Risk of premature deindustrialization: the case of the latecomer's developing countries in Asia

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Abstract

This paper aims to examine the risk of premature deindustrialization in the latecomer's developing countries in Asia with a focus on manufacturing output ratio by using the latecomer's index. This study's contributions are to target Asian economies that were treated as a group with comparative advantages in manufacturing by previous studies, and to adopt the latecomer's index to show downward shifts of the latecomer's manufacturing-income relationship that implies the existence of premature deindustrialization risk. The empirical analysis identified the downward shifts of manufacturing-income relationship in globalization processes, i.e., premature deindustrialization risk in the latecomer's developing countries in Asia, and also showed that the risk was higher in the manufacturing trade-deficit countries than the trade-surplus ones, and in South Asian countries than in Southeast countries. The strategic policy direction in the latecomers who have faced premature deindustrialization risk is to facilitate their participations in global value chains to mitigate and avoid the risk.

Keyword: Premature deindustrialization, Latecomers, Developing countries in Asia, Manufacturing output, Global value chains

JEL Classification Codes: O14, O53, F10

1. Introduction

The “premature deindustrialization” has been referred to as the economic phenomena that developing countries are turning into service economies without having gone through a proper experience of industrialization (see e.g., Dasgupta and Singh 2007, and Rodrik 2016). Advanced countries have already been stepping into a post-industrial phase of development for decades, according to the ordinary Petty–Clark’s Law (see Clark 1940). The deindustrialization in advanced countries has been accompanied with labor productivity improvements in manufacturing sectors, thereby leading to the loss of employment rather than output industrialization. On the other hand, the “premature” deindustrialization represents that since the 1980s developing countries have experienced the shrinking of manufacturing in both employment and output, sooner at much lower levels of income with their much lower shares compared to early industrializers, as Rodorik (2016) described.

The question then arises as to how serious effects premature deindustrialization would cause for the economic development in developing countries. Its detrimental effects on their economic growth are easily speculated, because the manufacturing sector is considered to be an engine of economic growth. For instance, Kaldor (1967), identifying the manufacturing as the sector embodying larger spillover effects and more “learning by doing” than other sectors, demonstrated the so-called Kaldor’s law: the larger the positive gap between the growth rate of the manufacturing sector and that of GDP, the higher the growth rate of the economy as a whole; the productivity growth of the manufacturing sector is faster when its output growth rate is faster; and the productivity of the non-manufacturing sector positively correlates with the growth rate of the manufacturing sector. Rodrik (2013) argued that the manufacturing sectors show unconditional labor productivity convergence; the manufacturing absorbs more unskilled labor than other sectors; and the manufacturing does not face the demand constraints of a home market due to its tradability in international markets. Thus, premature deindustrialization would remove all the channels above through which the manufacturing accelerates economic development, and thus block off the main avenue of rapid economic convergence in developing countries.

Another critical issue is the mechanism of premature deindustrialization in developing countries, which is different from that of the deindustrialization in advanced countries. A theoretical framework to account for the difference was presented by Rodorik (2016) as follows: the major factor for the deindustrialization in advanced countries is productivity improvements, which reasonably explain the labor displacement from manufacturing; on the other hand, developing countries except those with a strong comparative advantage in manufacturing have to "import" deindustrialization from advanced countries, as price takers in the world market under globalization, which leads to the deindustrialization in both employment and output (the theoretical model will be described in Section 3).

From the geographical perspective, Dasgupta and Singh (2007) argued that Latin American and African countries have suffered from the "pathological" deindustrialization due to specializing in their current comparative advantages and ignoring long-term dynamic comparative advantages, while East Asian countries have been able to focus on knowledge-based industries under industrial policies. Rodrik (2016) also emphasized that low- and middle-income countries in Latin America and Sub-Saharan Africa have been hard hit by premature deindustrialization, whereas Asian countries with comparative advantages in manufacturing have been insulated from its trend. Thus, it has so far been recognized commonly by empirical studies that Asian economies are outside of the scope of the issue on premature deindustrialization. Shedding light on individual Asian countries, however, there are a variety of economies with much different stages of development, some latecomers of which might be exposed to the danger and risk of premature deindustrialization.

This paper aims to examine the risk of premature deindustrialization in the latecomer's developing countries in Asia by using the latecomer's index. This study focuses on manufacturing output, not employment, because the deindustrialization in output is typical in developing countries while being ambiguous in advanced countries, whereas the deindustrialization in employment are common in both groups of countries. The latecomer's index in a certain year is shown by the ratio of the GDP per capita of a developing country relative to that of a benchmark country (China in this study) in that year. Suppose the relationship between industrialization (measured by manufacturing ratio) and GDP per capita. If the relationship for a latecomer denoted by the latecomer's index shift downward from that of the benchmark country, it implies the existence of premature deindustrialization risk. It is because under its downward shift of a latecomer, the latecomer would face lower manufacturing ratio than that of the benchmark country when it reaches the same GDP per capita as that of the benchmark country, and it suggests that the manufacturing ratio of the latecomer would peak out at the lower level than that of the benchmark country. The paper also proposes a policy direction to mitigate premature deindustrialization risk from the viewpoint of a participation in global value chains (GVC).

