



Digital-related economy sectors and regional economy disruption

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ARTICLE INFO

Article History:

Received 20-12-2018

Revised 04-03-2019

Accepted 05-03-2019

Kata Kunci:

ekonomi digital, i-o analysis, ekonomi regional

Keywords:

digital economy, i-o analysis, regional economy

ABSTRAK

Penelitian tentang ekonomi regional dan faktor-faktornya telah banyak diteliti oleh para peneliti dengan baik, namun demikian relatif sedikit yang meneliti tentang sektor ekonomi digital yang mempengaruhi ekonomi regional. Oleh karena itu, tujuan dari riset ini adalah untuk menyelidiki dampak ekonomi regional yang disebabkan oleh sektor ekonomi digital; menganalisis efek berganda dari sektor-sektor ini terhadap output, pendapatan, dan lapangan kerja; dan untuk menghitung dampak ekonomi dari investasi tambahan di sektor ekonomi digital. Studi ini berfokus pada wilayah Provinsi Jawa Timur, Indonesia. Metoda penelitian yang digunakan pada riset ini adalah analisis input-output (menggunakan matrik agregasi 13 x 13), analisis ini mampu menggambarkan transaksi barang dan jasa dalam waktu tertentu. Penelitian ini menggunakan data dari Badan Pusat Statistik, yaitu berupa data Tabel Input-Output Provinsi Jawa Timur tahun 2015 yang mencakup 110 sektor ekonomi, dan kemudian dikelompokkan menjadi sektor terkait digital dan sektor yang tidak terkait dengan digital. Hasilnya menunjukkan bahwa sektor ekonomi digital memiliki keterkaitan ke belakang dan ke depan dengan sektor lain di kawasan yang diteliti. Temuan lebih lanjut menunjukkan bahwa sektor manufaktur digital memiliki efek pengganda tertinggi pada output, pendapatan, dan lapangan kerja. Sementara investasi pada sektor ekonomi digital, berdasarkan akan membuat disrupsi yang lebih baik pada perekonomian Jawa Timur. Pemerintah daerah harus menekankan untuk menarik lebih banyak investasi di sektor ekonomi digital.

ABSTRACT

While the study of the regional economy and its factors has been well-researched, relatively less is known on the issues for the digital economy sectors affecting the regional economy. Therefore, the aims of this paper are: to investigate the regional economic impact caused by digital economy sectors; to analyze the multiplier effect of these sectors on the output, income, and employment; and to calculate the economic impact of additional investment in the digital economy sectors. The study focuses on the region of East

Java Province, Indonesia. The method used in this study is the input-output analysis (13 x 13 aggregation), which generates transaction of goods and services at a certain time. This study uses data from the Central Bureau of Statistics, Input-Output Table of East Java Province year 2015, which includes 110 economic sectors, which are then grouped into digital related and non-digital related sectors. The result indicates that digital economy sectors have both backward and forward linkages to other sectors in the region. Further finding shows that digital related manufacturing sector has the highest multiplier effect on the output, income, and employment. While investment injection on the digital economy sectors, based on the analysis, will make better disruption on East Java economy. The government of the region should put an emphasis to attract more investment in the digital economy sectors.

INTRODUCTION

The digital economy has become the most interesting topic of so many discussions forum in the last 2-3 years. However, the empirical research about digital economy is quite slight so that this paper offers such a discussion in the form of empirical result from the authors' conducted research. In Indonesian context, the country has more than 260 million populations with the average penetration of internet users reached fifty percent of them. It is a good achievement while the average penetration of internet users around the globe is only about 53 percent as it has been reported by (Kemp, 2018) in the 'Digital in 2018'.

