Analyzing the roles of the construction sector by using multiplier analyses: the cases of Indonesia and Japan

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Ubaidillah Zuhdi
Faculty of Economics and Business, University of Nahdlatul Ulama Surabaya, Surabaya 60237, Indonesia

Faculty of Management and Economics, Gdansk University of Technology, Gdansk 80-233, Poland

Email: ubaidillah.zuhdi@unusa.ac.id

Abstract. This study aims to analyze the roles of the constructionsector in the Indonesian and Japanese national economies by employing simple output and simple household income multipliers, the analysis devices in the analysis of Input-Output (IO). The analysis periods of the study are 2010 and 2011. The former year is an analysis period for the case of Indonesia while the Japanese case utilizes the latter one.The study uses2010 Indonesian and 2011 Japanese IO tables as data.The results show that, by utilizing simple output multiplier, the discussed sector included in the top five sectors for both cases on the analysis periods. Based on the results, one can say that the sector had the important positions in the national economies of both countries on the periods of analysis. On the other hand, by using simple household income multiplier,the analyzed sector included in the top five sectors on the analysis period for the Japanese case.

1. Introduction

The national developmentdiscussion cannot be separated from the roles of industries in supporting the national economy.One of the important industries in the national economy is the construction industry.According to [1], the construction refers to infrastructure and building works in many industries in both individual and commercial residential areas, such as energy, defense, and transportation. They also describe that the infrastructures that include in the construction sector are transportation systems, bridges, dams and irrigation systems, ports, airports, oil pipelines, and trendy buildings like residential and shopping centers.In other words,the scope of the construction sector in the national economy is broad.

There are many previous studies in the area of the construction sector.For example, [2]reviewsthe sources of photogrammetric errorand their effects on surveying and modelingfor constructionquality control, quantity takeoff, and site safety monitoring applications.On the other hand, [3] examinesthe construction sector's capacityin the socio-economic development of Nigeria utilizing economic data onthe aggregate GDP and the construction industry. For the case of Nigeria, the relationship between real GDP and construction sectoris significant.Besides, [4] proposes a research on supplier-contractor partnering and its effect on the construction performance. The object of the research is the Malaysian construction industry.

Meanwhile, [5]critically examines the factors that affect the productivity of labour, and classifies these factors into groups based on previous studies in various nations. Besides, [6] evaluates the cost impact of health and safety management within the construction sector in Abuja. Theresearch shows that implementing the programs of safety and health on the construction site tend to escalate the overall budget of the project.

On the other hand, [7] critically reviews theliterature regarding cost overrun in construction projects indifferent nations to determine the primary potential causes.The other previous study is [8]. The purpose of the research isto analyze environmental aspects of construction sector development and related policies in Latvia,including the last trends of green building certification development.

The topic of the international comparison regarding the roles of theconstruction sector in the national economies includes in the minority group based on the mentioned previous studies.The discussion of the topic is still needed in order to obtainthe characteristics of the sector so the recommendations for improving the national economies ofanalyzed countries through the industry can be madeappropriately. This study is conducted in order to fill the gap.

The goal of thecurrent study is to analyze the roles of the construction sector in the Indonesian and Japanesenational economies. Indonesia is a representative of developing country while Japan is a developed one. The study uses the analysis of Input-Output (IO)as an analysis tool. More specifically,the study employs simple output and simple household income multipliers in the process of analysis.Both multipliers are suitable devicesin describing the roles.

The rest of this paper is describedas follows. Section 2 scientifically explains the methodology of thestudy. Section threedescribes the results of calculations. Theresults analysis isalso conductedon this section. The next section, section four, showsthe conclusions of the study, and suggestions for the further researches.

2. Methodology

This part scientifically explainsthe methodology of the currentstudy.The first step of the methodology is toexplainthe data used. Thestudyutilizes2010 Indonesian and 2011 Japanese IOtablesas data. The study uses these years as analysis periods.More specifically, theanalysis period for the Indonesian case is 2010 while for thecase of Japan is 2011. The sources of thetablesfor Indonesian and Japanese cases are [9] and [10], respectively.The former table consists of seventeen industries while the latter one has thirteen industrial sectors. The Indonesian table uses basic prices while the Japanese oneemploys producer's prices.

The second step is to show Indonesian and Japanese industries used in this study. Tables 1 and 2 describes those industries. For the Indonesian case, the analyzed sector is represented by the sector number 6, construction. On the other hand, the discussedindustry for the case of Japan occupies the sector number 4, construction.

