Analysis of influences of GDP and ICT on Indonesian industrial structural changes using statistical analysis: 1990-2005

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ABSTRACT

The purpose of this study is to analyze the influences of Gross Domestic Product (GDP) and Information and Communication Technology (ICT) on the structural changes of Indonesian industrial sectors from 1990-2005. In this study, the former component is represented by growth of GDP per capita while telephone lines per 100 people explain the latter one. These components are explanatory variables used in this study. We employ statistical tool in investigating the influences, namely Constrained Multivariate Regression (CMR) model. Likelihood Ratio Test (LRT) method is used in order to test the statistical significance of estimators in the fitted model. In this study, we focus on (1) trade, (2) business services, and (3) personal and household services sectors. We then do the deeper analysis, microscopic analysis, for these sectors. The results show that the variables, in the analysis period, gave significant influences on the structural changes of analyzed sectors. Besides, the influences given by explanatory variables to the IO coefficients of these sectors generated the different patterns on this period.

Keywords: GDP, ICT, Industrial Structural Changes, CMR, LRT, Indonesia

INTRODUCTION

Lewis and Hildreth (2012) explained that Gross Domestic Product (GDP) is a tool to determine the economic performance of specific country during a set time period. Association for Investment Management and Research (AIMR) (2003) argued that the real GDP is a comprehensive tool to measure the well-being and health of an economy. On the other hand, Gutierrez, Glassman, Landefeld, and Marcuss (2007) explained the GDP as follows:

> "GDP is one of the most comprehensive and closely watched economic statistics: It is used by the White House and Congress to prepare the Federal budget, by the Federal Reserve to formulate monetary policy, by Wall Street as an indicator of economic activity, and by the business community to prepare forecasts of economic performance that provide the basis for production, investment, and employment planning."

Meanwhile, in recent years, the role of Information and Communication Technology (ICT) on the economic activities of specific country is important. This role can be observed in the micro and macro levels. In former level, we can see that now almost everyday people in the world use Internet. Kramer, Jenkins, and Katz (2007) emphasized the role of ICT in latter level as follows:

> "Unbound from the structures of the PTT days, ICT has become the foundation of every sector of every economy, everywhere. The reason for this are, by now, fairly well-known, but demand brief repetition here. Information and communications technologies reduce transactions costs and thereby improve productivity; offer immediate connectivity-voice, data, visual-improving efficiency, transparency, and accuracy; substitute for other, more expensive means of communicating and transacting, such as physical travel; increase choice in the marketplace and provide access to otherwise unavailable goods and services; widen the geographic scope of potential markets; and channel knowledge and information of all kinds"

There are many previous study discussed GDP and ICT. For example, Gu, Terefe, and Wang (2012) analyzed the effect of the capitalization of expenditures of Research and Development (R&D) on GDP and growth of labor productivity in Canada since 1981. Jordaan (2013) investigated the relationship between nominal GDP and nominal interest rate which the object of study was South Africa. Zuppo (2012) focused on making a hierarchy of applications and definitions of ICT. Zuhdi, Mori, and Kamegai (2012) compared the role of ICT sectors in the national economic structural changes of Indonesia and Japan by using Structural Decomposition Analysis (SDA), one of the analysis tools in Input-Output (IO) analysis. Besides, Zuhdi, Mori, and Kamegai (2013) analyzed the influences of ICT on the structural changes of particular Japanese industrial sectors from 1985-2005 using statistical analysis.

The study discusses the role of GDP and ICT in the industrial structural changes of specific country, which both components are simultaneously presented as explanatory variables, however, is still thin. This discussion is important because it can open the opportunity in increasing the economic growth of industrial sectors of analyzed country. This study is conducted in order to fulfill this gap.

The purpose of this study is to analyze the influences of GDP and ICT on the structural changes of industrial sectors of specific country. This study focuses on Indonesia. The analysis period of this study covers 1990-2005. We develop a statistical tool in order to achieve the objective. This paper is organized as follows. The methodology of this study is explained in chapter 2. Chapter 3 describes the calculation results and analysis of these

outcomes. Chapter 4 explores the conclusions and further researches which are suggested from this study.

METHODOLOGY

The methodology of this study which is referring to Zuhdi, Mori, and Kamegai (2013) can be explained as follows. First, we do the process of aggregation for 1990, 1995, and 2005 Indonesian IO tables in order to get same number on industrial sectors. The number of Indonesian industrial sectors for 1990, 1995, and 2005 was 161, 172, and 175, respectively. These numbers are aggregated into 159 sectors. The adjustment process is also done for 2005 IO table of Indonesia. This process aims to get proper data for this table. The details of aggregated sectors are displayed in Appendix.

Second, we do the calculation in order to get the IO coefficient matrices for each year in the analysis period. Miller and Blair (2009) mentioned that this calculation uses following equation:

$$a_{ij} = \frac{z_{ij}}{X_j} \qquad (1)$$

where a_{ij}, z_{ij}, and X_j are input needed by sector j from sector i to produce one unit of product, inter-industry sales by sector i to sector j, and total production of sector j, respectively. Further, a_{ij} represents IO coefficient from sector i to sector j.

