Doctor of Economics' Dissertation

Empirical Analysis of Industrial Structural Change in Vietnam

-Effect of Industrialization and Risk of Premature Deindustrialization-

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Executive Summary

The Vietnamese economy has performed well since the beginning of Doi-Moi. Over the last decade, the average GDP growth was the highest among the six main ASEAN countries and GDP per capita increased from USD 1,525 to USD 2,786. This stable development is attracting attention and raising expectations from all over the world.

Vietnam's stable development has been brought about by the expansion of manufacturing. However, the effect of Vietnam's manufacturing growth on the growth of the whole economy might weaker than those in the forerunner ASEAN countries with similar income levels.

Some recent studies indicated the problem that even if developing countries succeeded in starting industrialization, their growth may not continue. This problem is called "premature deindustrialization". Once a developing country falls into premature deindustrialization, it loses its manufacturing advantage, and its growth may come to a halt. According to previous studies, Vietnam may not be immune to this problem.

The objective of this dissertation is to evaluate the industrialization and premature deindustrialization risk in Vietnam and propose policy directions for further development of the Vietnamese economy. For this purpose, we conducted the following empirical analyses and presented the following outcomes and messages.

First, the empirical analysis of the effect of Vietnam's manufacturing growth using Kaldor's First Law revealed that the effect on the service industry is weaker than those in the forerunner ASEAN countries, and the reason for this is a higher foreign dependency of the service industry in manufacturing exports. To boost the effect, the Vietnamese government should encourage the development of industries supporting manufacturing (e.g., service industry) and appeal the achievement to multinational corporations.

Second, this study assessed the risk of premature deindustrialization in latecomer developing countries in Asia. The empirical analysis indicated that the risk is higher in countries with manufacturing trade deficit countries and South Asian countries than in countries with trade surplus countries and Southeast Asian countries. The existence of a positive relationship between a country's participation in the global value chains (GVC) and its manufacturing output ratio in the past two decades was also identified. The main policy implication is that latecomer developing economies in Asia should participate in the GVC activities in manufacturing, by improving their logistics performance to attract foreign GVC investors as a prerequisite, to mitigate their risk of premature deindustrialization.

Finally, this study examined the risk of premature deindustrialization in Vietnamese provinces. The main findings are summarized as follows. Although it could not be concluded from the estimation results that Vietnam is facing the risk of premature deindustrialization, this risk is becoming apparent in the Northern Midlands and Mountain Areas. Provinces with low levels of trade openness or foreign direct investment run the risk of premature deindustrialization. Several provinces in the Northern Midlands and Mountain Areas exhibited these characteristics. To prevent premature deindustrialization, the Vietnamese government should improve both the soft and hard sides of the business environment in these areas and promote export-oriented foreign direct investment.

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Chapter I Introduction

The Vietnamese economy has recently performed well. The average GDP growth rate of Vietnam between 2011 and 2020 was 6.0%, lower than those of Lao PDR (6.8%), Myanmar (6.2%), and Cambodia (6.1%). However, it was the highest among the six main ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam). Over the last decade, GDP per capita increased from USD 1,525 to USD 2,786. This stable development has been brought about by the expansion of manufacturing, as shown by an increase in the manufacturing share in output (from 12.4% in 2011 to 17.4% in 2020) and its share in employment (from 13.9% in 2011 to 21.1% in 2020). As a result of its strong economic growth, Vietnam is attracting the attention and raising the expectations of many countries and multinational corporations all over the world.

Nevertheless, the problem that even if developing countries succeeded in starting industrialization, their growth may not continue, has been acknowledged. This problem is called "premature deindustrialization". Once a developing country falls into premature deindustrialization, it loses its manufacturing advantage (e.g., scale economies, learning by doing and unconditional convergence), and its growth may come to a halt. Several previous studies have suggested that Asian developing countries including Vietnam may not be immune to this problem.

Based on this awareness of the problem, the objective of this dissertation was to evaluate the industrialization and premature deindustrialization risk in Vietnam and propose policy directions for further development of the Vietnamese economy.

The remainder of this dissertation is organized as follows. Chapter II verifies the effect of industrialization in Vietnam by testing the Kaldor First Law, and compares the effect with those in the main six the Association of South East Asian Nations (ASEAN) countries. Chapter III examines the risk of premature deindustrialization in Asian latecomer developing economies. This is because some previous studies pointed out that Asian developing countries could eliminate this risk, whereas some country-specific studies argued that they face this risk. After that, chapter IV focuses on the verification of the risk of premature deindustrialization in Vietnamese provinces. Finally, Chapter V summarizes and concludes the dissertation.

Chapter II The Effect of Manufacturing Growth in Vietnam

This chapter analyzes the effect of manufacturing growth in Vietnam by testing the Kaldor First Law.

2-1 Introduction

Since the 1960s, many Asian developing countries have experienced economic development driven by industrialization. Firstly, Hong Kong, the Republic of Korea, Singapore, and Taiwan achieved high GDP growth and were followed by Indonesia, Malaysia, and Thailand. In the 1990s, China joined this group. Recently, the Vietnamese economy showed good performance driven by manufacturing. Although the growth of manufacturing value added (MVA) in Vietnam just after the Great Recession (2008-09) dropped to negative (-21.8% in 2010), the introduction of South Korean electronics facilities induced a recovery (11.3% in 2016-20). This manufacturing growth brought overarching national economic development; GDP growth was 6.0% in 2016-20 and GDP per capita was USD 2,786 in 2020.

However, the effect of Vietnam's manufacturing growth on the growth of the whole economy is weaker than those in the forerunner ASEAN countries with similar income levels (GDP per capita: around USD 2,500). For example, Indonesia had MVA growth 3.9% vs GDP growth rate of 5.7% in 2006-10; Malaysia had 12.6% vs 8.1% in 1986-95; the Philippines had 5.4% vs 6.0% in 2011-15; Singapore had 11.1% vs 8.8% in 1971-80; and Thailand had 9.5% vs 8.5% in 1991-95.

Kaldor (1960, 1966, 1967) showed that the growth of GDP or the non-manufacturing value added (NMVA) is positively related to the growth of MVA, which was supported by empirical analysis of 12 Organization for Economic Co-operation and Development

(OECD) countries. This relation is called the Kaldor First Law. Some studies verified this law for developing countries. Felipe (1998) and Felipe et al (2007) focused on the South East Asian countries and confirmed the Law held true in them. However, these did not reflect the recent Vietnam's performance sufficiently. Additionally, although some studies tested this Law in the disaggregating service industry (Piper 2003, Dasgupsta et al. 2019, Meglio et al. 2018 and Meglio and Gallego 2022), no study has made a closer look at the effect of manufacturing growth on other industries.

This chapter has three purposes. Firstly, reflecting on the recent Vietnamese manufacturing growth, we test the Kaldor First Law to confirm that the manufacturing leading effect in Vietnam is lower those of other main five ASEAN countries. Secondly, this chapter clarifies on which industries the effect is weaker in Vietnam. Thirdly, this chapter proposes policy directions to support efficient development of the economic sector in Vietnam.

The remainder of this chapter is structured as follows. In Section 2-2, we review the literature on the Kaldor First Law for developing countries and show the contribution of this studies. Section 2-3 conducts empirical analyses to test the Kaldor First Law by applying it to ASEAN countries. Finally, Section 2-4 proposes policy directions.

2-2 Literature Review and Contribution

This section first reviews the literature related to Kaldor First Law.

Kaldor (1960, 1966, 1967) discovered three long-run relationship between level of manufacturing and economic growth in terms of value added, employment and productivity, well-known as Kaldor Laws. He conducted empirical analyses on 12 OECD countries and showed that manufacturing is a key engine of growth. The First Law is that the growth of GDP or NMVA is positively related to the growth of MVA as manufacturing is linked to many industries. The Second Law indicates that the productivity growth of manufacturing is positively related to the growth of MVA (this is also well-known as Verdoorn's Law). This is due to the nature of manufacturing, related to increased returns to scale, positive effect on capital accumulation and faster technical progress. The Kaldor Third Law tells us that there is a positive correlation between the productivity in the economy or non-manufacturing and the growth of MVA. In other words, the productivity growth of the economy or non-manufacturing has a negative relation to the growth of their employment, because most activities outside of manufacturing have a diminishing return to scale. Among these three Laws, this study focuses on the First Law. This is because it expressly shows the effect of manufacturing growth on whole economy.

Some studies tested the Kaldor First Law for developing countries. These confirmed the fundamental role of manufacturing as an engine of growth. Lopez et al. (2014) found that in open developing economies the Kaldor First Law is effective through the impact that manufacturing output growth has on export growth and the effect that export growth has on GDP growth with the sample data of 89 developing countries. Marconi et al. (2016) evaluated the role of the manufacturing in the developing process based on Kaldor Law by panel analysis about 63 high-income and middle-income countries. It stated that in middle-income countries manufacturing and manufacturing goods exports are important to achieve economic growth. Cantore et al. (2017) provided the evidence supporting the role of manufacturing as an engine of growth by an empirical analysis about 80 developing countries. It also decomposed the manufacturing growth into components of structural transformation and employment scale and pointed out that structural transformation enhanced economic growth in developing countries.

Regionally, Wells et al. (2003) confirmed that the Kaldor First Law held in African economics, which have the low levels of industrial development. As for ASEAN countries, Felipe (1998) and Felipe et al. (2007) compared the effect of manufacturing growth on the whole economy. However, the first work did not include Vietnam as an object of analysis. Although the second work analyzed the Vietnamese economy, it did not sufficiently reflect the recent Vietnam's manufacturing development after the extensive South Korean electronics companies' investment. Additionally, some studies tested the Kaldor Laws in the disaggregating service industry (Pieper 2003, Dasgupta et al. 2019, Meglio et al. 2018 and Meglio and Gallego 2022). However, these disaggregated service industries were introduced as explanatory variables, and thus the previous studies did not examine the effect of manufacturing development on the disaggregated service industries but tested whether service industry is an engine of growth.

On the basis of these previous works, this chapter has three areas of contributions. Firstly, with regards to the recent Vietnamese manufacturing growth, the Kaldor First Law is tested to confirm that the leading effect of manufacturing in Vietnam is lower than those in other ASEAN countries. Secondly, this study clarifies on which industries the effect is weaker in Vietnam. Thirdly, the work proposes a policy direction to expand the manufacturing effect to the whole Vietnamese economy.

2-3 Empirical Analysis: Testing the Kaldor First Law

This section illustrates the comparison of the effect of manufacturing growth among ASEAN economies and an empirical analysis to test the Kaldor First Law in Vietnam.

2-3-1 Observation of Vietnam's Manufacturing Growth

This sub-section observes the trend of Vietnam manufacturing growth and compares it with those of the six main ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam).

The introduction of the Doi-Moi started the manufacturing development in Vietnam. According to Table 1, the growth of MVA in Vietnam was more than 10% in the 1990s and early 2000s. Although the Great Recession deteriorated Vietnam's manufacturing performance, after the investment boom of Korean electronics companies around 2010, the performance of Vietnam's manufacturing recovered rapidly. This manufacturing development in Vietnam led to economic growth. The GDP growth in 2016-2020 was 6.0%, which is the highest among the six main ASEAN countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam). GDP per capita in Vietnam was USD 2,786 in 2020, which was 34 times higher than at the beginning of Doi-Moi.

However, the effect of Vietnam's manufacturing growth on the growth of the whole economy pales in comparison to those in the forerunner ASEAN countries at the times when they had their income levels similar to that of Vietnam. For example, Indonesia had MVA growth of 3.9% vs GDP growth ratee 5.7% in 2006-10; Malaysia had 12.6% vs 8.1% in 1986-95; the Philippines had 5.4% vs 6.0% in 2011-15; Singapore had 11.1% vs 8.8% in 1971-80; and Thailand had 9.5% vs 8.5% in 1991-95.

2-3-2 Econometric Analysis: Methodology and Data

This sub-section conducts an econometric analysis to test the Kaldor First Law in Vietnam. We confirm that the manufacturing is the engine of the growth and compare the manufacturing leading effect on whole economy with the other ASEAN economies.

The regression model is derived from Felipe (1998) and Felipe et al. (2007) based on Kaldor's seminal work (Kaldor 1960, 1966, 1967) as follows:

$$lnGdp_{it} = \gamma_0 + \gamma_1(lnMan_{it-1} - lnNMan_{it-1}) + \varepsilon_{it} \quad (1)$$

$$lnNMan_{ijt} = \gamma_2 + \gamma_3 lnMan_{it-1} + \varepsilon_{it} \quad (2)$$

where the subscripts i, j, and *t* denote countries, industries and years, respectively; *Gdp*, *NMan,* and *Man* stand for GDP, NMVA, and MVA, respectively; ε_{it} denotes a residual error term; $\gamma_{0\ldots3}$ stands for estimated coefficient, and *ln* shows a logarithm form.

Equation (1) regresses the growth of GDP on the excess of MVA growth over NMVA growth. Equation (2) regresses NMVA growth on MVA growth. These are a bit different from simple Kaldor First Law. This is because MVA is a part of GDP. The explanatory variables in Equations (1) and (2) are lagged by one period. This helps avoid reverse causality in the model specifications, including the endogenous interaction between the dependent and independent variables.

In these models, the coefficients γ_1 and/or γ_3 are the most important ones. This is because they show the effect of manufacturing growth on the growth of the whole economy or NMVA. If γ_1 and/or γ_3 are positive significantly, its growth is led by manufacturing. Meanwhile, if γ_1 and γ_3 in county A are lower than those of the other countries with statistical significance, these mean the manufacturing force as the engine of growth in country A is weaker than in those in the other countries.

The data are retrieved from the United Nation's National Accounts Main Aggregates Database. Among the six main ASEAN countries, Vietnam's sample period is from 1986 to 2020 as Vietnam's economic structure has changed drastically since the beginning of Doi-Moi, and the other five countries' ones are between 1970 and 2020.

The descriptive statistics for the data are presented in Table 2.

2-3-3 Estimation Results and Discussion

This sub-section explains the results of the regressions and discusses some points.

Table 3 reports the estimation results. In the estimation based on Equation (1), γ_1 is statistically significant in five countries except Singapore. Additionally, although γ_1 in Indonesia, Malaysia, Thailand, and Vietnam is positive, while the Philippines is negative. This result implies the possibility that the Philippines has grown by not manufacturing but other industry development, for example, service industry. Comparing among four countries, in which γ_1 is positively significant, Vietnam ranks third in its volume.

On the other hand, the estimation based on Equation (2) shows a slightly different picture. γ_3 in all six countries is significantly positive. Vietnam's coefficient is 0.651, which is higher than Indonesia's but lower than those in the rest of the countries.

Summarizing the results of these estimation, in Vietnam, manufacturing works as the engine of the growth. Although the effect of manufacturing growth on the whole economy in Vietnam is not necessarily weaker than those of the other five main ASEAN countries, its effect on non-manufacturing industry is weaker than them.

Looking into more detail according to industries, the estimation results show in Table 4 the followings: for 'Agriculture, hunting, forestry, fishing', 'Mining, utility' and 'Construction', $\gamma_3 > 0$ is statistically significant in all countries, while Vietnam's coefficient is not the lowest among the six countries (it is the fourth highest in 'Agriculture, hunting, forestry, fishing', the third highest in 'Mining, utility', and the highest in 'Construction'). However, the effect on the service industry in Vietnam is the lowest among those of the six countries (only in 'Other service', Vietnam's γ_3 is higher than that of Indonesia).

These results imply that the effect of Vietnam's manufacturing growth on the service industry is weaker than those in the other sampled ASEAN countries. There are two possible reasons for this: first, the value added of the service industry that accompanies manufacturing flows out overseas; and second, the consumption of manufacturing workers flows out overseas.

