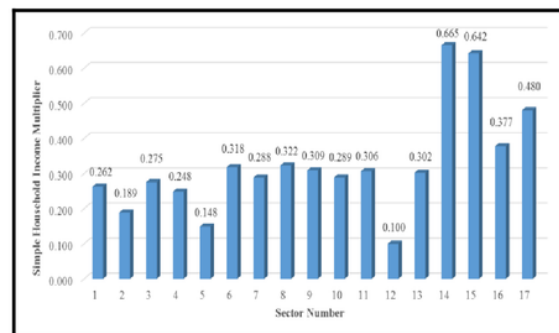


Fig. 2. The values of simple household income multiplier of Indonesian industrial sectors, 2010.

By using 159 Indonesian industrial sectors, previous study describes that the most attractive sectors from the point of view of simple output multiplier for 1990, 1995, and 2005 were plastic products, aircraft and its repair, and machinery and apparatus, respectively [11]. On the other hand, by using 159 Indonesian industrial sectors, and the point of view of simple household income multiplier, another previous study explains that the most fascinating sectors for 1990, 1995, and 2005 were general government, general government, and general government, respectively [12]. The current study provides the additional information regarding the discussed topic.

#### IV. CONCLUSION AND FURTHER RESEARCHES

This study analyses the roles of Indonesian industrial sectors in the national economy by using IO analysis. More specifically, the current study employs simple output multiplier, and simple household income multiplier as analysis tools. The analysis period of the study is 2010.

The results show that, on the period of analysis, electricity and gas sector had the highest simple output multiplier value. Therefore, one can argue that an additional final demand for the sector would generate the most attractive effect to the Indonesian economy by using the multiplier on the period of analysis. On the contrary, the lowest value of the multiplier was owned by the water supply, sewerage, waste management, and remediation activities sector in 2010.

On the other hand, from the point of view of simple household income multiplier, the highest value was owned by the public administration and defence; compulsory social security sector on the analysis period. This result indicates that an additional rupiah of final demand for the sector would generate the highest new household income on the analysis period. Conversely, the real estate activities sector had the lowest simple household income multiplier value in 2010.

The current study continues the previous studies in terms of analysing the roles of Indonesian industrial sectors in the national economy by using simple output multiplier, and simple household income multiplier. However, the study uses the aggregated 2010 Indonesian IO table as data. One can argue that more detailed information, in terms of more detailed Indonesian industrial sectors, will generate more detailed outcomes. Therefore, as a further research, the study proposes the same discussion by using the disaggregated Indonesian IO table for 2010.

The other suggested further research from the study is to conduct the international comparison on the discussed topic. One example is the comparison between Indonesia and Malaysia. This comparison might show the similarities and differences of discussed countries in terms of their industrial sectors.

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