Third, we calculate the influences of explanatory variables used in this study, growth of GDP per capita and telephone lines per 100 people, on Indonesian industrial structural changes. The former variable explains GDP while the latter one is a representation of ICT. The changes are represented by the dynamic changes in IO coefficient vectors extracted from IO tables. In order to conduct this calculation, we develop a Constrained Multivariate Regression (CMR) model.

The data of above variables are obtained from The World Bank (2014). As with main data, these variables data represent the data of 1990, 1995, and 2005. Following explanation describes the CMR model. In the beginning, we define the years of analysis, 1990, 1995, and 2005, as T. We then define the data represents Indonesian industrial structural changes, IO coefficient matrices, as *a(t)* t = 1…T. Further, in the calculation, the vectors of IO coefficient are used. In other words, this model is applied to each industrial sector of Indonesia through its IO coefficient. The explanatory variables used can be described as *x(k,t)* k = 1…k. The following mathematical model, a representation of CMR model, is employed as an elaboration of *a(t)*:

$$a(i,t) = b0(i) + \sum_k b(i,k) \times x(k,t) + e(i,t)$$
$$a(i,t) \geq 0, \quad \sum_i a(i,t) = 1.0 \qquad (2)$$

where *b0(i)* and *b(i,k)* explain the regression coefficients of model. Because the coefficients are non-negative and these summations should be unity by the definition, constraints among estimators are imposed. *e(i,t)* explains the difference of original and estimated values. By least square method, $\min . \sum_i \sum_t e(i,t)^2$, one can obtain the parameters. In this study, the calculation is separately conducted for each explanatory variable.

Fourth, we test the statistical significance of estimators in the fitted model using Likelihood Ratio Test (LRT) method. This method is based on the calculation formula of $-2N(\ln S - \ln S_0)$, where N and S are the number of data and the results of performance function optimization, respectively. N is given by $K \times M \times T$ where K, M, and T are the number of sectors which give input for discussed sector(s), number of discussed sector(s), and number of periods, respectively. The degree of freedom is given by $(K - 1) \times M \times$(the number of removed explanatory variable(s)). The statistical significance of an explanatory variable is

given by the formula which follows a $\chi 2$ distribution. In this study, we take 0.05 as the level of significance. Therefore, we use the 0.05 level of $\chi 2$ distribution in performing the test. As with previous calculation, this test is also separately conducted for each explanatory variable.

The value of degree of freedom used in this study is 159×1×1 = 159. The cutoff score for statistical significance in this study is $\chi 2_{0.05}$ (159) = 189.14. We use this score in investigating the statistical significance of the explanatory variables on analyzed sectors, namely (1) trade, (2) business services, and (3) personal and household services. A particular explanatory variable is called to give significant influence on the specific sector if its significance score is greater than the cutoff score. In this study, six null hypotheses are used to emphasize the results of the test, namely:

- Hypothesis 1: Growth of GDP per capita had no influence on the structural changes of Indonesian trade sector from 1990-2005.
- Hypothesis 2: Growth of GDP per capita had no influence on the structural changes of Indonesian business services sector from 1990-2005.
- Hypothesis 3: Growth of GDP per capita had no influence on the structural changes of Indonesian personal and household services sector from 1990-2005.
- Hypothesis 4: Telephone lines per 100 people had no influence on the structural changes of Indonesian trade sector from 1990-2005.
- Hypothesis 5: Telephone lines per 100 people had no influence on the structural changes of Indonesian business services sector from 1990-2005.
- Hypothesis 6: Telephone lines per 100 people had no influence on the structural changes of Indonesian personal and household services sector from 1990-2005.

Previous calculation steps can be simplified as follows. In the beginning we describe the original data of 3 points period of IO coefficient matrices of 159 Indonesian industrial sectors as an *A(t,i,j)*. The vectors of explanatory variables, *Ex_x(k,t)*, are used as a source of influences for the data. We use CMR model in order to calculate the influences of these variables on Indonesian industrial structural changes in the analysis period. We then describe the influenced original IO coefficient matrices as an estimated IO coefficient matrices, *A_est(t,i,j)*. In this study, General Algebraic Modeling System (GAMS) software, the software of high-level modeling system for conducting optimization and mathematical programming (GAMS, n.d.), is used in order to conduct the calculation. The test using LRT method which focuses on the analyzed sectors is done in the next step. The purpose of this test is to know the statistical significance of estimators in the fitted model.

Fifth, we do the deeper analysis, microscopic analysis, which focuses on the discussed sectors. The reason of choosing these sectors is because the explanatory variables used in this study seem to give direct impact to the business transaction activities occurred in the industries. The term of "microscopic" describes that the analysis focuses on more detailed aspects. We calculate the standard deviation for original IO coefficients of the sectors as a first step of the analysis. The purpose of this calculation is to know the magnitude of changes of original IO coefficients on the analysis period. The calculation for estimated IO coefficients is ignored because the results of this effort generally follow the original one. For each focused sector, we choose the top ten coefficients which have the highest standard deviation value. These top ten coefficients represent the most dynamic inputs. From these coefficients we choose one which have increasing pattern as a source of analysis. The values of coefficient of variation and correlation (R) are used in order to get deeper insight regarding the influences of variables on the analyzed sectors. As with previous calculation and test, this analysis is also separately conducted for each explanatory variable. After finishing the analysis, we describe the conclusions of this study and further researches which are suggested from this study.