To find out which is the main reason for the weaker manufacturing effect on the service industry in Vietnam, we calculated the foreign dependency of service industry from the following three perspectives: manufacturing output, manufacturing export, and final consumption. Each foreign dependency is defined as follows: the foreign dependency of service industry on manufacturing output is the ratio of input from foreign service industry against total output in manufacturing; the foreign dependency of service industry on manufacturing export is the ratio of input from foreign service industry against total export in manufacturing; and the foreign dependency of service industry on final consumption is the ratio of input from foreign service industry against final consumption expenditure. Table 5 shows the calculation results, which indicates the highest foreign dependency of service industry on manufacturing export. It implies the possibility that the higher the foreign dependence of service industry on manufacturing export is, the weaker the effect of the manufacturing growth on the service industry is.

To verify this hypothesis, this study categorizes the countries into three groups (upper, middle, and lower) based on their foreign dependency of the service industry on manufacturing export. Then, we run the panel analysis in the regression model as follows:

$$lnSER_{it} = \gamma_4 + \gamma_5 lnMan_{it} + f_i + f_t + \varepsilon_{it} \qquad (3)$$

where SER stands for service industry value added; f_i and f_t show a time-invariant country-specific fixed effect and a country-invariant time specific fixed effect, respectively.

In general, the Hausman-test statistic is utilized to make a choice between a fixed-effect model and a random-effect one (Hausman 1978). However, this study emphasizes the existence of exogenously given country-specific and time-specific factors. For example, geography, endowment, and history differ across countries and might be correlated with SER. Additionally the time-specific factors such as economic fluctuations due to external shocks should be also considered. The economic specification that does not account for these effects would lead to an inefficient estimation. Thus, the analysis should be controlled by the country-specific and the time-specific fixed effects.

Table 6 shows the estimation results. Although γ_5 is statistically significant in all groups, there are some differences in the coefficients' volume between the three groups. The higher the foreign dependence of the service industry in manufacturing export is, the smaller the γ_5 is. This result is consistent with our hypothesis and also complies with the previous studies on global value chain (GVC), which illustrates the value creation in the process in GVC. For instance, Taguchi and Pham (2019) examined the structural changes in domestic value creation in exports in the involvement process of GVC with a focus on eight Asian economies (Cambodia, China, India, Indonesia, Malaysia, Philippines, Thailand and Vietnam). Their paper concluded that to regain domestic value added share to exports, the supporting industry including the service industry is more important than the exporting industry itself. In other words, unless the emerging-market economies encourage the service industry, they would lose a part of the effect of industrialization.

As shown in Figure I and II, foreign dependency of the service industry in Vietnam's manufacturing export has increased from 13.3% in 1995 to 20.1% in 2018. When we look closely at the sub-industry level, the ratio of 'Distributive trade, transport, accommodation and food services' is the highest, and the ratio of 'wholesale and retail trade; repair of motor vehicles' shows the largest increase from 1995 to 2018.

The observation above suggests that in order for Vietnam to boost the effect of manufacturing growth, developing its supporting industry, especially service industry, is the key as it will decrease the foreign dependency of service industry in manufacturing exports.[1]

2-4 Policy Directions

This section proposes the policy direction to enhance the effect of manufacturing growth in Vietnam

ADB (2021) pointed out that multinational corporations (MNC) played an important role to organize the GVC. This implies that the Vietnamese government should improve the business environment of the service industry so that MNC would leave the wholesale and retail trade function of GVC in Vietnam.

The Vietnamese government has promoted service industry related manufacturing. In the Five-year Socio-economic Development Plan 2006-2010, Vietnam Government stipulated creating a leap in development of the service sector, raising the quality of traditional services, developing new services, and developing and raising the competitiveness of potential services as the major tasks and solutions. Additionally,

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[1] Generally, it is argued that nurturing of export-oriented Small-Medium sized Enterprises (SMEs) is a key strategy for Vietnam's development. However, it will take many years to raise SMEs up to the technology level enough for MNC to accept. Assuming the current position of Vietnam in GVC, developing service industry which supports manufacturing industry is an important strategy for Vietnam.

Industrial Development Strategy through 2020 vision toward 2035 raised the linking the manufacturing with the development of industrial services by 2025 as one of missions. These efforts have improved the business environment of the service industry in Vietnam as shown in Figure III and IV. FDI Restrictiveness Index of Distribution, Wholesale and Retail in 2020 decreased to less than the half level of 1997. International Logistic Performance Index also improved in the latest decade.

However, Vietnam is not only a country that improved the business environment of its service sector. In fact, in spite of the improvement in both indices, Vietnam's rank was not raised so drastically (see Figure V). To develop the service industry that supports manufacturing, the Vietnamese government should further improve the business environment and appeal the achievement to MNCs efficiently.

Chapter III Premature Deindustrialization Risk in Asian Latecomer Developing Economies

This chapter examines the risk of premature deindustrialization in Asian latecomer developing economies.

3-1 Introduction

In recent years, the problem that even if the developing countries succeed in starting industrialization, their growth would not continue, has been recognized. The problem is called "premature deindustrialization".

"Premature deindustrialization" is defined in the literature as the economic phenomenon wherein developing countries transition into service economies without having undergone a comprehensive industrialization experience (Dasgupta and Singh 2007; Rodrik 2016). The concept of "premature" is, therefore, characterized by the state of less industrialization in developing countries than advanced countries had ever experienced before. According the Petty-Clark law, advanced countries have already been in the post-industrial phase of development for decades.

Deindustrialization in advanced countries has been accompanied by labor productivity improvements in the manufacturing sector, thereby leading to a decline of employment share of manufacturing rather than an increase in the share of manufacturing. However, since the 1980s, the manufacturing sector in developing countries has been shrinking in terms of both employment and output sooner, at much lower levels of income, and with much lower shares, compared with early industrializers (Rodrik 2016).

As such, a question arises as to how seriously premature deindustrialization affects the economic development of developing countries. Its detrimental effects on their economic growth are obvious because the manufacturing sector is considered to be an engine of economic growth. For instance, Kaldor (1960, 1966, 1967) who identified manufacturing as the sector embodying larger spill-over effects and greater "learning by doing" than other sectors, demonstrated the eponymous Kaldor Law.

Rodrik (2013) argued that the manufacturing sector shows unconditional labor productivity convergence, absorbs more unskilled labor than other sectors, and does not face the demand constraints of a home market due to its tradability in international markets. Thus, premature deindustrialization, by removing all the channels through which manufacturing accelerates economic development, disrupts the main avenue for economic development of developing countries.

Another critical issue concerns the mechanism of premature deindustrialization in developing countries, which is contrary to deindustrialization in advanced countries. Rodrik (2016) proposed the following theoretical framework to account for this difference. Productivity improvements drive deindustrialization in advanced countries, which reasonably explains labor displacement from manufacturing. Conversely, as price-takers in a globalized world market, developing countries that lack a strong comparative advantage in manufacturing have to "import" deindustrialization from advanced countries. This is because the global decline in the relative price of manufacturing due to technological progresses and a rise of China in manufacturing should make developing countries become net importers of manufactured goods, if they do not have the price competitiveness when opening up their trades globally. This mechanism leads developing countries to deindustrialization in both employment and output

Most empirical studies consider Asian economies outside of the scope of premature deindustrialization. However, analyses of individual Asian countries reveal diverse economies in significantly different stages of development, of which some latecomers may be exposed to the threat of premature deindustrialization.

This study examines this risk for latecomer developing countries in Asia by applying the latecomer index. It focuses on manufacturing output, not employment, since deindustrialization in output is typical of developing countries but ambiguous in advanced countries, whereas deindustrialization in employment is common to both groups. The latecomer index in a certain year is given by the ratio of the GDP per capita of a developing country relative to that of a benchmark country (China, in this chapter) in that year. If the relationship between industrialization (measured by manufacturing ratio) and GDP per capita for a latecomer, denoted by the latecomer index, shifts below that of the benchmark country, this implies the existence of premature deindustrialization risk. This is because the latecomer's manufacturing ratio would be lower than that of the benchmark country for the same GDP per capita, suggesting that the former would peak at a lower level than the latter. Most of previous empirical studies have concentrated on the comparison of industrialization peaks between forerunner and latecomer economies, reporting that lower peaks with lower incomes in latecomers indicate premature deindustrialization. However, while latecomers face a high probability of falling into premature deindustrialization, not all latecomers necessarily reach their industrialization peaks. The latecomer index facilitates the identification of downward shifts in latecomers' manufacturing–income nexus, regardless of the existence of an industrialization peak. Even for a latecomer that has not reached its peak, its downward shift suggests an upcoming peak-out at a lower manufacturing share in a lower income stage, implying a symptom of premature deindustrialization. This study also proposes a policy direction involving participation in global value chains (GVCs) to mitigate premature deindustrialization risk.

The remainder of this chapter is structured as follows. Section 3-2 reviews the literature related to the issue on premature deindustrialization and clarifies this study's contributions. Section 3-3 presents a theoretical framework of premature deindustrialization in developing countries based on Rodrik (2016). Section 3-4 illustrates the empirical analysis performed to verify the risk of premature deindustrialization in latecomer developing countries in Asia and proposes a policy direction to mitigate the risk.

3-2 Literature Review and Contributions

This section reviews the literature on premature deindustrialization.

Although the term "premature deindustrialization" was first used by Dasgupta and Singh (2007), they focused only on employment, not output, and argued that the decline in manufacturing is not necessarily a pathological phenomenon. In Latin America and Africa, pathological deindustrialization occurred because of a focus on current, rather than long term, dynamic comparative advantage. Conversely, the information technology–driven service sector was regarded as a new engine of India's growth; similarly, East Asian countries benefited from a focus on knowledge-based industries under their industrial policies.

Rodrik's (2016) model refined the arguments of premature deindustrialization and described it as the early shrinking of manufacturing in terms of both employment and output in developing countries. The following results were identified using empirical estimations: Late industrializers attain peak levels of industrialization (measured by manufacturing employment and output shares) lower than those experienced by early industrializers, at lower income levels (the post-1990 peak incomes are around 40 percent of the pre-1990 ones). Among the developing regions, Latin America and sub-Saharan Africa have been hard hit by premature deindustrialization, whereas Asian countries, as a group with comparative advantages in manufacturing, have managed to avoid this trend. With respect to employment deindustrialization by skill groups, the manufacturing employment losses entirely constitute the low-skill category; high-skill employment has increased over time. Applying the method of Rodrik (2016) to their estimation with an expanded sample, Sato and Kuwamori (2019) found that both the peak level of the share of manufacturing employment and output and the corresponding income are lower for developing countries (non-OECD) than for developed countries (OECD), suggesting premature deindustrialization.

Most of the region- and country-specific studies on premature deindustrialization 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. Imbs (2013) pointed out that deindustrialization in sub-Saharan Africa has been correlated with the rising importance of extractive activities in its economy. The existence and symptoms of premature deindustrialization were also identified by country-specific studies. Rasiah (2011) clarified that Malaysia is facing negative deindustrialization since 2000s by examining the trend of manufacturing value added, trade and productivity and pointed out that one of the main reason is government's ethnic policy (Bumiputera). Islami ande Hastiadi (2020) found out that Indonesia's the share of MVA and income level at peak was lower than the thresholds which were shown in Rodrik (2016) by panel analysis of Indonesia province level data and concluded that Indonesia has fallen into the premature deindustrialization.

This study follows the concept and empirical framework of premature deindustrialization as proposed by Rodrik (2016), although the analytical concerns are somewhat different from those in the aforementioned literature. The contributions on premature deindustrialization in this study are highlighted as follows. First, diverging from the previous literature, which either analyzed the Asian economies with a collective comparative advantage in manufacturing (Dasgupta and Singh 2007; Rodrik 2016) or performed country-specific analyses without comparisons (Rasiah 2011; Hamid and Khan 2015; Islami and Hastiadi 2020), this study focuses on individual Asian economies and compares the deindustrialization processes between the forerunners and latecomers in economic development. Second, it applies the latecomer index, rather than simple time dummies as applied in previous studies, to examine the risk of premature deindustrialization in latecomer developing countries in Asia. Empirical estimation using the latecomer index makes it possible to identify downward shifts in latecomers' manufacturing–income relationship, the main symptom of premature deindustrialization. Third, this study extends the discussion beyond the risk of premature deindustrialization to provide a policy direction to mitigate and avoid the risk from the view point of participation in GVCs.

3-3 Theoretical Framework of Premature Deindustrialization

This sub-section explains the theoretical framework of premature deindustrialization based on previous literatures.

The theoretical framework of premature deindustrialization in developing countries in this study is based on Rodrik (2016) and 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 represented by α. Then, the production functions for the two sectors with diminishing marginal returns to labor are given as follows:

$$q_m^s = \theta_m \alpha^{\beta m} \tag{4}$$

$$q_n^s = \theta_n (1-\alpha)^{\beta n} \tag{5}$$

where q_m^s and q_n^s 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, represented by q_m^d and q_n^d, is expressed in the rates of change form as follows, with a dot above a variable representing proportional change ($\dot{y}=dy/y$):

$$\dot{q}_m^d - \dot{q}_n^d = -\sigma(\dot{p}_m - \dot{p}_n) \tag{6}$$

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, the two goods-market clearing equations can be written as

$$q_m^d + x = q_m^s \tag{7}$$

$$q_n^d = q_n^s \tag{8}$$

where x stands for the net exports of the manufactured good (for simplicity, trade non-manufactures are 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:

$$\beta_m p_m \theta_m \alpha^{\beta m-1} = \beta_n p_n \theta_n (1-\alpha)^{\beta n-1} \tag{9}$$

For relative prices, the non-manufactured good is treated as numeraire, so that p_n can be fixed at unity. Thus, the model has seven endogenous variables:

$\alpha, q_n^d, q_n^s, q_m^d, q_m^s, p_m,$ and x. We would need an additional assumption to determine p_m and x simultaneously.

In one case, which is meant to capture the situation in advanced countries, prices (p_m) are determined endogenously by development in the home economy and net trade (x) are exogenous. Under this assumption, the comparative statics for the output share of manufacturing ($d\alpha_q$) are expressed as follows;

$$d\alpha_q = \alpha_q(1-\alpha_q)\left\{\frac{\frac{\sigma}{\sigma-1}}{\left(\frac{\sigma}{\sigma-1}\right)-[(1-\alpha)\beta_m+\alpha\beta_n]}\right\}(\dot{\theta}_m-\dot{\theta}_n) \tag{10}$$

Intuitively, $\sigma < 1$ is assumed, namely the reduction in the relative price of manufacturing by the technological progress would not spur demand for manufacturing products sufficiently. So, Equation (10) suggests that rapid technological progress in manufacturing does not bring the output deindustrialization.

This result is interpreted that in an economy where trade plays a small role, as they are the price maker, the reduction in the relative price of manufacturing products and the technology progress would be achieved simultaneously. So they are difficult to fall into the output premature deindustrialization.

On the other hand, this study makes another assumption for the case of developing countries: The economy is sufficiently small and open that it remains a price-taker in world markets (such that x is endogenous and p_m is a parameter). Under this assumption, the comparative statics for the output share of manufacturing ($d\alpha_q$) are expressed as follows:

$$d\alpha_q = \alpha_q\left(1-\alpha_q\right)\left[(\lambda/(1-\lambda))\,\dot{p}_m + (1/(1-\lambda))(\dot{\theta}_m-\dot{\theta}_n)\right]$$
$$\lambda = (1-\alpha)\beta_m + \alpha\beta_n \tag{11}$$

Equation (11) suggests that an increase in the relative price of manufacturing ($\dot{p}_m$) and technological progress in manufacturing over that in non-manufacturing ($\dot{\theta}_m - \dot{\theta}_n$)

positively affect the output share of manufacturing.

These theoretical explanations are summarized as Table 7. Premature deindustrialization in small and open developing countries is interpreted as follows. While the global supply of manufactures exceeds that of non-manufactures with technological progress in manufacturing, the relative price of manufactures ($\dot{p}_m$< 0) declines for all countries under globalization. In this case, countries that are price-takers with less technological progress in manufacturing (the increase in $\dot{\theta}_m - \dot{\theta}_n$ is less than the decline in $\dot{p}_m$) witness a decline in the output share of manufacturing ("imported" deindustrialization); only countries with a manufacturing productivity growth sufficient to offset the relative-price decline (having a comparative advantage in manufacturing) can avoid premature deindustrialization.

