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## Article

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## Article

# Fragmented Flying Geese (FFG) and Intra-Regional Agglomeration: Towards a Model Explaining Location Shifting of Japanese Multinational Corporations and the Electric Value Chains of ASEAN Economies

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**Abstract:** In this article, we study corporate behavior and develop a model for trends and factors in Japanese Multinational Corporations (MNCs) in the electrical and electronic industry that have played an important role in the economic development of East and Southeast Asia. We focus on Thailand, where Japanese MNCs are still increasing, and examine the practical applicability of the model. Basically, the model will be developed based on the existing flying geese model and regional agglomeration, but it will also be developed to explain new events such as progress in the division of labor by fragmentation and intra-regional agglomeration in East and Southeast Asia. Japanese MNCs in the electrical and electronic industry have shifted their production bases to developing countries one after another, as a variant of the third type of flying geese model. While the network of the international division of labor is forming with the development of fragmentation, the area around the eastern seaboard from Bangkok is playing an increasingly important role in the network of Japanese companies. In that sense, this study contributes to the body of literature on flying geese models with a modified model embodied with dynamic and systematic features of the ASEAN integrated economies.

**Keywords:** fragmented flying geese (FFG); intra-regional agglomeration; electric industry; regional value chains (RVCs)

**JEL Classification:** F23; F63; L63; O24; O53



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## 1. Introduction

The rapid development of economies, led by Japan and followed by countries in East and Southeast Asia, and called the 'East Asian miracle' (World Bank 1993), has often been termed 'flying geese theoretical development' (e.g., Radelet and Sachs 1997; Kojima 2003; Ozawa et al. 2001; Lin 2012; Ozawa 2016). Multinational Corporations (MNCs) including those from Japan have played an important role in the economic development of East and Southeast Asia, particularly in some manufacturing industries, such as automobile and electronic industries, with a prominent advantage belonging to Japanese ones.

While the traditional flying geese models (FFG) have been extensively used in the literature to explain the relocation and transfer of certain industries from the lead country Japan to the Asian newly industrialized economies (NIES) in the 1970–1980s and ASEAN 4 (Indonesia, Malaysia, the Philippines, and Thailand) in the 1980–1990s, recent developments since the early 2000s in China and the new ASEAN member states (Cambodia, Lao PDR, Myanmar, and Vietnam) have shown different trends. From 2005 until recent years, for example, direct investment assets in terms of stock from Japanese electric machinery companies in Asia have been largest in China, followed by Thailand with incremental rates

of growth. Meanwhile, those rates in Malaysia, Indonesia, the Philippines, and Vietnam have maintained a steadily moderate growth. It is unclear in the literature whether the TFG models can still apply in these cases.

There are some recent studies focusing on China, Europe, and North America from the viewpoint of the flying geese model (e.g., [Ang 2018](#); [Damijan and Rojec 2007](#); [Kamińska 2016](#); [Petri 2012](#); [Ruan and Zhang 2014](#); [South 2016](#); [Wang et al. 2020](#)); however, to the best of our knowledge, there have not been any studies, theoretical or empirical, investigating the cases of Southeast Asia countries, specifically looking at the interaction between the ASEAN 4 and the new CLMV in a connection with the flying geese models to understand where the pattern of the FFG models is still applied.

Furthermore, with the booming of the fragmented production network and the global value chains from the early 2000s, the FFG models have been criticized for their caveats in the new context. For instance, [Watanabe \(2011\)](#), [Ozawa \(2016\)](#), and [Baldwin \(2016\)](#) raised criticism on FFG models in all their forms including basic, deformed, and general, especially with the disruptions of high industrial growth in China.

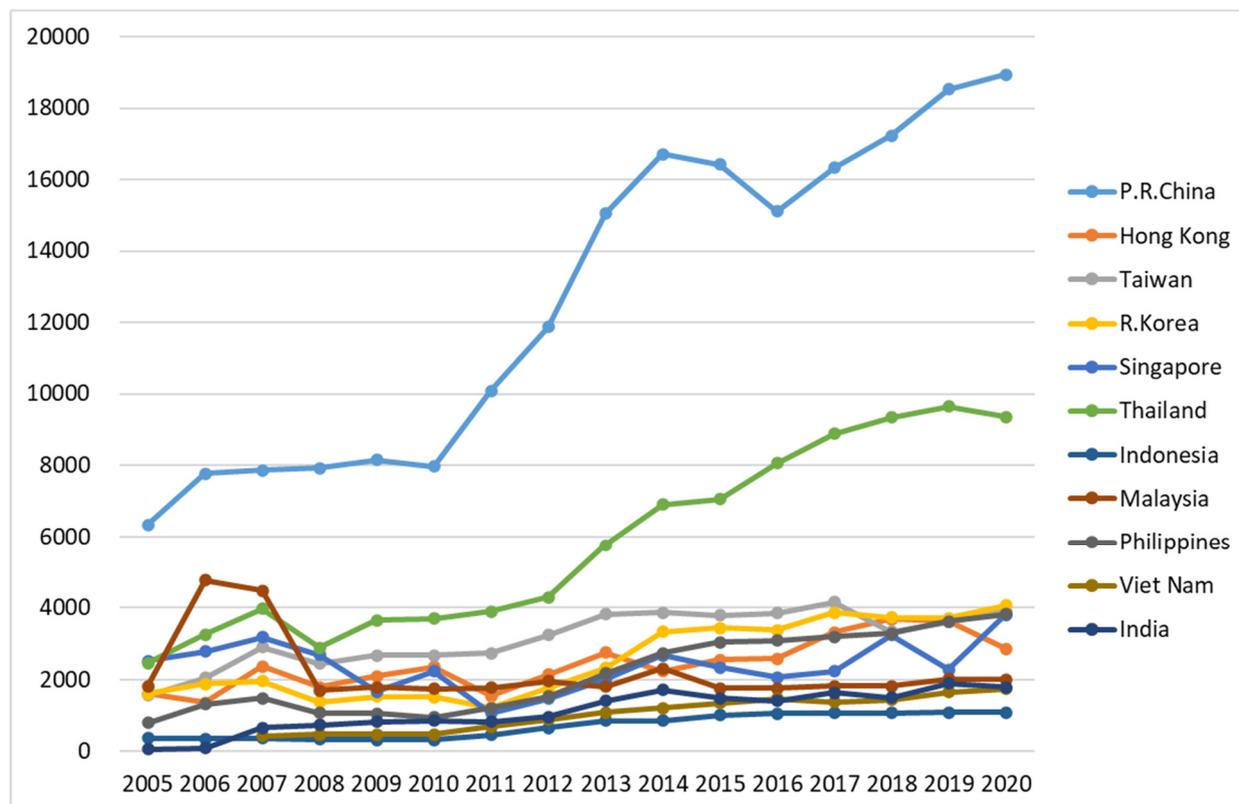
Similar to the Chinese phenomenon, our study noticed a very distinguished feature in the investment behavior of Japanese MNCs in Thailand in the electrical and electronics industry over the same time period despite the wage hike and the tightening of the Thai labor market. The number of Japanese MNCs is large and is still on the rise while their operations in new markets such as Vietnam have also been rising but at a slower pace. The electrical and electronic industries in Thailand, along with the automobile industry, are becoming more concentrated geographically and have been making important contributions to economic development. Some studies have attempted to understand the current situation in Thailand with the concept 'Thailand plus one'. For example, [Oizumi \(2013\)](#) uses the 'Thailand plus one' as a business model that transfers some labor-intensive processes in Thailand to neighboring countries; [Tokunaga et al. \(2015\)](#) demonstrate that demand and agglomeration are important as foreign investment factors for the Japanese electrical industry at production bases of both final and intermediate goods. Our current study will bring a deeper understanding of this issue by applying the flying geese model while taking into account some new elements such as industrial agglomerations and regional value chains. We ask a very profound question on why Japanese MNCs keep intensively investing in the Thai electrical and electronic industries despite the reduced wage cost advantages of the labor market and the attractiveness of other new ASEAN markets, and whether the TFG models can still apply and in what conditions and circumstances.