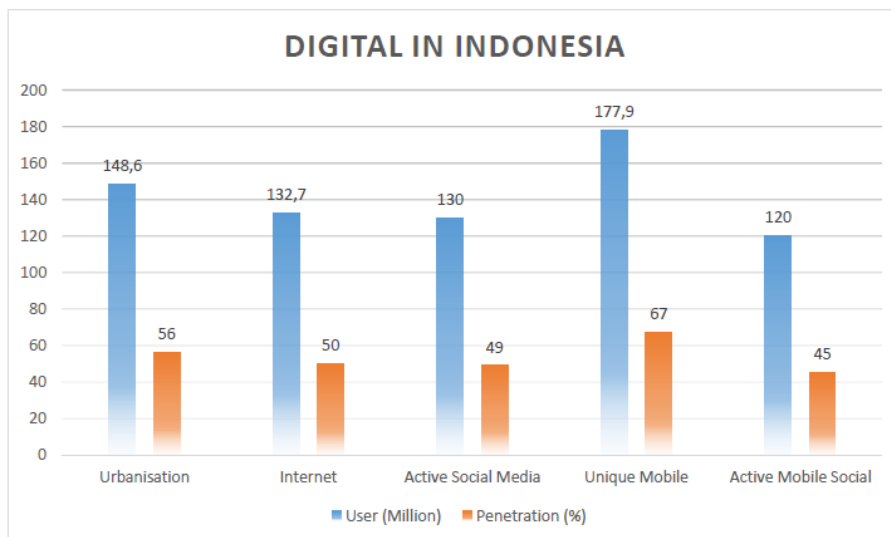


Figure 1
Digital in Indonesia

See figure 1, the ‘Digital in 2018’ report explains the essential insight into the internet, social media, mobile and e-commerce use around the world. It shows that the more people have the ability to access or to use the internet, the higher level of a country’s digitalization. Digitalization is now penetrating all sectors of human behavior including economics, health, agriculture, or even education. In the economic sectors, digital technology has been widely implemented from the very beginning to the very end of the business line; people call it as a digital economy.

The digital economy is the use of computing and communication technologies on the internet and resulting in the flow of information and technology that are changing all of vast organizational form and electronic commerce (Lane, 1999). Another study revealed that the digital economy can be defined as a range of economic and social activities that use internet network infrastructure. The activities of the digital economy include selling, buying, paying for a bill, transferring money, or even accessing education or entertainment resources using the internet from the connected device (AIPEG & KPPU, 2017). The most important thing in the development of the digital economy is the internet connection, by that definition Joshi and Yermish (2000) described that even a small business which only needs for cost of registration fee can put themselves in a space populated by huge industries. Currently, the business paradigm can not only be determined by the amount of the capital that the company has. As a proof, a-tiny and home managed- online shop can now directly compete with the huge capital corporations in this era of disruption by using a marketplace.

The disruption effect caused by the digitalization in economic sector seems highly profound. New technology development has brought a wide variety of business entrants, including commerce, retail, logistics and delivery, finance, insurance, investment, healthcare, transport, tourism, education, manufacturing, energy, and so on. A business operated under a digital platform provides fulfilled convenience for the customers right in front of their smartphone (Dutta, 2015). By this convenience, the digital economy is predicted to have more than USD150 billion annual economic impacts by 2025, it can lead Indonesia to the next level of economic growth (Das, Gryseels, Sudhir, & Tan, 2016).

The disruption has also affected economic growth at all stages, both national and regional level. In the regional level, East Java, for example, the digital economy contributes up to IDR1.2 trillion during 2017 from on-demand services sector including food order, food delivery, online transportation, traveling, and online shops. The statement arose during a discussion on Urban Transport Policy and Regional Economic Development in Surabaya, in August 2018. The discussion further recommends the government to boost fair business competition by increasing digital industrial ecosystem provider that connected to the customer (Susilawati, 2018).

While the study on the regional economy and its factors has been well-researched, see Guzman, Vassallo, and Hortelano (2016); Litvinenko et al. (2016); Patrakeeva and Kryukov (2016); Prats and Ramirez (2018); Ren, Folmer, and Vlist, (2014), relatively less is known on the issue for the digital economy sectors affecting the regional economy. Compared to the previous papers that the researchers have reviewed in the literature review, this paper provides a research gap, which includes all digital-related sectors of economy with a regional perspective, instead of a one-by-one sector with a national perspective. The research with regional approach provides an easy and applicable recommendation that can be easily implemented by the regional authority, in this paper is the Government of East Java Province, Indonesia. East Java Province was chosen as the location of the research because it becomes the second biggest GDP sources of Indonesia. It contributes in almost 15 percent of the total GDP Indonesia in 2016.