3-4 Empirical Analysis of the Premature Deindustrialization

This section conducts empirical analyses on the risk of premature deindustrialization with a focus on 14 Asian developing countries.

3-4-1 Manufacturing Output Ratio Trends

This sub-section overviews the relationship between manufacturing output ratio and GDP per capita for 14 Asian developing countries.

Figure VI shows the manufacturing–income relationship between 1970 and 2018 for 14 Asian emerging and developing economies—in East Asia: China; in Southeast Asia: Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, and Vietnam; and in South Asia: Bangladesh, India, Nepal, Pakistan, and Sri Lanka. Real GDP per capita is represented on the horizontal axis, whereas the real and nominal output ratios of manufacturing are represented on the vertical axis in Figure VIa and VIb, respectively.

The trajectories are observably different: Real output (Figure VIa) exhibits an increasing trend throughout for all individual trajectories, whereas the nominal output (Figure VIb) trajectories are mostly hump-shaped curves. A possible reason is that the nominal output is affected by the price decline resulting from manufacturing productivity growth, while the real output is not. However, the location of each economy's trajectory is almost the same between the two cases. Thus, the following observations focus on the real output ratio of manufacturing.

With China as the benchmark, all latecomers (except Malaysia) exhibit lower output ratios of manufacturing with growth in GDP per capita. In other words, latecomers' manufacturing–income trajectories tend to shift downwards. Although this implies, a priori, the risk of premature deindustrialization, latecomers' shifting patterns are further subjected to an econometric test by controlling for income and demographic trends and by using the latecomer index.

3-4-2 Econometric Analysis: Methodology and Data

This sub-section explains the methodology and data for the econometric analysis.

The baseline regression for this study is based on Rodrik (2016) as well as Sato and Kuwamori (2019), modified in line with its analytical concerns as follows:

$$man_{it} = \gamma_0 + \gamma_1 lnpop_{it} + \gamma_2 (lnpop_{it})^2 + \gamma_3 lnypc_{it} + \gamma_4 (lnycp_{it})^2 + \varphi_1 lac_{it} + \varphi_2 lac_{it} * d90 + \varphi_3 lac_{it} * d00 + f_i + f_t + \varepsilon_{it} \quad (12)$$

where the subscripts *i* and *t* denote countries (the 14 Asian emerging and developing economies) and years (1970–2018), respectively; *man* represents the output ratios of manufacturing; *pop* and *ypc* show a country's population size and real GDP per capita;

lac denotes the latecomer index; *d90* and *d00* represent time dummies for 1990–2018 and 2000–18, 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; $\gamma_{0\ldots4}$ and $\varphi_{0\ldots3}$ stand for estimated coefficients, respectively; and *ln* shows a logarithm form.

The most important variable in equation (12), which differentiates the present specification from those in earlier studies, is the latecomer index (*lac*). The index represents the degree of delayed development of a country and is captured by the ratio of its GDP per capita to that of a benchmark country (here, China[2]) in a certain year.

The usage of the latecomer index is justified in this study, because the index has been applied to represent latecomer advantages and disadvantages (e.g., Taguchi and Murofushi 2012) and the premature deindustrialization corresponds to the category of the latecomer disadvantage in industrialization process. In computing the index, China is chosen as a benchmark, because China has been a global manufacturing center (Sung 2007) and a top runner in the samples' manufacturing-output ratios so that the deindustrialization in the other sample economies can be clearly presented. The significance and sign of the coefficient of the latecomer index (φ) are critical for identifying the premature deindustrialization risk: A significant positive value of φ, that is, the link between a country's delayed development and its lower manufacturing output ratio, can substantiate the premature deindustrialization risk. This is because the downward shift of the manufacturing–income relationship suggests that a latecomer's

[2] According to the definition of premature deindustrialization, an advanced country should be chosen as a benchmark. However, most of advanced countries have already reached their peaks in industrialization and their choice as benchmark would make it difficult to clearly extract the latecomers' effect, namely the downward shift of their manufacturing–income relationship. Thus, this study chose China as a benchmark as a second-best option for an empirical purpose.

manufacturing ratio peaks or will peak at a level lower than the benchmark. The latecomers' effect on manufacturing–income relationships is also likely to be affected by globalization. Thus, the equation contains the cross-terms of the index (*lac*) and time dummies for 1990–2018 (*d90*) and 2000–18 (*d00*). One of the reasons of using time dummies is that Rodrik (2016) also regarded the post-1990 period as the one wherein globalization gathered momentum.

With respect to the control variables for income and demographic trends, an inverted U-shaped relationship between a country's manufacturing output ratio and real GDP per capita is observed if γ_1, $\gamma_3 > 0$ and γ_2, $\gamma_4 < 0$ are significant. Country-specific and time-specific effects, represented by f_i and f_t, respectively, must also be controlled for panel estimation. From a statistical perspective, the Hausman specification test is generally utilized to choose between fixed-effect and random-effect models (Hausman 1978). However, this study places a premium on the existence of exogenous country- and time-specific factors. Assume that factors such as geography, endowments, history, and political systems differ among sample countries and are correlated with manufacturing output ratios (not distributed randomly among sample countries). Further, assume that economic fluctuations due to external shocks, such as the Asian financial crisis of 1997–98 and the Great Recession of 2008–09, affected manufacturing activities. As a specification ignoring these effects leads to inefficient estimation, they should be controlled for by incorporating country- and time-specific fixed effects into the specification.

The descriptive statistics for the data are presented in Table 8 and the trend of latecomer index in each country is shown in Table 9. A panel dataset is then constructed for the 14 Asian emerging and developing countries for 1970–2018. The data for the estimation, manufacturing output ratio, population and GDP per capita are retrieved from UNCTAD Stat with real value from the series of constant (2015) prices and nominal value from current prices.

3-4-3 Estimation Results and Discussion

This sub-section explains the results of the regression and discusses them.

Table 10 reports the estimation results for the two cases with real and nominal output ratios of manufacturing as the dependent variable, respectively. Focusing on the real output ratio of manufacturing, Table 11 divides the sample countries into those with trade deficit and trade surplus in manufactures, while Table 12 divides the sample into South Asian and Southeast Asian countries. In most of the cases, $\gamma_1, \gamma_3 > 0$ and $\gamma_2, \gamma_4 < 0$ hold significantly, demonstrating an inverted U-shaped relationship between a country's manufacturing output ratio and its real GDP per capita.

For both the real and nominal manufacturing output cases in Table 10, the coefficients of the latecomer index (*lac*) with the post-1990 and post-2000 dummies (*d90* and *d00*) are significantly positive, while those without time dummies are negative. Additionally, the positive coefficients are much larger than the negative ones in both cases. These estimation outcomes suggest the link between a country's delayed development with a lower manufacturing output ratio, that is, a downward shift of manufacturing–income relationship, implying the premature deindustrialization risk under globalization. As common results are obtained for real and nominal manufacturing output, and nominal output is affected by price, the subsequent estimations focus on real manufacturing output.

Table 11 presents the estimation results when the sample countries are divided according to their trade deficit or surplus in manufactures. This captures the differences in "imported" deindustrialization between the countries with a comparative "disadvantage" in manufacturing (corresponding to a manufacturing trade deficit) and those with a comparative "advantage" (trade surplus). Among the sampled countries, China, Cambodia, Malaysia, Thailand, and Vietnam are classified as manufacturing trade-surplus countries and the others as trade-deficit countries. The results show that the latecomer index (*lac*) has significant and positive coefficients for the trade-deficit countries 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 latecomer index has positive coefficients only in the post-1990 and post-2000 periods, and the additional positive effects outweigh the negative only for the post-2000 period. Thus, the downward shift of the manufacturing–income curve, that is, the premature deindustrialization risk, is more acute for the manufacturing trade-deficit countries compared with the trade-surplus countries.

Table 12 shows the estimation outcomes for the sample divided by region, into South Asian and Southeast Asian countries. It is found that the latecomer index has positive coefficients in the total and the post-1990 and post-2000 periods for the South Asian countries; the *lac* coefficients for Southeast Asian countries are positive only in the post-1990 and post-2000 periods, although the positive effects outweigh the negative effects for the total sample period.

The positive effect, and thus the premature deindustrialization risk, is larger for South Asia than for Southeast Asia. The results in Table 12 are consistent with those in Table 11, because South Asia does not include any manufacturing trade-surplus countries.

Regarding the Vietnamese economy, it is found to be classified into a less risky economy in premature deindustrialization as a nation-wide level.

3-5 Policy Directions

This section proposes the policy direction to mitigate the risk of premature deindustrialization for 14 Asian developing countries.

Participation in GVCs can be a viable policy to mitigate premature deindustrialization risk in Asian emerging and developing economies. GVCs have dominated global economic activities over the past two decades. They have been described, by UNCTAD (2013), as the fragmentation of production processes and the international dispersion of tasks and activities among economies in diversified developmental stages, which have led to the emergence of borderless production networks. Kimura (2006) and Kimura et al. (2007) argued that international production and distribution networks typically exist in East Asian manufacturing activities. GVCs boost economic growth through specialization in production processes, which enhances efficiency and productivity; durable inter-firm relationships also promote technology diffusion along the chain. The World Bank (2020) estimated that a 1 percent increase in GVC participation would boost per capita income by more than 1 percent, causing more than 0.2 percent income gains from standard trade. Figure VII illustrates a rough correlation between the real manufacturing output ratio and the index of GVC participation in 2018. Table 13 reports the estimation outcome wherein the correlation of both variables controls for income and demographic trends as well as country- and time-specific fixed effects, similar to equation (12). The equation contains not only the GVC participation index (*gvc*) but also the cross-terms of the index (*gvc*) and the time dummy for 2000–18 (*d00*), considering the recent progress in GVC integration in Asia. The results show that the *gvc* index has significant and positive coefficients for the post-2000 period, although the index coefficient for the total sample period is insignificant. It suggests a positive link between a country's GVC participation and its manufacturing output ratio in the past two decades, thereby implying that GVC participation is partially effective in mitigating premature deindustrialization risk in emerging and developing Asian economies.

Numerous reports of international organizations (UNCTAD 2013; World Bank 2016, 2020) have recommended GVC participation strategies such as infrastructure and human resource development, institutional improvements, and policy frameworks to create industrial clusters and networks. One of the key concerns for latecomers to economic development is improving their logistics performance. GVC activities have often been discussed in the intra-industry manufacturing trade context by the “fragmentation theory” proposed by Jones and Kierzkowski (1990, 2005), which shows that a foreign investor’s decision on the fragmentation of production processes depends on the differences in locational advantages (e.g., factor prices such as wages) and the “service-link costs,” or the costs of linking remotely located production blocks. Following this theory, latecomers with lower wages have an advantage in attracting foreign investors in GVC activities. Conversely, they face a greater challenge in terms of higher service-link costs. Thus, their GVC participation is contingent on the reduction of service-link costs by improving logistics performances (Taguchi and Thet 2021).

One of the policy directions implied in this study are, therefore, for the governments of latecomer developing countries to reinforce their GVC participation strategies by creating business environments enough to attract foreign investors, particularly, by enhancing their logistics performance. The logistics performance includes not only hard infrastructure such as roads and ports but also soft infrastructure such as custom procedure and timeliness of shipment. These should be an essential avenue for them to mitigate the risk of premature deindustrialization.

Chapter IV Premature Deindustrialization Risk in Vietnam

4-1 Introduction

Among ASEAN, the Vietnamese economy has performed well. The average GDP growth rate of Vietnam between 2011 and 2020 was 6.0%, which was lower than Lao PDR (6.8%), Myanmar (6.2%), and Cambodia (6.1%). However, it was the highest among the six main ASEAN countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam). Over the last decade, GDP per capita increased from USD 1,525 to USD 2,786. This stable development has been brought about by the expansion of manufacturing, as shown by the increase in manufacturing share in output (from 12.4% in 2011 to 17.4% in 2020) and employment share (from 13.9% in 2011 to 21.1% in 2020). Vietnam's growth can be attributed to its manufacturing sector.

According to Petty-Clark's Law, deindustrialization and the transition to a service economy have been considered as proof of development (Clark, 1940). However, the recent studies found out that premature deindustrialization in developing countries constrains their development by removing all the channels that accelerate economic growth, such as economies of scale, learning by doing, and unconditional labor productivity convergence (Kaldor, 1960, 1966, 1967; Rodrik, 2013, 2016).

According to Dasgupta and Singh (2007), Latin American and African economies have experienced "pathological" deindustrialization. Additionally, Rodrik (2016) noted that Latin American and Sub-Saharan African countries have suffered from premature deindustrialization, while Asia countries with comparative advantages in manufacturing have been insulated from this trend. However, recent research has found that some Asian countries have been experiencing premature deindustrialization (Andriyani and Irawan, 2018; Islami and Hastiadi, 2020; Rasiah, 2011; Taguchi and Tsukada, 2022).

However, the question arises as to how seriously premature deindustrialization will affect Vietnam. From an economic perspective, Vietnam may lose its manufacturing advantage (for example, scale economies, learning by doing and unconditional convergence), and its growth may come to a halt. From a political perspective, Vietnam may face an increase in its social instability, as noted in Rodrik (2016). This poses a serious challenge to the country's development.

Although this chapter follows the concept and empirical framework of premature deindustrialization proposed by Rodrik (2016), it differs from previous studies. First, this study examines the risk of premature deindustrialization in Vietnam based on provincial-level data. It focuses on manufacturing output since output deindustrialization tends to occur more frequently in developing countries than in advanced countries. Second, during the early 2000s, Indonesia's manufacturing output ratio peaked, when it's GDP per capita was approximately USD 1,000 (Andriyani and Irawan, 2018). Despite Vietnam's GDP per capita being USD 2,786 in 2020, no study has yet been conducted on the premature deindustrialization risk in Vietnam. In the early stages of industrialization, it may be difficult to derive a clear inverted U-shaped curve in terms of the manufacturing output ratio and GDP or gross regional products (GRP) per capita. In order to overcome this obstacle, this study uses the latecomer index (LAC Index) with reference to Taguchi and Tsukada (2022). The LAC Index is calculated by comparing a province's GRP per capita with that of a benchmark province. The LAC Index's adoption in empirical estimations can identify the downward shift of latecomers' manufacturing-income relationship. This is the symptom of premature deindustrialization. Third, this chapter proposes a policy direction to mitigate or avoid the premature deindustrialization risk.

4-2 Empirical Analysis on the Risk of Premature Deindustrialization

This section illustrates an overview of the relationship between manufacturing output ratio and GRP per capita with a province level data, and we verify the risk of premature deindustrialization in Vietnamese provinces by an econometric analysis.

4-2-1 Observation on Trends in the Share of Manufacturing

This sub-section observes the trends in the share of manufacturing by provinces.

The observation covers 63 provinces in Vietnam. Figure VIII shows their manufacturing–income relationship, with nominal GRP per capita on the horizontal axis and the real manufacturing ratio on the vertical axis. The provincial data are retrieved from a statistical yearbook published by the General Statistics Office in Vietnam. Real manufacturing output are converted to a single time series version (2010 constant price) according to the UN's back-casting method for the National Accounts Main Aggregates Database. When time-series overlap for at least one year, the overlapping year is used to create a ratio that is applied backwards to the previous version of the time-series.

Table 14 shows the data coverage for each province and regional classification.

Figure VIII shows that manufacturing–income trajectories vary by region and province. For example, as GRP per capita increases in the Red River Delta and Mekong River Delta provinces, the real manufacturing ratio also increases. In contrast, manufacturing–income trajectories in some provinces of Northern Midlands and Mountain Area as well as Central Highlands tend to shift downward. This implies the possibility of premature deindustrialization risk. Therefore, these patterns need to be further assessed econometrically using the latecomer index, controlling for income and demographic trends.