RESULTS AND ANALYSIS

The Results of LRT Calculation

Table 1 describes the summary of LRT calculation which evaluates the CMR model. This summary focuses on analyzed sectors. From the information in the table, we can assert that both explanatory variables used in this study significantly influenced the structural changes of these sectors from 1990-2005. Based on this fact, we reject all null hypotheses.

Table 1. Summary of LRT calculation (null model as a base)

No.	Explanatory variable	Influence on trade sector	Influence on business services sector	Influence on personal and household services sector
1	Growth of GDP per capita	Significant	Significant	Significant
2	Telephone lines per 100 people	Significant	Significant	Significant

Microscopic Analysis

Trade Sector

Table 2 describes the top ten original IO coefficients of trade sector viewed from the value of standard deviation on the period between 1990 and 2005. From the information in this table, we can argue that the most dynamic input is an input from building and land rent sector, sector number 149. For investigating the influences of both explanatory variables in micro level, we choose $a_{141,137}$, an IO coefficient describes the input from road transport sector to trade sector, as a source of analysis. We select this coefficient because it had increasing pattern in the analysis period.

Table 2. The top ten original IO coefficients of trade sector viewed from the value of standard deviation (1990-2005)

No.	Input-output coefficient	Value of standard deviation	Value of mean
1	$a_{149,137}$	0.0239	0.0372
2	$a_{150,137}$	0.0124	0.0209
3	$a_{141,137}$	0.0098	0.0211
4	$a_{146,137}$	0.0071	0.0133
5	$a_{132,137}$	0.0062	0.0110
6	$a_{92,137}$	0.0060	0.0134

7	$a_{147,137}$	0.0056	0.0304
8	$a_{130,137}$	0.0039	0.0129
9	$a_{138,137}$	0.0039	0.0086
10	$a_{57,137}$	0.0038	0.0126

Influence of GDP per Capita Growth on Trade Sector

This section explains the influence of growth of GDP per capita on trade sector in the period of analysis. Figure 1 explains the changes of $a_{141,137}$ from 1990-2005 which the influence was coming from the discussed explanatory variable. Numbers in this figure, also in other figures, represents the analysis years, namely 1990, 1995, and 2005. Table 3 shows the coefficient of variation of both original and estimated values of this coefficient and correlation of both values on the analysis period. From these results we can argue that our model well follow the historical changes. In other words, we can say that, during 1990-2005, the explanatory variable had a strong influence in $a_{141,137}$.

Figure 1. The changes of $a_{141,137}$ from 1990-2005, influenced by growth of GDP per capita

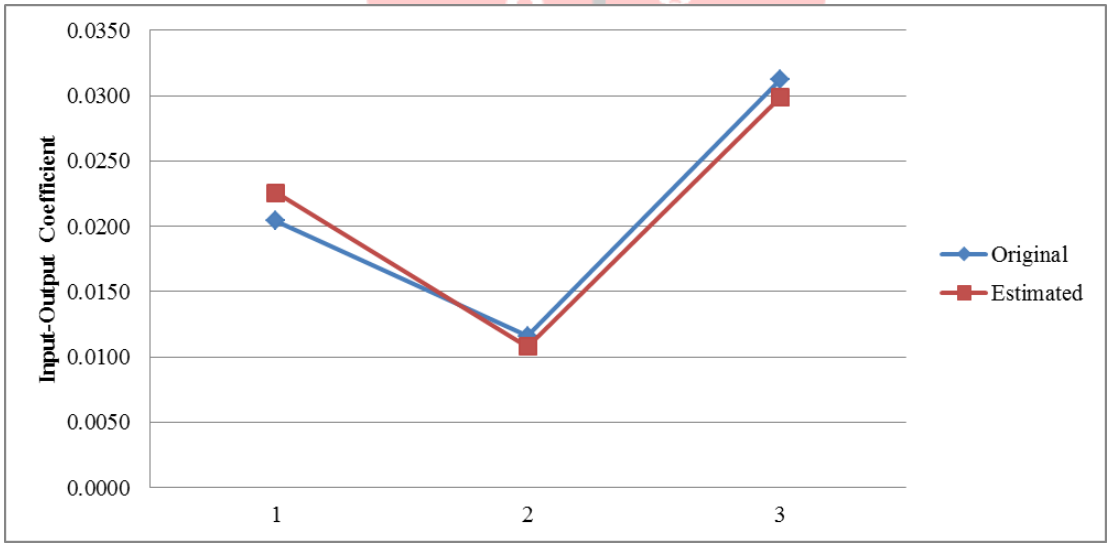

Table 3. The coefficient of variation of both original and estimated values of $a_{141,137}$ and correlation (R) of both values, influenced by growth of GDP per capita (1990-2005)

Coefficient of variation		Correlation
Original	Estimated	
0.466	0.458	0.981

Above phenomenon shows that, especially during 1995-2005, GDP per capita growth has supported the relationship between road transport and trade sectors. Following explanation gives more complete information regarding the phenomenon. GDP is usually used as a tool of national economic measurement. One country is called to have a good trend in economy if its GDP growth is high. The growth of GDP per capita of Indonesia in 1995-2005, compared with 1990-1995, had a decreasing pattern. This situation should give a negative impact to the relationship. However, this impact did not appear in the period. This fact indicates that, from 1995-2005, the decreasing of GDP per capita growth has strengthened the relationship.

