Nature of Indonesia's Deindustrialization

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Article Information	Abstract
	_____ This research aims to identify the nature of deindustrialisation on Indonesia's economy. To test the negative deindustrialisation, this research performed a descriptive analysis on value-added, export-import, and productivity data of manufacturing sector. To test the premature deindustrialisation, this research conducted a regression analysis to create a simulation of value of GDRP per capita at the top of industrialization taken place on Indonesia's economy. Descriptive analysis shows that deindustrialization in Indonesia prevails with downward trend of value-added, trade performance, and productivity of manufacturing sector. Subsector analysis also shows that manufacturing subsectors having high value added experienced negative trend in all mentioned indicators. The result of premature deindustrialization model regression shows that the peak of industrialization in Indonesia achieved at lower level income per capita compared to several thresholds of premature deindustrialization. Those results show that negative and premature deindustrialisation prevailed in Indonesia's economy. The consequence of these research's results is to promote the politics of reindustrialization. There are several recommendations for policy makers to enhance performance of manufacturing sector. From demand-side, it is important to expand market of manufacturing product internationally and domestically. From supply side, the policy makers should increase the investments and insentives for businesses.

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INTRODUCTION

The economic growth of Indonesia never surpassing 6 percent since 2014 according to the economists is caused by the problems in its economic structure. The manufacturing sector's performance as engine of growth does not improve since 1998 crisis hit East Asia (including Indonesia). As shown in Table 1, it can be clearly seen that the positive relationship between the declining performance of economic growth and decreasing performance of manufacturing sector growth.

Table 1. Development of Indonesia's Economic Growth and Manufacturing Sector

Year	2001	2011	2017	2018
Economic Growth (%)	3.64	6.17	5.07	5.17
Value-added Growth of Manufacturing Sector (%)	3.3	6.26	4.29	4.27

Note: Year of 2001 and 2011 was chosen to describe normal condition after crisises of 1998 and 2008
Source: Central Agency of Statistics (henceforth: BPS) (2019)

Indonesian government's concern on the economy considered as deindustrializing was quite inconsistant. The government once denied that deindustrialization is just a temporal impact of 2009 crisis to Indonesia's economy (Kemenperin, 2010). However, the government eventually acknowledged that Indonesian economy was deindustrialized (CNN Indonesia, 2018). In 2019, the president promised that reindustrialization politics would be taken seriously (Republika, 2019).

Theoretically, the economists do not reach an agreement regarding deindustrialization as a phenomenon threatening an economy. On one hand, deindustrialization can also be an indication that an economy has profoundly developed and matured marked with the high productivity of the workers in manufacturing sector (Rowthorn and Wells, 1987). On the other hand, other economists argue that deindustrialization may lower one's potential of economic growth, particularly for developing countries. It may slow down the convergence process of their income level with developed countries. The formal manufacturing sector tends to have the most dynamic technology level compared with other sectors causing it to be a source of unconditional convergence of an economy (Rodrik, 2013). Due to the stagnant performance of manufacturing sector, it can be considered that the economy of Indonesia is deindustrializing. The initial indication is portrayed in Table 2 that the share of manufacturing sector has a persistent decline from the early period until the final period. The declining of this sector causes Indonesia's economy to enter the phase of services economy. However, the shift to services economy without having achieved certain proper level of welfare (measured by proxy of per capita income) is a bad indication for deindustrialized economy (Rodrik, 2016).

Table 2. Development of GDP Share of Manufacturing Sector in Indonesia (National)

Sector	1987	1996	2010	2012	2018
Manufacturing	17.68	24.69	24.64	24.03	23.99
Total	100	100	100	100	100

Note: Other services include the sectors of house-real estate rental, government and land administration, and others. GDP values are in 2010 constant prices.
Source: BPS (Various Years)

Hence, it is necessary to implement identification in detail on the nature of deindustrialization experienced by Indonesian economy.

The disadvantage of deindustrialization might be one of the reasons why Indonesian economic growth level cannot reach 6 percent. This research aims to determine whether the deindustrialization in Indonesia is negative and or premature. The definition of negative and premature deindustrialization will be explained in the Chapter of Method.

A research of deindustrialization in Indonesia was conducted by Andriyani and Irawan (2018). The research examines whether premature deindustrialization occurred in Indonesia in the period of 1986–2015, while negative deindustrialization in Indonesia has not been investigated as far as the writer has explored.