To answer this question, our objective in this paper is to analyze the caveats of the TFG models and then to build a new theoretical framework based on TFG models incorporating new features of the ASEAN economies, including extensive GVC participation and the highly location-concentrated manufacturing activities of Thailand, which we called the Fragmented Flying Geese (FFG) model. This modified model incorporates the concepts of the division of labor across borders and regional agglomeration based on the industrial agglomeration theory in 'New Economic Geography Spatial Economics'. We then aim to illuminate our FFG model by providing empirical evidence on distinguished features in the case of Thailand's electrical and electronic industries with some descriptive analysis and mapping tools. This is our main contribution to the body of literature on flying models with more systematic and dynamic features, while it also paves the way for more empirical studies to be carried out in this region with micro-level industrial data.

The structure of the paper is organized as follows: Section 2 provides some stylized facts on the investment of Japanese MNCs in East Asia in the industrial sectors of our interest. An extensive discussion of relevant literature is presented in Section 3, which is followed by our methodology and data used in this research. Section 6 provides some empirical evidence, and lastly, some policy implications and conclusions are included.

## 2. Background

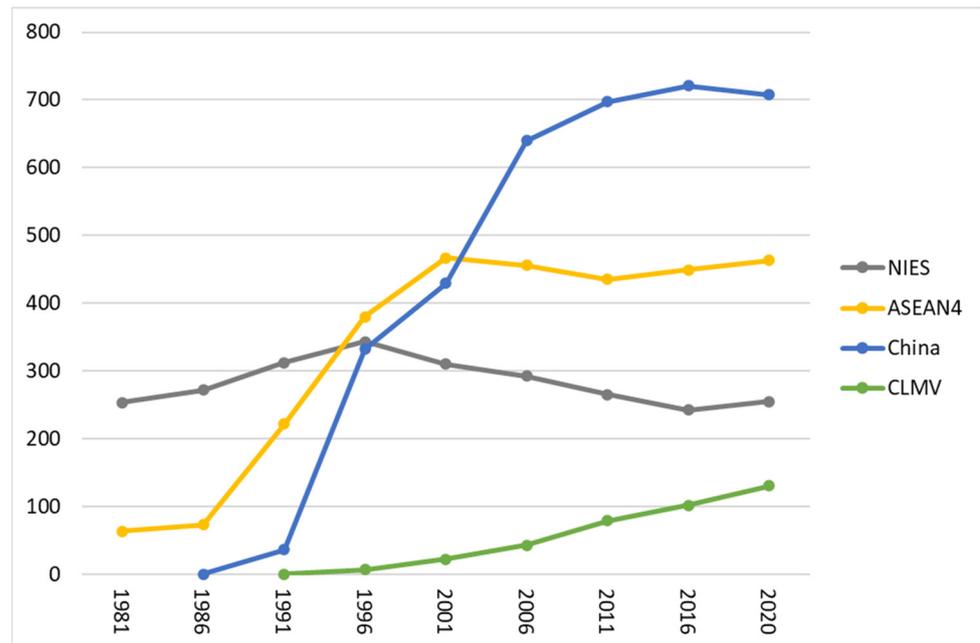
This section describes the investment situation of Japanese MNCs in the electric and machinery industry across East Asian countries over the last two decades to highlight some trends and critical changes. Figure 1 shows direct investment assets (stock) of Japanese electric machinery companies. In Asia, the direct investment to China is the largest, followed by Thailand.



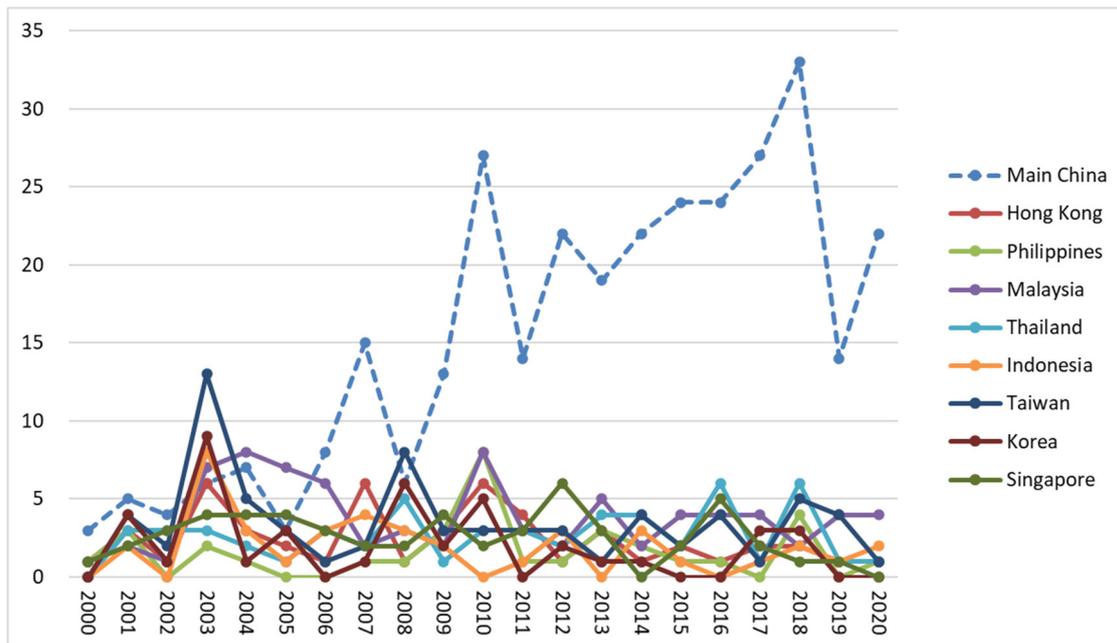
**Figure 1.** Direct investment assets of Japanese electric machinery companies (100 million yen). Data: Bank of Japan, “Direct investment assets”.

Figure 2 describes the long-term trend in the number of Japanese affiliates working in electric and information communication machinery in East and Southeast Asia. As is well known, many firms advanced to the Asian NIES before the 1985 Plaza Accord, but after that, the entries to ASEAN 4 increased, and since 1991, the number of affiliates in China has increased rapidly. In recent years, the expansion into CLMV countries has also increased gradually.<sup>1</sup>

On the other hand, the number of Japanese affiliates that have withdrawn from China has rapidly grown (Figure 3). Although the number of affiliates in China is still large, Japan’s MNCs that had operated in China have now moved to other countries due to rising wage costs and political risks (cf. ‘China Plus One’).<sup>2</sup> A micro-analysis of the countries that have seen the entry of individual companies that have withdrawn from China is left to other studies, but in this article, we will examine what is happening in countries other than China, which has had such a huge impact on the world economy, and what might happen after China reaches a certain level of development.<sup>3</sup>