Influence of Telephone Lines per 100 People on Trade Sector

This section describes the influence of telephone lines per 100 people on trade sector in the period of analysis. Figure 2 explains the changes of $a_{141,137}$ from 1990-2005 which the influence was coming from the analyzed explanatory variable. Table 4 shows the coefficient of variation of both original and estimated values of this coefficient and correlation of both values on the analysis period. From these results we can say that our model well follow the historical changes. In other words, we can argue that, during 1990-2005, the explanatory variable had a strong influence in $a_{141,137}$.

Above phenomenon shows that, during 1990-2005, telephone lines per 100 people have supported the relationship between road transport and trade sectors. Following explanation gives more complete description regarding this condition. ICT device, including telephone, makes the communication between two or more persons smoother. The impact of this situation is to increase the quality and quantity of relationship between them. This logic can be used in industrial level. Indonesia had an increasing pattern in telephone lines per 100 people from 1990-2005. This fact explains why the phenomenon happened.

Figure 2. The changes of $a_{141,137}$ from 1990-2005, influenced by telephone lines per 100 people

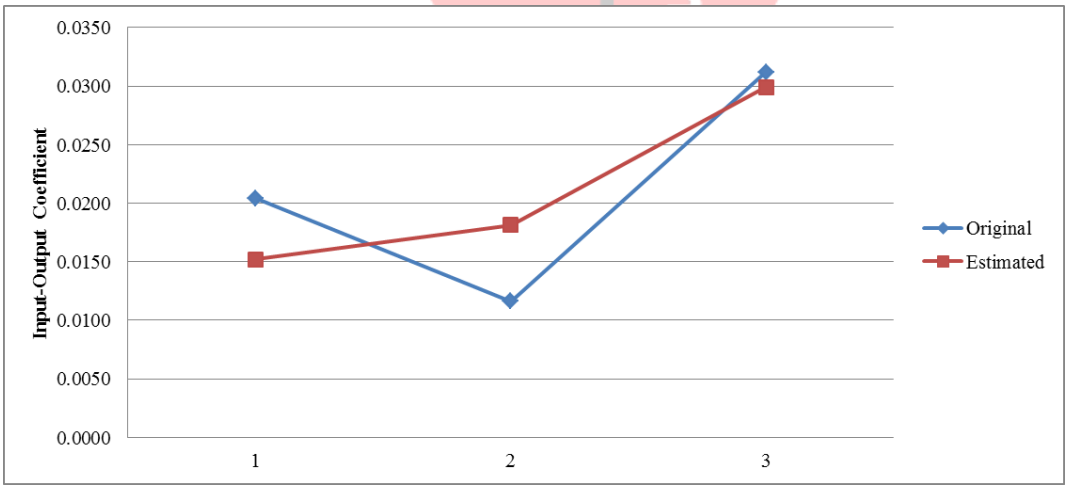

Table 4. The coefficient of variation of both original and estimated values of $a_{141,137}$ and correlation (R) of both values, influenced by telephone lines per 100 people (1990-2005)

Coefficient of variation		Correlation
Original	Estimated	
0.466	0.370	0.793

Business Services Sector

Table 5 describes the top ten original IO coefficients of business services sector viewed from the value of standard deviation on the period between 1990 and 2005. From information in this table, we can argue that the most dynamic input is an input from banking and other financial intermediaries, sector number 147. For investigating the influence of GDP per capita growth in micro level, we choose $a_{152,150}$, an IO coefficient describes the input from education services sector to business services sector, as a source of analysis. On the other hand, $a_{151,150}$, an IO coefficient explains the input from general government sector to business services sector, is used to analyze the influence of telephone lines per 100 people. We select these coefficients because it had increasing pattern in the analysis period.

Table 5. The top ten original IO coefficients of business services sector viewed from the value of standard deviation (1990-2005)

No.	Input-output coefficient	Value of standard deviation	Value of mean
1	$a_{147,150}$	0.0264	0.0727
2	$a_{157,150}$	0.0104	0.0287
3	$a_{156,150}$	0.0061	0.0035
4	$a_{144,150}$	0.0059	0.0135
5	$a_{149,150}$	0.0058	0.0133
6	$a_{158,150}$	0.0053	0.0095
7	$a_{138,150}$	0.0045	0.0095
8	$a_{152,150}$	0.0044	0.0091
9	$a_{151,150}$	0.0043	0.0025
10	$a_{137,150}$	0.0037	0.0161

Influence of GDP per Capita Growth on Business Services Sector

This section explores the influence of growth of GDP per capita on business services sector in the period of analysis. Figure 3 explains the changes of $a_{152,150}$ from 1990-2005. Table 6 shows the coefficient of variation of both original and estimated values of this

coefficient and correlation of both values on the analysis period. From these results we can say that our model well follow the historical changes. In other words, we can argue that, during 1990-2005, the explanatory variable had a strong influence in $a_{152,150}$.