The novelty offered in this research is identifying whether negative deindustrialization is happening in Indonesia. Moreover, related with premature deindustrialization, this research will fill the research gap from Andriyani and Irawan (2018) in several aspects, namely:

This research utilized the data based on real value instead of the nominal one as implemented by Andiryani and Irawan (2018). In this typical research, the use of data based on real value which controls the price fluctuations among the years is relevant for the research with long year periods. It is also performed by study of Castillo and Neto (2016) which was the main reference of Andriyani and Irawan (2018) in identifying premature deindustrialization. Despite using nomimal value might not result a false conclusion, it will still produce an inaccurate threshold.

This research does not merely utilize the national data of manufacturing sector's share and per capita income level when the peak of manufacturing sector's value-added share (peak of industrialization) was achieved by Indonesia to identify the premature deindustrialization occurring in Indonesia; as conducted by Andriyani and Irawan (2018). This study utilized panel data (province level) and conducted regression of the model to produce the estimation value of manufacturing sector's value-added share and per capita income level when the highest manufacturing sector's value-added

proportion is achieved in Indonesia. This method is referring to the method constructed by Rodrik (2016).

An accurate identification of the nature of deindustrialization in Indonesia will be a strong basis for the government to formulate effective policies to improve the economic growth of Indonesia. If the deindustrialization in Indonesia is a natural phenomenon, then the government's focus can be shifted to another sector, for instance service sector (including information and digital telecommunication sector) being a trend in this industry 4.0 era. On the contrary, if it is proven that the deindustrialization in Indonesia is negative and premature, then the government should consider to readopt industrialization politics which successfully gets East Asian countries out from the of lower-middle income nations (Chang, 2003); (Amirapu and Subramanian, 2015).

The term of negative deindustrialization for developing countries is most likely to be firstly proposed by Rasiah (2011). Negative deindustrialization occurs in an economy if the decline of manufacturing sector's value-added is also followed with the lower trade performance and diminishing productivity of manufacturing sector.

There was another author also proposing the term of negative deindustrialization. Yamashita (2014) stated that the nature of deindustrialization is shown by Japan's economy. Yamashita (2014) referred to Bazen and Thirwall (1992), providing the indicators, namely output growth level and declining productivity of the manufacturing sector.

Thus, there is a similarity between the concept proposed by Rasiah (2011) and that of Yamashita (2014), namely: declining of productivity performance. Hence, it can be concluded that there is not any contradiction in those concepts. The Yamashita's concept is already included in the Rasiah's concept.

The term premature deindustrialization, according to Rodrik (2016) is initially introduced by Dasgupta and Singh (2006). Premature deindustrialization is defined as the deindustrialization occurring in several

developing countries while they are still in the much lower per capita income level than that of present developed countries while they were historically starting to deindutrialize.

Rodrik (2016) argued that premature deindustrialization occurring in lower-middle income countries has two dimensions. Firstly, in line with others' arguments in general, their economy suffers from deindustrialization much earlier than the historical norms. Secondly, premature deindustrialization may have negative impacts for economic growth. It is based on several reasons. First, the manufacturing sector tends to be technologically more dynamic than other sectors. It can lead to the convergence phenomena of labour productivity in this sector. Second, the manufacturing sector may absorb a great number of unskilled labours. It cannot be implemented in other sectors which are famous for their high productivity, such as banking, finance, and mining sector. Third, manufacturing sector is a tradable sector. It means that this sector does not have any possible domestic constraints if the domestic economy is dominated by low-income community. It can be tackled with the widening access to export market, mainly the high-income countries. Therefore, manufacturing sector is the most quintessential sector for the economy of developing countries to transform as high-income countries.

There has not been yet any empirical research pertaining to negative deindustrialization in Indonesia as far as the researcher has explored. However, an empirical research on premature deindustrialization has been conducted by Andriyani and Irawan (2018). This research did not refer to the method used by Rodrik (2016). Regarding identification strategy of premature deindustrialization, this research observed the peak of Indonesia's industrialization i.e. the manufacturing sector's share in GDP (national) in the nominal price and per capita income value ($PPP) achieved when the peak of industrialization occured. Afterward, the threshold value of Castillo and Neto (2016) was utilized as the benchmark. This study concluded that the premature deindustrialization occurrs in Indonesia.