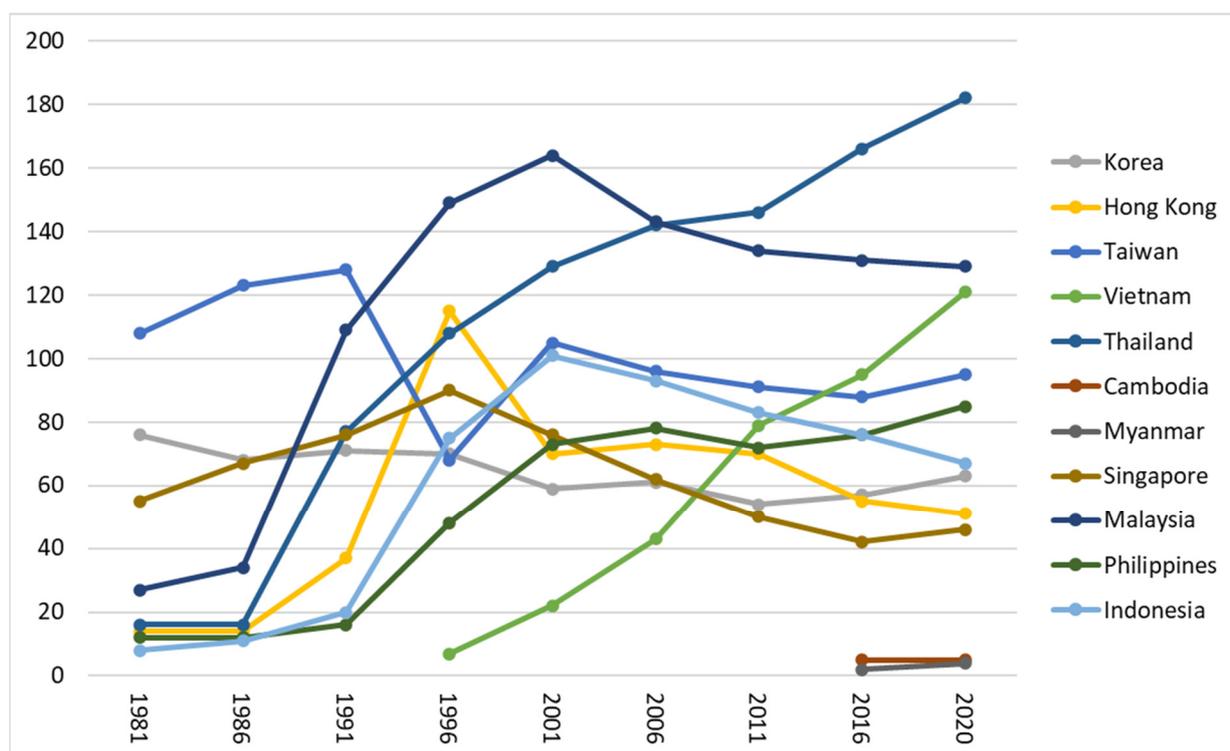


**Figure 2.** The number of Japanese affiliates working in electric and information communication machinery. Data: Toyo Keizai, various issues, *Kaigai Sinshutsu Kigyo Soran: Kuni Betsu Hen*, (Overseas Japanese Affiliated Companies: by Country), Toyo Keizai Shimposha.



**Figure 3.** The number of Japanese affiliates that were withdrawn, working in electric and information communication machinery. Data: METI, the Survey of Overseas Business Activities of Japanese Companies.

Figure 4 illustrates the number of Japanese affiliates working in electric and information communication machinery, excluding China. There are basically the same movements as seen in Figure 2; however, even within certain groups with similar income levels, various differences can be seen by country. It is particularly interesting that the number of Japanese affiliates in Thailand is steadily increasing. How can we explain this phenomenon in Thailand while the number of affiliates in many countries such as NIES and other ASEAN 4 has declined? Are the existing flying geese models still applicable or should they be modified to accommodate this new trend?



**Figure 4.** The number of Japanese affiliates working in electric and information communication machinery, excluding China. Data: Toyo Keizai, various issues, *Kaigai Sinshutsu Kigyo Soran: Kuni Betsu Hen*, (Overseas Japanese Affiliated Companies: by Country), Toyo Keizai Shimposha.

Although we have the traditional ‘flying geese’ (TFG) model to explain the international relocation of production bases, it is not enough to deal with the formation of the production network of MNCs in East and Southeast Asia. Therefore, we would like to develop and examine a ‘fragmented flying geese’ (FFG) model incorporating the concepts of division of labor across borders and regional agglomeration based on the industrial agglomeration theory in ‘New Economic Geography Spatial Economics’, which has developed rapidly since the early 1990s.

This paper builds a model to explore the movements of Japanese MNCs in the electrical and electronics industries that have played an important role in the economic development of East and Southeast Asia. Then, we will focus on Thailand, where the number of Japanese MNCs is large and is still on the rise, and we will verify whether the model can be applied. The focus is on the electrical and electronic industries, especially in Thailand, where, along with the automobile industry, the electrical and electronic industries are becoming more concentrated and are making an important contribution to economic development. In addition, we consider Japanese MNCs because detailed data and individual data such as the purpose of advancement have been accumulating for a relatively long period of time. We would like to discuss the applicability of the model in this paper again in future work.

### 3. Literature Review

This section discusses relevant theoretical models to the above-described phenomenon and explores their applicability as well as relevance, which will serve as the basis for the need for a modified or extended model.

#### 3.1. Flying Geese Model and Its Variants

First, we discuss the model of flying geese presented by Akamatsu (1945, 1961, 1965). Kojima (2003), Ozawa (2016), Shiozawa (2017), and Suenaga (2018) also discuss it in detail, but we briefly introduce three forms of the model. Regarding the theoretical framework,

Kemanai (1998, pp. 196–98) defines the process of import, production, and export of a certain manufacturing product such as the basic flying geese pattern of industrialization, and the succession from consumer goods to capital goods, or from crude products to refined products as a deformed type of flying geese pattern. Moreover, he defines a series of countries, from the most advanced to those in various developmental stages, as those that exhibit the general type of flying geese pattern.

In the last form, the flying geese model analyzes the process of catching up from various perspectives. Although the model has been quoted often in analyses of economic development in Asia, several problems have been noted about it.<sup>4</sup> This paper classifies these problems according to the three types of flying geese patterns (basic, deformed, and general). First, regarding problems with the basic type, there has been an increasing number of cases in which a pattern of import → production → export (→ import) has not always been observed. In particular, the number of cases in which the import stage is unnecessary has increased as the volume of outward foreign direct investment (O-FDI) has increased. Second, with regard to problems with the deformed type, it has been pointed out that, because the flying geese model analyzes the industry as a unit, it cannot sufficiently discuss the international specialization that has been observed in each process of production. Third, regarding problems with the general type, the flying geese pattern of industrialization has been particularly disrupted by China's rapid economic growth. In order to overcome these criticisms, this paper presents the FFG model that adapts the TFG model to the current situation.

Regarding the first criticism, Ozawa (2016) presents a model in which the process of import (M), production (P), and export (X) is shortened. In this model, foreign direct investment occurs in the process from MPX to reverse import (M\*), and the process of MPX is shortened in developing countries (host countries) that receive direct investment from developed countries. In the next section, we will further develop this model and present a variant of the general type, which is the third flying geese model (or it may be called the fourth flying geese model).

The second criticism is not appropriate because Akamatsu (1945, chp. 3) discusses the international division of labor that uses process as a unit. However, Baldwin (2016) insists that '[o]ne way to express this changed sequencing is to think of the orderly flying geese formation as being replaced by something that looks more like a flock of starlings. The starlings do fly in formation, but the formation is ever transforming—beautiful and orderly but extremely difficult to predict' (p. 269). Although his starling model may represent the chaotic situation of the current international division of labor, in the next section, we present the FFG model as a model to replace his starling model.

With regard to the third criticism, Lin (2013, p. 62) compares China to a dragon rather than a flying goose. China is much larger than other countries in terms of supply and demand, and the amount of direct investment it receives is also huge. In addition, without following a simple formation such as Japan, Asian NIES, and ASEAN 4, it leapfrogs over ASEAN 4, and is approaching Asian NIES and Japan. However, what about countries other than China? In countries other than China, there may still be a flying geese pattern. We will examine this point in the subsequent sections.<sup>5</sup> On the other hand, there are many recent studies focusing on China, Europe, and North America from the viewpoint of the flying geese model (e.g., Ang 2018; Damijan and Rojec 2007; Kamińska 2016; Petri 2012; Ruan and Zhang 2014; South 2016; Wang et al. 2020).

### 3.2. Spatial Economics

In addition to the flying geese model, the economic development of East and Southeast Asia has been debated in the context of the industrial agglomeration theory, which explains the spatial arrangement of economic activities, especially production bases. The industrial agglomeration theory consists of a series of models in traditional urban economics, regional economics, international trade theory, and 'New Economic Geography'<sup>6</sup>, which have been developed since the pioneering studies by Krugman (1991a, 1991b) in the early 1990s. Fujita

et al. (1999) synthesized various theoretical models in ‘Spatial Economics’, and Fujita and Thisse (2002, 2013) contributed to theoretical development in this field.