Above phenomenon shows that, especially during 1995-2005, GDP per capita growth gave a positive support to the relationship between education services and business services sectors. This phenomenon is unique because the growth of GDP per capita of Indonesia in 1995-2005, compared with 1990-1995, had a decreasing pattern. This situation supposedly had a negative impact to the relationship. However, this impact did not appear in the period. This fact informs that, from 1995-2005, the decreasing of GDP per capita growth has tightened the relationship.

Influence of Telephone Lines per 100 People on Business Services Sector

This section explains the influence of telephone lines per 100 people on business services sector in the period of analysis. Figure 4 describes the changes of $a_{151,150}$ from 1990-2005. Table 7 shows the coefficient of variation of both original and estimated values of this coefficient and correlation of both values on the analysis period. From these results we can argue that our model well follow the historical changes. In other words, we can say that, during 1990-2005, the explanatory variable had a strong influence in $a_{151,150}$.

Figure 3. The changes of $a_{152,150}$ from 1990-2005, influenced by growth of GDP per capita

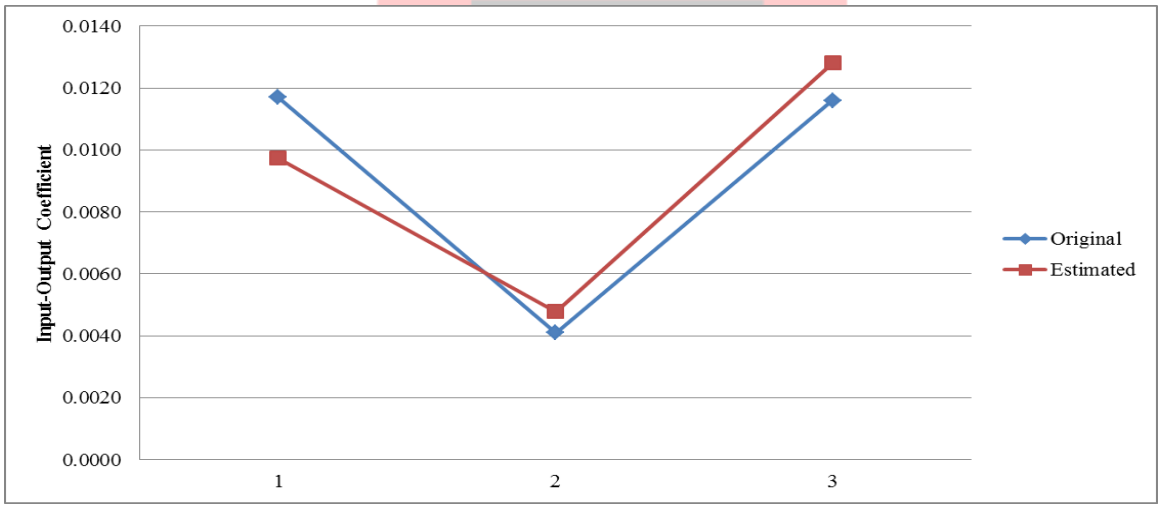

Table 6. The coefficient of variation of both original and estimated values of $a_{152,150}$ and correlation (R) of both values, influenced by growth of GDP per capita (1990-2005)

Coefficient of variation		Correlation
Original	Estimated	
0.477	0.445	0.921

Figure 4. The changes of $a_{151,150}$ from 1990-2005, influenced by telephone lines per 100 people

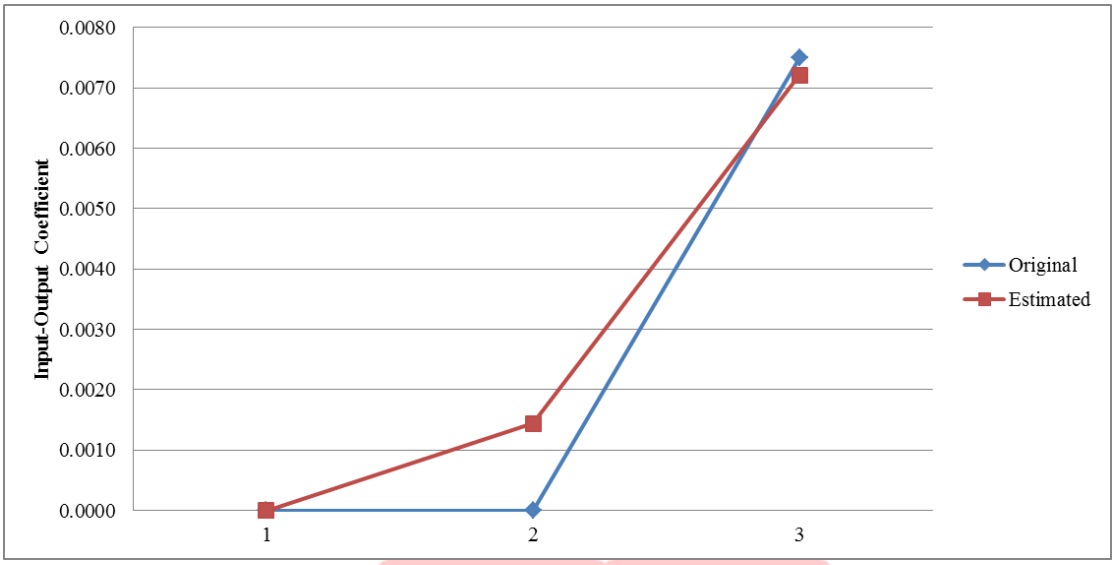

Table 7. The coefficient of variation of both original and estimated values of $a_{151,150}$ and correlation (R) of both values, influenced by telephone lines per 100 people (1990-2005)