Therefore, the aims of this paper are; to investigate the regional economic impact caused by digital economy sectors; to analyze the multiplier effect of these sectors on the output, income, and employment; and to calculate the economic impact of additional investment in the digital economy sectors. The study focuses on the region of East Java Province, Indonesia. The study also provides benefit for the government of East Java Province in order to calculate how much the impact of the currently growing digital economy sector to the regional economy disruption. The digital economy sectors show a positive impact on the regional economy, so the government should keep its pace with the additional investment, and vice versa.

LITERATURE REVIEW

The term of digital economy is firstly introduced by Tapscott (1996). He explained about the age of networked intelligence as a revolutionizing and advancing human's communication, computing, and content publishing from the traditional form to the modern one. This could make us rethink the way we envisage the traditional definitions of the economy. The digital economy has twelve special characteristics includes human knowledge, digitization, virtualization, molecularization, integration, disintermediation, convergence, innovation, presumption, immediacy, globalization, and discordance.

Joshi and Yermish (2000) then developed the term of digital economy as a questionable concern whether the digital economy strengthens the brand, supplier alliance, customer relationship, and value of information or it eliminates them. They found that entrepreneurs must obtain their special abilities and characteristics in the internet era if they want to be successful. They also revealed that the digital economy

has some benefits for entrepreneurs, such as increasing separation of information flow, increasing information focus, reducing distance, reducing time taken for executing transaction, and involving customers as a marketing agent.

Another recent research has been conducted by Escobar (2016) about the impact of digital revolution on the fashion luxury sector with the concern on development of market and communication strategies. He assumed that the use of internet has affected the growth of the economic sector, then the result from the customer interview revealed that fashion luxury should adapt the content and approach of current digital strategies. It can be proposed by a concept known as a brand expression, which involves the following strategies: economic of scale, good service performance, online strategies should be focused on determined target, good shopping experience from customer, effective content communication, and accessible information.

The paper about digital economy has also been researched by Midoun and Ismail (2018) in Malaysia from the 2000 to 2018. The paper aimed to investigate digital free trade zones and its impact on Malaysia's economy. Digital free trade zone has forced local business practice to compete with international competitors without any barriers. Nevertheless, digital free trade zones can also attract foreign funds and foreign direct investments inflow that will make many effects on the economy. The result revealed that economy of Malaysia is growing faster with the digital free trade zones; the author then explained that Malaysia would become a high-income country in the upcoming 10 years. The author recommended the government to modify policy which can attract more foreign investment in the digital economy.

The digital technology development has found to be a determinant of new business strategy development in India especially in banking and retail sectors (Dutta, 2015). He noted that "branchless banking" and "storeless shopping" have become the power of digital growing economy in India. The retail sector used internet to scale-up business and provide a web store with a user-friendly experience and customer convenience engagement. While the banking sector developed end-user easiness access with mobile banking, internet banking, one-click payment, and so on. He argued that the digital business is the new customer-savvy platform that must be developed by any business sector. Moving to the neighboring region, Pakistan, Ahmed and Akhlaq (2015) had conducted the research about online shopping behavior and intentions of the customers. The result showed that usefulness, ease, distrust, risk, enjoyment, and legal framework can affect the customer intentions to buy in online shop.

To some extent, another sector in addition to economy can also be affected by

digital disruption. In the case of media communication, book publishing i.e., Klamet (2017) has researched about changing process in traditional media in response to digitalization. In Germany, most of the traditional publishing houses are small and medium sized enterprises (SMEs), and those publishers have not been ready yet to offer digital book demanded by the international or regional customers. The result revealed a suggestion to start a strategic partnership between the digital service providers and the publishers in case of providing digital content. The digital business model has to be implemented in response to a new business model in the connected digital economy (Ng, 2014). Even the digital business is now entering to a new phase of development on the basis of block-chain technology (Vovchenko, Andreeva, Orobinskiy, & Filippov, 2017; Wolfond, 2017).

