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Premature Deindustrialization Risk in Thailand

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ABSTRACT

This study investigates the possibility of premature deindustrialization risk in Thailand, where the pressure of globalization and uneven industrial policies remain. This study adopts the latecomer index to materialize premature deindustrialization risk, which is expressed as the downward shift of the manufacturing-income relationship at the earlier level of income. The results of the empirical analysis confirm the presence of premature deindustrialization risk in Thailand's regions as a result of globalization pressure (represented by China's entry into the World Trade Organization) and uneven industrial policies conducted by the Thai government. Thus, the current industrial policies of the Thai government should be reconsidered to overcome premature deindustrialization risk in remote regions.

KEYWORDS

Globalization, Import Deindustrialization, Inclusive Growth, Industrial Policies, Latecomer Index, Manufacturing-Income Relationship, Premature Deindustrialization Risk, Thailand

INTRODUCTION

Conventionally, scholars attempt to outline economic developments by referring to the system of improving the economic and social well-being of people. Lewis (1955) presented the two-sector growth model of structural changes with an unlimited supply of labor, and Petty-Clark's law (Clark, 1940) presented the three-sector hypothesis for the developed and developing world. Developing countries, such as those classified as low and middle incomers, however, still experience from poverty traps and income inequalities among their provinces, regions, or districts within territories, and search for ways to mitigate them. In the literature, the flying geese model by Akamatsu (1962) is renowned for charting Asian countries' growth paths after its success in Japan, while the balanced growth (Nurkse, 1953) and the imbalanced growth (Hirschman, 1958) are also practical theories for regional development of a country. From the industrial perspective, the manufacturing sector is considered the engine of growth for a country. Kaldor (1966, 1967) found a positive relationship between the growth of manufacturing output and growth of GDP, now called Kaldor's law. Manufacturing sector expansion improves the primary sector's labor productivity by shifting oversupplied labor from the primary to the manufacturing sector. Therefore, the manufacturing output expands quickly, and the productivity growth, employment creation, and income growth

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persist. Thus, various forms of industrialization strategies and growth models have been adopted for regional development. The premature deindustrialization issue among regions/provinces, however, has not yet been fully discussed.

Recently, the concept of "Premature Deindustrialization" has gained attention among scholars, economists, and policy-makers. Specifically, Dasgupta and Singh (2007) and Rodrik (2016) have stressed developing countries' quick transition into the services sector with the reduction or destruction of the manufacturing sector. Advanced countries have already been experiencing this line of deindustrialization. However, labor productivity achievement rather than not prematurity has led to the structural changes from the secondary sector to the tertiary sector. This has resulted in employment loss but not output loss. It has, however, not been the case for developing countries since the 1980s. Developing countries have experienced a reduction in their manufacturing share of output with a reduction in their income levels. The theoretical framework of Rodrik (2016) considered developing countries as the price taker with a lack of comparative and competitive advantages; thus, they are compelled to import considerable amounts of manufacturing products from developed countries, which is called "import deindustrialization." This premature deindustrialization should be examined since the interruption in manufacturing output would lessen the catching-up effect for developing countries.

This paper examines the premature deindustrialization risk with a focus on Thailand's regions for 1995-2019. Specifically, this study concerns manufacturing output and the latecomer index represented by the ratio of a region's per capita gross regional product (GRP) relative to that of a benchmark region. Bangkok is selected as the benchmark region because it records the highest per capita GRP at the 2002 constant prices. The latecomer index makes it possible to identify the downward shift of the manufacturing-income relationship, thereby suggesting the existence of premature deindustrialization risk. The estimation methodology in this study follows Rodrick (2016), and Taguchi and Tsukada (2021). The ultimate objective of this study is to evaluate the industrial policies' performance and the degree of its inclusive growth in Thailand by examining whether premature deindustrialization risk has been emerging in its local regions. The research area and scope in this study are crucial in business and academic circles and policy makers in that alleviating premature deindustrialization risk in the latecomer's regions would lead to attaining "inclusive growth," one of the Sustainable Development Goals established by the United Nations.

The remainder of this paper is organized as follows. Section 2 briefly describes the manufacturing trends in Thailand's economy. Section 3 reviews the literature related to premature deindustrialization and clarifies this study's contributions. Section 4 presents the framework of econometric analysis with the methodology and data. Section 5 discusses the empirical results on the premature deindustrialization risk in Thailand. Section 6 concludes and summarizes this study.

THAILAND'S ECONOMY AND ITS MANUFACTURING TRENDS

Thailand is a developing country and is attempting to overcome its middle-income trap. Its per capita GDP has been higher than the East Asia and Pacific average (excluding high-income countries), with a substantial rise during the 1960s and 1980s. Its economic structure has changed from agriculture to manufacturing. The share of manufacturing export out of total exports rose from 1.2% in 1960 to 77.8% in 1992 (Falkus, 1995). Thailand's economic growth rate had been on a rise until the late 1990s. Its growth rate was one of the highest, at more than 7% during the boom, and an average of 5% even in the severe recession period of 1999–2005 (Glassman, 2007; World Bank, 2021). However, it started facing growth slow-down in 2013, and the growth rate fell to lower than the East Asia and Pacific country average (excluding high-income countries) until 2020. Thailand's economy has been severely impacted by COVID-19. Since the early 1960s, industrialization and urbanization have been the driving forces toward Thailand's modernization (Biggs et al., 1990; Cuyvers et al., 1997;