The third step is to conduct the calculations by employing simple output and simple household income multipliers. These multipliers arethe components of IO analysis. The equations of both multipliers are explained by [11] as follows:

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

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

The firstequationdescribesthe simple output multiplier while the second one explains the multiplier of simple household income. 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, the coefficients of labor-input, the number of analyzed industrial sectors, and a matrix of sector-to-sector multipliers, respectively.

According to [11], an output multiplier for sector *j* is the total value of production in all industries of the economy that is required in order to fulfill a currency's worth of final demand for the output of sector *j*. The reference also explains that, in the case ofthe multiplier of simple output, the total value of production is coming from themodel of household exogenous.

On the other hand, [11] mentions that the multiplier of simple household income is used to explainthe economic impacts of a new final demand as calculated by the new household income by employing the model of household exogenous. The next action is to analyze the roles of the construction industry in the economiesof Indonesia and Japan on the analysis periods.Conclusions of the study, and suggestions for further researches are described on the final step.

Table 1. Indonesian industrial sectors used in this study (Source: [12]).

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

Table 2. Japanese industrial sectors used in this study (Source: [13]).

Sector Number	Sector Name
1	Agriculture, forestry, and fishery
2	Mining
3	Manufacturing
4	Construction
5	Electricity, gas, and water supply
6	Commerce
7	Finance and insurance

Sector Number	Sector Name
8	Real estate
9	Transport and postal services
10	Information and communications
11	Public administration
12	Services
13	Activities not elsewhere classified

3. Results and discussion

Tables3and 4 showthe top five industriesof Indonesia and Japan seen from the simple output multipliervalues on theperiods of analysis,respectively.For both cases, the analyzed sector includes in those industries. For theIndonesian case, the value of the simple output multiplierof the sector is 2.300.The value explains that in order to satisfy a rupiah's worth of final demand for the sector's output, all Indonesian industrial sectors need to make the products which the total value is Rp2.300.On the other hand, the value is 2.268 for the case of Japan. The value indicates that alleconomic sectors of Japan need to make the products which the total value is ¥2.268 in order to satisfy a yen's worth of final demand for the output of construction sector.

Meanwhile, for the case of Indonesia, the highest simple output multiplier value on the period of analysiswas owned by electricity and gas, industry number 4. The value was 2.889. For theJapanese case, the highest simple output multiplier value on the period of analysiswas 2.769. The value was owned by the manufacturingindustry. One can argue that, based on the results, an additional final demand for the discussedindustry would give attractive impacts to theIndonesian and Japanese economies on the analysis periods. More attention should be given to the case of Indonesia because in the Indonesian economy in 2010, the analyzed sector occupied the second positionviewed from the value of simple output multiplier.

Figures 1 and 2 describe the values of simple output multiplier of all Indonesian and Japanese economic sectorsin 2010 and 2011, respectively. For the case of Indonesia, the lowest value on theperiod of analysis was owned bywater supply, sewerage, waste management, and remediation activitiesindustry.Meanwhile,for the Japanese case, the real estate industry had the lowest value in 2011.

Both discussed countries have an Information and Communication Technology (ICT) sector. The sector is represented by sector number 10, information and communication(s). For the case of Indonesia, the simple output multiplier value of the sector was 1.695 in 2010. On the other hand, the value was 1.935 for the Japanese case in 2011. Interestingly, these values are below the average values.

Tables5 and 6explaintop five Indonesian and Japanese industries seen from thesimple household income multiplier values on theperiods of analysis, respectively. Unlike the previous multiplier, construction sector does not include in these industries for the case of Indonesia. For the Indonesian case, the value was 0.318 in 2010. The sector occupied the sixth position from the point of view of thesimple household income multiplieron the period of analysis. For theJapanese case, the discussed sector includes in the top five industries. More specifically, the sector occupied the first position which the value was 0.646 in 2011 viewed from themultiplier.Based on these facts, one can say thatan additional final demand for the analyzed industrywould generate the attractive impact to theJapanese economies on the analysis period while the same argument might not be suitable for the Indonesian case.

Table 3. Top five Indonesian industrial sectors viewed from the values of simple output multiplier, 2010 (Source: [14]).

Number	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

Table 4. Top five Japanese industrial sectors viewed from the values of simple output multiplier, 2011 (Source: [15]).