The remainder of the paper is structured as follows. Section 2 reviews the literature related to the issue on premature deindustrialization and clarifies this study's contributions. Section 3 presents a theoretical framework of premature deindustrialization in developing countries based on Rodorik (2016). Section 4 conducts an empirical analysis to verify the risk of premature deindustrialization in the latecomer's developing countries in Asia, and proposes a policy direction to mitigate the risk from the viewpoint of a participation in GVC. Section 5 summarizes and concludes.

2. Literature Review and Contributions

This section reviews the literature related to the issue on premature deindustrialization and clarifies this study's contributions.

The term "premature deindustrialization" was first used by Dasgupta and Singh (2007). However, they focused only on employment, not output, in their discussion on the fall in the share or the absolute number of manufacturing, and argued that the manufacturing fall is not necessarily pathological phenomenon: whereas in Latin American and African countries the deindustrialization have been pathological, in India the services connected with information technology have been regarded as a new engine of growth. Rodorik (2016) refined the arguments of premature deindustrialization, and described it as the earlier shrinking of manufacturing in "both" employment and output in developing countries through a theoretical model and empirical estimations. Its empirical estimation identified the following results: late industrializes reach peak levels of industrialization measured by manufacturing employment and output shares, which are lower than those experienced by early industrializes; these peak levels are reached at lower levels of incomes (the post-1990 peak incomes are around forty percent of the pre-1990 ones; looking at the geographical patterns, Latin America and Sub-Saharan Africa among the developing regions have been hard hit by premature deindustrialization, whereas Asian countries with comparative advantages in manufacturing have managed to avoid this trend; and with respect to employment deindustrialization by skill groups, the entire manufacturing employment losses have come in the low-skill category, whereas the high-skill employment has increased over time. Rodorik (2016) also presented a simple two-sector model to uncover the mechanism of premature deindustrialization in developing countries with the "import" deindustrialization from advanced countries, which will be explained in Section 3. Sato and Kuwamori (2019), applying the method of Rodorik (2016) to their estimation with expanded samples, found that both peak level of the share of manufacturing employment and output and corresponding income are lower in developing countries (non-OECD) than in developed countries (OECD), suggesting the phenomenon of premature deindustrialization.

There have also been some counterarguments against the detrimental impacts of premature deindustrialization on economic development. Nayyar et al. (2018), for instance, argued that some features of manufacturing that were thought of as uniquely special for development, such as scale economies and innovation, are increasingly shared by services sector such as the ones with information and communication technology. Ravindran and Babu M (2021) suggested from their findings that even in the presence of premature deindustrialization, income inequality would be reduced if the displaced workers were absorbed into high-productivity services sectors such as banking, finance, and administrative and other professional service activities.

There have been also region- and country-specific studies on premature deindustrialization, and most of them have provided evidence to support its existence. For Latin America, Castillo and Neto (2016) argued that Argentina, Brazil and Chile faced premature deindustrialization, increasing their specialization in commodities, resource-based manufactures and low productivity services. As for Sub-Saharan Africa, Imbs (2013) pointed out that the deindustrialization of Sub-Saharan Africa has been often associated with the rising importance of extractive activities in its economy. Regarding country-specific studies, the existence and symptom of premature deindustrialization were identified in Malaysia (Rasiah 2011), in Indonesia (Andriyani and Irawan 2018, and Iskami and Hastiadi 2020), and in Pakistan (Hamid and Khan 2015).

This study basically follows the concept and empirical framework of premature deindustrialization in Rodorik (2016), although analytical concerns are different from the literature reviewed above. The contributions of this study are highlighted as follows. First, this study, different from previous studies, targets Asian individual economies and compares the deindustrialization processes between the forerunners and latecomers in economic development. Dasgupta and Singh (2007) and Rodrik (2016) treated Asian economy as a group with comparative advantages in manufacturing, did not get into the heterogeneity of Asian individual economies with different stages of development. The other studies, though having dealt with Asian individual economies such as Malaysia, Indonesia and Pakistan, conducted country-specific analyses and not comparative ones among their economies. Second, this study uses the latecomer's index instead of simple time dummies inserted in previous studies, to examine the risk of premature deindustrialization in the latecomer's developing countries in Asia. The adoption of latecomer's index in empirical estimations makes it possible to identify the downward shift of the latecomer's manufacturing-income relationship, that is, their symptom of premature deindustrialization. Third, this study extends the argument from the risk of premature deindustrialization to a policy direction to mitigate and avoid the risk from the viewpoint of a participation in GVC.