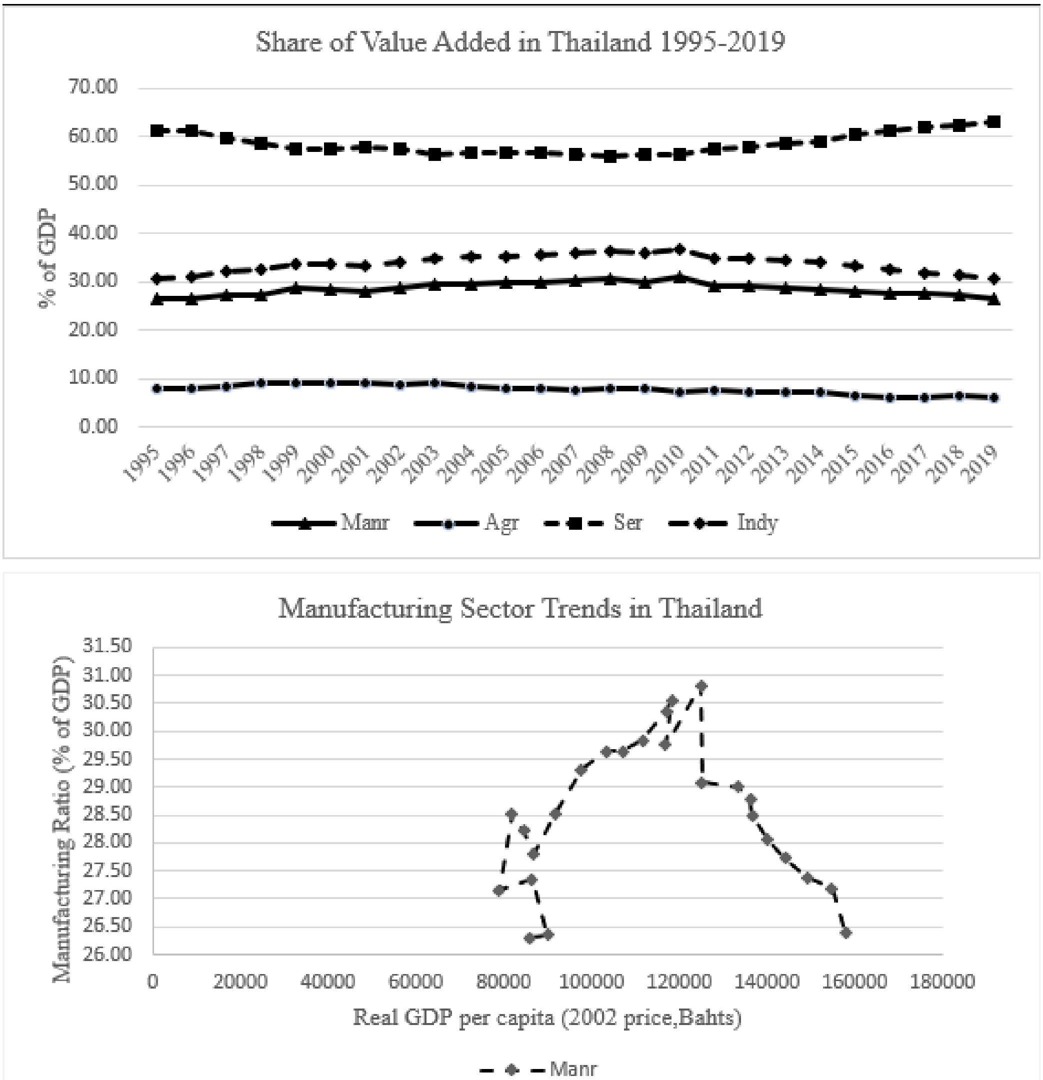
Panpiemras, 1988; World Bank, 1993). In particular, Thailand's industrialization has been impressive since it has been accompanied by job creation in the millions, welfare improvement, longer years of education and enrolment, and improvements in health security status (World Bank, 2021).

This sector's contributions to GDP surpassed that of the agriculture sector during 1986. Thailand's growth path became export-led industrialization in 1975-78, although it had been practicing import-substitution strategy during 1966-1972 (Falkus, 1995). However, the focus of Thailand's industrialization policies and strategies has been inadequate with regard to rural areas, sectoral linkage, and economic distribution, despite its import-substitution industrialization strategy propelling the rapid industrialization (Panpiemras, 1988; Poapongsakorn, 1995; and Pansuwan, 2010). Consequently, income inequality increased due to massive domestic migration from rural regions to industrial areas, since the industrialization strategies were primarily concentrated in the Bangkok Metropolis Region (Hussey, 1993). The shift in the industrial policy from centralization to decentralization began in 1987 to encourage private investors to invest in remote areas. The policy effects had, however, been confined to the Central and Northeast regions in the early 1990s (Poapongsakorn, 1995). The regions that the Thai government did not focus on for industrialization faced slow growth, income disparity, and a dominance of the agriculture sector, even though Thailand's Ministry of Industry intended to promote provincial and rural industry development[1] by supporting infrastructure and other related facilities (Pansuwan, 2010). ADB (2015) also warned against unbalanced growth among various regions: the North, Northeast, and Southern regions lag behind Bangkok and the Central region.