The initial models were developed as a general equilibrium theory based on the Dixit and Stiglitz (1977) monopolistic competition model. Krugman and other theorists had focused on constructing a unified framework to analyze the emergence of agglomerations and dispersions of various economic activities in a geographical space during the 1990s<sup>7</sup>; therefore, they did not take into account all actual forces of industrial agglomeration and dispersion in their models. However, as Fujita (2010, p. 6) pointed out, these restricted models could explain the following phenomena:

- (i). The formation of a spatial economic system with a core–periphery structure within a country and a regional economy, and the accompanying appearance of income inequality.
- (ii). The flying geese pattern of the location shifts of various industries within a country and between countries.
- (iii). Various types of industrial agglomerations and the formation of specialized cities<sup>8</sup>.
- (iv). The formation of urban systems with a hierarchical structure within a country.
- (v). Agglomerations of various specialized activities in an urban area.

Krugman’s (1991b) model explains the transition from the symmetric regional pattern of production to the concentration of production in one region and the possible emergence of a core–periphery structure. This transition is the outcome of the interplay among the scale economies (increasing returns) at the firm’s level, the transportation costs, and the mobility of workers (factors of production). Moreover, Krugman and Venables (1995) show that industrial agglomeration is caused by decreasing transportation costs, while industries would be re-dispersed toward the periphery as a result of a further fall in the transportation costs across a certain threshold. Hence, the relationship between the degree of agglomeration and the transportation cost level is not linear, and both industrial agglomeration and dispersion could occur due to the different conditions in this model.

In relation to the formation of the international production network of Japanese MNCs and the economic development of East and Southeast Asia, models such as those of Venables (1996), Krugman and Venables (1995), and Puga and Venables (1996) are important. These models explain the industrial agglomeration due to the effects of backward and forward linkages in the production process by introducing the intermediate sector under the circumstance that the existence of borders restricts the mobility of workers among regions.<sup>9</sup>

However, while it is argued that these models can explain the ‘flying geese pattern of location shifts of various industries within a country and between countries’, they do not concretely articulate these transfers in the context of an increasing division of labor. In this paper, we theoretically and empirically clarify the dynamic changes in the relocation of MNCs in Japan, drawing on research findings in spatial economics and industrial agglomeration theory.

### 3.3. FDI

Theoretical research on the FDI of multinational corporations emphasizes the horizontal and vertical motives of multinational corporations. FDI, in the view of horizontal motives, is intended to place similar production facilities in multiple locations in relation to factors such as trade costs (e.g., Markusen 1984; Brainard 1997; Markusen and Venables 2000). In addition, according to the view of vertical motives, globally allocating production processes with different levels of technology should take advantage of cost differentials such as wages (e.g., Helpman 1984; Yeaple 2003). Kimura et al. (2007) use the gravity model to compare East Asia and Europe, and argues that larger income gaps and lower service link costs have contributed to the expansion of production networks in East Asian countries. Moreover, Baldwin and Okubo (2014) criticize the previous work classifying FDI as vertical or horizontal, and emphasize that the FDI network type is increasing.

Some interesting recent work in the field of overseas production networks has been devoted to studying the relationship between firms’ productivity and their overseas expan-

sion. Melitz (2003) and Helpman et al. (2004) first developed models of that. They classified the production process of intermediate goods from two viewpoints. The first viewpoint concerns where the intermediate goods are produced: domestically or offshore, and the second one concerns who makes them: intra-firm production or outsourcing. This classification gives the production process the following four options: (1) domestic intra-firm sourcing, (2) domestic outsourcing, (3) offshore intra-firm sourcing (FDI), and (4) offshore outsourcing. Firms choose the most suitable one from these production methods.<sup>10</sup>

Suppose that there is a wage difference between home and abroad. In that case, if a firm is highly productive and can cover the fixed costs for overseas expansion, offshore production is advantageous. Whether a firm chooses intra-firm production or outsourcing depends on the nature of the intermediate goods produced.<sup>11</sup> If in-house production is more efficient and a firm can cover the fixed costs of having an intermediate goods production department, it will choose intra-firm sourcing.

These models are related to the two criticisms of the flying geese model described above. In other words, the import–production–export pattern has been shortened, and international inter-process division of labor has progressed. In empirical terms, although a clear causal relationship has not been confirmed, the correlation is clear that the more productive companies are, the more they are expanding overseas. In addition, while these models emphasize static choices, the dynamic choices, which also involve changes in industrial structure, are important with regard to the topic dealt with in this paper.<sup>12</sup>

In addition, Oizumi (2013) tries to understand the current situation in Thailand with the concept ‘Thailand plus one’. According to him, ‘Thailand plus one’ is a business model that transfers some labor-intensive processes in Thailand to neighboring countries. In this paper, we focus on the electrical industry and examine whether these phenomena actually occur. Moreover, Tokunaga et al. (2015) demonstrate that demand and agglomeration are important as foreign investment factors for the Japanese electrical industry at production bases of both final and intermediate goods. We will also consider changes in these factors.

### 3.4. GVC

In addition, what is the relationship between the FFG model developed in this paper and the GVC model? The flying geese model is a magnificent system that structurally captures the relationships between processes, products, industries, and countries (see Suenaga 2012, 2018 for details), but the TFG model did not fully capture the modern international division of labor, including the division of labor between processes. Nevertheless, it has the same perspective as the GVC model in that it tried to grasp global economic activities from the structure between processes, products, industries, and countries.<sup>13</sup> However, as Yeung and Coe (2015) point out, the GVC model tends to overemphasize governance types and categories of analysis and is not a dynamic theory, so that they seek to build a dynamic theory in terms of competitive dynamics (optimizing cost/capacity ratios, market imperatives, and financial discipline) and risk environments. However, the flying geese model was originally a dynamic and evolutionary one that discussed how the follower countries would catch up, and the FFG model, which is based on the progress of division of labor in recent years, is also systematic, dynamic, and evolutionary. Although Yeung and Coe’s dynamic theory is not closely related to existing economic theories, this paper presents a dynamic model and policies based on existing economic theories.

Moreover, as the degree of division of labor increases, the policies that the government should take are also changing. For example, Gereffi and Sturgeon (2013) distinguish three types of industrial policies (‘horizontal’ policies that affect the entire national economy, ‘selective’ or ‘vertical’ industrial policies for targeted industries and sectors, and GVC-oriented industrial policies in GVCs or RVCs) and emphasize that the role of the last is becoming more important. Taglioni and Winkler (2014) identify three priority areas: entering GVCs, expanding and strengthening participation in GVCs, and turning them into sustainable development. Baldwin (2014) also points out that 20th century RTAs (Regional Trade Agreements) were trade agreements, while 21st century RTAs were trade

agreements as well as production-sharing agreements. In addition, he discusses policies that support international supply chains, such as coordinating internationally dispersed production facilities and reducing or eliminating risks to tangible and intangible property. These studies make very suggestive analyses and recommendations, but in this paper, we build a dynamic and evolutionary model based on the progress of this division of labor and then make policy recommendations based on that model.

#### 4. Methodology

To fulfill the objectives specified above, in this theoretical paper, we rely heavily on the existing literature to build our theoretical model and then verify it using statistical data. As a result, the key method applied here is simply descriptive statistical analysis and mapping. The data employed include three different sets as follows:

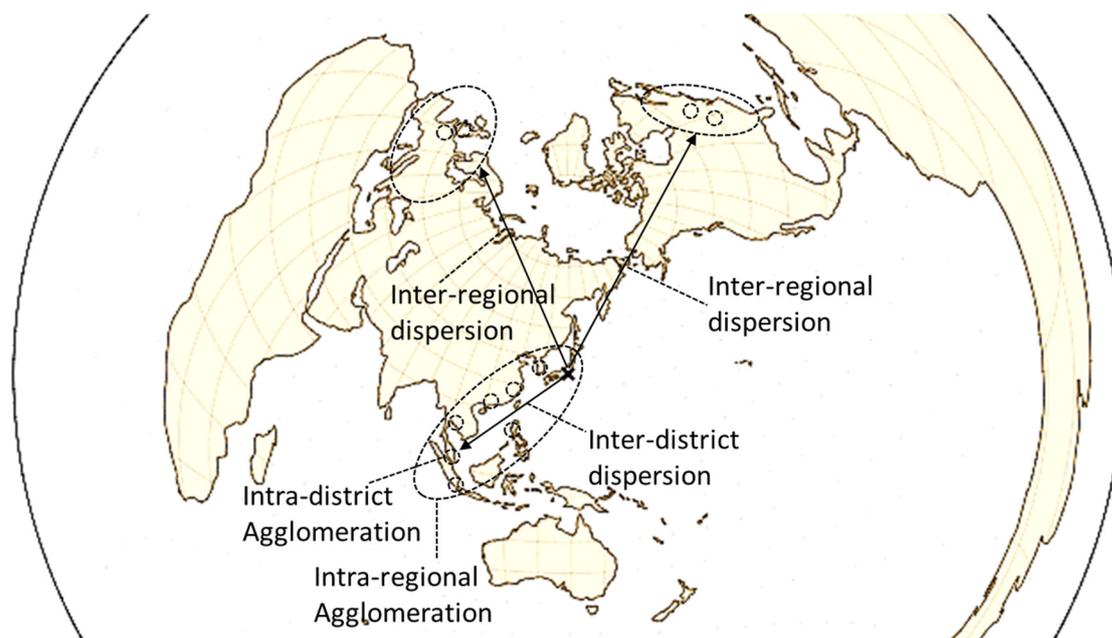
1. Macro dataset from the Bank of Japan, "Direct investment assets".
2. Toyo Keizai, various issues, *Kaigai Sinshutsu Kigyo Soran: Kuni Betsu Hen*, (Overseas Japanese Affiliated Companies: by Country).
3. Ministry of Economy, Trade, and Industry (METI) in Japan, various issues, the Survey of Overseas Business Activities of Japanese Companies.
4. Trade Industry Database (2018) of The Research Institute of Economy, Trade, and Industry (RIETI-TID 2018) in Japan.
5. Thailand industrial census in 2007 and 2012 from the ([National Statistical Office of Thailand n.d.](#)).

This is a national census of all establishments in Thailand every five years. For the purpose of this study, we extracted information from firms and establishments in the central region of Thailand and the Bangkok metropolitan area to illuminate the industrial agglomeration in the electrical and electronic manufacturing industry. Based on the Thailand System of Industrial Classification System TSIC, we picked up two industries at the two-digit level for TSIC 30 (machinery and equipment) and TSIC 32 (radio equipment and television equipment) as shown in Section 4 for empirical evidence on intra-regional agglomeration. The map is produced through the GIS visualization tools of the NSO (<http://statgis.nso.go.th/d/index/th>) (accessed on 1 July 2019).

#### 5. The Modified Model (FFG) with Intra-Regional Agglomeration

In this section, a new model, which extends the existing flying geese model, is constructed based on the above-mentioned previous research. Basically, the model is based on the existing flying geese model and industrial agglomeration theory, but in this new model, new phenomena, such as the international production network of MNCs in Japan, the progress of the international division of labor, and intra-regional agglomeration in East and Southeast Asia, can be explained.

The industrial agglomeration theory is based on the spatial location of economic activities, focusing on two concepts, agglomeration and dispersion, but in this paper, in order to understand the current situation in Asia, two geographical concepts, 'district' and 'region', are introduced. Figure 5 shows an azimuth equidistant chart centered on Tokyo, illustrating the dynamic concepts of agglomeration and dispersion and the geographical concepts of district and region. For example, the Keihin Industrial Zone in Japan can be mentioned as an example of intra-district agglomeration, but negative effects such as wage increases within a district become factors that cause inter-district dispersion of production bases (or production processes) to other districts such as Bangkok. In addition, when the production activities in these two districts are combined to form a value chain, intra-regional agglomeration is built from the viewpoint of the broader geographical concept, the 'region' (for example, East and Southeast Asia). Conversely, dispersion to more remote areas (e.g., the EU and North America) can be called inter-regional dispersion.



**Figure 5.** Intra-district/regional agglomeration and inter-district/regional dispersion. Note: This map was originally available at <http://maps.ontarget.cc/azmap/> (accessed on 1 January 2020).

Marshall (1920) cites information spillover, auxiliary industries, and the labor market as factors in regional centralization. In addition, Baldwin (2016) emphasizes the importance of being able to make a day trip in building RVCs. It will be possible to use information, auxiliary industries, and workers within that range, and the agglomeration effect, as Marshall points out, will cause intra-regional agglomeration (but not as much as intra-district agglomeration).

Here, we consider transportation costs in the broad and narrow senses. The term ‘transportation costs in a broad sense’ includes ‘transportation costs in a narrow sense’ associated with the movement of goods, as well as trade costs such as tariffs, non-tariff barriers, and legal and cultural differences. While ‘transportation costs in a narrow sense’ are mainly related to the means and technology of transportation, ‘transportation costs in a broad sense’ are affected by a number of different factors such as the development of information and communication technology, the progress of trade liberalization, and economic integration. In addition, these ‘transportation costs in a broad sense’ become higher as they cross national borders and corporate boundaries.<sup>14</sup>

Table 1 compares the characteristics of intra-district/regional agglomeration and inter-district/regional dispersion. In general, transportation costs in a narrow and broad sense increase according to the distance (intra-district < intra-regional < inter-regional). However, in transactions between developed countries, problems such as legal and cultural differences are often already mitigated, and transportation costs in a broad sense are relatively low compared to the transactions between developed and developing countries. Moreover, the diffusion of information and communication technology and the liberalization of trade become factors that reduce transportation costs in a broad sense between developed and developing countries. This will make the relative importance of transportation costs in a narrow sense greater than in the broad sense, and it may increase the relative advantage of intra-regional over inter-regional transactions. In addition, when negative factors such as wage increases in a district cause inter-district dispersion, regions with large wage differences may be better able to combine countries’ comparative advantages, such as factor endowment. The progress of fragmentation, such as the separation of production processes, will increase the possibility of utilizing the comparative advantages, and intra-regional agglomeration tends to become a vertical division of labor or vertical industrial structure under such an influence.<sup>15</sup> At the same time, because there are often different industries

in different districts and intra-regional agglomeration involves diverse districts, this agglomeration often also involves diverse industries (horizontal division of labor). Therefore, intra-regional agglomeration tends to be a type of network that combines vertical and horizontal industrial structures. In contrast, inter-regional dispersion to the EU, North America, etc., often results in a horizontal division of labor. Although intra-district agglomeration is discussed in industrial agglomeration theory and inter-regional dispersion is discussed in strategic trade theory, inter-district dispersion, and intra-regional agglomeration, which are focused upon in this paper, can be best explained by the FFG model presented below. In addition, the lines below the trip length are based on [Kimura \(2009\)](#), but the numerical values are given as a guide only.<sup>16</sup>

**Table 1.** Comparison between intra-district/regional agglomeration and inter-district/regional dispersion. Note: The trip length to transport mode based on [Kimura \(2009\)](#) with modifications. However, Kimura divides the realm into four layers instead of three ranges.

	Intra-District Agglomeration	Inter-District Dispersion/Intra-Regional Agglomeration	Inter-Regional Dispersion
Area	Industrial zone	Continent	World
Example	Keihin	East and southeast Asia	US, EU
Structure	Vertical	Networked	Horizontal
Theory	Agglomeration	Fragmented flying geese	Strategic trade
Trip length	Less than 100 km	100 to 5000 km	Longer
Lead time	Less than 2.5 h	1 day to 2 weeks	2 weeks to 2 months
Frequency	Once or more in a day	Once or more in a week	Less than once a week
Transport mode	Trucks	Trucks/ships/airplanes	Ships/airplanes

Although Figure 6 is a rough diagram, it shows how the effect of agglomeration and the ‘effect of comparative advantage’ change depending on the distance. The effect of agglomeration is higher as the distance is shorter, as in intra-district agglomeration, but if it is important to be able to make a day trip as pointed out by [Baldwin \(2016\)](#), the effect of intra-regional agglomeration is up to that distance. However, if the distance is exceeded, the effect will be significantly reduced. In addition, comparative advantage is often relatively similar between each district in the country, but the difference in comparative advantage becomes greater as the distance increases (however, beyond a certain distance, the difference is within a certain range). Firms can obtain higher effects by making use of such differences in comparative advantage and decentralizing production bases (or using companies from other countries). In this paper, such effects are referred to as ‘effects of comparative advantage’ (effects that use the difference in factor prices).<sup>17</sup> The slope and position of the curve in the figure change greatly depending on the location and time, but it can be considered that the intra-regional agglomeration utilizes both effects of this agglomeration and comparative advantage.