In addition, to explain more about the literature review, the disruption effects of the digital transformation overwhelm many sectors including; retail (Escobar, 2016), banking (Dutta, 2015), publishing (Klamet, 2017), payment (Goparaju, 2017), tourism (Sovani & Jayawardena, 2017), agriculture (Burkaltseva et al., 2017), entrepreneurship (Hamid & Khalid, 2016) and women entrepreneurship (Balogh, 2016; Freedman, 2016). The disruption effect of digital economy developmen which is quite encouraging, yet it came along with multiple risks. Therefore, the risk must be successfully managed to make the digital business be profitable and sustainable (Dellermann, Fliaster, & Kolloch, 2017).

RESEARCH METHOD

We used secondary data obtained from the Central Bureau of Statistics (*Badan Pusat Statistik/BPS*) of East Java Province. The data are in the form of Input-Output Table (I-O) for the year 2015 that includes up to 110 real economic sectors. All of the 110 sectors are then grouped into digital related and non-digital related groups (the description of the group sector is attached at the end of this paper). The differentiation of the groups can be seen from the business line process for each sector whether it is digital related or non-digital related, taken from the very beginning, such as a production process to the distribution process until the product received by the customer.

The matrix aggregation from 110 x 110 sectors was applied in the I-O table of East Java Province to become only 13 x 13 sector classification. The aim of this classification relies on the purpose of the paper; the first is to investigate regional economic impact caused by the digital economy sector, and the second is to analyze the multiplier effect of these sectors on the output, income, and employment. The classification sector is shown in Table 1.

Table 1
The Classification Sector

Sector	Digital	Non Digital
Agriculture, Livestock, Forestry, and Fishery	√	√
Mining	-	√
Manufacturing	√	√
Electricity, Gas, and Water	-	√
Construction	-	√
Trade, Transportation, Accommodation dan Information	√	√
Finance, Real Estate and Company Services	√	√
Other services	√	√

The I-O analysis applied in this paper actually has also been long time used by various authors (Ching-Han Fei, 1956; Evans, 1952; Su, 1970; Tiebout, 1957). Later, Chung (2014) used the method to measure the economic impact of agricultural and textile sector, Kim and Kim (2015) used it to find the effect of hotel industry to the economy, while Loizou, Chatzitheodoridis, Michailidis, Tsakiri, and Theodossiou (2015) applied the model to reveal linkages of energy sector in Greek and Kresnowati, Ananda, and Khusaini (2016) analyzed the role of manufacturing, trade, hotel, and restaurant sector to the economy using this model.

The I-O analysis consists of three main measurements, namely descriptive analysis, multiplier analysis, and linkages analysis. The authors use only linkages analysis and multiplier analysis to reveal whether each sector has the linkages (backward and forward) to other sector or not, and which sector that has the biggest multiplier effect on the output, income, and employment. In order to calculate the linkages of each sector, whether it is backward or forward linkage, we used the model developed by the BPS as illustrated in Table 2.

Table 2
Backward and Forward Linkage Model

Backward Linkage		Forward Linkage	
$TBL_j = \frac{\sum_{i=0}^n b_{ij}}{1/n \sum_{j=0}^n \sum_{i=0}^n b_{ij}}$		$TFL_i = \frac{\sum_{i=0}^n b_{ij}}{1/n \sum_{i=0}^n \sum_{i=j}^n b_{ij}}$	
TBL_j	: Total Backward Linkage for sector j	TBL_i	: Total Forward Linkage for sector i
b_{ij}	: Inverse matrix of i and j	b_{ij}	: Inverse matrix of i and j
n	: Total sector	n	: Total sector

Source: BPS Jawa Timur, 2015

Backward linkage represents a link when there is an increase in output from the sector i, it will increase input for that sector, both from sector i and others. While forward linkage describes a link when there is an increase in the output from the sector i, it will increase the output distribution of that sector, which makes other sectors (sector j) have more input, further will force the sector to increase its production

process and finally the sector will get more output. Hereafter, in order to measure and calculate the multiplier effect of each sector, we used the model developed by the *BPS* as illustrated in Table 3.