The structural transformation of Thailand's economy depicted in Figure 1-a reveals that the agricultural share of value-added reduces between 1995-2019, while the share of services continues to be the highest contributor among the four sectors. Figure 1-b illustrates the relationship between the manufacturing share in GDP and GDP per capita (2002 constant prices). GDP per capita grows from 85,900 Baht in 1995 to 157,700 Baht in 2019. Manufacturing share in GDP forms an inverted-U shape with the turning point being 31% and 113,000 Baht in GDP per capita in 2006-2007. From this nationwide relationship, Thailand appears to have experienced technological-driven deindustrialization, and ordinary transformation from agriculture to services through manufacturing along with income growth, just like that in advanced economies. The regional manufacturing-income relationship, however, has not necessarily followed the nationwide relationship because some regions lag in development due to the insufficient effects of Thailand's industrial policies. Thus, the regional manufacturing-income relationship is worth investigating.

Figure 2 presents the industrial transformation in Thailand by region. There is a clear contrast between the two groups (Eastern and Central regions and the other regions): the Eastern and Central regions concentrate on the manufacturing sector, whereas in the others, the service sector has a dominant share. Bangkok and its vicinities appear to have entered a mature stage with an increase in the service sector's share, as their GRP per capita (2002 constant prices) is the highest among the regions. The Eastern and Central regions appear to follow the robust industrialization process as their manufacturing shares reach a high level, namely, above 50%. In the other regions, the manufacturing shares stay at lower levels, implying the existence of premature deindustrialization risk. The additional observation is the degree of convergence in GRP per capita among regions in Thailand's regions. The Organisation for Economic Co-operation and Development (OECD; 2016) argued that convergence depends on labor productivity and industrial policies. Figure 3 illustrates the gap in GRP per capita between Bangkok and other regions. It shows that the convergence is realized slowly, but its pattern has stopped (the gap levels off or even widens slightly in the Northeastern and Northern regions) since 2011. From these observations on industrial transformation and income gap among Thailand's regions, the question that arises is whether there has been premature deindustrialization risk in underdeveloped regions, and if this related to the uneven industrial policies in Thailand.

Figure 1. (a) Thailand Structural Change during 1995–2019; (b) Thailand Manufacturing-Income Relationship during 1995–2019 (Sources: NESDC stat (Error! Hyperlink reference not valid.); NESDC stat (https://www.nesdc.go.th/nesdb_en/main.php?filename=index))



LITERATURE REVIEW AND STUDY CONTRIBUTIONS

This section reviews the literature related to the issue on premature deindustrialization and clarifies this study's contributions. The reviewed literature is organized in Table 1.

The seminal works as the origin of the study of premature deindustrialization are Dasgupta and Singh (2007) and Rodrik (2016). Dasgupta and Singh (2007) initially proposed the concept of premature deindustrialization. They examined the role of manufacturing and services sectors in developing countries and argued that manufacturing is still a core contributor of growth in developing countries, as in Kaldor's law. They used the term "premature deindustrialization" in the sense of a fall in the share of manufacturing output and employment, with an increase in service share taking place at the lower income levels in developing countries. However, they argued that deindustrialization

Figure 2. Structural Transformation Trends in Thailand's regions (Sources: NESDC stat (https://www.nesdc.go.th/nesdb_en/main.php?filename=index))