Number	Sector Number	Sector Name	Simple Output Multiplier
1	3	Manufacturing	2.769
2	5	Electricity, gas, and water supply	2.625
3	4	Construction	2.268
4	1	Agriculture, forestry, and fishery	2.210
5	2	Mining	2.181

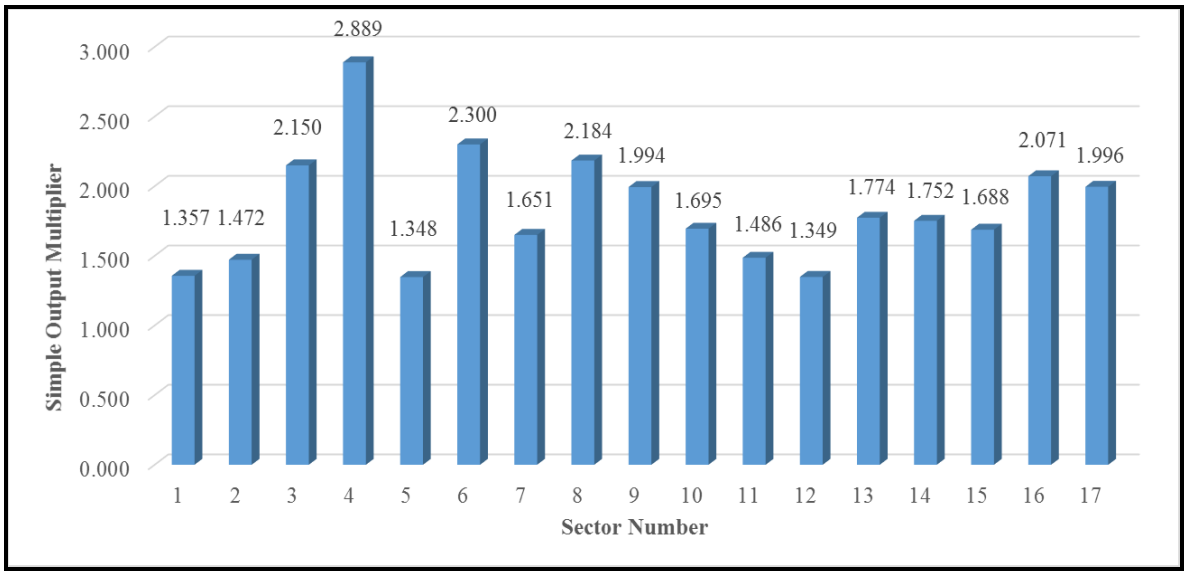

Figure 1. The values of simple output multiplier of Indonesian industrial sectors, 2010 (Source: [14]).

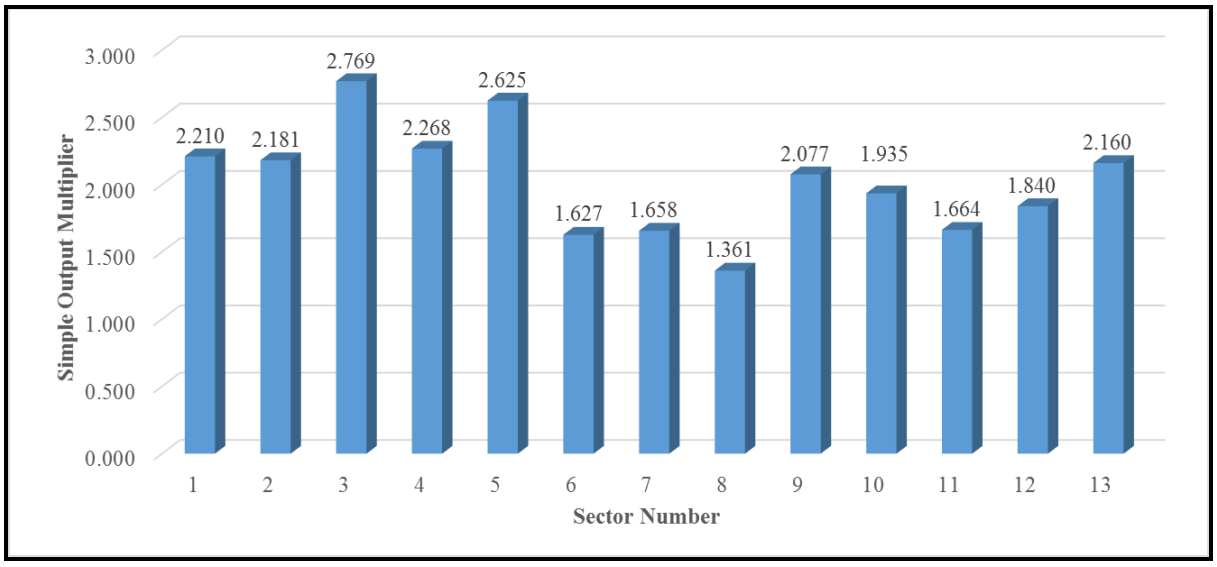

Figure 2. The values of simple output multiplier of Japanese industrial sectors, 2011 (Source: [15]).