4-2-2 Econometric Analysis: Methodology and Data

This sub-section conducts an econometric analysis to verify the risk of premature deindustrialization in Vietnamese provinces.

The regression model is derived from Rodrik (2016) and Taguchi and Tsukada (2022), but modified for analytical reasons as follows:

$$man_{it} = \gamma_0 + \gamma_1 lnpop_{it} + \gamma_2 (lnpop_{it})^2 + \gamma_3 lnypc_{it} + \gamma_4 (lnypc_{it})^2 + \varphi_1 lac_{it} + \varphi_2 lac_{it} * d00 + \varphi_3 lac_{it} * d10 + f_i + f_t + \varepsilon_{it} \quad (13)$$

where the subscripts *i* and *t* denote provinces and years, respectively; *man* stands for the real manufacturing output ratio; *ypc* and *pop* show a province's GRP per capita and population size, respectively; *lac* denotes the latecomer index; d00 and d10 represent time dummies for 2000–2018 and 2010–2018, respectively; f_i and f_t show a time-invariant province-specific fixed effect and a province-invariant time-specific fixed effect, respectively; ε_{it} denotes a residual error term; $\gamma_{0 \ldots 4}$ and $\varphi_{0 \ldots 3}$ stand for estimated coefficients and *ln* shows a logarithm form.

The *lac* index represents the level of development in a particular province. In a given year, it is computed by the ratio of the GRP per capita of a certain province to that of the benchmark province (TP. Ho Chi Minh). The significance and sign of the latecomer index (φ) coefficient are critical for identifying premature deindustrialization risk. A significantly positive φ may indicate the existence of a premature deindustrialization risk. It implies that a province's later development is linked with a lower manufacturing output ratio, which indicates a downward shift of manufacturing–income relationship. This downward shift suggests that the manufacturing output ratio of a latecomer province peaks or will peak at a lower income level than that of the benchmark province. The equation contains the latecomer index cross-terms and time dummies for 2000–2018 (d00) and for 2010–2018 (d10) since the latecomer's effect appears to be affected by globalization.

In general, the Hausman-test statistic is utilized to differentiate between a fixed-effect and a random-effect (Hausman 1978). However, this study emphasizes the existence of exogenously given province-specific and time-specific factors. For example, consider that geography, endowments and history differ across provinces and are correlated with manufacturing output ratios. Furthermore, consider the possibility that economic fluctuations due to external shocks affected manufacturing activity in Vietnam. Then, a specification that does not account for these effects would lead to an inefficient estimation. They should be controlled by equipping province-specific and time-specific fixed effects.

The descriptive statistics for the data are presented in Table 15.

4-2-3 Estimation Results and Discussion

This sub-section explains the results of the regression and discusses them.

Table 16 reports the estimation results. In all the cases, $\gamma_3 < 0$ and $\gamma_4 > 0$ holds significantly. This does not indicate the existence of an inverted U-shaped relationship between a country's manufacturing output ratio and its GRP per capita. It may be because of the following two reasons. First, Vietnam is an emerging country classified as a lower middle-income country and undergoing industrialization. Second, the sample periods for several provinces are too short to determine a clear inverted U-shaped pattern.

The coefficients for the latecomer index (*lac*) with the post-2000 dummies and without time-dummy are not significant. Only the latecomer index coefficients with the post-2010 dummy are positive, but the level of significance is 90%. These results indicate no sign of a premature deindustrialization risk in Vietnam as a nation-wide economy. The subsequent estimations focus on the regional analysis

Table 17 reveals the estimation results by dividing Vietnam's provinces into six regions (Red River Delta, Northern Midlands and Mountain Areas, North Central and Coastal Area, Central Highland, South East, and Mekong River Delta) based on the General Statistics Office classification. Essentially, this division is intended to observe the difference in premature deindustrialization risks across regions.

According to the estimation results, in the Red River Delta and Central Highland, $\gamma_3 > 0$ and $\gamma_4 < 0$, hold significantly at a 95% confidence level and a 99% confidence level, respectively. This indicates that an inverted U-shaped relationship exists between a province's manufacturing output ratio and its GRP per capita. However, in the Northern Midlands and Mountain Areas, γ_3 is negative with a 95% confidence level, and γ_4 is positive without a confidence level. This indicates that an inverted U-shaped relationship does not exist in this region. This may be the case since Northern Midlands and Mountain Areas is the most emerging region as shown in Table 15 and in the process of undergoing industrialization.

The latecomer index coefficients for the Northern Midlands and Mountain Areas are positive, with a 99% level of confidence. The level of confidence is only 90% in North Central and Central Coastal Areas. However, the Mekong River Delta is negative, with a 95% level of confidence. These results imply that premature deindustrialization risk in Vietnam varies across regions, and the Northern Midlands and Mountain Areas is highly exposed to the risk of premature deindustrialization.

The results of the analysis can be summarized as follows. There is no reason to conclude that Vietnam is facing the risk of premature deindustrialization. However, that risk has become apparent in a few regions, especially in the Northern Midlands and Mountain

Areas, where measures must be taken to promote industrialization.

4-3 Policy Direction

According to Rodrik (2016), the primary cause of premature deindustrialization in developing countries was a lack of technological advancement in manufacturing sector compared to advanced countries. This could only be prevented in countries with sufficient productivity growth. In developing countries, it can be challenging for local enterprises to promote technology advancement on their own. There is no alternative but to rely on technology diffusion from advanced countries. Previous studies have suggested that trade and foreign direct investment promoted technology diffusion in developing countries (Blomstrom and Sjoholm, 1999; Chuang and Lin, 1999; Coe et al., 1997; Kokko, 1994; Sjoholm, 1999; Takii, 2005; Todo, 2008; Van Biesebroeck, 2005)

Table 18 reports the estimation outcomes based on Equation (13). This estimation categorizes provinces into three groups (upper, middle and lower) based on their trade openness and foreign direct investment. Trade openness is calculated as the ratio of trade value (export plus import) to GRP. Human interaction is one of the main routes for technology diffusion. Therefore, foreign direct investment is measured as the number of investments per capita. Data on trade statistics and foreign direct investment are retrieved from the General Statistical Office and Vietnam Customs.

Based on the estimation results regarding trade openness and foreign direct investment, the coefficients for the latecomer index are negative in the upper 1/3 of provinces. Conversely, those in the lower 1/3 of provinces are positive with a 99% confidence level. According to Table 19, Northern Midlands and Mountain Areas are included in these lower 1/3 groups.

In light of these analyses, it appears that the provinces that receive more export-oriented foreign direct investment are less exposed to the risk of premature deindustrialization, while those that receive less export-oriented foreign direct investment are likely to have the risk.

Perkins and Vu (2009) observed that industrial investment by foreign enterprises was concentrated in specific locations, specifically around the Hanoi–Haiphong area and Ho Chi Minh City, and this was attributed to weak transport infrastructure in Vietnam.

Based on the analyses and discussion above, the Vietnamese government should improve the business environment of the Northern Midlands and Mountain Areas to attract more export-oriented foreign direct investments and prevent premature deindustrialization. Both the soft and the hard aspects of the business environment should be improved. The soft side includes land access and tenure, time costs, as well as informal charges as improvement points, while the hard side includes not only the infrastructure that has been denoted by Perkins and Vu (2009), but also the development of industrial parks, as shown in Figures IX and X.

Although there are many mountainous regions in the Northern Midlands and Mountain Areas, some of these provinces border China. Therefore, the "China Plus One" movement can be a great opportunity for the Northern Midlands and Mountain Areas as well as for Vietnam as a whole.

Chapter V Conclusion

This chapter summarizes and concludes this dissertation.

The effect of Vietnam's manufacturing growth was examined in Chapter II and the premature deindustrialization risk in Asian developing countries and Vietnamese provinces in Chapters III and IV, respectively.

The main contributions and findings of this study can be highlighted as follows.

The main findings on the effect of Vietnam's manufacturing growth discussed in Chapter II, are as follows. First, the effect of Vietnam's manufacturing growth on the service industry is weaker than those in the forerunner ASEAN countries. Second, a country with the higher foreign dependency of the service industry in manufacturing exports tends to lose part of its manufacturing growth. The Vietnam's foreign dependency is higher than those of the forerunner ASEAN countries. The Vietnamese government should encourage the development of industries supporting manufacturing (e.g., service industry) and appeal the achievement to MNCs.

In Chapter III, the risk of premature deindustrialization in latecomer developing countries in Asia was assessed using the latecomer index, with a focus on the manufacturing output ratio. The empirical analysis indicated that the risk of premature deindustrialization was higher in the countries with manufacturing trade deficit countries and South Asian countries than in the countries with trade surplus countries and Southeast Asian countries. A positive relationship was also identified between a country's GVC participation and its manufacturing output ratio in past two decades. The main policy implication of this study is that latecomer developing economies in Asia should participate in GVC activities in manufacturing, by improving their logistics performance to attract foreign GVC investors, to mitigate the risk of premature deindustrialization.

Chapter IV examined the risk of premature deindustrialization in Vietnam using provincial data. The manufacturing-income relationship was estimated based on Rodrik (2016). The main findings in this chapter are summarized as follows. First, although it could not be concluded that Vietnam is facing the risk of premature deindustrialization, this risk is becoming apparent in the Northern Midlands and Mountain Areas. Second, provinces with low levels of trade openness or foreign direct investment run the risk of premature deindustrialization. Several provinces in the Northern Midlands and Mountain Areas have exhibited these characteristics. To prevent premature deindustrialization, the Vietnamese government should improve both the soft and hard sides of the business environment in these areas, and promote export-oriented foreign direct investment.

Lastly, we show the limitation of this dissertation and the future research direction. This dissertation provides empirical analyses and discusses several policy implications. However, there are some issues that should be further investigated in the future. First, in the ASEAN countries, the sub-sectors of manufacturing which have led the industrialization are different by each country. Thus, it would be a next study area how different sub-sectors of manufacturing, which have driven the economy, have produced the ripple effect of industrialization on the whole economy. Second, it would be necessary to reconfirm the theoretical framework of premature deindustrialization by reviewing the related literature, because Rodrik (2016) simplified the explanation of the model structure of premature deindustrialization. Third, case studies of each region in Vietnam and Vietnam's manufacturing export products should be conducted to enrich evidence of the risk of premature deindustrialization and to propose practical policy recommendations.

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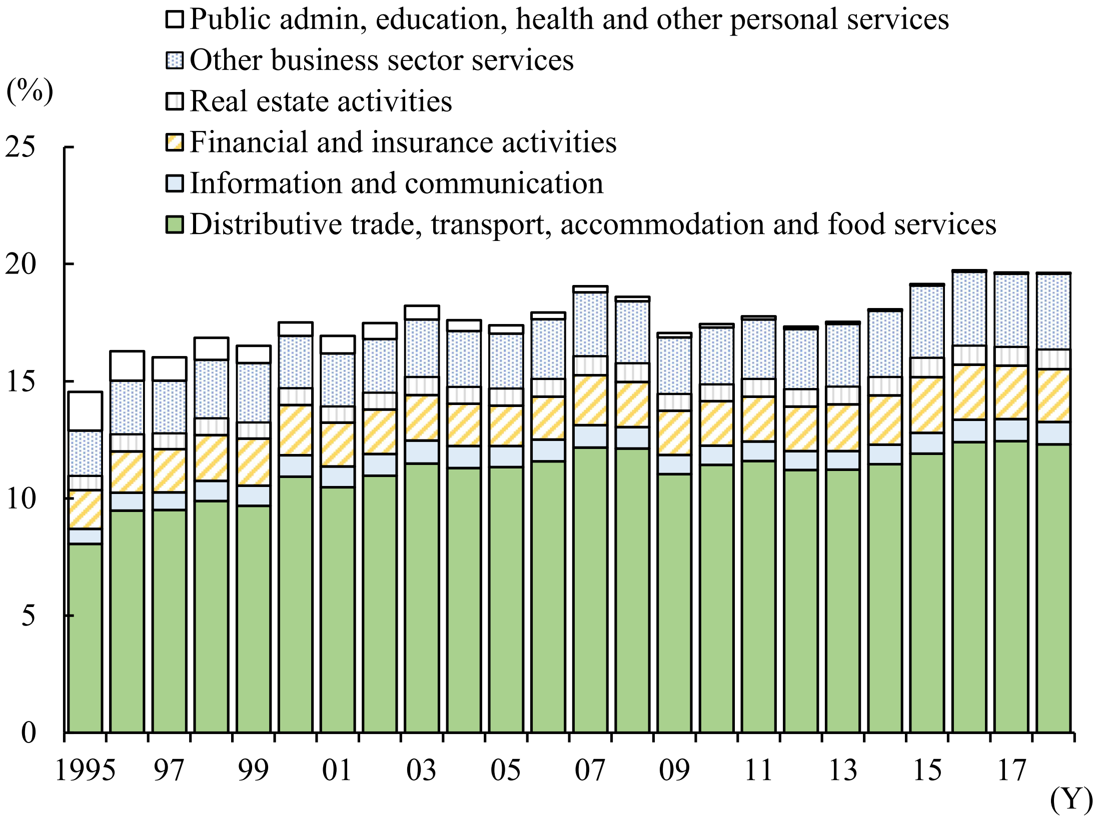
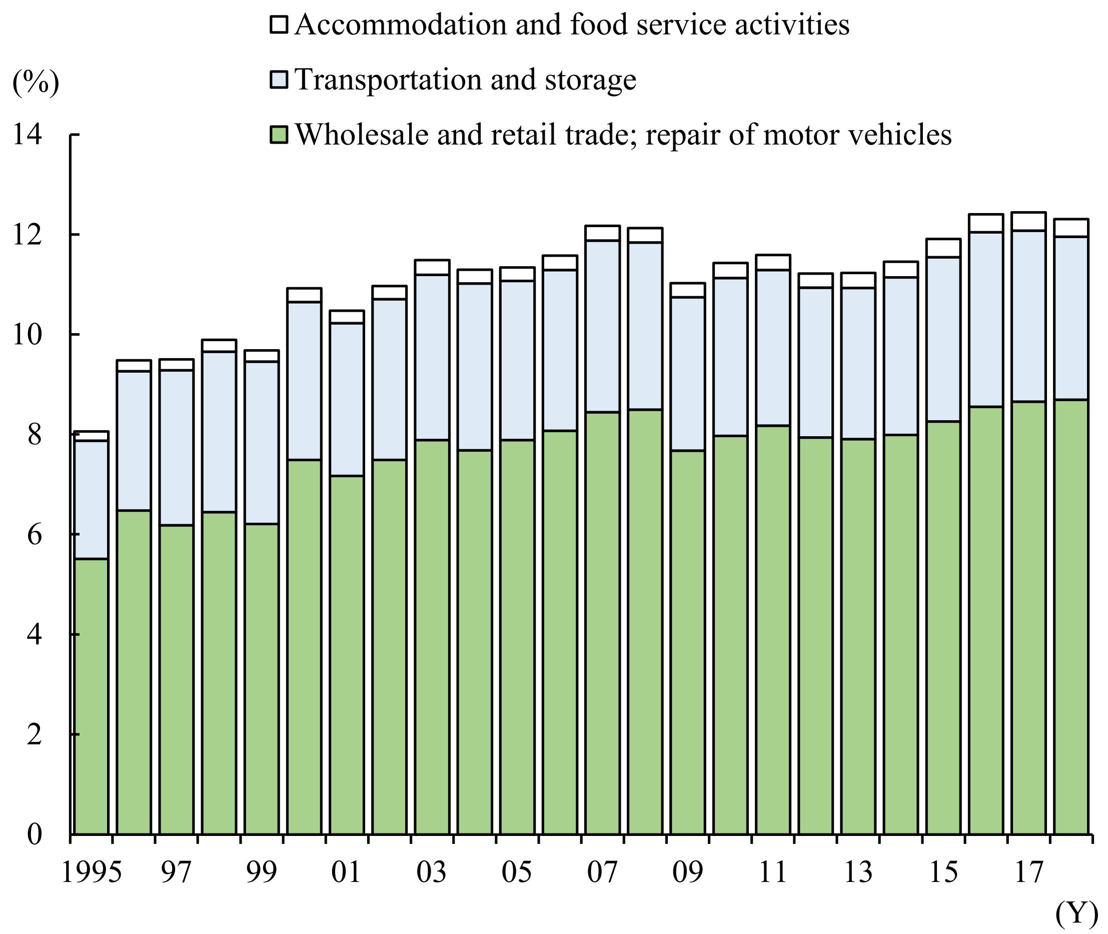
Figure and Tables