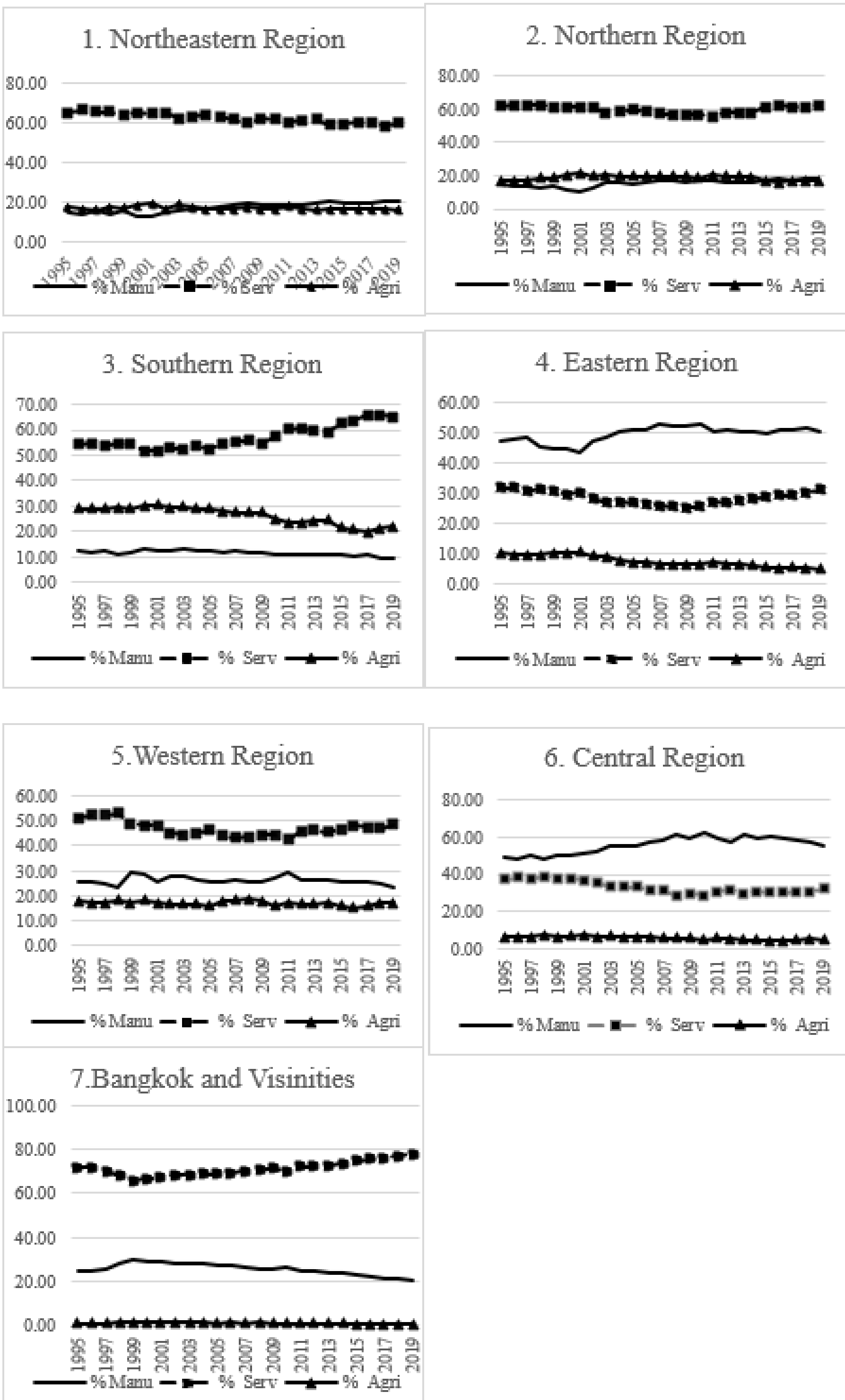
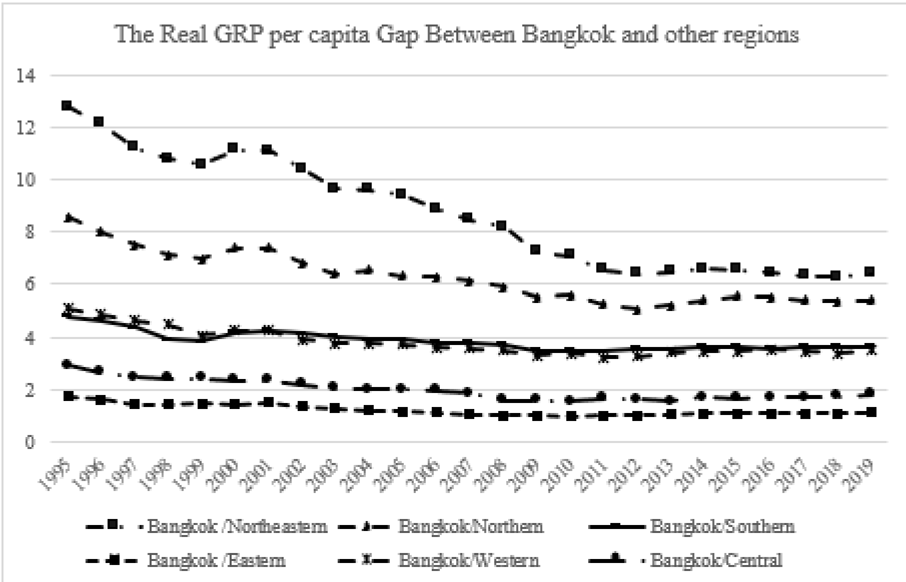


Figure 3. The Real GRP per Capita Gap of Regions in Thailand (Sources: NESDC stat (https://www.nesdc.go.th/nesdb_en/main.php?filename=index))



in developing countries could be classified into two types: technological-driven and pathological. India, for instance, belongs to the former type, and several Latin American and African countries fall into the latter type, where their economies have faced balance-of-payment problems under import substitution industrialization strategies.

Rodrik (2016) polished the concept and implication of premature deindustrialization. He constructed a simple two-sector theoretical model with manufacturing and non-manufacturing sectors, and demonstrated that the developing countries opening up to trade tend to be price-takers in global markets for manufacturing, and those who lack a strong comparative advantage in manufacturing must become net importers of manufacturing under a decline in the relative price of manufacturing and the rise of China, thereby leading to deindustrialization in both employment and output. He also conducted empirical estimations for cross countries and different country groups during the late 1940s to post 2010. The empirical results showed that Latin American and African countries suffered from both employment- and output-deindustrialization as these countries discovered their resources and experienced a rise in commodity prices. However, Asian countries that maintained a comparatively stronger advantage in manufacturing avoided premature deindustrialization. The results of the pre- pre-and post-1990 estimations also indicated that late industrializers reach their peak levels of industrialization, as measured by manufacturing employment and output shares at lower income level, which is around 40% of the level gained by early industrializers. Fujiwara and Matsuyama (2020), extending the theoretical model of Rodrik (2016), constructed the model of "technology gaps" representing the heterogenous capacity to adopt the frontier technology to describe premature deindustrialization.