3. Theoretical Framework of Premature Deindustrialization

This section presents a theoretical framework of premature deindustrialization in developing countries based on Rodorik (2016). The framework constitutes a simple two-sector model. Suppose that the economy is divided into manufacturing (*m*) and non-manufacturing (*n*) with a constant labor force fixed at unity. The share of employment in the manufacturing sector is shown by α. Then, production functions in the two sectors with diminishing marginal returns to labor are written as follows:

$$q^{s}_{m} = \theta_m \alpha^{\beta m} \qquad (1)$$

$$q^{s}_{n} = \theta_n (1 - \alpha)^{\beta n} \qquad (2)$$

where q^{s}_{m} and q^{s}_{n} are the supplies of manufactures and non-manufactures, respectively; θ_m and θ_n are parameters denoting the productivity of the two sectors; and β_m and β_n are technological constants between 0 and 1. The demand side is shown in rates of change form, with a "dot" above a variable representing proportional changes ($\dot{y} = dy/y$):

$$\dot{q}^{d}_{m} - \dot{q}^{d}_{n} = -\sigma (\dot{p}_m - \dot{p}_n) \qquad (3)$$

where p_m and p_n are the prices of manufactures and non-manufactures, respectively; and σ is the elasticity of substitution in consumption between the two goods. Then, two goods-market clearing equations are as follows:

$$q^{d}_{m} + x = q^{s}_{m} \qquad (4)$$

$$q^{d}_{n} = q^{s}_{n} \qquad (5)$$

where x stands for the net exports of the manufactured good (for simplicity, trade non-manufactures is assumed to be balanced). Labor is fully employed and mobile between the two sectors. This leads to the labor-market equilibrium, which equates the value marginal product of labor in the two sectors:

$$\beta_m p_m \theta_m \alpha^{\beta m-1} = \beta_n p_n \theta_n (1 - \alpha)^{\beta n-1} \qquad (6)$$

For relative prices, the non-manufactured good is treated as be the numeraire, so that p_n can be fixed at unity. Thus, the model has seven endogenous variables: α, $q^d{}_n$, $q^s{}_n$, $q^d{}_m$, $q^s{}_m$, p_m and x. Here this study makes one extreme assumption for the case of developing countries: the economy is sufficiently small and open that it remains a price taker in world markets (so that x is endogenous and p_m is a parameter). Under this assumption, the comparative statics for the output share of manufacturing ($d\alpha_q$) is expressed as follows:

$$d\alpha_q = \alpha_q\,(1-\alpha_q)\,[(\lambda / (1-\lambda))\,\dot{p}_m + (1 / (1-\lambda))\,(\dot{\theta}_m - \dot{\theta}_n)] \qquad (7)$$
$$\lambda = (1-\alpha)\,\beta_m + \alpha\,\beta_n$$

The equation suggests that an increase in the relative price of manufacturing and technological progress in manufacturing over that in non-manufacturing have positive effect on the output share of manufacturing. From this equation, premature deindustrialization in small-open developing countries are interpreted as follows. As long as the global supply of manufactures exceeds supply of non-manufactures with technological progress in manufacturing, all countries face a decline in the relative price of manufactures ($\dot{p}_m < 0$) under globalization processes. In this case, those price takers with less technological progress in manufacturing suffer declines in the output share of manufacturing ("imported" deindustrialization), and only those countries with the more productivity growth in manufacturing that offsets the effect of its relative-price decline (with having a comparative advantage in manufacturing) can avoid the imported deindustrialization.

4. Empirical Analysis on Risk of Premature Deindustrialization

This section conducts an empirical analysis to verify the risk of premature deindustrialization in the latecomer's developing countries in Asia, and proposes a policy direction to mitigate the risk from the viewpoint of a participation in GVC. Before conducting econometric estimations, the section starts with a simple observation of the relationship between manufacturing output ratio and GDP per capita for 14 Asian emerging and developing economies.

4.1 Observation on Trend in Manufacturing Output Ratio

The observation targets the period between 1970 and 2018, and 14 Asian emerging and developing economies: China in East Asia; Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, The Philippines, Thailand, and Vietnam in Southeast Asia; and Bangladesh, India, Nepal, Pakistan, and Sri Lanka in South Asia. Their manufacturing-income relationship is described in Figure 1, with real GDP per capita in the horizontal axis and with real and nominal output ratios of manufacturing in the vertical axis. All the data are retrieved from UNCTAD Stat[1]: "real" value from the series of constant (2015) prices and "nominal" one from current prices.

The upper part and lower part in Figure 1 show the cases of real and nominal output ratios of manufacturing, respectively. The shape of trajectories are different between them: the case of real output displays totally increasing trends in individual trajectories, while the case of nominal output reveals hump-shaped curves in most of trajectories. The difference seems to come from the fact that nominal output of manufacturing is affected by the price decline through the productivity growth in the sector, while the real output is not. The location of each economy's trajectory is, however, almost the same between the two cases. Thus, the observation of the trajectory's location can be focused on the case of real output ratio of manufacturing.

Except for Malaysia, with China being a benchmark, the other latecomers appear to have experienced less output ratio of manufacturing along with the development process of GDP per capita. In other words, the latecomer's manufacturing-income trajectories tend to shift downward. Although the downward shift in latecomers implies the existence of premature deindustrialization risk, the latecomer's shifting patterns should be further put in an econometric test by controlling for income and demographic trends and by using the latecomer's index.