RESEARCH METHODS

There are two important terms in this research: negative deindustrialization and premature deindustrialization. Rasiah (2011) explained that negative deindustrialization occurs to one's economy if the decline of manufacturing sector's value added is also followed with the decline of trade performance and productivity of the manufacturing sector.

This study follows the definition of Rasiah (2011) because the concept of Yamashita (2014) is already included in this concept. Besides, the case study of Rasiah (2011) was conducted in a developing country (Malaysia) making this approach more relevant for Indonesia. Finally, the definition from Rasiah (2011) was chosen because the indicators are more comprehensive than those of Yamashita (2014). Practically, descriptive analysis was conducted in this research to identify this negative deindustrialization. The data used are the cross-sectoral data (to determine the share of manufacturing sector compared with the other sectors in Indonesian economy) and intrasectoral manufacture data to examine the three indicators of Rasiah (2011) in the Indonesia's manufacture: value-added decline, trade performance decline, and labour productivity decline in manufacturing sector.

Premature deindustrialization in this research is defined as the deindustrialization experienced by one's economy shifting into service economy without passing through the proper industrialization (Rodrik, 2016). At this point, it should be emphasized that the concept of negative deindustrialization and premature deindustrialization are two different concepts. The core concept of negative deindustrialization lies on the indications of declining value added, trade performance, and labour productivity in manufacturing sector. On the other hand, the essential concept of premature deindustrialization lies on the economy of developing country in which historically has shifted into service economy with a relatively low industrialization level. Consequently, one's economy may suffer from negative deindustrialization without having to suffer from

premature deindustrialization. An example of this case is the Japanese economy (Yamashita, 2014). The threshold of Rodrik (2016) is used in this research due to following considerations:

Other thresholds proposed by Castillo and Neto (2016) and Rowthorn and Coutts (2004) were produced by conducting a polling on several countries without distinguishing whether they are developed countries or developing countries.

The threshold of Rodrik (2016) provided a threshold of share of manufacturing value added compared to that of Castillo and Neto (2016) and Rowthorn and Coutts (2004) which proposed the share of manufacturing employment. According to Tregenna (2008) the threshold of manufacturing value-added is better because the it is very likely that that the share of the manufacturing sector's employment in an economy may be declining but the share of the manufacturing sector's value-added keeps increasing. This approach anticipates factor of technology development that utilize more capital-intensive factor.

Lastly, the threshold of Rodrik is based on the data with the larger sample with more various countries characteristic (developing and developed countries).

The threshold considered as "proper industrialization" here refers to the calculation of Rodrik (2016). It is categorized as proper when the manufacturing sector achieves its peak when per capita income is $47,099 (1990 PPP of international dollar). The threshold value is produced from the regression of empirical model of deindustrialization. Since the threshold value of Rodrik (2016) is adopted in this study, the regression model also refers to the model of Rodrik (2016). The model is as follows:

$$
\begin{aligned}
Mshare_{it} = c_0 + \ & \beta_1 \ln pop_{it} \\
& + \beta_2 (lnpop_{it})^2 + \beta_3 \ln y_{it} \\
& + \beta_4 (lny_{it})^2 + \beta_5 \ln y_{it} P \\
& + \beta_6 (lny_{it})^2 P \\
& + \varepsilon_{it} \dots \dots \dots \dots \dots \dots \dots (1)
\end{aligned}
$$

Mshare is the proportion of manufacturing sector to GDP, *pop* is population, y is per capita income (per capita GRDP) (ln means that the value is in the form of natural logarithm), P is dummy variable for the period after 1990, *Mshare* is the industrialization level of an economy described by the share of manufacturing sector in gross regional domestic product (GRDP) of the provinces in Indonesia. *pop* variable is used as the population control of an economy and y variable is used to control the trend of per capita income. y variable is real gross regional domestic product (with the constant price of 2010 $PPP) of the provinces in Indonesia. Control variable is also involved in the form of square to examine whether the industrialization function is a quadratic function to produce threshold value of peak industrialization. P dummy variable is the period after 1990 to determine if there is any significant difference of industrialization level in 1990 and the previous years. This empirical model uses the panel data of the provinces in Indonesia.