Based on the theoretical model of Rodrik (2016), a lot of empirical studies have been conducted for identifying the existence of premature deindustrialization in the levels of multi and specific countries. Regarding multi-country analyses, Sato and Kuwamori (2019), targeting non-OECD and OECD countries as samples, confirmed the existence of premature deindustrialization in non-OECD countries in that their share of manufacturing employment and output hit a peak at their lower income levels than those of OECD countries. Daymard (2020) suggested the occurrence of premature

Table 1. Literature Review

	Sample	Methodology	Message
[Origins of PD studies]			
Dasgupta & Singh 2006	Panel with 14 countries for 1986-2000	Inverse U-shape for manufacturing-income nexus	- Pathological PD in Latin America & Africa - Technology-driven PD in India
Rodrik 2016	Panel with 42 countries for 1960s-2010s	Inverse U-shape for manufacturing-income nexus	- PD in Latin America & Africa - No PD in Asia with comparative advantage in manufacturing
[Theoretical study]			
Fujiwara & Matsuyama 2020	Theoretical Model: A Technology-Gap Model		- PD is driven by a technology gap: the frontier technology whose productivity growth rate differs across the sectors.
[Empirical studies: multi-country analyses]			
Sato & Kuwamori 2019	Panel with 42 countries for 1950-2014	Inverse U-shape for manufacturing-income nexus	- PD in non-OECD - No PD in OECD
Daymard 2020	Panel with 41 countries for 1950-2013	Panel fixed-effect model with two-stage least square estimation	- The difficult creation of manufacturing jobs in Latin America and Africa—a trait commonly referred to as PD
Nayyar et al. 2021	43 countries for 2000-2014	Growth Decomposition Exercise	- The rising share of services is largely not driven by a statistical artifact. The prospect of services-led development in lower-income countries is limited.
Ravindran & Babu 2021	Panel with 54 middle-income countries for 1992-2017	Panel fixed-effects and bootstrap-corrected dynamic fixed-effect models	- The rise of income inequality with PD if the displaced workers are absorbed into low-productive and informal market services
Botta et al. 2022	Panel with 36 countries for 1980-2017	Inverse U-shape for manufacturing-income nexus	- Net capital inflows as a potential source of PD

	Sample	Methodology	Message
[Empirical studies: regional multi-country analyses]			
Caldentey & Vemengo 2021	8 Latin American countries	Descriptive analysis	- Premature financialization connected with the process of PD in Latin America
Ssozi & Howard 2018	Panel with Sub-Saharan Africa 35 countries for 1993-2016	Panel fixed-effect model with General Method of Moments estimation	- The transition into a industrial economy is constrained by not only international competition and the poor business climate, but also the low participation in the global value chains.
Taguchi & Tsukada 2021	Panel with 14 Asian countries for 1970-2018	Inverse U-shape for manufacturing-income nexus and latecomer index	- PD risk in Asia
[Empirical studies: specific-country analyses]			
Lee 2020	Malaysia	GVC analysis for 2006-2015 & micro analysis of 581 firms in 2015	- PD in Malaysia has been accompanied by a decline in the countrys participation in GVCs
Hamid & Khan 2015	Pakstan	Descriptive sectoral analysis for 1959-2014	- Pakistan is on the brink – if not already in the process – of PD, as a result of stagnation in manufacturing since 2007
Andriyani & Irawan 2018	Indonesia: panel with 4 islands for 1986-2015	Regional panel analysis	- The speed of deindustrialization varies between islands and PD is identified in Indonesia
Islami & Hastiadi 2020	Indonesia: panel with 26 provinces for 1987-2018	Inverse U-shape for manufacturing-income nexus	- PD in Indonesia (the peak is lower than the threshold value of Rodrik 2016)

Note: PD means premature deindustrialization.
Source: Author's description.

deindustrialization in Latin America and Africa from the viewpoint of manufacturing jobs. Nayyar et al. (2021) argued that premature deindustrialization matters in lower-income countries because the prospect of their service-led development is limited. Ravindran and Babu (2021) identified the rise of income inequality with premature deindustrialization in case that workers are absorbed into low-productive and informal market services. Botta et al. (2022) found that net capital inflows are as a potential source of premature deindustrialization.

As for regional multi-country analyses, Caldentey and Vemengo (2021) analyzed premature financialization in connection with the process of premature deindustrialization in Latin America. Ssozi and Howard (2018) discussed the premature deindustrialization in Sub-Saharan Africa in relation to the low participation in global value chains. Taguchi and Tsukada (2021) presented the risk of premature deindustrialization with a focus on Asian developing economies by applying the latecomer index to demonstrate downward shifts in the latecomers' manufacturing-income relationship. They showed that the risk is higher for manufacturing trade-deficit countries and South Asian countries, and also suggested the need for greater participation in global value chains to avoid premature deindustrialization.

There have been also specific-country studies that also verified the existence of premature deindustrialization: in Malaysia (Lee, 2020), Pakistan (Hamid and Khan, 2015), and Indonesia (Andriyani and Irawan, 2018; Islami and Hastiadi, 2020). The two studies in Indonesia conducted a regional panel analysis to verify the existence of premature deindustrialization.

In sum, there are a limited number of specific-country empirical studies of premature deindustrialization, particularly, with regional panel analyses (only Andriyani and Irawan, 2018; Islami and Hastiadi, 2020), whereas a large number of multi-country studies exist. In addition, it is only Taguchi and Tsukada (2021) that applied the latecomer index to explicitly identify the risk of premature deindustrialization.