Figure I Foreign Dependency of Service Industry in Vietnam's Manufacturing Export



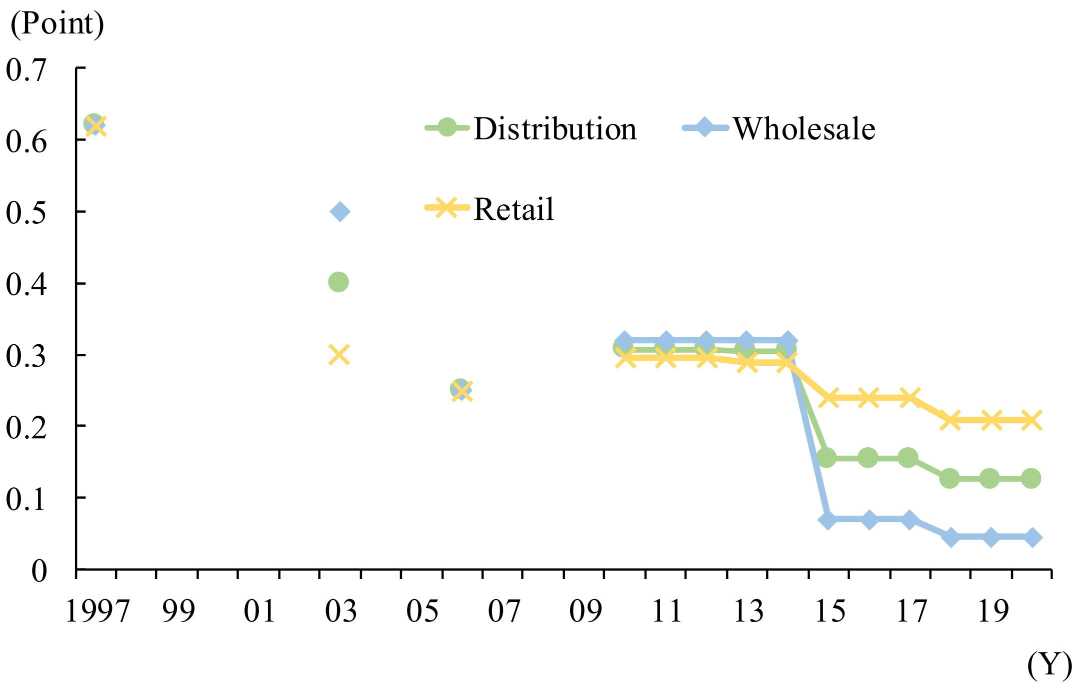
Source: OECD

Figure II Foreign Dependency of Service Industry in Vietnam's Manufacturing Export, Breakdown Distributive trade, transport, accommodation and food services



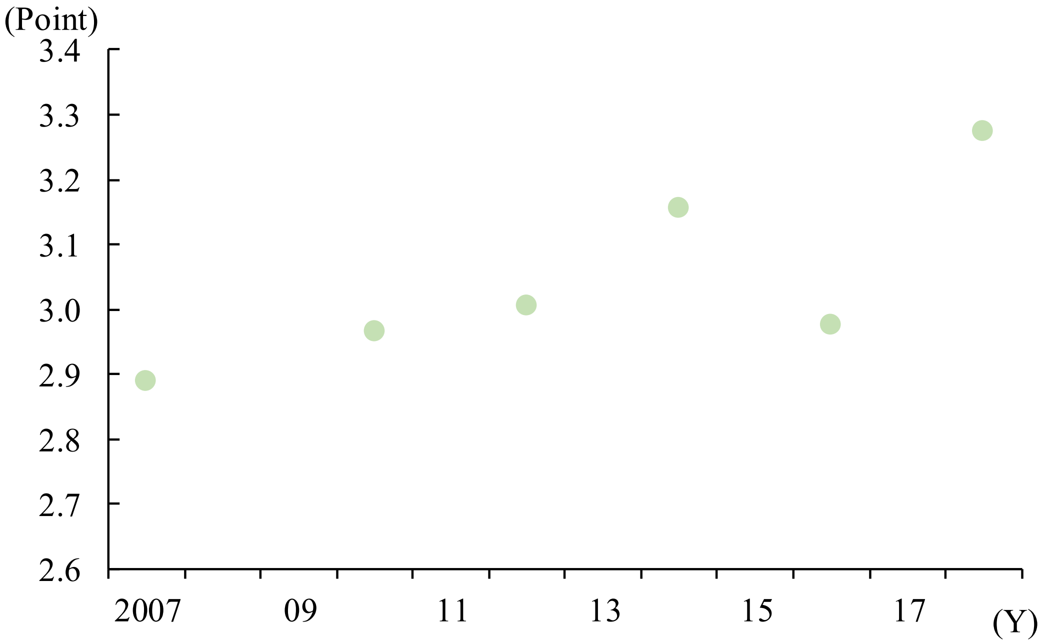
Source: OECD

Figure III FDI Restrictiveness Index in Vietnam



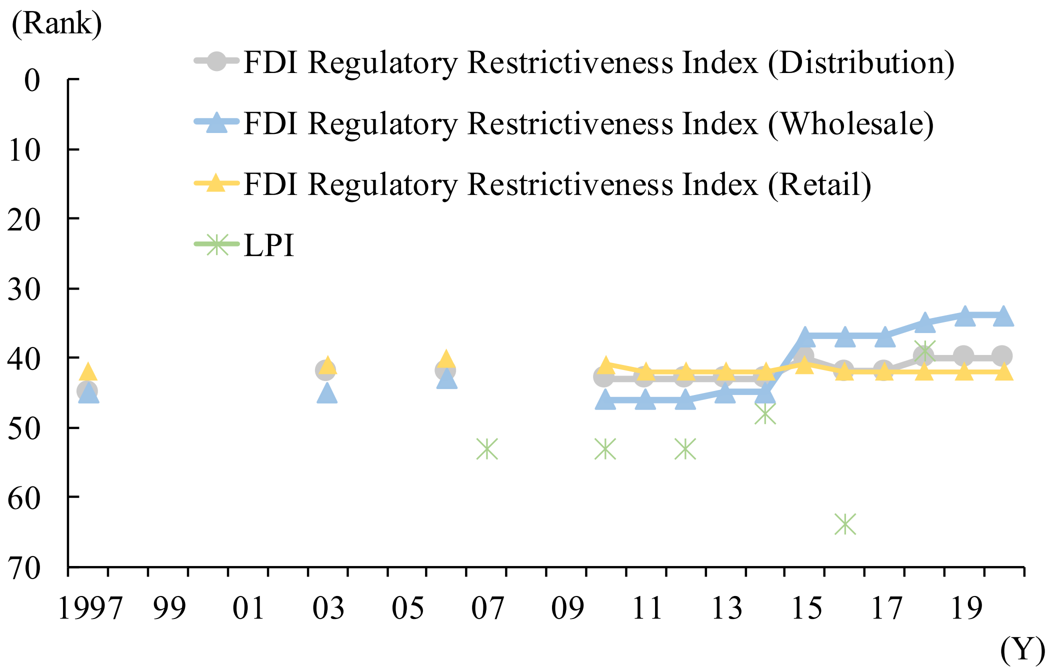
Source: OECD

Figure IV International Logistic Performance Index in Vietnam



Source: World Bank

Figure V Vietnam’s Business Environment Comparison in Distribution, Wholesale and Retail

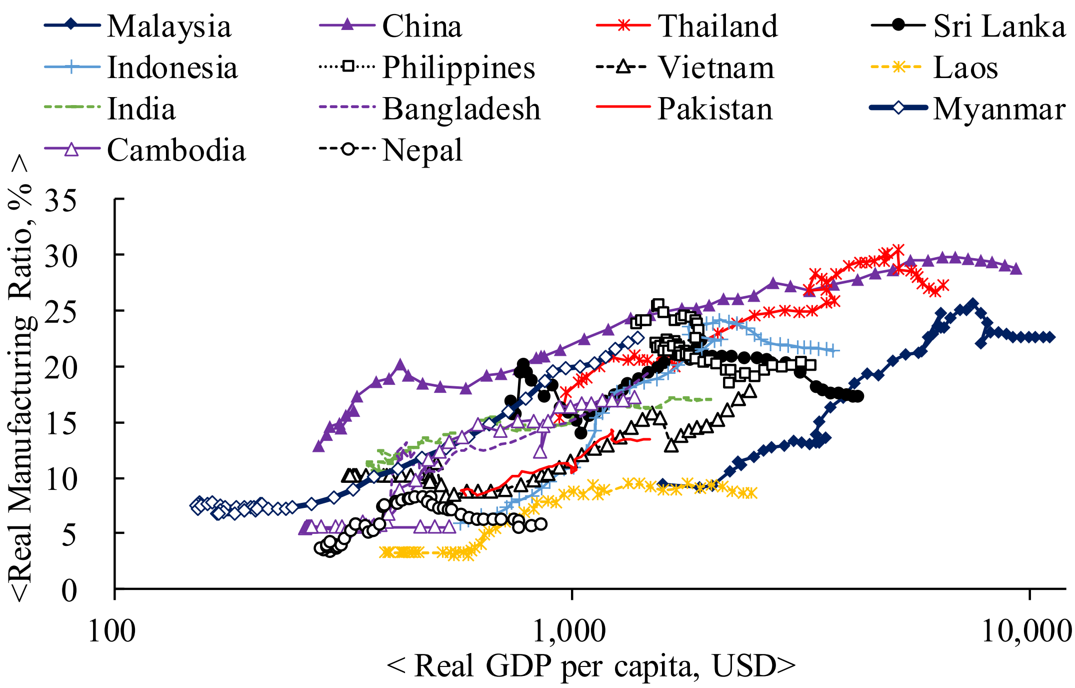


Source: OECD

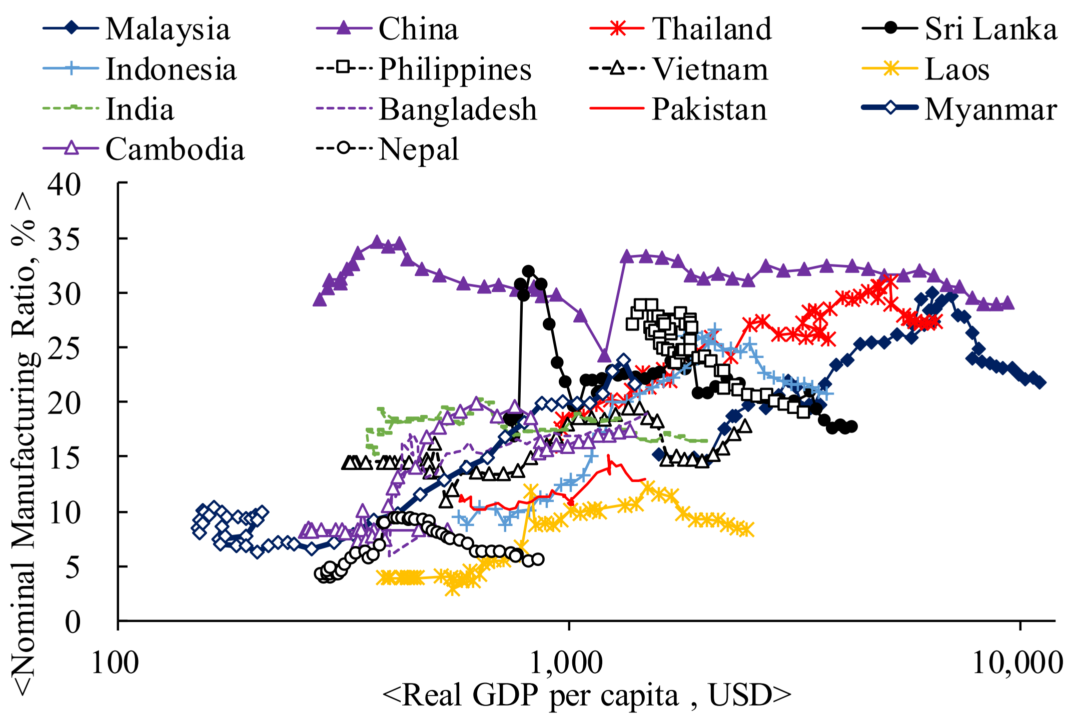
Note: Index is 0(open)~1(close)