Figures3 and 4describethesimple householdincome multiplier values of all Indonesian and Japanese industries in 2010 and 2011, respectively.For theIndonesian case, real estate activitiesindustry had the lowest value on the period of analysis.As with the previous multiplier,in 2011, the lowest value of simple household income multiplier for the case of Japan was owned by the real estate industry. The values of ICT industry for the cases of Indonesia and Japan on the analysis periods were 0.289 and 0.480, respectively. The value on the Indonesian case is below the average value.

Table 5. Top five Indonesian industrial sectors viewed from the values of simple household income multiplier, 2010(Source: [14]with the slight modifications).

Number	Sector Number	Sector Name	Simple Household Income 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

Table 6. Top five Japanese industrial sectors viewed from the values of simple household income multiplier, 2011(Source: [15]).

Number	Sector Number	Sector Name	Simple Household Income Multiplier
1	4	Construction	0.646
2	12	Services	0.618
3	9	Transport and postal services	0.560
4	6	Commerce	0.554
5	11	Public administration	0.543

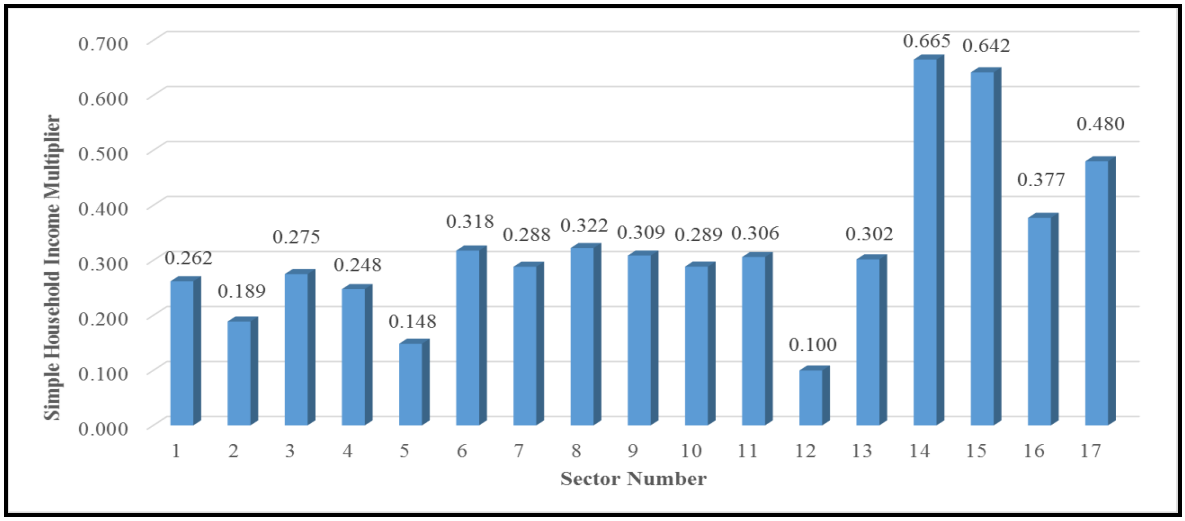

Figure 3. Thevalues of simple household income multiplier of Indonesian industrial sectors, 2010 (Source: [14]).