The data required in this research are the national-level data of the value added of manufacturing sector, export and import of manufacturing sector, and labour productivity of manufacturing sector to identify negative deindustrialization. While for the identification of premature deindustrialization, the data required are province-level data of population, per capita income, GRDP, and GRDP of manufacturing sector. Those data are collected from various sources of Badan Pusat Statistik/ Central Agency of Statistics (micro data and publication). In addition, data of $PPP value from World Bank are utilized for the conversion data in local currency to international $ value.

RESULTS AND DISCUSSION

Firstly, the identification of deindustrialization was conducted by observing whether the decrease of manufacturing sector's share on GDP is followed with the decline of trade performance and productivity of manufacturing sector.

Table 3. Development of GDP Share of the Economic Sectors in Indonesia

Economic Sector	1987	1996	2010	2012	2018
Agriculture	20.56	15.03	13.93	13.37	12.27
Mining and Quarrying	16.98	10.64	10.51	9.99	8.03
Manufacturing	17.68	24.69	24.64	24.03	23.99
Electricity, Water, & Gas Supply	1.10	1.26	0.40	0.37	0.34
Construction	4.49	7.46	9.57	9.85	10.31
Trade	16.64	17.47	16.45	16.98	17.55
Transport and Communication	6.16	7.01	7.42	7.97	9.58
Banking and Other Financial Intermediaries	3.70	4.10	3.49	3.62	3.88
Other Services	12.69	12.34	13.58	13.82	14.05
Total	100	100	100	100	100

Note: Other services include the sectors real estate, public administration and defence, and other service activities. GDP values are in 2010 constant prices.
Source: BPS (Various Years)

It can be seen from Table 3 that the share of manufacturing sector in GDP increased from approximately 18% in 1987 to approximately 25% in 2000s. However, it consistently declined until about 24% in 2018, even though it was not as low as its initial value in 1987. If service sector is defined to be consisted of the subsectors of transport-communication, banking and other financial intermediaries, and other services; the share of service sector surpassed that of the manufacturing sector in 2012. In 2012, the service sector contributed 25.41% of the national GDP, while the manufacturing sector only did 24.03%.

Table 4. Development of Average Growth of Sectoral Economy per Year.

Economic Sector	1987-1992	1993-2000	2001-2004	2005-2014	2015-2018
Agriculture	5.18	2.46	3.59	3.10	3.47
Mining and Quarrying	3.51	2.82	-0.98	4.24	1.65
Manufacturing	10.38	7.21	3.59	5.11	4.90
Electricity, Water, & Gas Supply	13.20	-0.67	7.68	-2.20	3.09
Construction	10.08	4.89	5.26	14.53	5.58
Trade	8.24	3.06	7.03	4.92	5.80
Transport and Communication	8.33	1.22	8.37	9.60	8.29
Banking and Other Financial Intermediaries	8.21	7.22	4.81	4.05	6.25
Other Services	4.73	4.37	5.53	7.05	5.21
Total	6.97	3.80	4.26	5.63	5.04

Source: BPS (Various Years)

The industrialization progress was quite high during the New Order era, then it drastically shrunk during the era of post-reformation and political unstability (until 2004). It bounced back with the average growth rate of 5% in 2005 – 2014, meaning that it was not able to reach the growth rate per year as it was before the era of economic crisis in 1997 – 1998. The deindustrialization trend is evident from the declining growth rate of manufacturing sector to 4.9% from 5.1% after 2015. The sectors experiencing the positive trend after 2015 are agriculture, trade, and banking-other financial intermediaries. Regarding data of intrasectoral

of the manufacturing, actually there is a quite positive shift of the industrial structure of Indonesian economy. It can be seen from Table 5 that the share of technology-knowledge intensive subsector keeps increasing. It is also seen that the share of chemicals and metal products, machinery, and equipment (including electronic goods) subsector increases and the share of food, beverages, and tobacco subsector decreases.

Table 5. Development of Value-Added Share of Manufacturing Subsectors

Manufacturing Subsector	1987	1996	2010	2017
Manufacture of food, beverages, and tobacco	28.19	18.85	25.46	22.88
Textile, wearing apparel, and leather industries	12.57	17.05	9.70	12.58
Manufacture of wood and wood products, including furniture	12.07	7.35	1.60	2.05
Manufacture of paper and paper products, printing, and publishing	3.69	5.16	6.05	4.37
Manufacture of chemicals and chemical, petroleum, coal, rubber, and plastic products	15.05	13.06	19.62	19.28
Manufacture of non-metallic mineral products, except products of petroleum and coal	4.66	4.02	3.74	6.76
Base metal industries	9.68	10.55	3.57	3.96
Manufacture of fabricated metal products, machinery and equipment	13.69	23.23	28.24	26.35
Other manufacturing industries	0.40	0.73	2.02	1.76
Total	100	100.0	100	100

Source: Indicators of Industry by BPS (Various Years)

On one hand, the structure of manufacturing industry is getting more dominated by subsectors having high value added; on the other hand, based on macro data reflecting the declining share of manufacturing sector for Indonesian economy, there is an indication that the growth rate of each is not as fast as that of the previous years.