Before expanding the FFG model below, we extend the model of [Ozawa \(2016\)](#) taken up in the previous section, and consider the FDI of MNCs more systematically (see Figure 7). In this model, as discussed in the previous section, the leading country (L) goes through the process of MPX and then through the process of reverse import by O-FDI. The leading country’s O-FDI is inward FDI (I-FDI) from the viewpoint of the follower country 1 (F<sub>1</sub>) receiving the FDI, and the follower country can shorten the time-consuming process of MPX ([Ozawa 2016](#)). The arrow from X in the leading country to M in the follower country 1 and the arrow from X in the follower country 1 to M\* in the leading country in Figure 7 are the movements of goods, and the arrow from O-FDI in the leading country to I-FDI in follower country 1 indicates the transfer of capital and technology. With the negative factors such as wage increases and congestion effects within follower country 1 increasing, the leading country’s O-FDI will be headed toward follower country 2 (F<sub>2</sub>) with lower wages. After that, through a similar process, the leading country’s O-FDI will head to follower country 3 (F<sub>3</sub>) with lower wages. Moreover, the follower countries such as F<sub>3</sub> can

receive the FDI not only from leading country L, but also from  $F_1$  and  $F_2$ . In the general type of flying geese model, the process of moving the production base from the leading country to the follower countries was discussed, but the economic agent responsible for the transfer was not clearly discussed. Therefore, the process by which the MNCs' FDI moves from the leading country to the follower countries can be called a variant of the third type of flying geese model (or the fourth type of flying geese model).

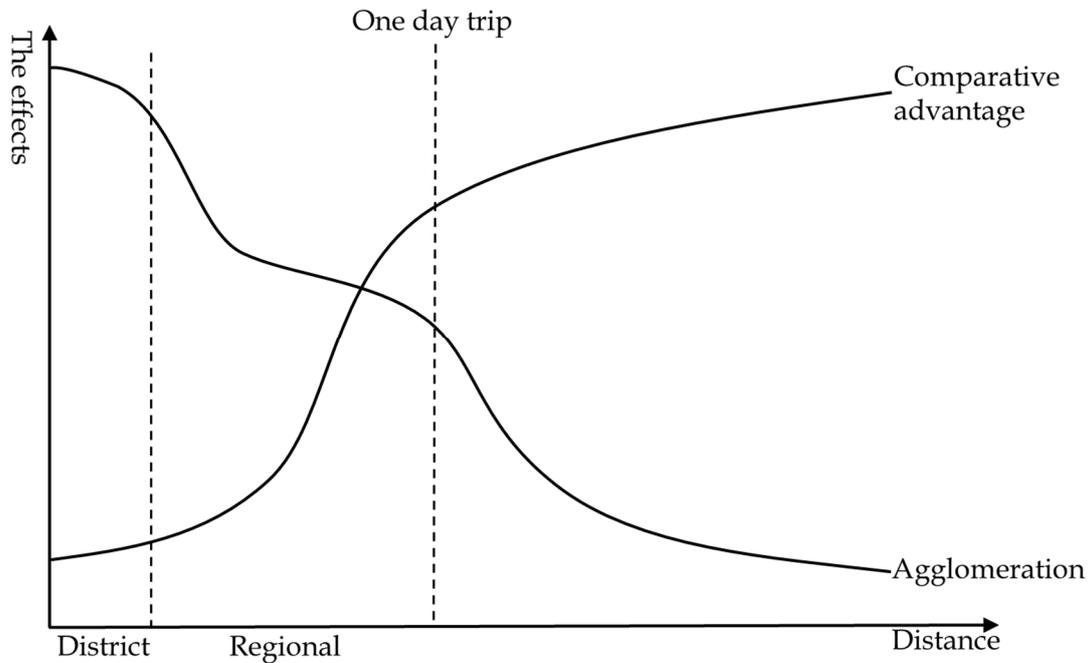


Figure 6. Change in the effect of agglomeration and comparative advantage according to distance.

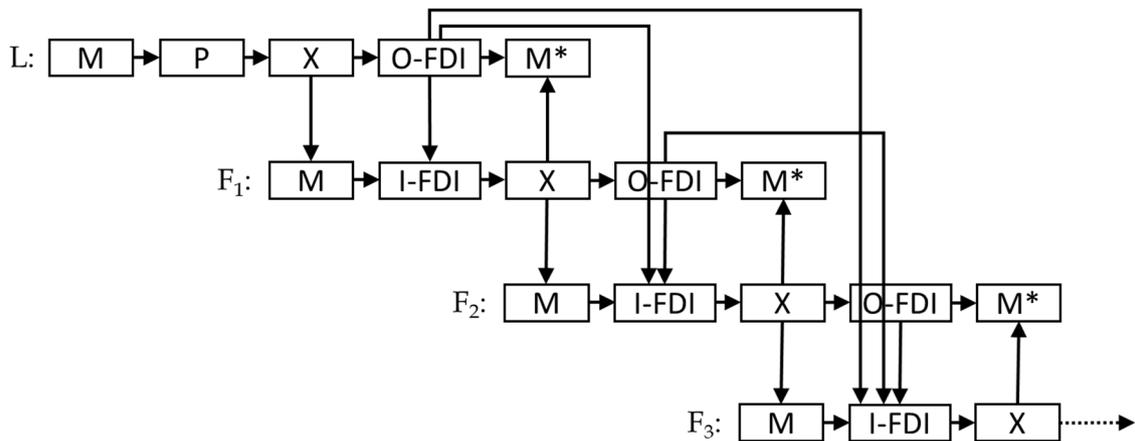


Figure 7. A variant of the general type (or the fourth type): a shift of O-FDI. Source: Extension of Ozawa (2016).

As the role of MNCs has increased, the basic type, which is the first type of flying geese model, and the general type, which is the third type, have been greatly influenced. However, what kind of impact did the international division of labor and the industrial agglomeration in the Asian region have on the traditional flying geese development pattern?

Figure 8 illustrates the TFG model (the general type). The horizontal axis represents time, the vertical axis shows technology level, and the circle indicates a country (or a region).<sup>18</sup> In a country (red circle), production of a certain industry 1 is carried out in Phase I, but the low-technology ( $L_1$ ), middle-technology ( $M_1$ ), and high technology ( $H_1$ ) sectors (or processes) in that industry are vertically integrated and one company (and

its affiliated companies) may be responsible for almost all sectors within its country.<sup>19</sup> With the passage of time or increasing technology levels, the country shifts to industry 2 where the capital/labor ratio and the technology level are higher, and along with factors such as rising wage levels, the production of industry 1 with a lower capital/labor ratio is transferred and dispersed to follower countries with a lower capital/labor ratio and wages (e.g., blue circle).

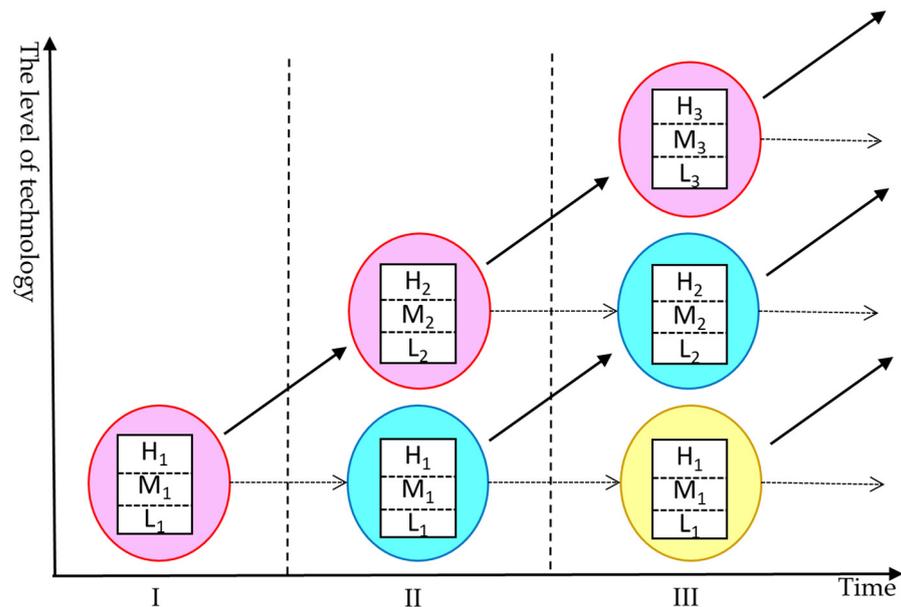


Figure 8. TFG model (general type): full set type.