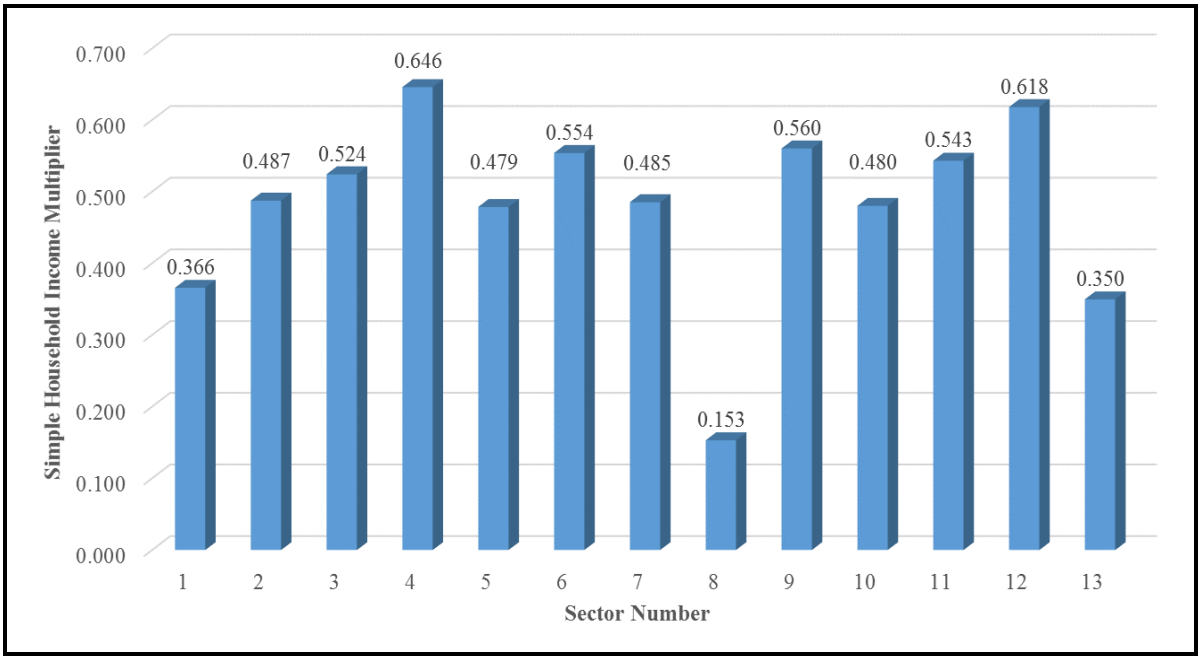

Figure 4. The values of simple household income multiplier of Japanese industrial sectors, 2011 (Source: [15]).

The calculation resultsof simple output multiplier explain that, for both cases,constructionsector included in the top five sectors on the analysis periods.This fact indicates that, from the point of view of the multiplier, the sector had important positions in the national economies of Indonesia and Japan on the periods of analysis.The activists of constructionin Indonesia and Japan can use the results as references in makingstrategic steps for improving the industry. For the case of Japan, by using simple household income multiplier, the discussed sectorincluded in the top five sectors on the analysis period too. Therefore, in this case, the reason for improving the sector is stronger.

ObviouslyIndonesian and Japanese governments can also use the calculation results of both multipliers asinputs in deciding the prioritized industries. These decisions will influence the directions of government movement for both countries. For example, the decisions will influence the number of export and import activities of industrial sectors.

4. Conclusions

This study analyzes the roles of the constructionsector in the national economies of Indonesia and Japan. The analysis periods for the cases of Indonesia and Japan are 2010 and 2011, respectively.Thestudy usesthe analysis of IOas an analysis tool. More specifically, the study employs simple output and simple household income multipliers in the processes of analyses. For the Indonesian case, the study focuses on the seventeen industrial sectors. On the other hand, thirteen industries are analyzed in the case of Japan.For the case of Indonesia, the discussed sector is represented by the sector number 6, construction. On the other hand, for the Japanese case, the analyzed sector is the sector number 4, construction.

The results show that, by using simple output multiplier,the analyzed sector included in the top five sectors for both cases on the analysis periods.More specifically, in 2010, by using the simple output multiplier, the sector occupied the second position in the Indonesian economy while the third position was owned by the sector in the Japanese casein 2011.Based on the results, one can say that the sector had important positionsin the national economies of both countries on the periods of analysis. The construction activists and governments of Indonesia and Japan can use the results as references in making the strategic actions for improving the sector. On the other hand, by using simple household income multiplier,the discussed sector included in the top five sectors on the analysis period for the Japanese case.Therefore,in this case, one can argue that the reason for improving the sector is stronger.

The understanding regarding the roles of the constructionsector in the Indonesian and Japanese national economies on theanalysis periods is obtained from the current study.However,for both countries, the study utilizes the aggregated economic sectors. In other words, the opportunity to conduct the deeper analysis regarding the discussed sector in both countries is still available especially in exploring the derivative constructionsectors. Therefore, as a further research, the study suggeststhe same methodologyby utilizingthe disaggregated IO tables of Indonesiaand Japan.

The other proposed further research from the study is to performan international comparison between Indonesia and Japan by focusing on the other industries.Thecomparison can be focused on, for example, healthcare, ICT, and service industries. Besides, the other international comparison focuses on the construction sector can be conducted as a further research.Oneexample is the comparison between Indonesia and the Philippines.

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