Table 6. Development of Average Growth of Value-added per Year of Manufacturing Subsectors

Manufacturing Industry Subsector	1988-1996	1997-2004	2005-2010	2011-2018
Manufacture of food, beverages, and tobacco	21.24	23.46	17.12	15.06
Textile, wearing apparel, and leather industries	31.55	16.64	12.54	20.76
Manufacture of wood and wood products, including furniture	19.42	14.97	-2.51	21.64
Manufacture of paper and paper products, printing, and publishing	31.66	26.73	11.38	13.04
Manufacture of chemicals and chemical, petroleum, coal, rubber, and plastic products	24.26	22.05	21.88	16.67
Manufacture of non-metallic mineral products, except products of petroleum and coal	25.44	21.82	12.61	26.53
Base metal industries	30.27	8.09	17.42	18.76
Manufacture of fabricated metal products, machinery and equipment	34.54	20.24	20.14	15.40
Other manufacturing industries	39.82	43.07	18.80	15.81
Total	26.17	19.13	16.56	16.28

Source: Indicators of Industry by BPS (Various Years)

Table 6 shows that in total, the manufacturing's average growth of value-added per year keeps declining. Since 2011 (post 2008/2009 crisis) the highest average growth per year is achieved by manufacture of non-metallic mineral product (natural resources based). Textile, wood products, and base metal manufactures also experience improvement of average growth per year. However, the growth of chemicals and fabricated metal products, machinery and equipment manufacturing subsectors (possessing high value added) keep having declining trend.

Table 7. Average Growth of Trade Balance per Year

Product Section	1987-1996	1997-2004	2005-2010	2011-2018
Live Animals; Animal Product	0.71	0.59	0.22	0.17
Vegetable Products	0.07	-0.30	-0.31	-0.39
Fats, Oils, Waxes of Animal/Vegetable	0.73	0.96	0.98	0.98
Prepared Foodstuffs, Beverages, Spirits, and Tobacco	0.10	0.02	0.00	-0.08
Mineral Products	0.66	0.45	0.35	0.29
Products of Chemical or Allied Industries	-0.65	-0.35	-0.34	-0.26
Plastics, Rubber, and Articles Thereof	0.10	0.29	0.29	0.02
Raw Hides, Skins, Leather, and Articles Thereof	0.13	0.22	0.03	-0.27
Wood and Its Articles, Wickerwork, etc.	0.98	0.94	0.83	0.79
Pulp, Paper, and Articles Thereof	-0.25	0.39	0.41	0.30
Textiles & Textile Articles	0.40	0.55	0.51	0.19
Footwear, Umbrellas, Artificial Flowers, and etc.	0.81	0.89	0.86	0.78
Articles of Stone, Cement, Mica, Ceramic, Glass, and etc.	-0.04	0.38	0.31	-0.12
Pearls, Precious/Semi-Precious Stones, Precious/Semi-Precious Metal, and etc.	0.89	0.96	0.90	0.79
Base Metals and Articles Thereof	-0.36	-0.15	0.13	-0.14
Machinery, Electrical Equipments, and Accessories of Such Articles	-0.78	0.00	-0.11	-0.42
Vechiles, Aircraft, Vessels, and etc.	-0.82	-0.54	-0.45	-0.32
Optical, Photographic, Musical Instruments, Watches, and etc.	-0.60	0.04	-0.15	-0.39
Arms and Amunition; Parts & Accesesories	-0.93	0.32	-0.89	-0.98
Miscellaneous Manufactures Articles	0.58	0.81	0.65	0.30
Works of Art, Collector Pieces, and Antiques	0.11	0.32	0.30	0.37
Total	0.11	0.27	0.14	0.01