Figure VI Trends in Manufacturing in Asian Countries

(a) Real Value-added as a percentage of GDP

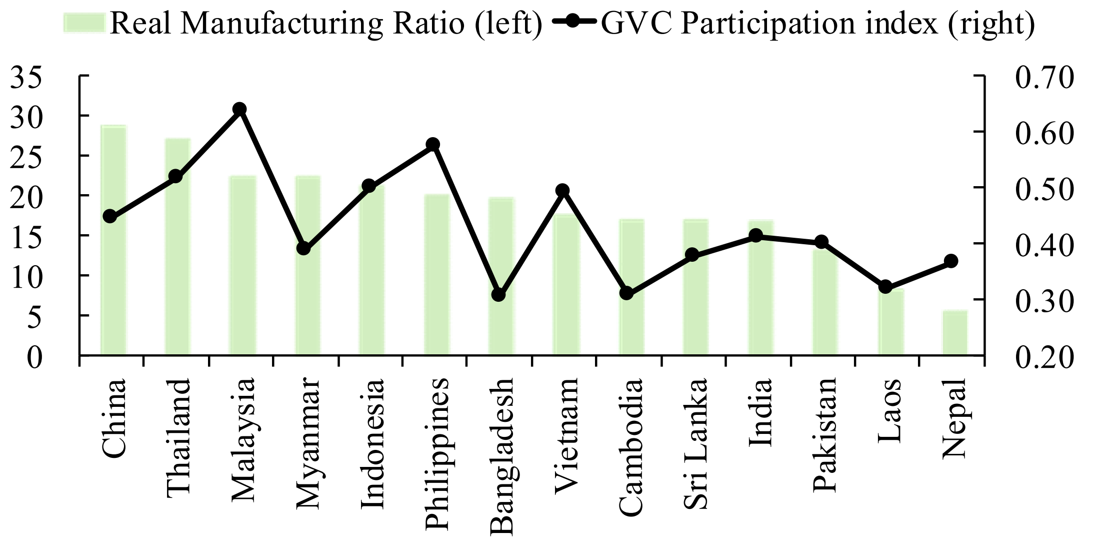


(b) Nominal Value-added as a percentage of GDP



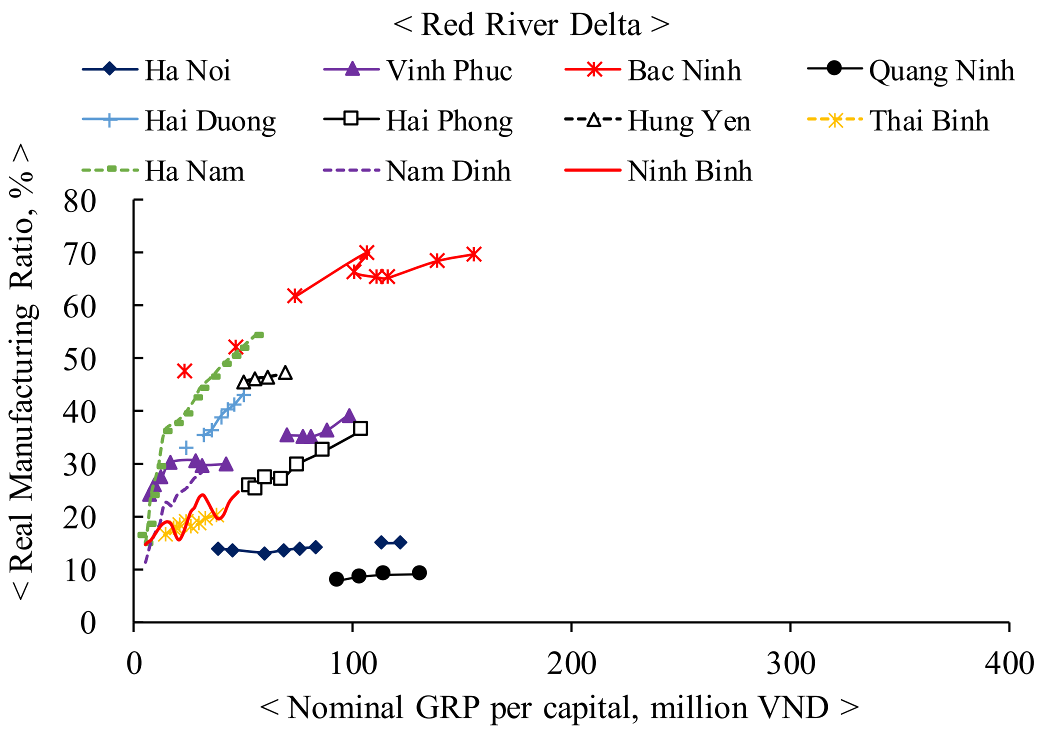
Source: UNCTAD

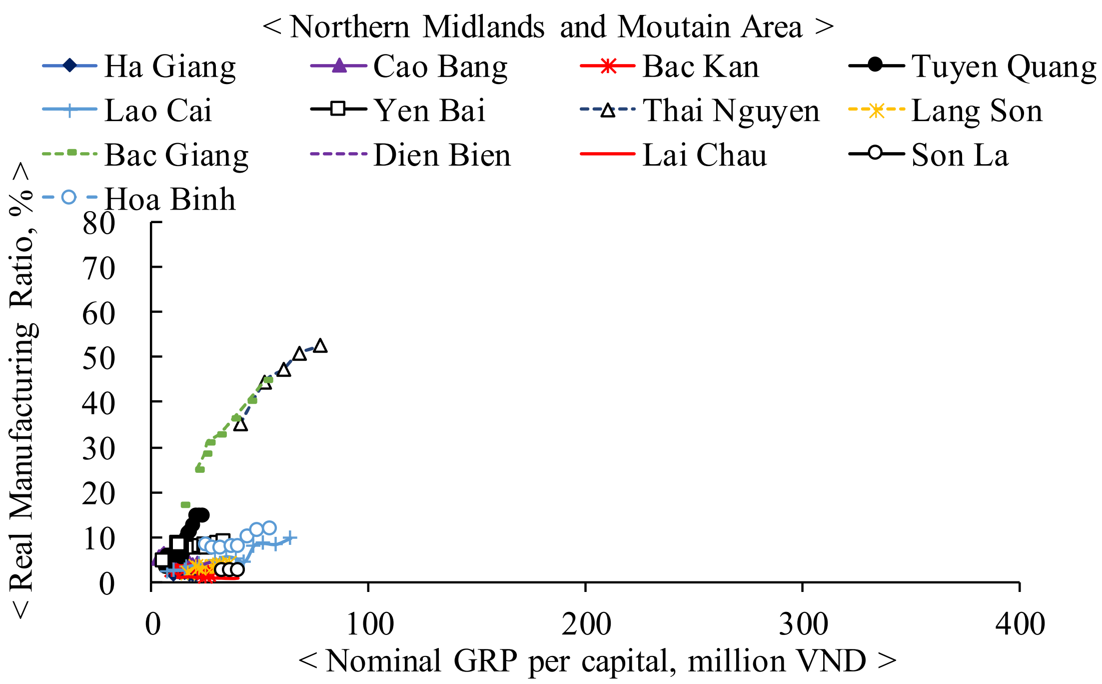
Figure VII Manufacturing and GVC Participation in CY 2018

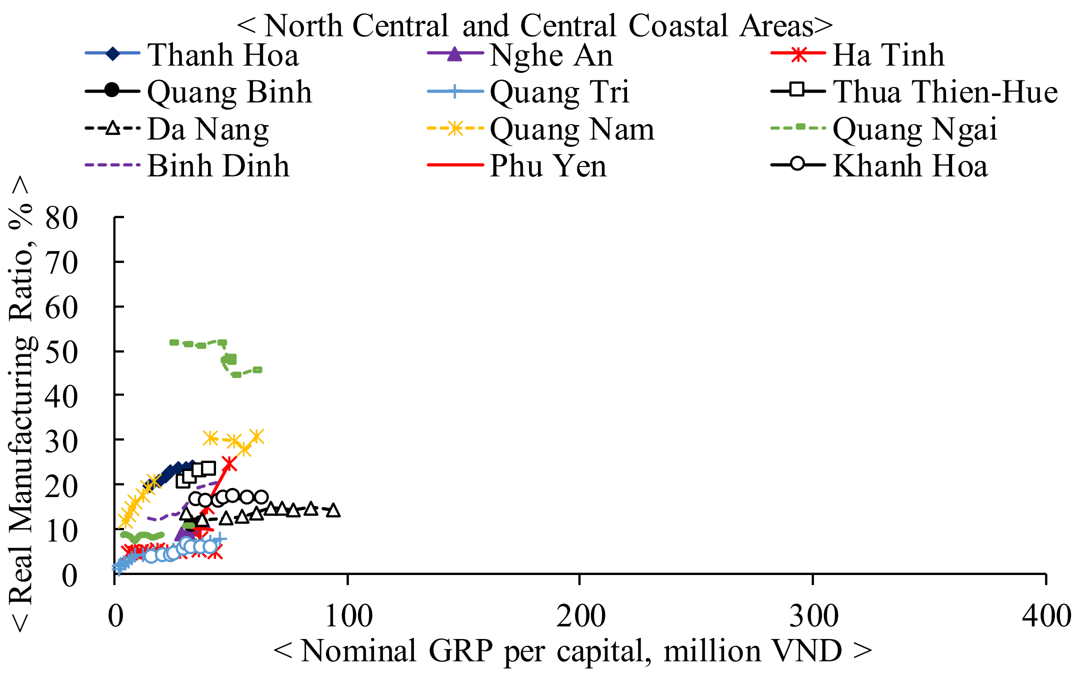


Source: UNCTAD, UNCTAD-Eora

Figure VIII Trends in Manufacturing by Vietnamese Provinces



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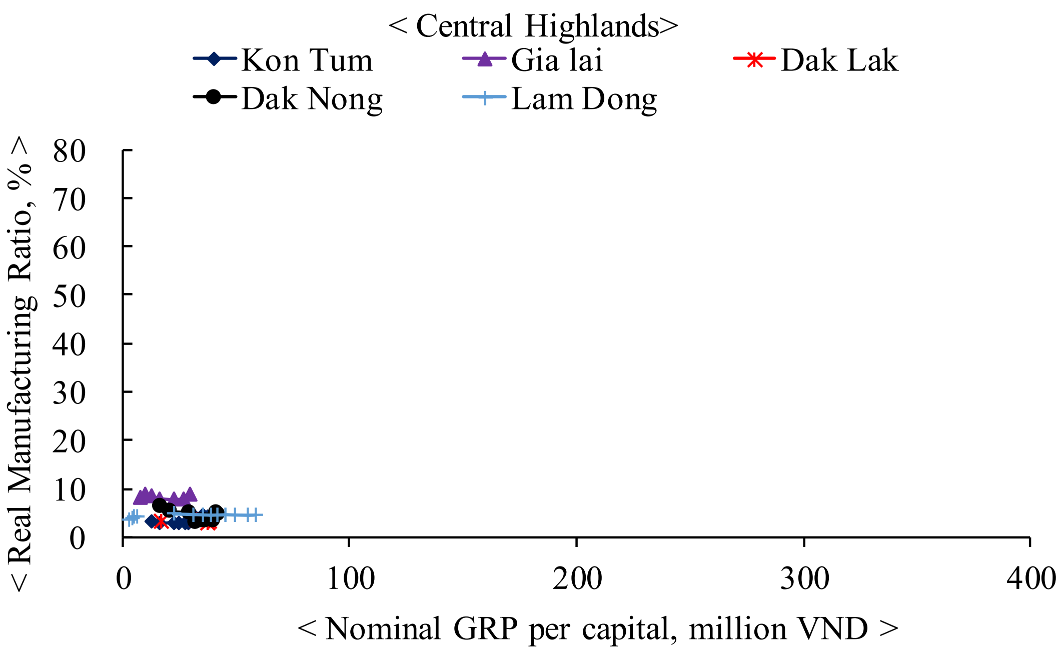
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Dak Lak
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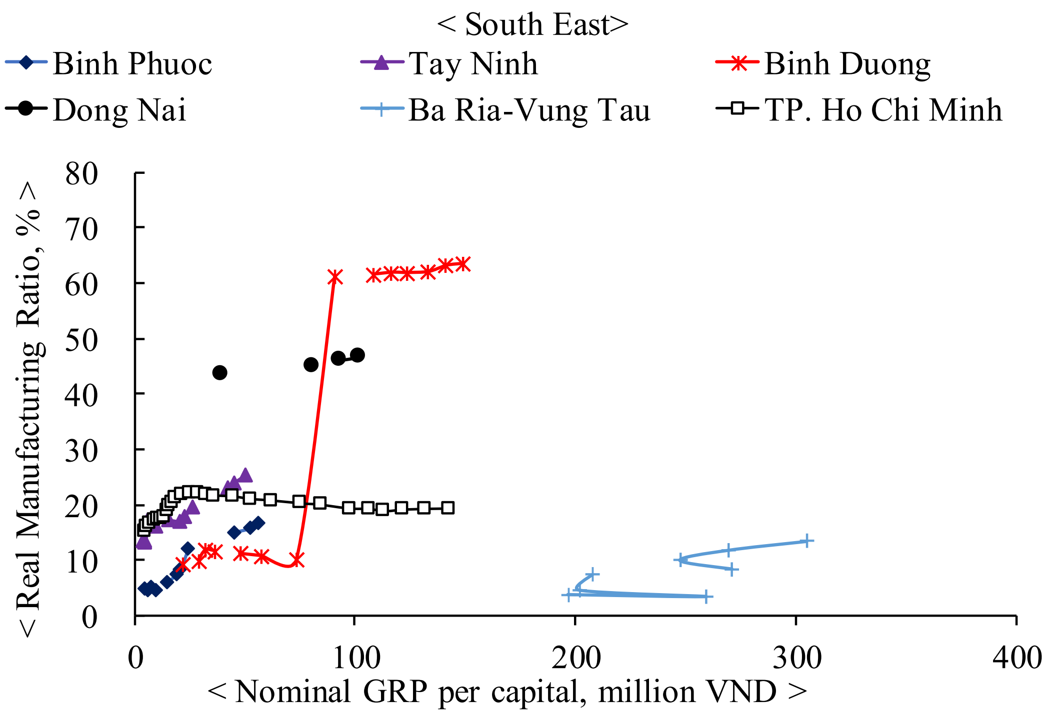
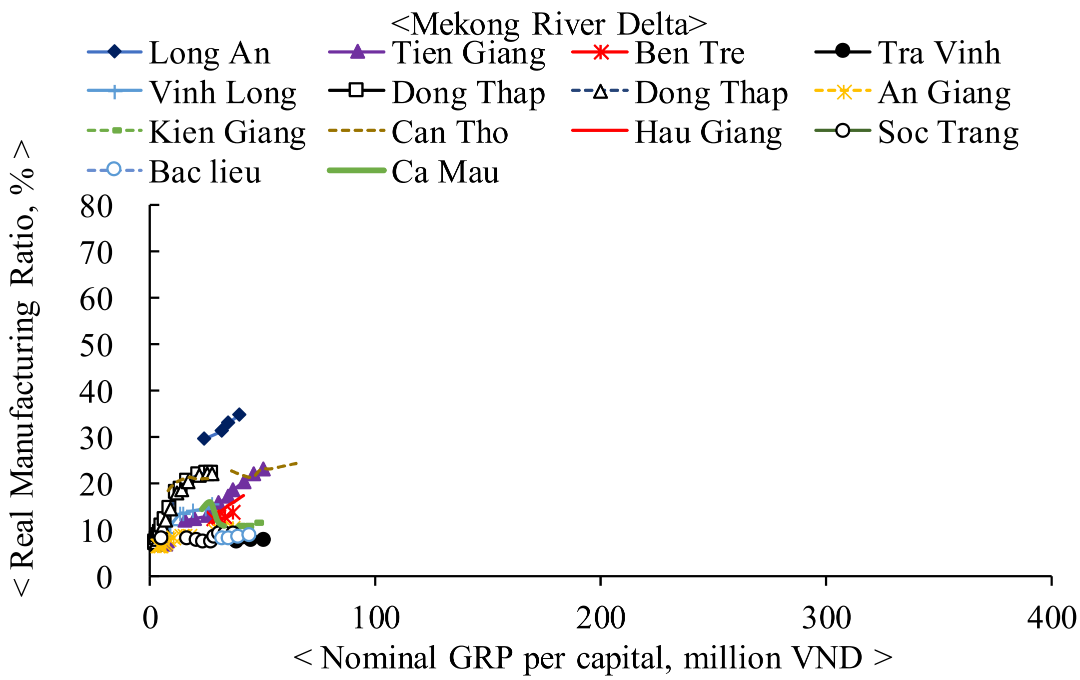
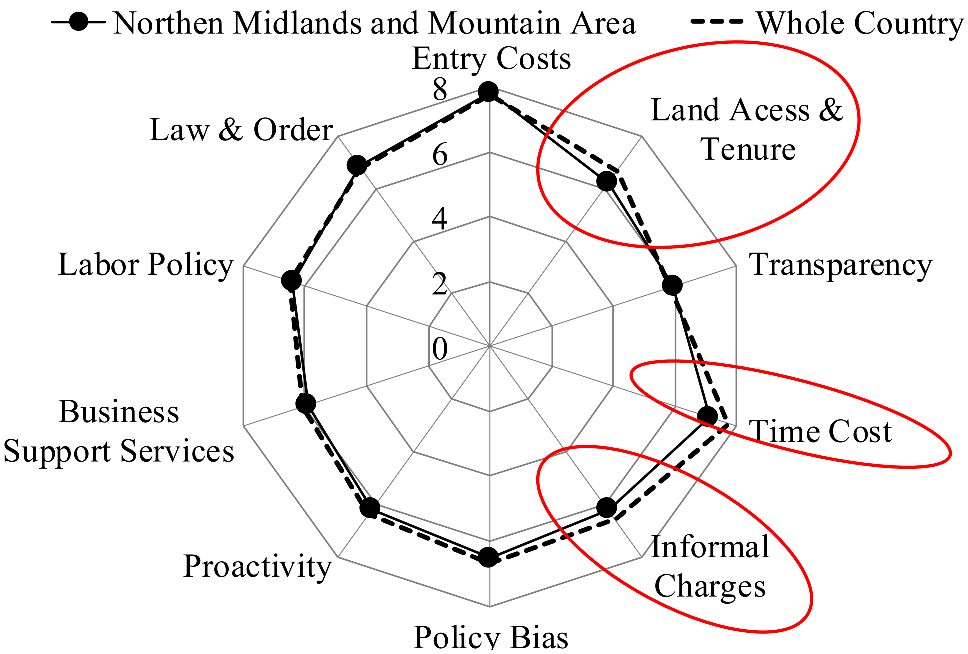