Table 3
Multiplier Effect Model

Output Multiplier		
$\overline{O}_j = \sum_i^n \alpha'_{ij}$	O_{ij}	: Output multiplier for sector j
	α'_{ij}	: Inverse matrix which includes household as an endogen factor
	i	: 1, 2, 3, ... n
Income Multiplier		
Type 1	$\frac{v(1-A)^{-1}}{v}$	v : Value added/total output
Type 2	$\frac{v(1-\lambda)^{-1}}{v}$	$(1-A)^{-1}$: Inverse Matrix $(1-\lambda)^{-1}$: New Inverse Matrix
Employment Multiplier		
If	$W_j = \frac{L_j}{X_j}$	W_j : Employment Coef sector j L_j : Labor for sector j X_j : Total output for sector j
Then	$I_j = SW_j(1-A)^{-1}$	I_j : Employment Multiplier sector j

Source: BPS Jawa Timur, 2015

In order to meet the third purpose of this paper, which is to calculate the economic impact of additional investment in the digital economy sectors, the researchers then develop an investment injection scenario toward variables. Digital economy sectors will be given additional injection simulation for up to 10 percent increase of investment fund toward each sector. The result will describe which sector has the highest output return of the investment, so that the government can put an emphasis on the development of that sector.

RESULTS AND DISCUSSIONS

We divided the paper into three major results and discussions, first is to answer the question whether the digital economy sector has a linkage to other sector or not, the second is to investigate the multiplier effect, while the last is to simulate an investment injection to the digital-related economy sectors.

Backward Linkage and Forward Linkage

In every economic transaction, a sector will always has a linkage to other sectors. The sector that produces input also needs a primer input from the other

sector(s). The relation between sectors creates its Backward Linkages and Forward Linkages. Backward linkage represents a link when there is an increase in output from a sector, it will also increase input for that sector and others. While forward linkage describes a link when there is an increase in output from a sector, it will also increase the output distribution of that sector, which makes other sectors have more input, more production process, and more output. See Figure 2.