Note: 21 sections based on CCCN (Customs Cooperation Council Nomenclature). Trade balance formula: (Export-Import)/(Export+Import).
Source: Statistics of Foreign Trade by BPS (Various Years)

Based on the trade sector (Table 7), the superior products of Indonesia are fats, oils, waxes of animal/vegetable, wood products, footwears and thereof, and stones-precious metals (positive number means that Indonesia as the net exporter). Of those which can be categorized as manufacturing industry are only woods products and footwears manufacture. Textile industry has once ever been the superior one, yet since 2011 its average value of trade balance per year has been decreasing about more than its half value in the previous periods. Another superior product is the products based on natural resources extraction. On the contrary,

Indonesian economy still becomes the net importer for high value-added industries such as chemicals, machinery, vehicle, optical, photographic, musical instruments, watches, and arms-ammunitions.

The subsector experiencing the improving trend is the fats, oils, and animal/vegetable waxes which consists of coconut palm oil (CPO), a superior product of Indonesia. Superior industries such as wood products, textile, footwears, and thereof have declining trend after 2011. The manufactures of chemicals and vehicle have improving trend, while other industries such as food, plastics-rubber, pulp-paper, stones-precious metal, machinery, optical, photographic, musical instruments, watches, and ammunitions-weapons have declining trend. Consequently, in post 2011, most manufacturing sectors have declining trade performance. In total, trade balance (including non-

manufacturing products) also shows a declining trend. Concerning the labour productivity (Table 8), it can be seen that the subsectors possessing increasing average growth of labour productivity, compared to its state in the early period (1988 – 1996), are the manufacturing sectors of woods and textile.

One of the subsectors experiencing improvement of average growth of labour productivity in post 2011 compared to its previous period (2005 – 2010) is the sector of non-metal mining products (excluding petroleum and coal) only, which is the industry based on natural resources extraction. The industries having high value added, for instance industry of metal, machinery, and equipment industries are constantly declining during the whole periods. In total, the average growth of labour productivity of the whole sector experiences declining trend in the post 2011.

Table 8. Development of Average Growth of Labour Productivity per Year

Subsector Manufacturing Industry	1988-1996	1997-2004	2005-2010	2011-2017
Foodstuffs, Beverages, and Tobacco	16.17	20.55	15.96	11.42
Textile, Ready-to-Wear Clothes, and Leather	15.76	18.41	11.47	16.13
Woods and Wooden Products	7.56	22.54	18.23	19.73
Paper and Paper Products, Printing, and Publishing	18.22	26.26	11.11	9.03
Chemicals and Chemical Products, Petroleum, Coal, Rubber, and Plastic Products	16.15	20.36	20.78	12.74
Non-Metal Mining Products, Except Petroleum and Coal	89.00	23.65	12.95	25.36
Heavy Metal	16.65	5.70	14.15	14.80
Metal Products, Machinery, and Equipments	20.45	19.17	17.24	9.72
Other Manufacturing Industries	17.21	16.53	11.72	15.35
Total	14.96	13.86	14.05	12.83

Note: The formula of productivity used is value added/labour.
Source: Indicators of Industry by BPS (Various Years)

Based on the descriptive analysis above, this research reveals that there is declining value added of the manufacturing sectors in Indonesian economy followed with the declining trade performance and productivity of manufacturing sectors. The deminishing of trade performance is

shown by the declining average trade balance of the whole commodities, while the declining manufacturing productivity is also reflected by the declining average growth of the labour productivity per year on the whole manufacturing sector. Moreover, regarding the

subsector analysis, it can be seen that most high-tech subsectors which are associated with high value added have consistently-negative trend on trade performance and labour productivity compared to the initial period of research. This finding is similar to the findings of the research conducted by Rasiah (2011) for the case of Malaysia and the research conducted by Nazeer and Rasiah (2016) for the case of Pakistan. All those countries are experiencing negative deindustrialization.

Secondly, in order to prove that premature deindustrialization occurs in Indonesia, regression analysis of equation (1) was conducted. By using the panel data, the model selection was conducted based on the theory explained by Gujarati (2003). Firstly, Chow Test (F-restricted) was conducted to select between the Pooled Least Square or Fixed Effect (FE). H_0 (PLS) was rejected (Prob > F=0.0058, less than the alpha value), meaning that FE model was chosen. Hausman test was then conducted to choose between the model of Fixed Effect (FE) or Random Effect (RE). H_0 (RE) was rejected (Prob > chi2=0.0000, less than the alpha value), meaning that FE model was chosen. Thus, all of the statistial tests consistently proved that Fixed Effect provides a more consistant estimation.