This study's contributions to fill the literature gap could be highlighted as follows. First, this study targets Thailand with a regional panel analysis as in the two studies in Indonesia, thereby contributing to enriching empirical evidence in specific-country studies. Second, this study applies the latecomer index to verify the risk of premature deindustrialization as in Taguchi and Tsukada (2021). The majority of previous empirical studies have concentrated on the comparison in industrialization peaks between developed and developing economies and have proved its lower peak with a lower income stage in developing economies to show premature deindustrialization. However, all developing economies and regionally local economies do not necessarily reach the industrialization peak. The latecomer index makes it possible to identify downward shifts in latecomers' manufacturing–income relationship regardless of the existence of the peak in manufacturing ratio. For the economies that have not reached the peak yet, its downward shift suggests the upcoming peak-out at a lower manufacturing ratio in a lower income stage, namely, the symptom and risk of premature deindustrialization. This study applies the latecomer index to the regional manufacturing–income analysis for the first time. The application of the index in regional analysis also contributes to evaluating a country's industrial policies' performance and the degree of its inclusive growth.

METHODOLOGY

This study follows the theoretical framework and the empirical specification presented by Rodrik (2016). He constructed a simple two-sector theoretical model with manufacturing and non-manufacturing sectors, and derived the different outcomes for a closed economy in advanced countries (exogenous in net manufacturing exports x and endogenous in manufacturing price Pm) and a small open economy for developing countries (exogenous in Pm and endogenous in x; namely, price takers in global manufacturing markets), as Table 2 shows. This model could explain premature deindustrialization in the case of a developing country as a small open economy that liberalizes trade. Suppose that the global supply of manufacturing exceeds that of non-manufacturing with technological

Table 2. Theoretical Framework of Rodrik (2016): Effects of shocks on manufacturing

A. Closed economy			
Effect on:	Technology shock	Trade shock	Domestic demand shock
	$\theta m - \theta n > 0$	$dx < 0$	
Employment share	-	-	-
Real output share	+	-	-
B. Small open economy	Technology shock	External price shock	Domestic demand shock
	$\theta m - \theta n > 0$	$Pm < 0$	
Employment share	+	-	**0**
Real output share	+	-	**0**

Notes: θm and θn: the productivity of manufacturing and non-manufacturing sectors, respectively; dx: net exports of manufactured goods; and Pm: prices of manufactured goods.
Source: Extracted from Rodrik (2016).

progress in manufacturing, and the relative price of manufactured goods ($Pm < 0$) declines for all countries under globalization. In this case, developing countries with less technological progress in manufacturing (the increase in $\theta m - \theta n$ is less than the decline in Pm) witness a decline in the output and employment share of manufacturing. Then, only countries with a manufacturing productivity growth sufficient to offset the relative-price decline (having a comparative advantage in manufacturing) can avoid premature deindustrialization.

Regarding the empirical specification, this study applies the equation with the inverted U-shaped manufacturing-income nexus proposed by Rodrik (2016), which controls for the effect of demographic and income trend with their quadratic terms. However, this study modifies the Rodrik specification by adopting the latecomer index as in Taguchi and Tsukada (2021) to demonstrate downward shifts in the regional latecomers' manufacturing-income relationship to verify the risk of premature deindustrialization:

$$ln\ manrit \ = \ q0 \ + q1\ ln\ popit \ + q2\ \left(ln\ popit\right)2 \ + q3\ ln\ grppit \ + q4\ \left(ln\ grppit\right)2 \ + \ d1\ lacit \\ + \ d2\ lacit\ d99 \ + d3\ lacit\ d02 \ + \ d4\ lacit\ d06 \ + \ d5\ lacit\ d12 \ + \ fi \ + \ eit\left(1\right) \qquad (1)$$

where the subscripts i and t denote the regions (the seven regions in Thailand) and years (1995–2019), respectively; *manr* represents the output ratios of manufacturing in GRP in 2002 constant prices; *pop* and *grpp* indicate the region's population size and GRP per capita in 2002 constant prices; *lac* denotes the latecomer index; *d*99, *d*02, d*06*, and *d*12 represent time dummies for 1999–2019, 2002–2019, 2006–2019, and 2012–2019, respectively; f_i shows a time-invariant regional-specific fixed effect; ε denotes a residual error term; $\theta_{0...4}$ and $\delta_{1...5}$ stand for estimated coefficients, respectively; and ln shows a logarithm form.

The key variable in Equation (1) is the latecomer index (*lac*) proposed by Taguchi and Tsukada (2021) for examining premature deindustrialization risk in their cross-country panel analysis. In this study, the index is expressed as the ratio of GRP per capita of a region relative to that of a benchmark region in each year. Bangkok is selected as the benchmark region because it records the highest per capita GRP at the 2002 constant prices. Thus, the index shows the degree of delayed development of a region relative to Bangkok. The significance and sign of the latecomer index's coefficient (δ) are critical for identifying the premature deindustrialization risk. The regions are considered to be at premature deindustrialization risk if the coefficient (δ) is significantly positive, since it reveals the linkage between a region's delayed development and its lower manufacturing output ratio. This relationship is called the risk of premature deindustrialization because it implies that the regions would reach their peak in manufacturing output ratio at a lower-income level than Bangkok.

Equation (1) also equips the cross-terms of the latecomer index (*lac*) with the time dummies for 1999–2019 (*d*99), 2002–2019 (*d*02), 2006–2019(*d*06), and 2012–2019 (*d*12). This is because the regional manufacturing activities related to premature deindustrialization also appears to have been affected by the following events. First, Thailand suffered from the 1997-98 financial crisis, and continuous capital flights depressed the manufacturing activities at the regional level as well. Second, China's entry into the World Trade Organization (WTO) in 2001 affected manufacturing in Thailand because it led to massive inflows of lower priced manufactured products from China. Third, the political crisis during 2005–06, and the flood in 2011 also dampened the Thai manufacturing sector.