Why does such a mechanism occur? Akamatsu (1961, p. 209) states that demand-linkage effects play significant roles in flying geese theoretical economic development, emphasizing the existence of domestic demand such as imports in the early stages of industrial development. This is also associated with the backward linkage effects of Hirschman (1958). On the other hand, Akamatsu (1965, p. 169) also emphasizes the existence of supply-linkage effects: supplying leads to induce supply in other sectors, which is also related to the forward linkage effects of Hirschman (1958). Although, in the process by which these linkage effects occur, capital accumulation and the introduction and imitation of technology were important; in the former, parameters such as savings rate and population growth rate, and in the latter, factors such as social ability (Abramovitz 1989) have played a significant role. In addition, it is important to make policy to bring out the effects of learning-by-doing, for example, through infant industry protection policies and measures to curb the rent-seeking that accompanies them.<sup>20</sup> In some follower countries, the successful functioning of these factors and mechanisms has led to the realization of flying geese patterns of economic development. Then, as the factor price ratio changes, production bases will move to other countries (see also Suenaga (2012, 2018) for the factors and mechanisms of the flying geese pattern of economic development).

However, with divisions of labor between sectors or processes, low, middle, and high technology sectors (or processes) are carried out by multiple countries and international vertical disintegration or fragmentation becomes possible. Figure 9 (the FFG model) illustrates the situation. For example, in Phase II, the high technology ( $H_1$ ) and middle-technology ( $M_1$ ) sectors of industry 1 are dominated by the leading country (red circle), but the low-technology sector ( $L_1$ ) of the industry is responsible for the follower country (blue circle). In addition, the high technology ( $H_2$ ) and middle-technology ( $M_2$ ) sectors of industry 2 are developed by the leading country, and the low-technology sector ( $L_2$ ) is the responsibility of the follower country. In this way, in the FFG model, there is an international vertical division of labor in which one industry (or sector) is divided among multiple countries, and

a horizontal division of labor in which one country (or region) straddles multiple industries. In such a process, each country or firm specializes in entering a certain industry, sector, or process where it has its own comparative advantage.

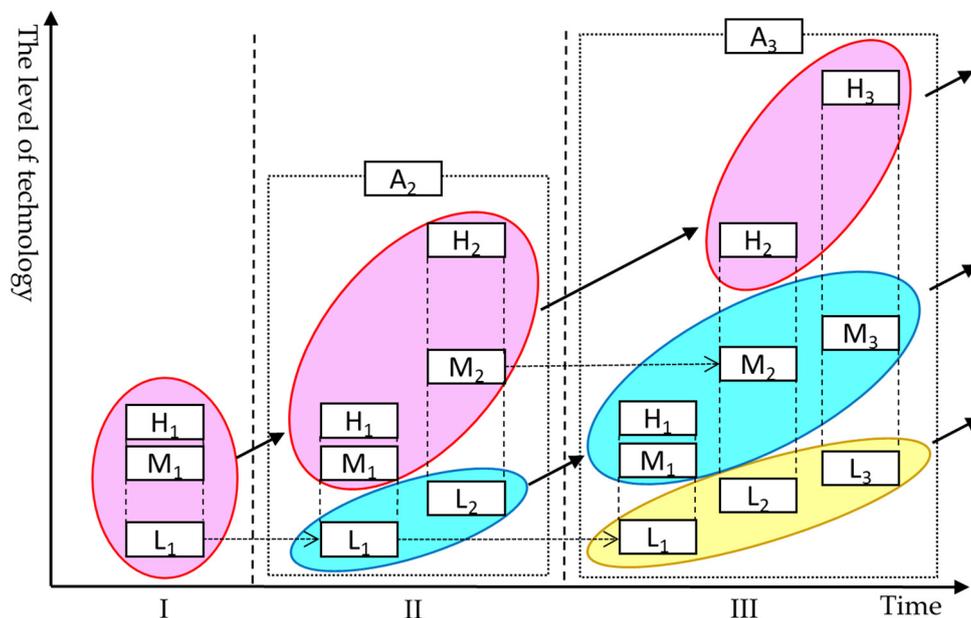


Figure 9. FFG and intra-regional agglomeration.

What are the factors and mechanisms of economic development in the FFG model? The TFG model emphasized domestic demand such as imports, but the FFG model emphasizes domestic as well as overseas demand. Therefore, production and exports will increase without going through the import stage. On the other hand, the existence of domestic demand also plays an important role. In terms of supply, overseas supply (export) is important, while domestic supply is also important. However, what is different from the TFG model is that supply and demand are at the process level rather than the industrial level and are in a complex network that includes not only domestic but also overseas factors (the importance of production networks related to supply and demand will be revisited in Section 4). In these processes, the introduction of technology through MNCs has become more important, but the progress of the division of labor between processes has also made it easier for firms in the follower countries to enter specific processes.<sup>21</sup> Moreover, the TFG model emphasized the forward–backward linkage effect in the vertically integrated model of a specific industry, but in the FFG model, the pattern of division of labor, such as entering multiple industries across similar processes, is increasing, and the importance of ‘economy of scope’ is also increasing.

Moreover, with the passage of time or the technology level rising, the country shifts to a higher technology sector (or process), and as the wage level increases, a specific sector (or process) moves to a follower country. From the viewpoint of the follower countries, they start developing from a sector (or process) with a lower technology level and evolve to a higher technology level (raising ladders), taking advantage of comparative advantages such as low wages.<sup>22</sup> These processes are exactly the same as what the TFG model has claimed.<sup>23</sup> The effects of MNCs, division of labor, and China have largely changed the development pattern. However, if we consider the effects of MNCs and division of labor and exclude the influence of China, the dynamism of the flying geese pattern still remains.<sup>24</sup>

In addition, in the TFG model, the degree of division of labor was low, so that analysis at the national level was central, but as the division of labor has progressed, analysis not only at the national level, but also at regional levels such as East and Southeast Asia, has become important. The circle in Figure 9 can be said to represent one country or one region

(such as ASEAN 4), and the size of this circle can also be considered to represent the size of agglomeration.

In the follower region (developing countries), production networks are formed and organized in a short period of time by MNCs, which transfer capital, technology, and know-how through FDI from developed countries to the region. These production networks cause the agglomeration effect. It is reinforced in the process of circular causality of the effects of both the forward and backward linkages. The forward linkage generates the effect that the supply of various intermediate goods from the upstream process improves the productivity of firms (industries) in the downstream process and attracts more firms (industries) to the region. Thus, it leads to the backward linkage effect whereby the expansion of the demand for the intermediate goods induces an increase in the supply in the upstream process and realizes economies of scale. In addition, workers' experience (learning/training), knowledge spillover, innovation, and other external economies are also related to the agglomeration effects in the region. These factors result in not only an increase in supply, but also positive feedback on the demand side through rapid economic growth, a rise in wage levels, and an expansion of consumption. Therefore, this region would have opportunities for economic development.

If the adverse effects on the industrial agglomeration raise wages, land rent (costs of land acquisition for factories, office rents, housing expenses, etc.), and commuting costs, and cause traffic congestion, serious environmental pollution, and other external diseconomies in the region, firms would consider transferring their production bases to other regions (such as the yellow area in Figure 9) or breaking down their production process into various stages spread across different countries. However, when the region has a solid foundation for production and highly skilled labor as a result of industrial agglomeration in the past, it may be possible for the region to accept higher technology sectors (processes) from advanced regions (countries) and promote new industrial agglomeration within the region at the higher level. In the case of the coexistence of countries with different levels of development in the same region, such as East and Southeast Asia, the region could combine plenty of capital, higher technology, and the know-how of MNCs in advanced countries, with abundant low-wage workers in other countries and low transportation costs (in the narrow and broad senses). Hence, these countries could take advantage of differences in technology, factor endowments, or factor prices, and expand industrial agglomeration within the region by optimizing the global production network. (i.e.,  $A_3$  in Figure 9 shows regional agglomeration with the comparative advantage of each country).