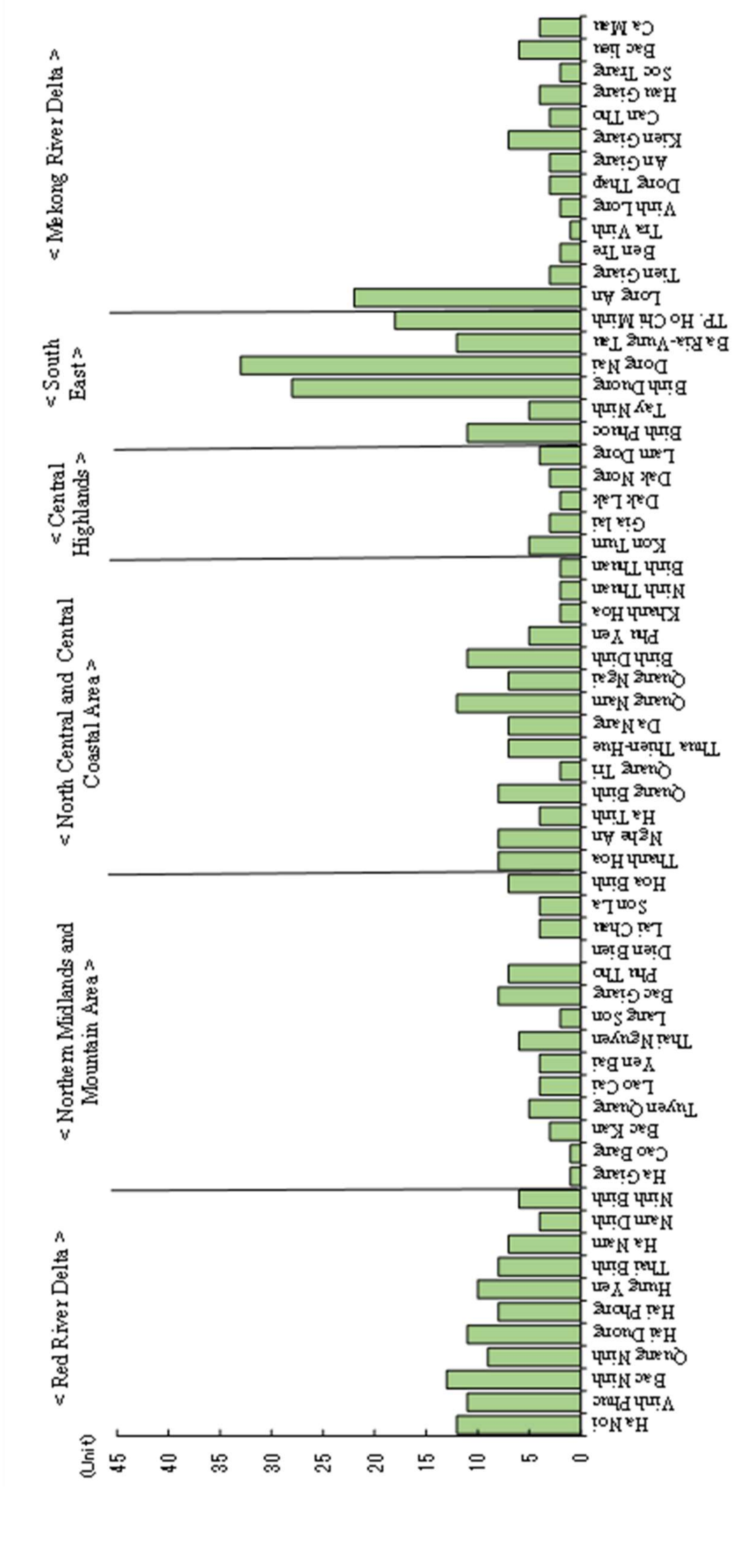
Source: General Statistics Office

Figure IX Vietnam Provinces Competitiveness Index



Source: PCCI

Figure X Industrial Park in Vietnam



Source: JETRO, Japan ASEAN Centre

Table 1 GDP Per Capita, GDP Growth and Manufacturing Growth in the six main ASEAN countries

Country		1971-75	76-80	81-85	86-90	91-95	96-00	01-05	06-10	11-15	16-20
Indonesia	Per Capita GDP (Nominal USD)	172	425	660	612	979	944	1,092	2,302	3,557	3,860
	GDP Growth (%)	8.07	7.92	5.68	6.93	7.83	1.02	4.73	5.74	5.53	3.65
	Manufacturing Growth (%)	14.29	15.07	13.75	11.02	11.07	3.06	4.98	3.91	5.04	2.74
Malaysia	Per Capita GDP (Nominal USD)	611	1,302	1,981	2,081	3,453	4,049	4,616	7,652	10,692	10,654
	GDP Growth (%)	10.63	8.55	5.16	6.70	9.47	4.99	4.76	4.53	5.31	2.75
	Manufacturing Growth (%)	13.12	11.78	5.33	13.60	11.66	8.97	4.75	2.85	4.83	3.31
Philippines	Per Capita GDP (Nominal USD)	311	599	746	725	993	1,161	1,088	1,863	2,795	3,247
	GDP Growth (%)	5.69	6.07	▲ 0.98	4.77	2.23	3.65	4.67	4.99	6.04	3.39
	Manufacturing Growth (%)	6.25	5.17	▲ 2.09	4.65	1.99	4.82	4.22	2.83	5.36	2.81
Singapore	Per Capita GDP (Nominal USD)	1,862	3,620	6,677	9,466	19,153	24,205	25,144	39,930	55,297	60,889
	GDP Growth (%)	9.29	ed	6.93	8.68	8.62	5.67	4.91	6.91	4.51	1.46
	Manufacturing Growth (%)	10.94	11.24	1.76	12.70	8.03	6.90	4.64	7.84	1.47	5.39
Thailand	Per Capita GDP (Nominal USD)	283	549	793	1,177	2,263	2,280	2,381	4,202	5,863	6,978
	GDP Growth (%)	5.62	7.96	5.45	10.34	8.50	0.86	5.45	3.79	2.98	1.60
	Manufacturing Growth (%)	10.41	9.90	4.99	15.11	9.47	2.33	6.54	4.68	1.10	0.45
Vietnam	Per Capita GDP (Nominal USD)				89	186	355	520	1,075	1,852	2,525
	GDP Growth (%)				4.16	8.21	6.96	7.28	6.32	5.91	6.00
	Manufacturing Growth (%)				0.59	11.24	11.26	11.65	3.29	9.67	11.28

Source : United Nations

Table 2 Descriptive Statistics for Main Six ASEAN Countries Data

Country			Indonesia (Trillion Rupiah)			
Variables	Time	Obs.	Median	Std. Dev.	Min.	Max.
Gross Domestic Products	1970-2020	51	5001.40	3809.54	882.91	14049.76
Manufacturing	1970-2020	51	1069.39	867.08	50.96	2846.69
Non-Manufacturing	1970-2020	51	3884.97	2950.60	831.95	11203.08
Agriculture, hunting, forestry, fishing	1970-2020	51	844.09	415.30	352.58	1829.60
Mining, utility	1970-2020	51	731.73	247.72	230.61	1081.84
Construction	1970-2020	51	414.20	411.22	33.46	1484.03
Wholesales, retail trade, restaurant, and hotels	1970-2020	51	756.98	628.36	124.38	2252.20
Transport, strage, communication	1970-2020	51	176.41	382.82	15.73	1344.82
Other service	1970-2020	51	859.68	713.19	147.64	2712.33

Country			Malaysia (Billion Ringgit)			
Variables	Time	Obs.	Median	Std. Dev.	Min.	Max.
Gross Domestic Products	1970-2020	51	458.25	402.04	66.63	1421.45
Manufacturing	1970-2020	51	97.64	96.81	7.25	316.32
Non-Manufacturing	1970-2020	51	360.61	305.71	59.38	1105.13
Agriculture, hunting, forestry, fishing	1970-2020	51	60.50	22.27	20.98	101.55
Mining, utility	1970-2020	51	94.26	40.34	23.18	140.23
Construction	1970-2020	51	23.75	17.47	3.08	66.27
Wholesales, retail trade, restaurant, and hotels	1970-2020	51	67.90	80.17	7.86	292.22
Transport, strage, communication	1970-2020	51	29.78	38.94	2.30	138.08
Other service	1970-2020	51	87.99	101.89	12.77	351.52

Country			Phillippines (Billion Peso)			
Variables	Time	Obs.	Median	Std. Dev.	Min.	Max.
Gross Domestic Products	1970-2020	51	5437.22	4197.04	2308.78	18029.34
Manufacturing	1970-2020	51	1208.29	788.05	563.95	3500.18
Non-Manufacturing	1970-2020	51	4228.93	3411.45	1744.82	14529.16
Agriculture, hunting, forestry, fishing	1970-2020	51	853.97	345.03	494.49	1620.11
Mining, utility	1970-2020	51	229.26	184.46	35.85	704.38
Construction	1970-2020	51	392.11	266.93	151.93	1353.80
Wholesales, retail trade, restaurant, and hotels	1970-2020	51	919.35	879.61	354.60	3548.18
Transport, strage, communication	1970-2020	51	247.06	335.88	93.06	1294.82
Other service	1970-2020	51	1574.34	1450.08	609.08	6005.28

Country			Singapore (Billion Singapore Dollar)			
Variables	Time	Obs.	Median	Std. Dev.	Min.	Max.
Gross Domestic Products	1970-2020	51	147.14	145.96	19.94	479.68
Manufacturing	1970-2020	51	29.70	28.92	3.67	99.21
Non-Manufacturing	1970-2020	51	117.44	117.18	16.27	387.18
Agriculture, hunting, forestry, fishing	1970-2020	51	0.20	0.11	0.11	0.45
Mining, utility	1970-2020	51	2.35	1.94	0.38	5.92
Construction	1970-2020	51	7.08	5.82	1.58	20.43
Wholesales, retail trade, restaurant, and hotels	1970-2020	51	22.46	24.99	3.83	78.14
Transport, strage, communication	1970-2020	51	16.27	16.29	1.24	53.53
Other service	1970-2020	51	59.31	59.53	9.41	201.70

Country			Thailand (Billion Baht)			
Variables	Time	Obs.	Median	Std. Dev.	Min.	Max.
Gross Domestic Products	1970-2020	51	6943.36	4584.77	1188.68	15779.63
Manufacturing	1970-2020	51	1840.52	1336.54	178.52	4095.30
Non-Manufacturing	1970-2020	51	5102.84	3256.08	1010.16	11712.49
Agriculture, hunting, forestry, fishing	1970-2020	51	814.62	338.94	315.46	1337.13
Mining, utility	1970-2020	51	2197.96	1634.54	197.48	4942.69
Construction	1970-2020	51	266.19	132.08	63.15	569.94
Wholesales, retail trade, restaurant, and hotels	1970-2020	51	1449.42	839.73	284.23	3328.66
Transport, strage, communication	1970-2020	51	343.81	397.01	51.87	1385.52
Other service	1970-2020	51	1867.04	1277.04	312.77	4458.28

Country			Vietnam (Trillion Dong)			
Variables	Time	Obs.	Median	Std. Dev.	Min.	Max.
Gross Domestic Products	1986-2020	35	2002.70	1481.64	662.20	5609.01
Manufacturing	1986-2020	35	257.73	255.95	63.76	978.09
Non-Manufacturing	1986-2020	35	1744.97	1229.99	597.32	4630.92
Agriculture, hunting, forestry, fishing	1986-2020	35	486.42	173.05	245.52	807.64
Mining, utility	1986-2020	35	621.94	445.50	112.39	1648.01
Construction	1986-2020	35	100.42	92.20	23.54	346.78
Wholesales, retail trade, restaurant, and hotels	1986-2020	35	324.78	200.26	118.45	795.14
Transport, strage, communication	1986-2020	35	58.96	53.27	21.80	195.44
Other service	1986-2020	35	460.84	330.57	127.15	1260.24

Source: United Nations

Table 3 The Estimation Results for the Kaldor First Law: The effect on whole economy

		Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
	C	38.226***	30.198***	23.289***	22.236	33.028***	39.935***
Gdp		(232.686)	(144.818)	(45.487)	(8.469)	(182.868)	(85.550)
	ln Man-Nman(-1)	1.356***	2.354***	-4.956***	-2.405	3.210***	2.341***
		(14.282)	(17.124)	(-12.074)	(-1.275)	(20.837)	(10.132)
Number of Observation		50	50	50	50	50	34
	C	15.977***	8.984***	-3.460***	1.668***	7.977***	13.547***
Nman		(25.871)	(28.945)	(-8.060)	(6.786)	(31.224)	(6.259)
	ln Man(-1)	0.581***	0.702***	1.170***	0.991***	0.757***	0.651***
		(32.101)	(56.484)	(76.092)	(96.461)	(82.560)	(9.965)
Number of Observation		50	50	50	50	50	34

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

Source : Author estimation

Table 4 The Estimation Results for the Kaldor First Law: The effect on each industry

Independent Variable : Man		Indonesia	Malaysia	Philippine
Agriculture, hunting, forestry, fishing	C	21.717***	16.989***	7.996***
		(46.814)	(65.118)	(18.152)
	ln Man(-1)	0.371***	0.314***	0.701***
		(27.239)	(30.044)	(44.440)
Mining, utilities	C	23.607***	12.602***	-15.549***
		(61.677)	(42.700)	(-9.014)
	ln Man(-1)	0.308***	0.498***	1.493***
		(27.461)	(42.162)	(24.164)
Construction	C	6.892***	7.000***	4.333*
		(9.171)	(11.575)	(1.896)
	ln Man(-1)	0.781***	0.667***	0.805***
		35.426	(27.541)	(9.832)
Wholesale, retail trade restaurant, hotels	C	11.080***	3.224***	-10.058***
		(18.220)	(6.490)	(-15.787)
	ln Man(-1)	0.675***	0.864***	1.352***
		(37.876)	(43.476)	(59.563)
Transport, storage, communication	C	0.130	-1.178***	-18.251***
		(0.092)	(-3.316)	(21.600)
	ln Man(-1)	0.959***	1.006***	1.602***
		(23.194)	(70.766)	(52.940)
Other services	C	12.111***	4.617***	-7.829***
		(20.757)	(11.462)	(-11.395)
	ln Man(-1)	0.650***	0.823***	1.290***
		(37.988)	(51.032)	(52.430)
Number of Observation		50	50	50

Independent Variable : Man		Singapore	Thailand	Vietnam
Agriculture, hunting, forestry, fishing	C	30.152***	14.677***	21.614***
		(40.146)	(81.586)	(16.975)
	ln Man(-1)	-0.456***	0.455***	0.368***
		(-14.564)	(70.570)	(9.575)
Mining, utilities	C	0.471	-8.992	9.096**
		(1.381)	(-18.954)	(2.623)
	ln Man(-1)	0.879***	1.259***	0.731***
		(61.694)	(73.990)	(6.973)
Construction	C	4.890***	10.788***	3.961
		(5.936)	(8.998)	(1.408)
	ln Man(-1)	0.741***	0.551***	0.853***
		(21.532)	(12.810)	(10.043)
Wholesale, retail trade restaurant, hotels	C	0.241***	7.706***	13.648***
		(0.633)	(20.403)	(6.920)
	ln Man(-1)	0.983***	0.720***	0.597***
		(61.717)	(53.143)	(10.019)
Transport, storage, communication	C	-3.054***	-2.539***	7.744***
		(-6.529)	(-4.567)	(3.389)
	ln Man(-1)	1.104***	1.040***	0.727***
		(56.457)	(52.146)	(10.534)
Other services	C	1.544***	5.824***	11.425***
		(4.600)	(19.659)	(4.566)
	ln Man(-1)	0.968***	0.797***	0.675***
		(69.012)	(75.043)	(8.927)
Number of Observation		50	50	34

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

Source : Author estimation

Table 5 Foreign Dependency of Service Industry (CY2018)

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
Manufacturing Output	1.89%	4.60%	2.65%	11.17%	4.46%	4.32%
Manufacturing Export	6.90%	17.44	11.25%	23.63%	15.55%	20.11%
Final Cousumption	2.95%	5.01%	2.73%	17.81%	6.23%	3.35%

Source : OECD

Table 6 The Estimation Results for the Kaldor First Law Classified with Foreign Dependency of Service Industry

	Upper	Middle	Lower
C	18.044***	17.505***	16.758***
	(35.224)	(41.171)	(48.688)
MAN	0.323***	0.372***	0.447***
	(15.412)	(22.445)	(36.290)
Country Fixed Effects	YES	YES	YES
Period Fixed Effects	YES	YES	YES
Number of Countries	22	22	21
Number of Observation	1026	1062	997

Note 1 : ***,**,* denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance in the coefficients. T-statistics are in parentheses.