4.2 Econometric Analysis: Methodology and Data

This subsection conducts an econometric analysis to verify the risk of premature deindustrialization in the latecomer's developing countries in Asia. The baseline regression is based on Rodorik (2016) and Sato and Kuwamori (2019), but is modified for this study's analytical concerns as follows:

$$man_{it} = \gamma_0 + \gamma_1 \ln pop_{it} + \gamma_2 (\ln pop_{it})^2 + \gamma_3 \ln ypc_{it} + \gamma_4 (\ln ypc_{it})^2 + \varphi_1\, lac_{it} + \varphi_2\, lac_{it}*d90 + \varphi_3\, lac_{it}*d00 + f_i + f_t + \varepsilon_{it} \qquad (8)$$

where the subscripts i and t denote countries (14 Asian emerging and developing

[1] See the website: https://unctadstat.unctad.org/EN/.

economies presented in Section 4.1) and years (for 1970-2018), respectively; *man* stands for output ratios of manufacturing; *pop* and *ypc* show a country's population size and real GDP per capita; *lac* denotes the latecomer's index; *d*90 and *d*00 represents time dummies for 1990-2018 and for 2000-2018, respectively; f_i and f_t show a time-invariant country-specific fixed effect and a country-invariant time-specific fixed effect, respectively; ε denotes a residual error term; $\gamma_{0 \ldots 4}$ and $\varphi_{0 \ldots 3}$ stand for estimated coefficients, respectively; and ln shows a logarithm form.

The variable with the greatest concern in Equation (8), which differentiates the specification from those of Rodorik (2016) and Sato and Kuwamori (2019), is the latecomer's index (*lac*). The index represents the later degree of a country's development, and is computed by the ratio of the GDP per capita of a certain country relative to that of a benchmark country (China in this study) in a certain year. The significance and sign of the coefficient of the latecomer's index (φ) are critical for identifying premature deindustrialization risk: a significantly positive sign of φ, i.e., a linkage of a later development of a country with a lower manufacturing output ratio (a downward shift of manufacturing-income relationship) could be a proof of the existence of premature deindustrialization risk. It is because its downward shift suggests that a manufacturing ratio of a latecomer would peak out at a lower level than that of the benchmark country. The latecomer's effect on manufacturing-income relationship seems to be affected also by globalization processes the latecomer has faced. Thus, the equation contains the cross-terms of the index (*lac*) and time dummies for 1990-2018 (*d*90) and for 2000-2018 (*d*00).[2]

Regarding the variables to control income and demographic trends, for seeing an inverted U-shaped relationship between a country's manufacturing output ratio and real GDP per capita, $\gamma_1, \gamma_3 > 0$ and $\gamma_2, \gamma_4 < 0$ are supposed to hold significantly. Another factors to be controlled in the specification are country-specific and time-specific effects represented by f_i and f_t, respectively, for panel estimation. From the statistical perspective, the Hausman-test statistic is generally utilized for the choice between a fixed-effect and a random-effect (Hausman 1978). This study, however, places a premium on the existence of exogenously given country-specific and time-specific factors. Suppose that such factors as geography, endowments, history and political system differ among sample countries and are correlated with manufacturing output ratios (not distributed randomly among sample countries). Suppose also that economic fluctuations due to external shocks such as the Asian financial crises in 1997–1998 and the global financial crises in 2008–2009 affected manufacturing activities. As a specification that ignores these effects leads

[2] Rodorik (2016) also regarded the post-1990 period as the one in which globalization gathered speed.

to an inefficient estimation, they should be controlled by equipping country-specific and time-specific fixed effects in the specification.

All the data for the estimation of Equation (8), manufacturing output ratio, population, GDP per capita are retrieved from UNCTAD Stat with "real" value from the series of constant (2015) prices and "nominal" one from current prices, as Section 4.1. The descriptive statistics for the data are presented in Table 1. The study then constructs a set of panel data of 14 Asian emerging and developing countries for 1970-2018.

4.3 Econometric Analysis: Results and Discussions

Table 2 reports the estimation results: Table 2-1 shows the two cases with a dependent variable being "real" and "nominal" output ratios of manufacturing. Focusing on the real output ratio of manufacturing, Table 2-2 divides the sample countries into those with trade deficit and those with trade surplus in manufactures, and Table 2-3 divides the samples into South Asian countries and Southeast Asian ones. In the majority of cases, γ_1, $\gamma_3 > 0$ and γ_2, $\gamma_4 < 0$ holds significantly, so that inverted U-shaped relationships between a country's manufacturing output ratio and real GDP per capita are identified.

Starting with Table 2-1, in both cases with real and nominal manufacturing output, the coefficients of the latecomer's index (*lac*) with the post-1990 and post-2000 dummies (*d*90 and *d*00) are significantly positive, while the ones without time dummy are negative. In addition, the magnitudes of positive coefficients are much larger than those of negative ones in both cases. These estimation outcomes suggest a linkage of a later development of a country with a lower manufacturing output ratio, i.e., a downward shift of manufacturing-income relationship, thereby implying the existence of premature deindustrialization risk under globalization processes. As common results are obtained in real and nominal manufacturing output, and nominal output is affected by price effect, the subsequent estimations focus on real manufacturing output.