Coefficient of variation		Correlation
Original	Estimated	
1.732	1.323	0.982

Above phenomenon indicates that, during 1990-2005, telephone lines per 100 people have strengthened the relationship between general government and business services sectors. Following explanation gives more complete information regarding this situation. ICT device, including telephone, makes the connection between two or more parties better. The consequence of this condition is to improve the quality and quantity of relationship between them. This logic can be applied in the level of industrial sector. Indonesia had an increasing pattern in telephone lines per 100 people from 1990-2005. This fact explains the occurrence of the phenomenon.

Personal and Household Services Sector

Table 8 describes the top ten original IO coefficients of personal and household services sector viewed from the value of standard deviation on the period between 1990 and 2005. From the information in this table, the most dynamic input is an input from textile, sector number 65. For investigating the influences of both explanatory variables in micro level, we choose $a_{146,158}$, an IO coefficient describes the input from communication services sector to personal and household services sector, as a source of analysis. We select this coefficient because it had increasing pattern in the analysis period.

Table 8. The top ten original IO coefficients of personal and household services sector viewed from the value of standard deviation (1990-2005)

No.	Input-output coefficient	Value of standard deviation	Value of mean
1	$a_{65,158}$	0.0205	0.0245
2	$a_{149,158}$	0.0137	0.0542
3	$a_{130,158}$	0.0114	0.0300
4	$a_{64,158}$	0.0106	0.0123
5	$a_{150,158}$	0.0106	0.0165
6	$a_{146,158}$	0.0100	0.0097
7	$a_{116,158}$	0.0076	0.0051
8	$a_{137,158}$	0.0076	0.0113
9	$a_{92,158}$	0.0057	0.0045
10	$a_{152,158}$	0.0046	0.0029

Influence of GDP per Capita Growth on Personal and Household Services Sector

This section describes the influence of growth of GDP per capita on personal and household services sector in the period of analysis. Figure 5 explains the changes of $a_{146,158}$ from 1990-2005 which the influence was coming from the discussed explanatory variable. Table 9 shows the coefficient of variation of both original and estimated values of this coefficient and correlation of both values on the analysis period. From these results we can argue that our model well follow the historical changes. In other words, we can say that, during 1990-2005, the explanatory variable had a strong influence in $a_{146,158}$.

Figure 5. The changes of $a_{146,158}$ from 1990-2005, influenced by growth of GDP per capita

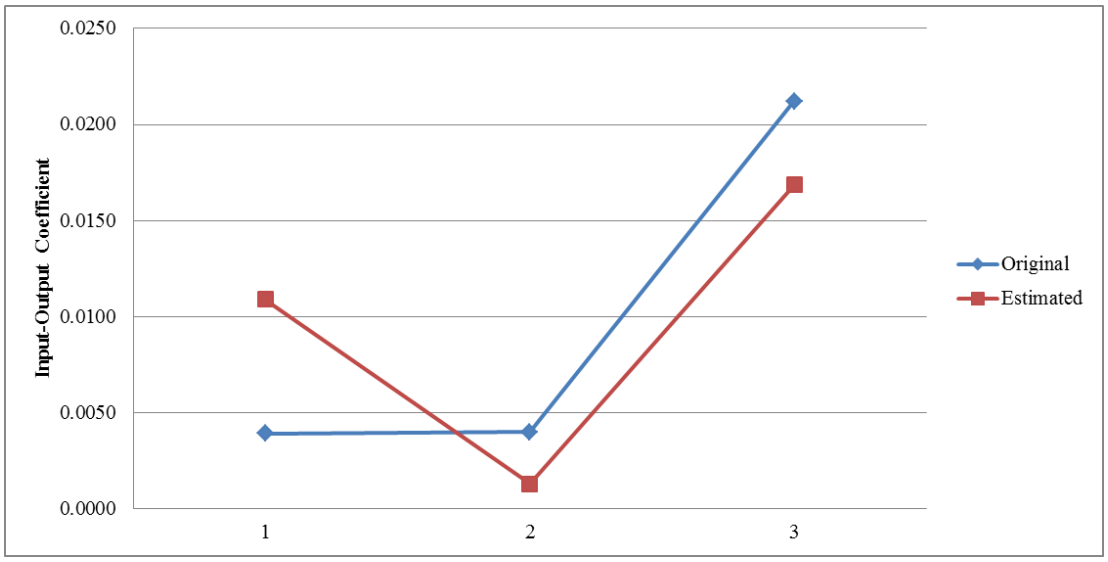

Table 9. The coefficient of variation of both original and estimated values of $a_{146,158}$ and correlation (R) of both values, influenced by growth of GDP per capita (1990-2005)

Coefficient of variation		Correlation
Original	Estimated	
1.027	0.811	0.788

Above phenomenon shows that, especially during 1995-2005, GDP per capita growth gave a positive endorsement to the relationship between communication services and personal and household services sectors. This is a peculiar phenomenon because, usually, the positive support is given by the increasing of growth of GDP per capita. Indonesian GDP per capita growth in 1995-2005, compared with 1990-1995, had a decreasing pattern. This situation should give a negative contribution to the relationship. However, this contribution did not appear in the period. This fact indicates that, from 1995-2005, the decreasing of GDP per capita growth has invigorated the relationship.