Note 2 : Each group includes countries as follows;

Upper : Austlia, Belgium, Bulgaria, Czech Republic, Estonia, Finland, Hong Kong, Hungary, Iceland, Ireland, Luxembourg, Malaysia, Malta, Mexico, Morocco,Netherands, Poltugal, Singapore, Slobak Republic, Slovenia, Tunisia, Vietnam

Middle : Canada, Cambodia, Costa Rica, Croatia, Cyprus, Denmark, France, Israel, Italy, Germany, Greece, Latvia, Lithuania, Norway, the Philippines, Poland, Romania, Spain, Sweden, Swizerland, Thailand, United Kingdom

Lower : Argentina, Australia, Brazil, Burunei Darussalam, Chile, China, Colombia, India, Indonesia, Japan, Kazakhstan,Lao PDR., Myanmar, New Zealand, Peru, Russia, Saudi Arabia, South Africa, South Korea, Turkey, United States

Note 3 : The estimation term is 1970-2020 except China (2004-2020), former Soviet Union (1990-2020) and Vietnam (1986-2020).

Source : Author estimation

Table 7 The Effects of Shocks on Manufacturing

(1) Closed Economy			
Effects on:	Technology Shock	Trade Shock	Domestic Demand Shock
	$\theta m - \theta n > 0$	$dx < 0$	
Employment Share	-	-	-
Real Output Share	+	-	-
(2) Small Open Economy			
Effects on:	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 : productivity of manufacturers and non-manufacturers, respectively; dx : Net exports of manufactured goods; and Pm : Prices of manufactured goods
Source: Rodrik(2016)

Table 8 Descriptive Statistics for 14 Asian Developing Countries Data

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

Source : UNCTAD and UNCTAD-Eora

Table 9 The trend of latecomer index in Southeast Asia and South Asia countries

Southeast Asia	Combodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Thailand	Vietnam
1970-74	1.50	2.15	1.37	6.72	0.51	4.92	3.33	1.11
1975-79	0.91	2.31	1.26	7.40	0.47	4.87	3.49	1.07
1980-84	0.55	2.15	1.10	6.86	0.41	3.83	3.14	0.88
1985-89	0.41	1.61	0.78	4.75	0.25	2.09	2.53	0.66
1990-94	0.34	1.51	0.63	4.40	0.17	1.54	2.72	0.55
1995-99	0.24	1.13	0.47	3.50	0.14	1.00	2.06	0.47
2000-04	0.22	0.78	0.40	2.62	0.15	0.73	1.52	0.42
2005-09	0.19	0.58	0.32	1.87	0.16	0.52	1.15	0.34
2010-14	0.15	0.46	0.28	1.39	0.15	0.39	0.85	0.28
2015-18	0.15	0.41	0.27	1.22	0.15	0.36	0.72	0.26
South Asia	Bangladesh	India	Nepal	Pakistan	Sri Lanka			
1970-74	1.50	1.22	0.97	1.97	2.53			
1975-79	1.23	1.11	0.85	1.79	2.37			
1980-84	0.94	0.87	0.64	1.53	2.12			
1985-89	0.63	0.64	0.46	1.13	1.55			
1990-94	0.49	0.53	0.37	0.90	1.27			
1995-99	0.34	0.40	0.25	0.58	0.97			
2000-04	0.27	0.33	0.20	0.41	0.79			
2005-09	0.21	0.26	0.14	0.29	0.61			
2010-14	0.17	0.22	0.11	0.20	0.52			
2015-18	0.16	0.21	0.09	0.16	0.47			

Source : UNCTAD and UNCTAD-Eora

Table 10 The Estimation Results: 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 _nominal	(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 parentheses.

Source : Author estimation

Table 11 The Estimation Results: 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 parentheses.

Source : Author estimation

Table 12 The Estimation Results: 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 parentheses.

Source : Author estimation

Table 13 The Estimation Results: 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%, 95% and 90% level of significance in the coefficients. T-statistics are in parentheses.

Source : Author estimation

Table 14 Regional Classification and Data Coverage for Vietnamese Provinces

Region	Province	Data Coverage
Red River Delta	Ha Noi	2008-13, 2017-18
	Vinh Phuc	2004-18
	Bac Ninh	1997-2018
	Quang Ninh	2015-18
	Hai Duong	2010-17
	Hai Phong	2012-18
	Hung Yen	2015-18
	Thai Binh	2010-18
	Ha Nam	1999, 2005-18
	Nam Dinh	2005-18
	Ninh Binh	1999, 2003-18
Northern Midlands and Mountain Area	Ha Giang	2010-18
	Cao Bang	2002-15
	Bac Kan	2009-18
	Tuyen Quang	2004-18
	Lao Cai	2005, 2007-18
	Yen Bai	2005, 2009-18
	Thai Nguyen	2014-18
	Lang Son	2010-18
	Bac Giang	2010, 2012-18
	Phu Tho	-
	Dien Bien	2017-18
	Lai Chau	2010-18
	Son La	2016-18
	Hoa Binh	2011-18
North Central and Central Coastal Areas	Thanh Hoa	2011-18
	Nghe An	2015-18
	Ha Tinh	2006-18
	Quang Binh	2017-18
	Quang Tri	1995-2018
	Thua Thien-Hue	2015-18
	Da Nang	2009-18
North Central and Central Coastal Areas	Quang Nam	2004-18
	Quang Ngai	2010-18
	Binh Dinh	2009-18
	Phu Yen	2015-18
	Khanh Hoa	2012-18
	Ninh Thuan	2010-18
	Binh Thuan	2002-14
Central Highlands	Kon Tum	2009-18
	Gia lai	2007-13
	Dak Lak	2010-18
	Dak Nong	2009-18
	Lam Dong	1999-18
South East	Binh Phuoc	2000, 2003-05, 2007-10, 2015-18
	Tay Ninh	2000-14
	Binh Duong	2002-18
	Dong Nai	2010-18
	Ba Ria-Vung Tau	2007-18
	TP. Ho Chi Minh	1992-18
Mekong River Delta	Long An	2010-13
	Tien Giang	2005-18
	Ben Tre	2015-18
	Tra Vinh	2014-18
	Vinh Long	2000-12
	Dong Thap	2000-13
	An Giang	2001-18
	Kien Giang	2015-18
	Can Tho	2005-18
	Hau Giang	2014-18
	Soc Trang	2005-10, 2012-18
	Bac lieu	2015-18
	Ca Mau	2011-14

Source : General Statistics Office

Table 15 Descriptive Statistics for Vietnamese Provinces

Region	Whole Country				
Variables	Obs.	Median	Std. Dev.	Min.	Max.
man(real, %)	562	12.03	14.10	0.70	70.06
PCY(million VND)	562	28.77	36.66	1.82	304.85
POP(thousand)	562	1162.80	1427.49	294.60	8598.70
LAC	562	0.30	0.46	0.17	5.79

Region	Red River Delta				
Variables	Obs.	Median	Std. Dev.	Min.	Max.
man(real, %)	103	25.14	15.20	7.67	70.06
PCY(million VND)	103	35.88	34.88	3.18	155.43
POP(thousand)	103	1188.90	1547.59	786.20	7520.70
LAC	103	0.37	0.26	0.19	1.09

Region	Northern Midlands and Mountain Area				
Variables	Obs.	Median	Std. Dev.	Min.	Max.
man(real, %)	116	5.38	11.17	0.70	52.59
PCY(million VND)	116	22.22	14.57	3.35	77.68
POP(thousand)	116	735.60	323.72	294.60	1691.80
LAC	116	0.24	0.09	0.17	0.54

Region	North Central and Central Coastal Areas				
Variables	Obs.	Median	Std. Dev.	Min.	Max.
man(real, %)	124	11.22	11.80	1.11	51.88
PCY(million VND)	124	30.65	18.45	1.82	93.83
POP(thousand)	124	1194.25	746.08	534.90	3544.40
LAC	124	0.29	0.11	0.19	0.66

Region	Central Highlands				
Variables	Obs.	Median	Std. Dev.	Min.	Max.
man(real, %)	44	4.33	1.77	2.76	8.96
PCY(million VND)	44	30.22	13.50	3.09	58.51
POP(thousand)	44	1094.70	447.54	431.80	1919.20
LAC	44	0.30	0.06	0.20	0.42

Region	South East				
Variables	Obs.	Median	Std. Dev.	Min.	Max.
man(real, %)	74	17.83	15.73	3.51	63.51
PCY(million VND)	74	43.48	74.28	3.97	304.85
POP(thousand)	74	1730.80	2599.49	682.90	8598.70
LAC	74	1.00	0.99	0.25	5.79

Region	Mekong River Delta				
Variables	Obs.	Median	Std. Dev.	Min.	Max.
man(real, %)	101	12.00	6.45	6.51	34.75
PCY(million VND)	101	28.02	14.56	3.44	64.90
POP(thousand)	101	1312.50	392.54	768.40	2164.20
LAC	101	0.30	0.06	0.20	0.46

Source : General Statistics Office

Table 16 The Estimation Results: Real Manufacturing

man	**(1)**	**(2)**	**(3)**
ln PCY	-81.913***	-81.907***	-65.373***
	(-3.526)	(-3.521)	(-2.622)
(ln PCY)^2	2.603***	2.603***	2.07***
	(3.866)	(3.861)	(2.825)
ln POP	325.189***	324.822***	320.691***
	(4.348)	(4.123)	(4.079)
(ln POP)^2	-11.229***	-11.216***	-11.089***
	(-4.202)	(-3.973)	(-3.936)
LAC	-1.375	-1.298	-0.748
	(-0.993)	(-0.243)	(-0.140)
LAC*d00		-0.078	1.385
		(-0.015)	(0.264)
LAC*d10			3.343*
			(1.810)
Province Fixed Effects	Yes	Yes	Yes
Period Fixed Effects	Yes	Yes	Yes
Number of Provinces	62	62	62
Number of Observation	562	562	562

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

Table 17 The Estimation Results: Real Manufacturing by Region

man	Red River Delta	Northern Midlands and Mountain Area	North Central and Central Coastal Area
ln PCY	118.882**	-87.422**	131.970
	(2.614)	(-2.391)	(1.239)
(ln PCY)^2	-3.148**	1.714	-5.076
	(-2.235)	(1.331)	(-1.360)
ln POP	118.035	-1074.734***	-1007.294**
	(0.479)	(-4.814)	(-2.246)
(ln POP)^2	-3.312	39.192***	36.375**
	(-0.380)	(4.539)	(2.198)
LAC	19.211	122.931***	159.278*
	(1.027)	(2.837)	(1.748)
Province Fixed Effects	Yes	Yes	Yes
Period Fixed Effects	Yes	Yes	Yes
Number of Provinces	16	13	14
Number of Observation	103	116	124

man	Central Highland	South East	Mekong River Delta
ln PCY	131.797***	-21.033	118.382*
	(3.521)	(-0.115)	(1.830)
(ln PCY)^2	-3.781***	-1.043	-1.456
	(-3.095)	(-0.186)	(-0.592)
ln POP	100.043	-1399.734	-4687.829***
	(0.736)	(-1.535)	(-5.489)
(ln POP)^2	-3.933	54.630	168.146***
	(-0.714)	(1.695)	(5.579)
LAC	4.025	14.156	-162.547**
	(0.092)	(1.268)	(-2.010)
Province Fixed Effects	Yes	Yes	Yes
Period Fixed Effects	Yes	Yes	Yes
Number of Provinces	5	5	13
Number of Observation	44	47	101

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

Source: Author estimation

Table 18 The Estimation Results: Real Manufacturing by Trade Openness and FDI Number

man	Trade Openness		
	Upper1/3	**Middle1/3**	**Lower1/3**
ln PCY	-130.178**	-16.22150	-4.932
	(-2.102)	(-0.463)	(-0.209)
(ln PCY)^2	6.159***	0.542150	-0.878
	(2.994)	(0.530)	(-1.164)
ln POP	841.332***	-165.2390	7.691
	(5.140)	(-0.730)	(0.063)
(ln POP)^2	-27.972***	4.795	-0.707
	(-4.687)	(0.557)	(-0.154)
LAC	-117.547***	-1.391	111.554***
	(-4.116)	(-1.217)	(4.304)
Province Fixed Effects	Yes	Yes	Yes
Period Fixed Effects	Yes	Yes	Yes
Number of Provinces	20	21	21
Number of Observation	192	197	173

man	FDI Number		
	Upper1/3	**Middle1/3**	**Lower1/3**
ln PCY	62.781	-26.788	94.641***
	(1.388)	(-0.665)	(2.887)
(ln PCY)^2	-0.911	0.405	-3.909***
	(-0.700)	(0.280)	(-3.968)
ln POP	374.34***	-123.135	-68.062
	(2.716)	(-0.478)	(-0.534)
(ln POP)^2	-10.544**	2.570	2.491
	(-2.130)	(0.271)	(0.516)
LAC	-8.341***	49.860	131.286***
	(-2.808)	(0.968)	(3.261)
Province Fixed Effects	Yes	Yes	Yes
Period Fixed Effects	Yes	Yes	Yes
Number of Provinces	20	21	21
Number of Observation	191	201	170

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

Source: Author estimation

Table 19 Classification by Trade Openness and FDI Number

Region	Province	Trade Openness	FDI Number
Red River Delta	Ha Noi		
	Vinh Phuc		
	Bac Ninh		
	Quang Ninh		
	Hai Duong		
	Hai Phong		
	Hung Yen		
	Thai Binh		
	Ha Nam		
	Nam Dinh		
	Ninh Binh		
Northern Midlands and Mountain Area	Ha Giang	**Lower**	**Lower**
	Cao Bang	**Lower**	
	Bac Kan	**Lower**	**Lower**
	Tuyen Quang	**Lower**	**Lower**
	Lao Cai		
	Yen Bai	**Lower**	**Lower**
	Thai Nguyen		
	Lang Son		
	Bac Giang		
	Phu Tho		
	Dien Bien	**Lower**	**Lower**
	Lai Chau	**Lower**	**Lower**
	Son La	**Lower**	**Lower**
	Hoa Binh		
North Central and Central Coastal Areas	Thanh Hoa		
	Nghe An	**Lower**	**Lower**
	Ha Tinh		
	Quang Binh	**Lower**	**Lower**
	Quang Tri		**Lower**
	Thua Thien-Hue		
	Da Nang		

Region	Province	Trade Openness	FDI Number
North Central and Central Coastal Areas	Quang Nam		
	Quang Ngai	**Lower**	
	Binh Dinh	**Lower**	
	Phu Yen	**Lower**	
	Khanh Hoa		
	Ninh Thuan	**Lower**	
	Binh Thuan		
Central Highlands	Kon Tum		**Lower**
	Gia lai	**Lower**	**Lower**
	Dak Lak		**Lower**
	Dak Nong	**Lower**	**Lower**
	Lam Dong	**Lower**	
South East	Binh Phuoc		
	Tay Ninh		
	Binh Duong		
	Dong Nai		
	Ba Ria-Vung Tau		
	TP. Ho Chi Minh		
Mekong River Delta	Long An		
	Tien Giang		
	Ben Tre		
	Tra Vinh	**Lower**	
	Vinh Long	**Lower**	
	Dong Thap		**Lower**
	An Giang	**Lower**	**Lower**
	Kien Giang	**Lower**	**Lower**
	Can Tho		
	Hau Giang		**Lower**
	Soc Trang		**Lower**
	Bac lieu		**Lower**
	Ca Mau		**Lower**

Source : General Statistics Office, Vietnam Customs