Regarding the variable of GRP per capita, if the coefficients hold $\theta 3 > 0$ and $\theta 4 < 0$ at the conventionally significant level, the relationship between the regions' manufacturing output share and GRP per capita would form an inverted U-shaped curve. Equation (1) contains the region-specific fixed effect, f_i, as a control variable for the panel estimation. Each region is embedded with time-invariant factors such as geography and resource endowments (not distributed randomly among the regions), affecting manufacturing activities. The fixed effect absorbs all these factors, including unobservable ones, and contributes to avoiding biased estimation. The estimation does not include the time-specific dummy because the sample period is limited, and the aforementioned time dummies cover most economic fluctuations.

A panel dataset is then constructed for the seven Thailand regions for 1995–2019. All the data for the estimation of Equation (1) are retrieved from the Office of the National Economic and Social Development Council (NESDC) Stat, which is the most reliable authority of statistics in Thailand. The descriptive statistics for the data are presented in Table 3.

RESULTS AND DISCUSSION

Table 4 reports the estimation result with estimation (a) being without any time dummies as the cross-terms, and estimations (b), (c), (d), and (e) being those with the time dummies adding *d*99, *d*02, d*06*, and *d*12 as the cross-terms, respectively. In all the results, the coefficients of GRP per capita satisfy $\theta 3 > 0$ and $\theta 4 < 0$ at the conventionally significant level, thereby showing the inverted U-shaped relationship between the regions' manufacturing output share and GRP per capita. The turning point can be computed by the simplified equation:

$$Ln\ manr_{it} = \varphi_0 + \varphi_1 lngrpp_{it} + \varphi_2 \left(lngrpp_{it}\right)^2 \tag{2}$$

Table 3. Descriptive Statistics

Variables	Observations	Mean	Median	Standard Deviation	Minimum	Maximum
Dependent Var						
ln *manr*	175	3.203	3.221	0.557	2.214	4.127
Explanatory Var						
ln *pop*	175	8.924	9.070	0.663	7.966	9.966
ln *grpp*	175	11.468	11.340	0.778	9.991	12.726
lac	175	0.453	0.286	0.327	0.078	1.003

Sources: NESDC stat at https://www.nesdc.go.th

Table 4. Estimation Results

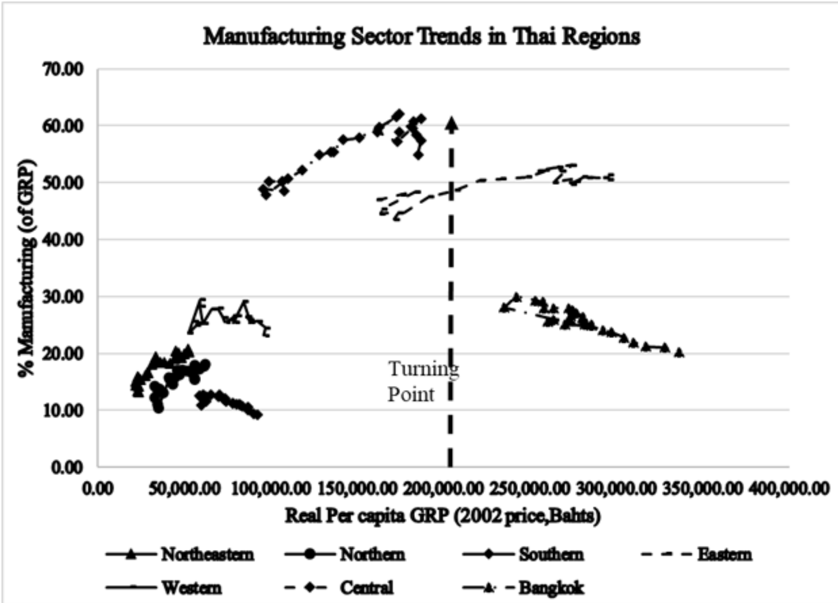
Estimation	a	b	c	d	e
const.	27.202***	21.143**	22.919**	24.304***	24.242***
	(-2.968)	(-2.286)	(-2.507)	(-2.677)	(-2.680)
ln *pop*	2.647	2.341	2.951**	3.709**	3.428**
	(-1.597)	(1.437)	(1.818)	(2.247)	(2.070)
(ln *pop*)^2	-0.160*	-0.152**	-0.192**	-0.242***	-0.233**
	(-1.806)	(-1.753)	(-2.199)	(-2.697)	(-2.600)
ln *grpp*	3.406***	2.678***	2.609***	2.403***	2.768***
	(-4.901)	(3.665)	(3.622)	(3.335)	(3.640)
(ln *grpp*)^2	-0.150***	0.116***	0.114***	-0.106***	-0.125***
	(-4.612)	(-3.399)	(-3.381)	(-3.136)	(-3.462)
lac	0.911***	0.643***	0.497**	0.276	0.386
	4.469	(2.894)	(2.192)	(1.108)	(1.485)
*lac***d*99		0.108***	0.068	0.083*	0.086**
		(2.758)	(1.615)	(1.970)	(2.047)
*lac***d*02			0.103**	0.105**	0.128***
			(2.446)	(2.511)	(2.873)
*lac***d*06				0.081**	0.087**
				(2.037)	(2.179)
*lac***d*12					0.053
					(1.458)
Regional fixed effect	Yes	Yes	Yes	Yes	Yes
Period fixed effect	-	-	-	-	-
Number of regions	7	7	7	7	7
Number of observations	175	175	175	175	175