Table 2-2 reveals the estimation results by dividing the sample countries into those with trade deficit and with trade surplus in manufactures. The reason for this division is to see the difference in the deindustrialization between the countries with a comparative "disadvantage" in manufacturing (corresponding to trade deficit in manufactures) and those with its comparative "advantage" (its trade surplus).[3] As mentioned in Section 3, the theoretical framework tells that having a comparative advantage in manufacturing is

[3] Rodorik (2016) also split sample countries according to patterns of comparative advantage in manufactures by using its trade balance, and found that countries with a strong comparative advantage have managed to avoid declines in real output ratio of manufacturing.

the only way to avoid the imported deindustrialization. Among the sample countries, China, Cambodia, Malaysia, Thailand, and Vietnam are classified into trade-surplus countries in manufactures, and the others are into its trade-deficit countries.[4] According to the estimation results, in the trade-deficit countries the latecomer's index (*lac*) has positive coefficients at conventionally significant levels over the sample period with additional positive effects in the post-1990 and post-2000 periods; in the trade-surplus countries, on the other hand, the *lac* index has positive coefficients only in the post-1990 and post-2000 periods whereas its coefficients in total sample period are negative, and only in the post-2000 period the additional positive effects exceed the negative effects. Thus, the downward shift of manufacturing-income relationship, i.e., premature deindustrialization risk, is more acute in the trade-deficit countries in manufactures than in the trade-surplus ones.

Table 2-3 shows the estimation outcomes by dividing the samples into South Asian countries and Southeast Asian ones. It is found that in South Asian countries, the *lac* index has positive coefficients in total and the post-1990 and post-2000 periods, while the index's coefficients in Southeast Asian countries is positive only in the post-1990 and post-2000 periods, though its positive effects exceed the negative effects in total sample period. The magnitudes of positive effects in South Asia are larger than those in Southeast Asia. Thus, premature deindustrialization risk is higher in South Asian than Southeast Asia. The result in Table 2-3 is considered to be consistent with that in Table 2-2, because no manufacturing trade-surplus countries is included in South Asia.

4.4 Policy Direction

This section proposes a policy direction to mitigate premature deindustrialization risk in Asian emerging and developing economies from the viewpoint of a participation in GVC. The GVC has been one of the popular trends in global economic activities over the past two decades. The GVC is described, for instance, by UNCTAD (2013) in such a way as the fragmentation of production processes, and the international dispersion of tasks and activities among the economies with diversified development stages, which have led to the emergence of borderless production networks. Kimura (2006) and Kimura et al. (2007) argued the international production and distribution networks are typically found in manufacturing activities in East Asia. The GVC is considered to boost an economic growth, as the specialization in production processes enhances efficiency and productivity,

[4] The trade balance in manufactures in 2018 is computed by using the UNCTAD Stat database.

and the durable firm-to-firm relationships promote the diffusion of technology along the chains. World Bank (2020), for instance, estimated that a 1 percent increase in GVC participation would boost per capita income by more than 1 percent, or cause a much more than 0.2 percent income gain from standard trade.

Figure 2 observes the relationship between real output ratio of manufacturing and index of GVC participation in 2018. The index of GVC participation is provided by the UNCTAD-Eora Global Value Chain Database[5]. There appears to be rough correlation between real manufacturing ratio and GVC participation. Table 3 reports the estimation outcome in which the correlation of both variables is controlled by income and demographic trends as well as country-specific and time-specific fixed effects, similar to Equation (9). The sample period are the one for 1990-2018 due to data constraint of the GVC database, while the sample economies are the same as those in Section 4.1. The equation contains not only the GVC participation index (*gvc*) but also the cross-terms of the index (*gvc*) and time dummy for 2000-2018 (*d*00), considering the recent progress in GVC integration in Asia. According to the result, the *gvc* index has significantly positive coefficient in the post-2000 period, although the index's coefficient in total sample period is insignificant. It suggests some positive linkage of a country's GVC participation with manufacturing output ratio in the recent two decades, thereby implying some effect of GVC participation on mitigating premature deindustrialization risk in Asian emerging and developing economies.

The strategies for a country to participate in GVC are recommended by a plenty of reports of international organizations (e.g., UNCTAD 2013, World Bank 2016 and 2020), such as infrastructure and human resource development, institutional improvements, and policy frameworks to create industrial clusters and networks. Among these recommendations, one of the key issues for latecomers in economic development is how to improve their "logistics" performances. GVC activities have been often discussed in the context of manufacturing intra-industry trade by the "fragmentation" theory proposed by Jones and Kierzkowski (1990, 2005). The theory tells that a foreign investor's decision on whether to fragment production processes depends on the differences in location advantages (e.g., the differences in factor prices such as wages) and the levels of the "service-link costs," which are costs to link remotely located production blocks. Following this theory, latecomers with lower wages have a greater opportunity to attract

[5] See the website: https://worldmrio.com/unctadgvc/. The methodological background of this database was described by Casella et al. (2019). The database offers the GVC data with global coverage (189 countries and a "Rest of World" region) and a time series from 1990 to 2018, and provides the key GVC indicators. The GVC participation index in this study is computed by GVC values divided by gross export values.

foreign investors in GVC activities. On the other hand, they face a greater challenge in their higher service-link costs. Thus, their GVC participation depends highly on how to reduce their service-link costs by improving their logistics performances (e.g., Taguchi and Thet 2021).

5. Concluding Remarks

This paper examined the risk of premature deindustrialization in the latecomer's developing countries in Asia with a focus on manufacturing output ratio by using the latecomer's index. This study's contributions were to target Asian economies that had been treated as a group with comparative advantages in manufacturing by previous studies, and to adopt the latecomer's index to show downward shifts of the latecomer's manufacturing-income relationship that implies the existence of premature deindustrialization risk. The empirical analysis identified the downward shifts of manufacturing-income relationship in globalization processes, i.e., premature deindustrialization risk in the latecomer's developing countries in Asia, and also showed that the risk was higher in the manufacturing trade-deficit countries than the trade-surplus ones, and in South Asian countries than in Southeast countries.