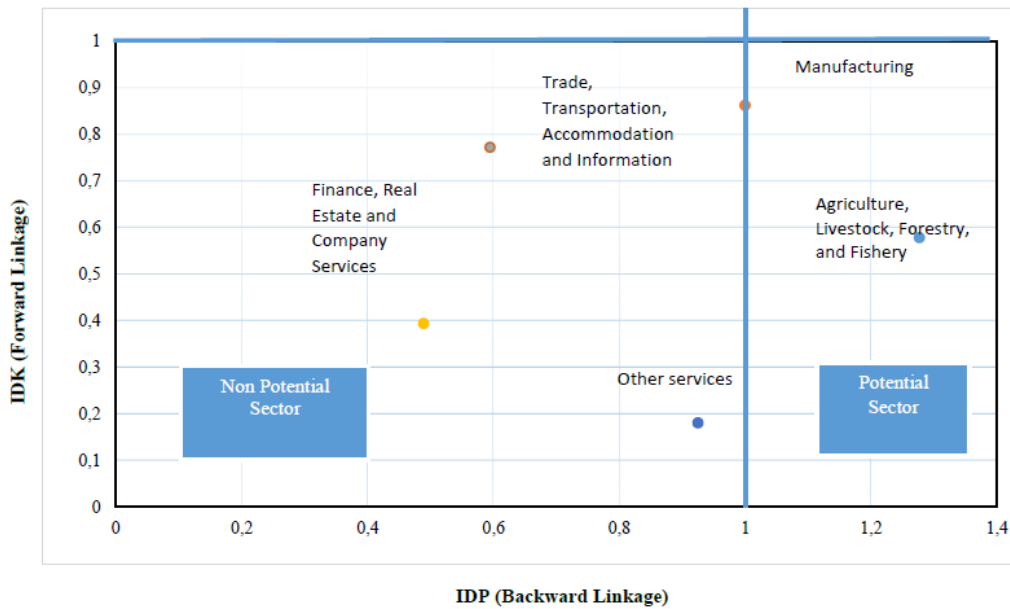


Figure 2
Digital-related Economy Sector based on Backward and Forward Linkage

The backward linkage that shows index more than 1 means that the sector(s) has/have the ability to pull up the upstream sector. The forward linkage that shows index more than or almost 1, means that the sector(s) has/have the ability to encourage the downstream sector, or else this sector(s) has/have strong ability to boost another sector’s production that uses input from this sector. Sector(s) that has/have backward linkage or forward linkage more than/almost 1 recommended to be developed by the government, in order to stimulate expansion for the other sectors.

Based on Figure 2, in East Java, digital-related manufacturing is the leading sector (both in forward linkage and in backward linkage), even in the forward linkage the number is still less than 1. It means that manufacturing can be a booster and a puller to the other sectors. Increasing production in this sector will increase the production in another related sector because the manufacturing sector uses a high input from East Java, and sells the output that will also be used by East Java.

The second is the digital-related transportation, accommodation, and

information. This sector has a high forward linkage, but a little bit low backward linkage. This case means that transportation, accommodation, and information do not use much input from other sectors in East Java. However, this sector has a high contribution as an input for other sectors (downstream sectors). Input that used by this sector may come from the outside area of East Java. Similar to the digital-related finance sector and other services sector, both of these sectors use little input and give the same output for East Java. This condition is possible because the most of digital-related services sectors stand alone as independent sectors that do not need any input or output from other sectors.

The last sector is the digital-related agriculture, livestock, forestry, and fishery sectors. These sectors have a high backward linkage (more than 1) but a low forward linkage that is still below digital-related manufacturing sector. It means that this sector act as the main input for another sector in East Java. It is known that East Java is still in high rank for the agriculture, livestock, forestry, and fishery and other primer sectors.

Multiplier Effect on Output, Income, and Employment

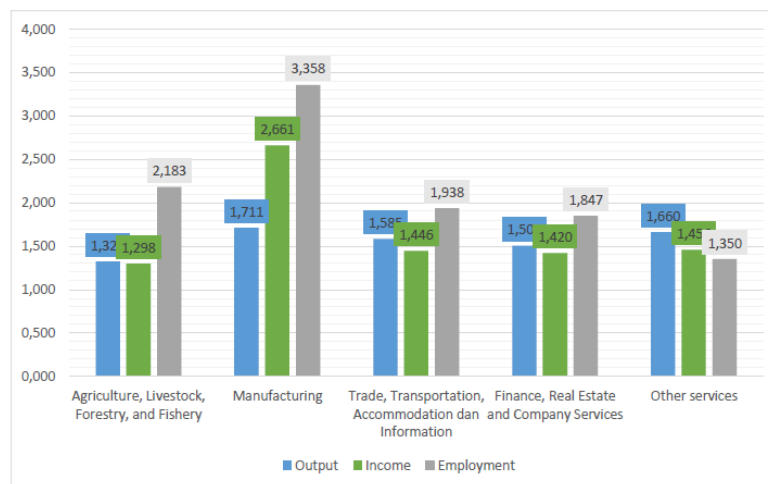


Figure 3
Digital-related Sector Multiplier Effect on Output, Income, and Employment

See Figure 3. There are three multiplier effects in the I-O analysis, which are output multiplier, income multiplier, and employment multiplier. The first discussion is the digital-related sector multiplier effect on output. We found out that the highest output multiplier is digital-related manufacturing sector. This output multiplier means that if there is/are (a) change(s) or an addition of one Rupiah in manufacturing sector's final demand, there will be an increase in the total output multiplied by 1,711 times. If the main purpose of the government is to maximize the impact on the output of the

production sectors in the economy, the additional final demand should be allocated to sectors with high output multipliers, such as this digital-related manufacturing sector.