Note. *, **, and *** denote the rejection of null hypothesis at 90%,95%, and 99% levels of significance respectively, t-statistics are in parentheses.
Sources: Author's estimation

where the GRP per capita at the turning point is exp (φ_1 / 2 φ_2). It is calculated as 221,562 Bath in 2002 constant prices per capita, which is a reasonable level among the regions. This income level at the peak of industrialization can be converted into around 5,000 US dollars using exchange rate in 2002. Islami and Hastiadi (2020) also estimated the level of GDP per capita at the maximum industrialization as 6,285 US dollars in Indonesia. Thus, the peak-incomes in Thailand and Indonesia are similar, and both are far below 47,099 US dollars in the pre-1990 and 20,537 US dollars in the post-1990, estimated as the maximum industrialization income level by Rodrik (2016). This implies the existence of premature deindustrialization as a nation-wide level in both countries. Figure 4 displays the relationship between manufacturing output share and GRP per capita in each of the seven regions in Thailand. Bangkok and the Eastern region already surpass the turning point, and the Central region is approaching it. The rest of the regions are far behind the turning point with their lower share of manufacturing output.

All the estimation results from (a) to (e) contain significant coefficients with positive signs on the latecomer index and its cross-terms with the time dummies. This indicates the downward shift of

Figure 4. Turning Point in Thailand's regions (Sources: Author's estimation based on NESDC stat)



the manufacturing-income relationship for the latecomer regions, thereby suggesting the existence of premature deindustrialization risk in the latecomer regions. The subsequent description focuses only on the estimation result (e) because it contains all the variables on the latecomer index. In this result, the coefficients are significantly positive in the cross-terms of lac_{it} *d*99, lac_{it} *d*02, and lac_{it} *d*06. Thus, it implies that the 1997-98 financial crisis, China's entry into the WTO in 2001, and the political crisis during 2005-06 depressed manufacturing activities in the latecomer regions, thereby contributing to the rise of premature deindustrialization risk. Among the coefficient sizes, lac_{it} *d*02 is the largest, suggesting that the globalization effect caused by China's entry into the WTO in 2001 is the major factor that contributed to the premature deindustrialization risk in the latecomer regions' economies. This result has a similarity to the outcomes of Taguchi and Tsukada (2021) that could showcase downward shifts of the latecomers' manufacturing-income relationship with the progress in globalization (the rise of premature deindustrialization risk) in the Asian country panel analysis. Both results are in line with theoretical framework of "import deindustrialization" proposed by Rodrick (2016). Then, the largest contribution of this study is that it could verify the existence of premature deindustrialization risk in regional level in a specific country, thereby being able to bring this result to industrial-policy discussion and evaluation.

Once premature deindustrialization risk is identified in the latecomer regions in Thailand, the question of how to avoid it comes up. As discussed in Section 2, the current industrial policies by the Thai government have not necessarily focused on the industrial development of the latecomer regions. In fact, the Northern and Northeastern regions are still far behind others in manufacturing development, as shown in Figures 2 and 4. The suggestion provided by Rodrick (2016) for avoiding premature deindustrialization even under "import deindustrialization" is to create comparative and competitive advantages in manufacturing sectors in a country's economy. In the context of regional development within a country, overcoming the premature deindustrialization in latecomer regions appears to lead to attaining "inclusive growth" in an economy. Inclusive growth is defined by the OECD as the economic growth that is distributed fairly across society and creates opportunities for all[2]. Ianchovichina and Lundstrom (2009) also argued that the focus of inclusive growth is on productive employment rather than on direct income distribution as a means of increasing income for excluded groups. Thus, the fundamental role of government policies for avoiding premature deindustrialization is to prioritize the regional development of infrastructure and human resources. It will enable the latecomer regions to materialize their comparative and competitive advantages in the manufacturing sector.

CONCLUSION

This study confirms the presence of premature deindustrialization risk in Thailand's regions as a result of the pressure of globalization (represented by China's entry into the WTO) and uneven industrial policies conducted by the Thai government. From a regional perspective, the Northeastern and Northern regions are still far behind other regions in manufacturing development, which suggests that latecomer regions are under premature deindustrialization risk. Thus, the current industrial policies of the Thai government should be reconsidered to overcome this risk in the latecomer regions. Specifically, the government should prioritize regional development of infrastructure and human resources so that the latecomer regions can realize their comparative and competitive advantages in the manufacturing sector.

A limitation of this study is the lack of detailed analyses in individual provinces and manufacturing sectors, including the impact of globalization and strategic policy analysis to overcome premature deindustrialization in the latecomer regions. Thus, further research should be conducted by collecting more detailed data and factual evidence.

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ENDNOTES

1 Nine provinces were chosen for development target according to Pansuwan 2010: Nakhon Ratchasima, Khon Kaen, Nakhon Sawan, Phitsanulok, Chiang Mai, Saraburi, Ratchaburi, Surat Thani, and Songkhla.

2 See the website: https://www.oecd.org/inclusive-growth/.