The empirical study also verified a positive linkage of a country's GVC participation with manufacturing output ratio in the recent two decades, thereby implying some effect of GVC participation on mitigating premature deindustrialization risk in the latecomer's developing countries in Asia. Then, for facilitating their GVC participation, they strategically need to improve their logistics performances to attract foreign investors in GVC activities.

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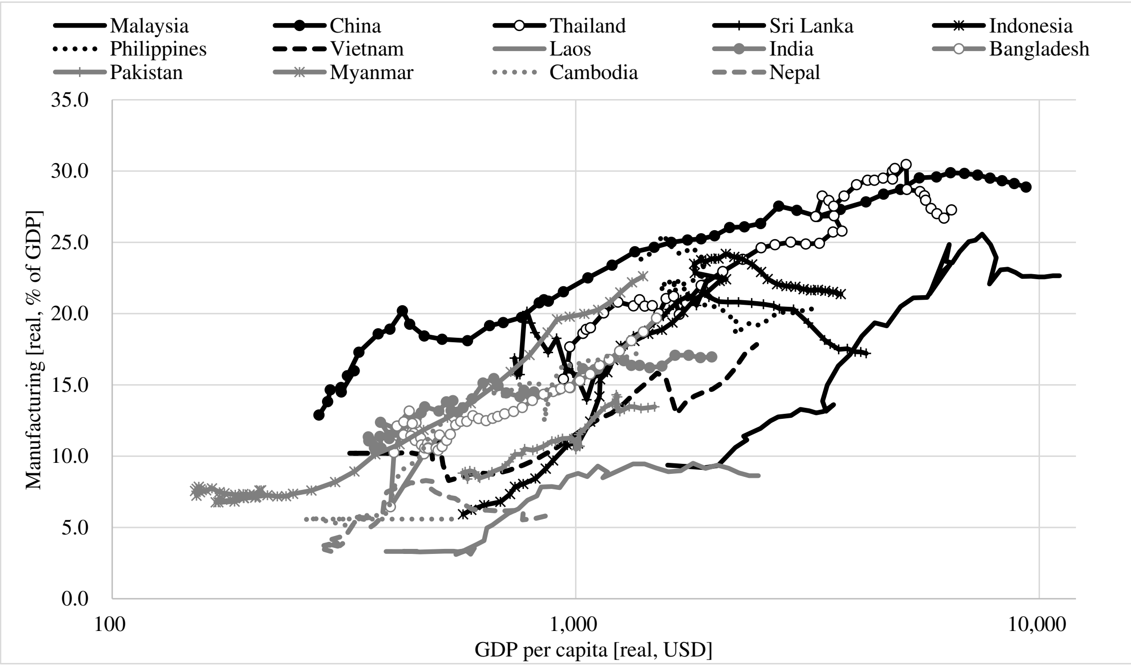
Table 1 Descriptive Statistics

Variables	Obs.	Median	Std. Dev.	Min.	Max
Dependent Variable					
man (real, %)	686	13.760	6.917	3.093	30.451
man (nominal, %)	686	17.189	7.827	2.888	34.606
Explanatory Variables					
pop (thousand)	686	56,165	367,955	2,688	1,427,648
pcy (USD)	686	972	1,803	151	11,057
lac	686	0.771	1.342	0.092	7.780
gvc	406	0.411	0.115	0.228	0.687

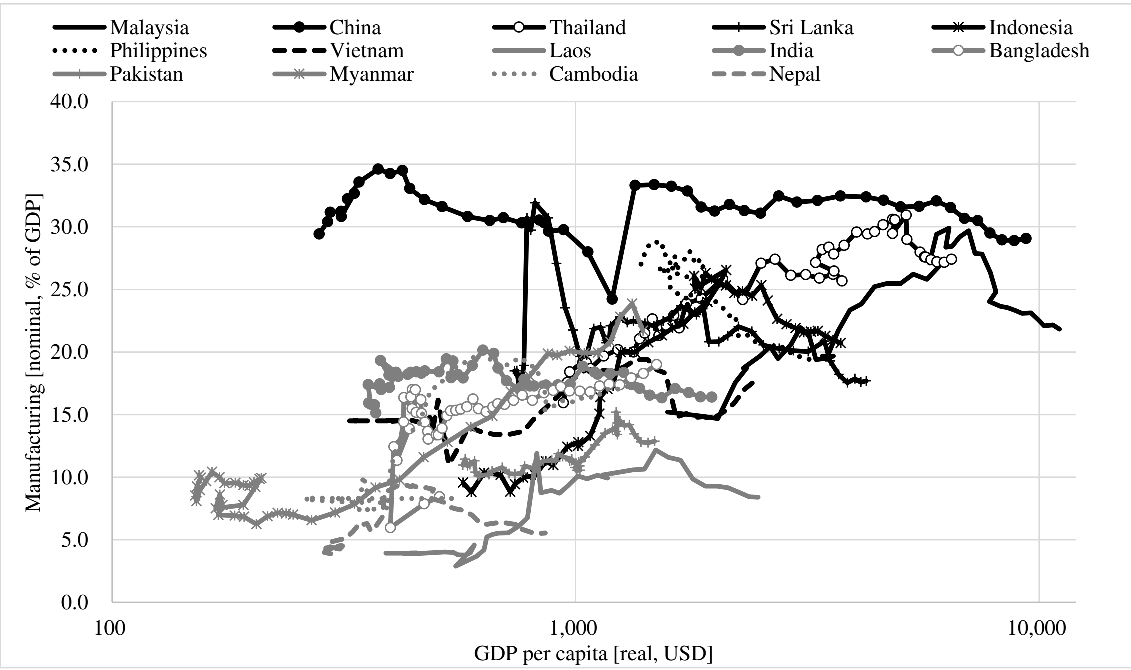
Sources: UNCTAD Stat database and UNCTAD-Eora database