Table 9. Regression Result of Deindustrialization Equation (1)

Independent Variable:	Dependent Variable: Manufacture Share (share on real GRDP)		
	(1)	(2)	(3)
ln per capita GRDP	0.4527**	0.4456**	0.4964**
	(0.2098)	(0.1979)	(0.2167)
ln per capita GRDP square	-0.0253*	-0.0259**	-0.0297**
	(0.0124)	(0.0122)	(0.0133)
ln Population		-1.5361***	-1.5802***
		(0.4885)	(0.5142)
ln Population square		0.0518***	0.0528***
		(0.0175)	(0.0181)
ln per capita GRDP X post 1990			-0.0121
			(0.0119)
ln per capita GRDP square X post 1990			0.0017
			(0.0015)
Constant	-1.8593**	9.5624**	9.8454**
	(0.8817)	(3.4310)	(3.6588)
Provincial Fixed Effect	Yes	Yes	Yes
Number of Province	26	26	26
Number of Observation	832	832	832
Within R^2	0.0598	0.1559	0.1686
Adj R^2	0.0575	0.1518	0.1626

Note: Levels of statistical significance: ***99%, **95%, *90%. Robust standard errors are reported in parentheses (clustered by 26 provinces).

The cluster of 26 provinces was conducted to produce a robust and efficient standard error on the heteroskedasticity and autocorrelation problems (Baum, 2006). It is evident that the value of independent variable's coefficient in the robust model is at least one digit after decimal point. Considering the R^2 value and its accordance with the model proposed by Rodrik (2016) in constructing the threshold, model (3) was chosen in this research analysis. Model (3) refers to the model of Rodrik (2016) used to produce a threshold to determine whether one's economy suffers from premature deindustrialization. The population variable is included in the model to control the demographic factor (Rodrik, 2016). The dummy variable with the separating year of 1990 was not proven statistically significant. It means that the year of 1990 is not significant in explaining the difference of industrialization rate in Indonesian provinces. The variable of per capita GRDP has positive impact on the variable of manufacturing share in

economy. It confirms the Engel's Law which explained that as the income increases, the agricultural product demand decreases (shifting to the demand of -one of them- manufacturing product) (Hamilton, 2001). The coefficient of the

per capita GRDP square variable is negative. It means that the relationship between industrialization rate and per capita GRDP forms inverted U-shaped curve.

Table 10. Description of Manufacturing Share by Provinces in Indonesia and Per Capita GRDP

Variable	Number of Observation	Means	Min	Max
Manufacturing share	832	0.152	0.012	0.475
ln per capita GRDP	832	8.688	7.082	10.788

Based on the regression model (3), a pattern as shown in Figure 1 can be simulated. This simulation is obtained from the fitted value of thedependent variable (produced after regressing model 3) and the matrix of 1n per capita GRDP variable and 1n per capita GRDP square variable. As seen in Table 11, it is evident that the fitted value achieved by both the maximum share of manufacturing on GRDP of Indonesian provinces and the per capita income level when reaching the peak of industrialization are still lower than threshold proposed by Rodrik (2016). Even by using the post-1990 threshold (meaning that the threshold used is the level of late industrializers nations while achieving its industrialization peak after 1990), the value of Indonesia's industrialization peak is still around $\frac{3}{4}$ of that threshold value.

This confirms the findings of the research conducted by Andriyani and Irawan (2018) showing that the premature deindustrialization is existing in Indonesia's economy, even though this research implements different method in identifying premature industrialization (according to Rodrik (2016), his method will be more systematic in producing the threshold value for premature deindustrialization of one's economy). Another threshold value is proposed by Castillo and Neto (2016) which is in the range from 10,000 to 15,000 (1990$) equivalent with the value of 15,095 to 22,642 (2010$). This value according to Castillo and