Influence of Telephone Lines per 100 People on Personal and Household Services Sector

This section explains the influence of telephone lines per 100 people on personal and household services sector in the period of analysis. Figure 6 explains the changes of $a_{146,158}$ from 1990-2005 which the influence was coming from the analyzed explanatory variable. Table 10 shows the coefficient of variation of both original and estimated values of this coefficient and correlation of both values on the analysis period. From these results we can say that our model well follow the historical changes. In other words, we can argue that, during 1990-2005, the explanatory variable had a strong influence in $a_{146,158}$.

Figure 6. The changes of $a_{146,158}$ from 1990-2005, influenced by telephone lines per 100 people

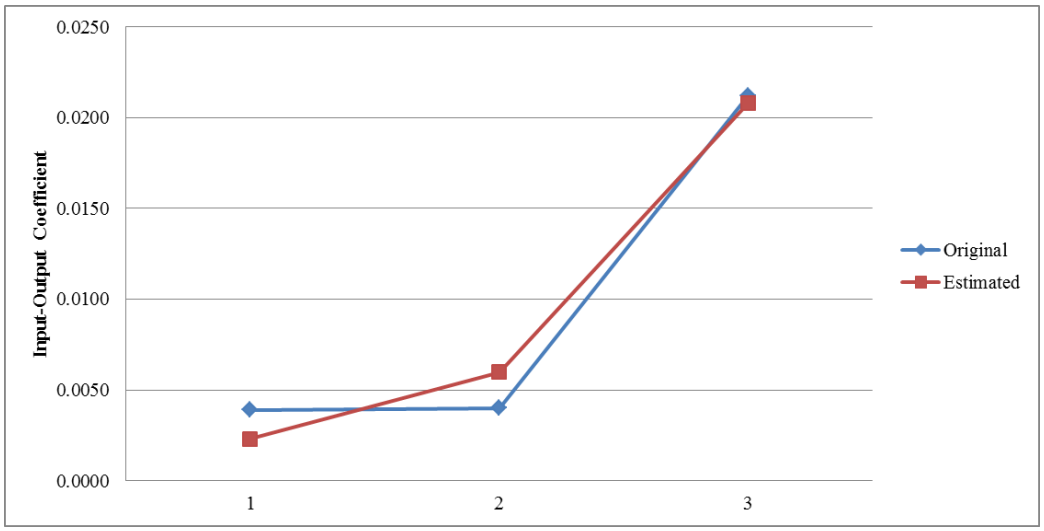

Table 10. The coefficient of variation of both original and estimated values of $a_{146,158}$ and correlation (R) of both values, influenced by telephone lines per 100 people (1990-2005)

Coefficient of variation		Correlation
Original	Estimated	
1.027	1.010	0.983

Above phenomenon shows that, during 1990-2005, telephone lines per 100 people have endorsed the relationship between communication services and personal and household services sectors. Following explanation gives more complete description regarding this circumstance. ICT device, including telephone, makes one person easier to conduct the communication with the others. This situation will increase the quality and quantity of relationship between them. This logic can be adopted in industrial level. From 1990-2005, the amount of telephone lines per 100 people of Indonesia increased. This fact explains why the phenomenon happened.

CONCLUSIONS AND FURTHER RESEARCH

This study analyzed the influences of GDP and ICT on the changes of structure of Indonesian industrial sectors from 1990-2005. In this study, GDP was represented by growth of GDP per capita while telephone lines per 100 people explained the ICT. Both of these represented explanatory variables used in this study. This study focused on three Indonesian industrial sectors, namely (1) trade, (2) business services, and (3) personal and household services. CMR model was employed as an analysis tool. LRT method was used in order to test the statistical significance of estimators in the fitted model. This study also conducted hypothesis testing in order to emphasize the results of this test. We then did the deeper analysis, microscopic analysis, which focused on the analyzed sectors. The values of standard deviation, coefficient of variation, and correlation were used in order to get deeper understanding related to the influences of the variables on these sectors. The calculations in this study were separately conducted for each explanatory variable.

The results showed that above variables, in the analysis period, gave significant influences on the structural changes of analyzed sectors. Based on the statistical significance

values, the structural changes of all analyzed sectors got stronger influence from telephone lines per 100 people than GDP per capita growth. The results also showed that the influences given by explanatory variables to the IO coefficients of analyzed sectors generated the different patterns on the period of analysis. More specifically, the influence of growth of GDP per capita produced decreasing-increasing pattern while increasing trend appeared after receiving the influence of telephone lines per 100 people.