Figure 1 Trends in Manufacturing in Asian Countries

[Real Value added, a percentage of GDP]



[Nominal Value added, a percentage of GDP]



Sources: UNCTAD Stat database

Table 2.1 Estimation Result: Real and Nominal Manufacturing

man _real	(1)	(2)	(3)
ln *pop*	11.260 ***	10.174 ***	9.825 ***
	(4.413)	(4.042)	(7.231)
(ln *pop*)^2	-0.248 **	-0.229 **	-0.214 ***
	(-2.434)	(-2.281)	(-4.762)
ln *ypc*	11.171 ***	11.197 ***	13.794 ***
	(5.370)	(5.478)	(3.999)
(ln *ypc*)^2	-0.222	-0.292 **	-0.537 **
	(-1.615)	(-2.144)	(-2.494)
lac	-0.631 ***	-0.380 *	-0.036
	(-3.255)	(-1.925)	(-0.130)
*lac*d90*		1.106 ***	1.294 ***
		(4.807)	(6.322)
*lac*d00*			1.987 ***
			(6.006)
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Number of countries	14	14	14
Number of observation	686	686	686

man _real	(4)	(5)	(6)
ln *pop*	26.402 ***	24.629 ***	24.352 ***
	(7.436)	(7.081)	(11.228)
(ln *pop*)^2	-0.891 ***	-0.859 ***	-0.847 ***
	(-6.264)	(-6.186)	(-13.425)
ln *ypc*	14.399 ***	14.440 ***	16.500 ***
	(4.973)	(5.112)	(3.546)
(ln *ypc*)^2	-0.675 ***	-0.789 ***	-0.983 ***
	(-3.520)	(-4.190)	(-3.337)
lac	-0.406	0.004	0.277
	(-1.503)	(0.015)	(0.794)
*lac*d90*		1.807 ***	1.956 ***
		(5.683)	(7.933)
*lac*d00*			1.576 ***
			(4.334)
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Number of countries	14	14	14
Number of observation	686	686	686

Note: ***, **,* denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance in the coefficients. T-statistics are in the parentheses.

Sources: Author estimation

Table 2.2 Estimation Result: Classified by Trade Balance in Manufacturing

man _trade deficit	(7)	(8)	(9)
ln *pop*	0.906	0.738	1.499
	(0.288)	(0.237)	(1.078)
(ln *pop*)^2	0.227 **	0.217 **	0.203 ***
	(2.079)	(2.006)	(3.426)
ln *ypc*	16.413 ***	15.816 ***	18.670 ***
	(7.429)	(7.220)	(5.719)
(ln *ypc*)^2	-0.652 ***	-0.705 ***	-0.951 ***
	(-4.521)	(-4.915)	(-4.351)
lac	0.451 *	0.938 ***	1.096 ***
	(1.762)	(3.217)	(4.764)
*lac*d90*		2.234 ***	2.379 ***
		(3.352)	(3.967)
*lac*d00*			2.187 **
			(1.972)
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Number of countries	10	10	10
Number of observation	490	490	490

man _trade surplus	(10)	(11)	(12)
ln *pop*	67.444 ***	51.985 ***	53.443 ***
	(11.047)	(7.793)	(8.636)
(ln *pop*)^2	-4.033 ***	-3.048 ***	-3.147 ***
	(-10.205)	(-7.085)	(-7.569)
ln *ypc*	28.544 ***	23.671 ***	25.594 ***
	(7.540)	(6.330)	(6.198)
(ln *ypc*)^2	-1.205 ***	-1.043 ***	-1.194 ***
	(-5.340)	(-4.810)	(-5.107)
lac	-2.430 ***	-1.811 ***	-1.667 ***
	(-7.860)	(-5.628)	(-4.569)
*lac*d90*		0.987 ***	1.064 ***
		(4.670)	(5.395)
*lac*d00*			0.935 ***
			(3.418)
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Number of countries	5	5	5
Number of observation	245	245	245

Note: ***, **,* denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance in the coefficients. T-statistics are in the parentheses.
Sources: Author estimation