We also found digital-related manufacturing sector has the highest multiplier effect on income in East Java Province. The income multiplier is the total of the household income (including the income spent back into the economy) because of an additional final demand in a sector. The approximate value of multiplying income is 2,661 times. This number means that in every additional in one unit of final demand, the output of manufacturing will increase the total household income by 2,661 times. This situation also applies to other sectors.

Employment multiplier is the total effect of changes in the employment in economy due to the change in the final demand. The employment multiplier is expressed in employment units. This paper revealed that the digital-related manufacturing sector is still the highest multiplier on employment. This sector can multiply employment up to 3,358 times. It means that if there is an additional unit of final demand in the digital-related manufacturing sector, the employee in this sector will increase 3,358 times. If before there is 1 employee in this sector, it will increase up to 3 or 4 times. Some other indicators must be considered by the policy makers, especially in decision making (not only multiplier effect). This is due to some limitations from the I/O tool.

Investment Injection Scenario

Investment in the final demand in the I-O table is a combination of Gross Fixed Capital (PMTB) and it changes the stocks in the economy. The total number of PMBT in East Java based in I-O table 2015 is 1,699,314,389.43 million Rupiahs. This investment simulation analysis starts with the injection of 10 percent in one subsector while the other sectors are fixed. According to the writers' analysis, the highest investment structure is in the manufacturing sector. If the manufacturing sector is given a 10 percent investment simulation injection, final demand will increase up to 5,373,427.70 times. It is the highest value among others, see Figure 4.

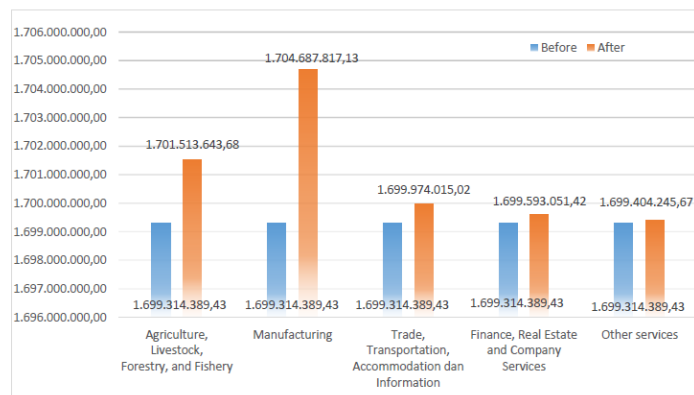


Figure 4
Investment Injection Scenario

According to the calculation, additional investment in the digital-related manufacturing sector will give fantastic return on investment. Other sectors may have an additional in return, but it will not reach as big as the digital-related manufacturing sector. Therefore, this sector is recommended for investments' purpose in East Java Province. The result supports the findings from Kresnowati et al. (2016) which have analyzed the role of manufacturing sector toward regional economy.

CONCLUSION AND RECOMMENDATION

The digital-related manufacturing sector has become a leading sector in East Java Province. It has been discussed from the results of the three calculation indicators, which are backward and forward linkages, multiplier effect, and additional investment simulation. The digital-related manufacturing sector has the highest forward linkages and second highest backward linkages. It means that manufacturing can be a booster and a puller to the other sectors. Increasing production in this sector will also increase the production in another related sector, because the manufacturing sector uses a high input from East Java, and provide the output that will also be used by East Java.

Further finding shows that the digital related manufacturing sector has the highest multiplier effect on the output, income, and employment. It means that if there is an additional unit of final demand in the digital-related manufacturing sector, the output, the income and the employee in this sector will increase multiple times, and the last is the indicator of investment injection simulation, as the manufacturing sector also has the most promising returns scale. Investment injection on the digital economic sectors, based on our analysis, will make better disruption on East Java's economy. Based on the analysis of the input-output calculation, the digital manufacturing sector

really needs to get more attention because the impact is quite large for the economy as a whole. It is suggested that the government of the region should put an emphasis to attract more investment in the digital economy sectors. For the future studies, in order to acquire better result, it is encouraged to fill out this paper limitation, which is lack of timeseries data availability by obtaining more complete timeseries data (not only a year).

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