This study could analyze the influences of GDP and ICT on the structural changes of Indonesian industrial sectors from 1990-2005, especially the structural changes of ICT related sectors. The scope of this study, however, should be expanded. This argument is based on the limited analysis period. This study only used three periods for the analysis. Therefore, adding the period of analysis is a suggestion from this study for the further research.

Finally, the other suggested further research from this study is to perform the international comparison in this topic. The comparison between developing and developed countries is a good example. More specifically, the comparison between current and previous studies, the study analyzed the influences of ICT on the structural changes of Japanese industrial sectors, will be interesting future work. This comparison will describe the characteristics of industrial structural changes of compared countries.

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Appendix

Industrial sectors of Indonesia used in this study

Sector no.	Sector name
1	Paddy
2	Maize
3	Cassava
4	Other root crops include sweet potatoes
5	Groundnut
6	Soybeans
7	Other beans
8	Vegetables
9	Fruits
10	Cereals and other food crops
11	Rubber
12	Sugarcane
13	Coconut
14	Oil palm
15	Fibre crops
16	Tobacco
17	Coffee
18	Tea
19	Clove
20	Other estate crops
21	Other agriculture
22	Livestock and livestock product except fresh milk
23	Fresh milk
24	Poultry and its product
25	Other livestock raising
26	Wood

27	Other forest product
28	Sea fish and other sea products
29	Inland water fish and its product
30	Coal
31	Crude oil
32	Natural gas and geothermal
33	Tin ore
34	Nickel ore
35	Bauxite ore
36	Copper ore
37	Gold and silver ore
38	Other mining
39	Crude salt
40	Quarrying, all kinds
41	Meat and entrails of slaughtered animal
42	Processed and preserved meat
43	Dairy products
44	Canning and preserving of fruits and vegetables
45	Drying and salting of fish
46	Processed and preserved fish
47	Copra, animal oil, and vegetables oil
48	Rice
49	Wheat flour
50	Other flour
51	Bakery product and the like
52	Noodle, macaroni, and the like
53	Sugar
54	Peeled grain, chocolate, and sugar confectionery
55	Milled and peeled coffee
56	Processed tea
57	Soya bean products
58	Other foods
59	Animal feeds
60	Alcoholic beverages
61	Non-alcoholic beverages

62	Tobacco products
63	Cigarettes
64	Yarn and cleaning kapok
65	Textile
66	Made up textile goods except wearing apparel
67	Knitting mills
68	Wearing apparel
69	Manufacture of carpet, rope, twine, and other textile
70	Leather tanneries and leather finishing
71	Manufacture of footwear and leather products
72	Sawmill and preserved wood
73	Manufacture of plywood and the like
74	Wooden building components
75	Manufacture of furniture and fixtures mainly made of wood, bamboo, and rattan
76	Manufacture of other products mainly made of wood, bamboo, rattan, and cork
77	Manufacture of non-plastic plait
78	Pulp
79	Paper and cardboard
80	Paper and cardboard products
81	Printing and publishing
82	Basic chemical except fertilizer
83	Fertilizer
84	Pesticides
85	Synthetic resins, plastic, and fibre
86	Paints, varnishes, and lacquers
87	Drugs and medicine
88	Native medicine
89	Soap and cleaning preparation
90	Cosmetics
91	Other chemical products
92	Petroleum refineries products
93	Liquefied of natural gas
94	Smoked and crumb rubber

95	Tire
96	Other rubber products
97	Plastic products
98	Ceramic and earthenware
99	Glass products
100	Clay and ceramic structural products
101	Cement
102	Other non-ferrous products
103	Basic iron and steel
104	Basic iron and steel products
105	Non-ferrous basic metal
106	Non-ferrous basic metal products
107	Kitchen wares, hand tools, and agricultural tools
108	Furniture and fixed primarily made of metal
109	Structural metal products
110	Other metal products
111	Prime movers engine
112	Machinery and apparatus
113	Electric generator and electrical motor
114	Electrical machinery and apparatus
115	Communication and electronic equipment and apparatus
116	Household electronics appliances
117	Other electrical appliances
118	Battery and storage battery
119	Ship and its repair
120	Train and its repair
121	Motor vehicle except motor cycle
122	Motor cycle
123	Other transport equipment
124	Aircraft and its repair
125	Measuring, photographic, and optical equipment
126	Jewelry
127	Musicals instruments
128	Sporting and athletics goods
129	Other manufacturing industries

130	Electricity and gas
131	Water supply
132	Residential and nonresidential buildings
133	Construction on agriculture
134	Public work on road, bridge, and harbor
135	Construction and installation on electricity, gas, water supply, and communication
136	Other construction
137	Trade
138	Restaurant
139	Hotel
140	Railway transport
141	Road transport
142	Sea transport
143	River and lake transport
144	Air transport
145	Services allied to transport
146	Communication services
147	Banking and other financial intermediaries
148	Insurance and pension fund
149	Building and land rent
150	Business services
151	General government
152	Education services
153	Health services
154	Other community services
155	Private motion picture and its distribution
156	Private amusement, recreational, and cultural services
157	Repair shop n.e.c
158	Personal and household services
159	Other goods and services n.e.c

n.e.c.: Not elsewhere classified