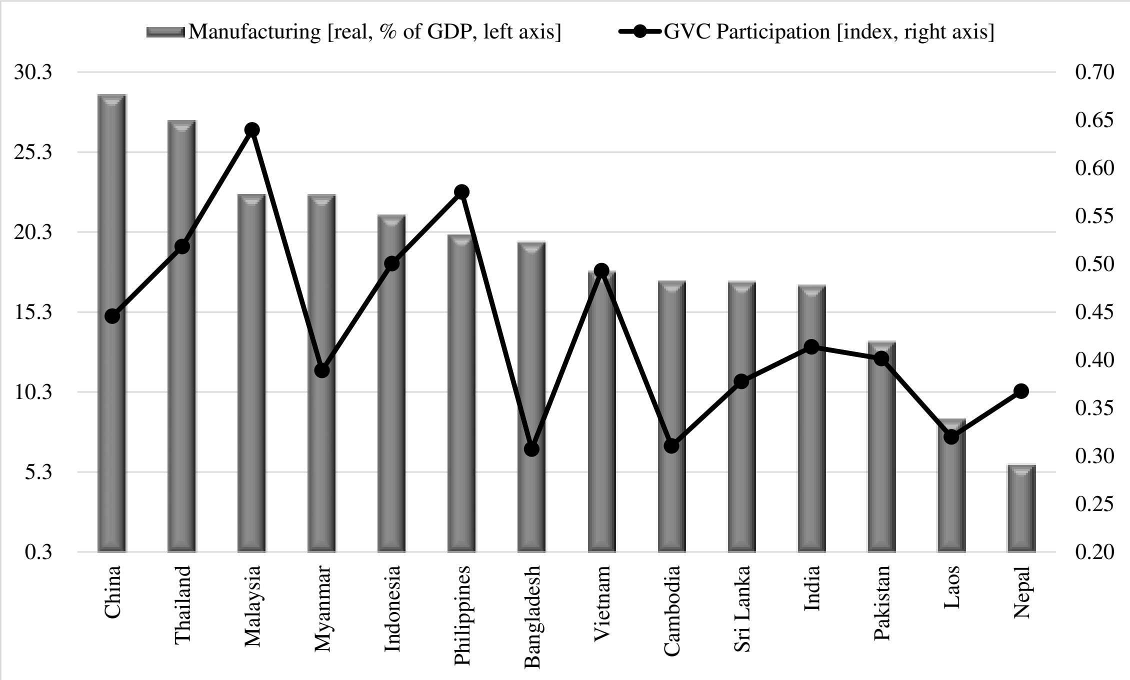
Table 2.3 Estimation Result: Classified by Regions, South and Southeast Asia

man _South Asia	(13)	(14)	(15)
ln *pop*	9.627 **	6.890	6.934 *
	(2.310)	(1.640)	(1.694)
(ln *pop*)^2	-0.045	0.045	0.057
	(-0.330)	(0.328)	(0.425)
ln *ypc*	11.018 ***	7.227 *	12.032 ***
	(3.089)	(1.936)	(3.114)
(ln *ypc*)^2	-0.344	-0.206	-0.620 ***
	(-1.641)	(-0.976)	(-2.640)
lac	0.434	1.258 **	1.348 **
	(0.771)	(2.032)	(2.232)
*lac*d90*		2.364 ***	2.347 ***
		(2.979)	(3.035)
*lac*d00*			3.666 ***
			(3.674)
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Number of countries	6	6	6
Number of observation	294	294	294

man _Southeast Asia	(16)	(17)	(18)
ln *pop*	13.228 ***	11.053 ***	10.441 ***
	(3.751)	(3.482)	(3.018)
(ln *pop*)^2	-0.797 ***	-0.708 ***	-0.662 ***
	(-4.200)	(-3.792)	(-3.566)
ln *ypc*	11.781 ***	11.510 ***	13.594 ***
	(4.662)	(4.659)	(5.307)
(ln *ypc*)^2	-0.265	-0.341 **	-0.542 ***
	(-1.611)	(-2.107)	(-3.077)
lac	-1.047 ***	-0.673 **	-0.374
	(-3.993)	(-2.490)	(-1.295)
*lac*d90*		1.241 ***	1.413 ***
		(4.328)	(4.857)
*lac*d00*			1.538 ***
			(2.776)
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Number of countries	9	9	9
Number of observation	441	441	441

Note: ***, **,* denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance in the coefficients. T-statistics are in the parentheses.
Sources: Author estimation

Figure 2 Manufacturing and DVC Participation in 2018



Sources: UNCTAD Stat database and UNCTAD-Eora database

Table 3 Estimation Result Estimation: GVC Participation

man	(19)	(20)
ln *pop*	11.089 **	13.686 **
	(2.121)	(2.587)
(ln *pop*)^2	-0.062	-0.156
	(-0.288)	(-0.716)
ln *ypc*	20.757 ***	21.546 ***
	(12.176)	(12.523)
(ln *ypc*)^2	-0.874 ***	-0.923 ***
	(-7.119)	(-7.481)
gvc	-0.101	0.459
	(-0.109)	(0.485)
*gvc*d00*		1.521 **
		(2.530)
Country fixed effects	Yes	Yes
Period fixed effects	Yes	Yes
Number of countries	14	14
Number of observation	406	406

Note: ***, ** denote the rejection of null hypothesis at the 99% and 95% level of significance in the coefficients. T-statistics are in the parentheses.
Sources: Author estimation