Neto (2016) refers to the experience of industrialization history of industrial countries in East Asia. If this threshold value is used, the peak industrialization of Indonesia occured when its income was around $\frac{2}{5}$ of the lowest threshold (10,000 1990$). It means that even by using a relatively low threshold value, Indonesian economy is still categorized as suffering from premature deindustrialization.
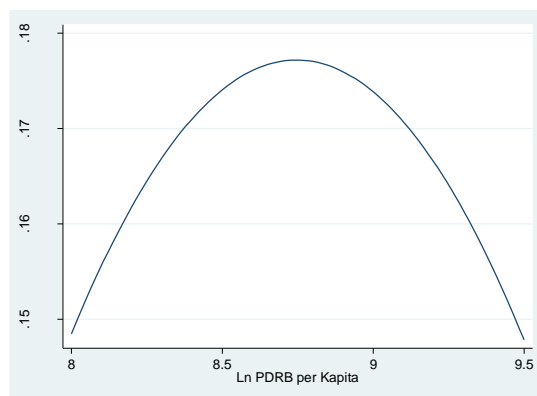

Figure 1. Simulation of Manufacturing Share on per Capita GRDP

Based on the simulation above, the peak of industrialization in Indonesia is located in the point of 1n per capita GRDP*=8.746 and the manufacture share*=18%. The comparison to the threshold value proposed by Rodrik (2016) in identifying premature deindustrialization is presented in Table 11.

Table 11. Indonesia's Deindustrialization and Threshold of Premature Deindustrialization based on Rodrik (2016)

Criteria	This Research	Rodrik's Threshold for pre- 1990 industrializers	Rodrik's Threshold for post- 1990 industrializers
Maximum share	18%	27,9%	24,1%
Reached at income level (per capita in 2010 international $)	6285	47099 (1990 international $) = 71094.88 (2010 international $)	20537 (1990 international $) = 31000.13719 (2010 international $)

Therefore, the nature of Indonesian deindustrialization based on the findings of this research is negative and premature. It is quite worrisome. Several research since several decades ago, which constructed its conceptual framework based on the research conducted by Chenery and Syrquin (1989), such as: Murphy, et. al. (1989) and Matsuyama (1991); or on the Kaldorian tradition, such as: Mamgain (1989), Felipe (1998), Wells and Thirwall (2004), Marconi, et. al. (2016); still consistently conclude that manufacturing sector is still an engine of growth for the economy of developing countries. Haraguchi, et. al. (2017) even emphasized the significance of manufacturing sector which has been irreplaceable since 1970s.

Hence, regarding of the policy implication of this study, the results suggest the policy makers to implement reindustrialization politics. Several policy aspects which can be implemented to improve the performance of manufacturing sectors are: on the supply side, the government could improve industrialization by keep strengthening the cooperation with non-conventional trade partner countries, for instance South Asian countries (Pakistan and Bangladesh) and African countries for exporting the products of Indonesian manufacturing sectors. On the supply side, the government needs to facilitate and improve the investment of manufacturing sector in Indonesia, including foreign capital investment. Deregulating the local regulations overlapping the state regulations might be the priority. This is also to absorb the technological advantage possessed by foreign companies and to benefit technological spillover (Suyanto, et. al., 2012) for the domestic supplying companies.

Moreover, the presence of foreign companies which export-oriented may also improve the participation of Indonesian economy in the global value chain and thus expand the market of Indonesia's manufacture product. Tax incentives and export subsidy for manufacturing companies are also beneficial for the companies operating in Indonesia in order to be able to operate more efficiently, which may also be followed with the expansion to other sectors providing high value added.

CONCLUSION

This study reveals that the share of manufacturing sectors in Indonesian economy is constantly declining and it is also followed with the declining value added of the manufacturing sectors (including those possessing high value added). The trade performance of manufacturing sectors' products is also declining. The average productivity in manufacturing sectors (including the high value-added subsectors, for instance the subsectors of chemicals and metal articles thereof, machinery, and its equipments) is declining as well. This typical deindustrialization, according to Rasiah (2011), deserves to be categorized as negative deindustrialization. Meanwhile, premature deindustrialization is proven by the fact that the peak of industrialization in Indonesia was reached when its per capita income (per capita GRDP) was lower than threshold value proposed by Rodrik (2016), even referring the threshold for the post-1990 industrializers.

Since Indonesian economy suffers from negative and premature deindustrialization, the suggested policy implication is to reenact

reindustrialization policy in Indonesia. Several aspects of policy can be implemented. On the demand side, it is important to expand the export market of Indonesia's manufacturing product. On the supply side, attracting foreign direct investments which bring cutting-edge technology and providing various incentives for the efficiency of the company should be considered.

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