Figure 9 shows the FFG model that integrates a fragmented division of labor and regional agglomeration. We still need face-to-face communication and have to pay the communication costs to coordinate activities within the production networks. Thus, these production networks (or value chains) are required to have some degree of geographical proximity. Therefore, it may be more appropriate to call them regional production networks (or RVCs) rather than international production networks (or GVCs).<sup>25</sup>

In recent years, although the leapfrogging phenomenon in production has often been discussed (e.g., Lee 2016), this phenomenon has often been seen, for example, entering the low-technology sector of an industry 3 such as  $L_3$  in Phase III, as shown in Figure 9. In this case, it is necessary to be careful that the follower country gradually enters into a low-technology process of the new industry while it still has the low-technology sector of existing industry 1 or industry 2. It might be difficult for the follower country to introduce the high technology process of a new industry immediately.

Table 2 compares the TFG and FFG models. In the TFG model, specific industries were often discussed, and the industrial structure was vertically integrated and of the 'full set type', which has a comprehensive production network. On the other hand, in the FFG model, there are many cases across multiple industries rather than specific industries. In addition, the industrial structure is not vertically integrated and regional networks are formed. Moreover, the division of labor is not only vertical; there are also an increasing number of cases where the horizontal division of labor is carried out between countries

on the same economic level in a specific area. In the TFG model, processes such as MPX were time consuming and continuous, but in the FFG pattern, they become time saving and discontinuous due to the influence of MNCs and the division of labor.

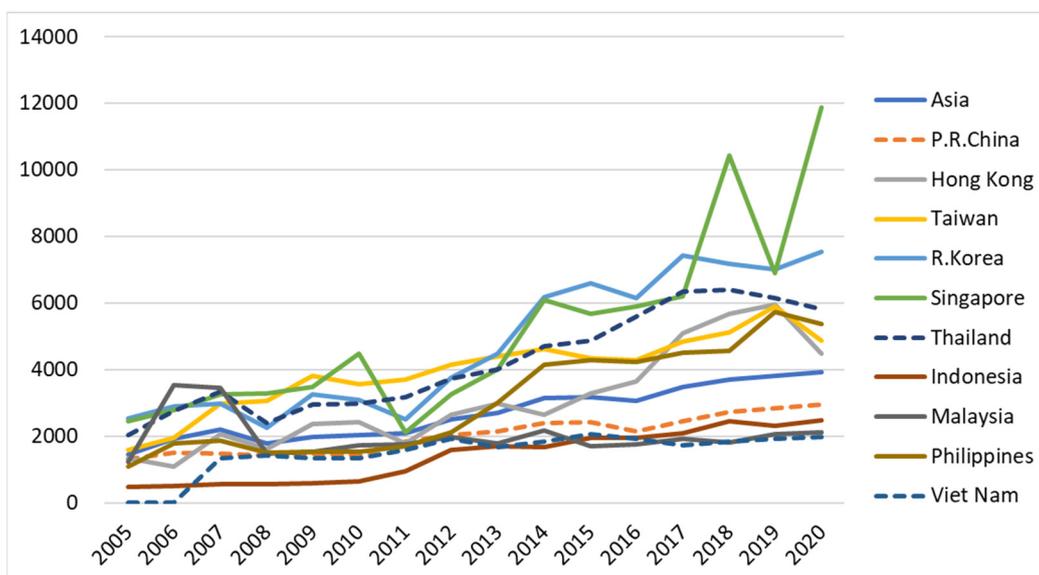
**Table 2.** Comparison between TFG and FFG models.

	TFG	FFG
Industrial structure	Integral	Disintegral
Industrial relationship	Intra-industry	Inter-industry
Network of production	National full-set	Regional networked
Speed of catching-up	Time-consuming	Time-saving
Sequence	Continuous	Discontinuous; “Leap-frogging”?

## 6. Empirical Evidence on Location Shifts of Japanese MNCs in the Electrical Industry

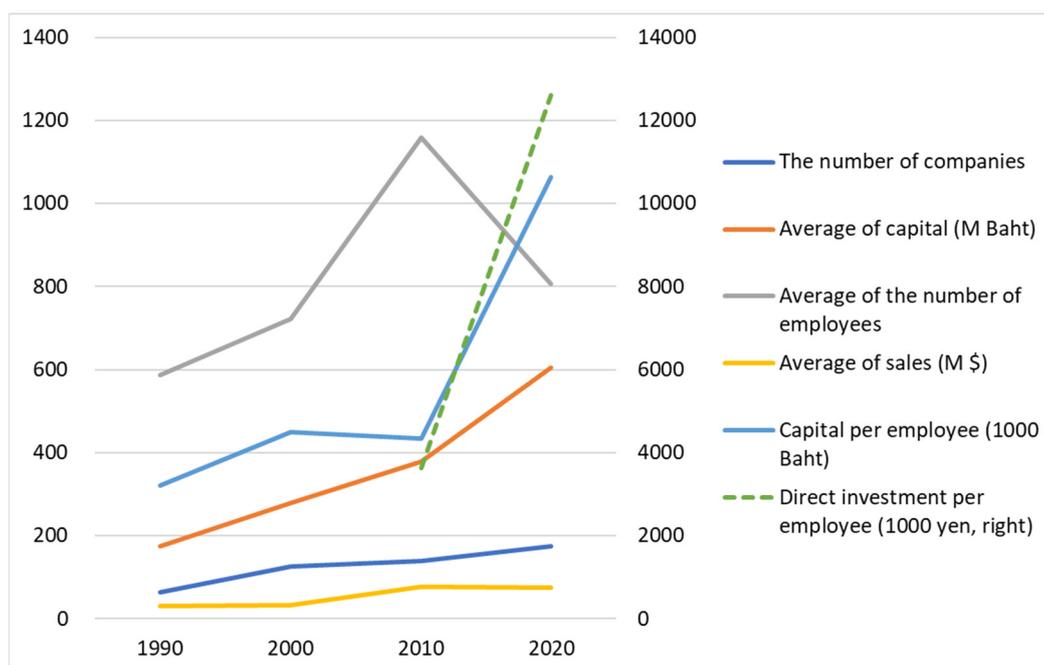
### 6.1. Evidence on Increasing FDI

As discussed in Section 1, Japanese MNCs in the electrical industry have changed their location from Asian NIES, ASEAN 4, to CLMV countries, in particular Vietnam. Although the volume of FDI and the number of firms in China is higher, it is worth noting that Thailand has the largest number of Japanese MNCs except China, and the number continues to increase. Figure 10 depicts shifts in direct investment assets per Japanese MNC. While the average investment amount of Japanese companies that have advanced into Thailand is much higher than that of companies that have expanded into China and Malaysia, it is second only to that of companies that have gone into South Korea and Singapore. This may be due to the fact that the Japanese MNCs in Thailand are making high-volume investments with a view to the future rather than having high technology.



**Figure 10.** Direct investment assets per Japanese MNC (electrical machinery, million yen). Data: Bank of Japan, “Direct investment assets”; METI, “the Survey of Overseas Business Activities of Japanese Companies”.

According to Figure 11, the average amount of capital per Japanese MNC has increased since 1990; however, the average number of employees has decreased since 2010. Using the data in Figure 10, the average investment assets in relation to the number of employees more than doubled from 2010 to 2020. This means that Japanese MNCs in Thailand shifted from labor-intensive sectors to capital-intensive sectors.



**Figure 11.** Average capital and employees of Japanese electrical MNCs in Thailand. Data: Toyo Keizai, 1990, 2000, 2010, and 2020, *Kaigai Sinshutsu Kigyo Soran: Kuni Betsu Hen*, (Overseas Japanese Affiliated Companies: by Country), Toyo Keizai Shimposha. The volume of FDI is based on data from the Bank of Japan, “Direct investment assets”.

## 6.2. Evidence on Intra-Regional Industrial Agglomeration

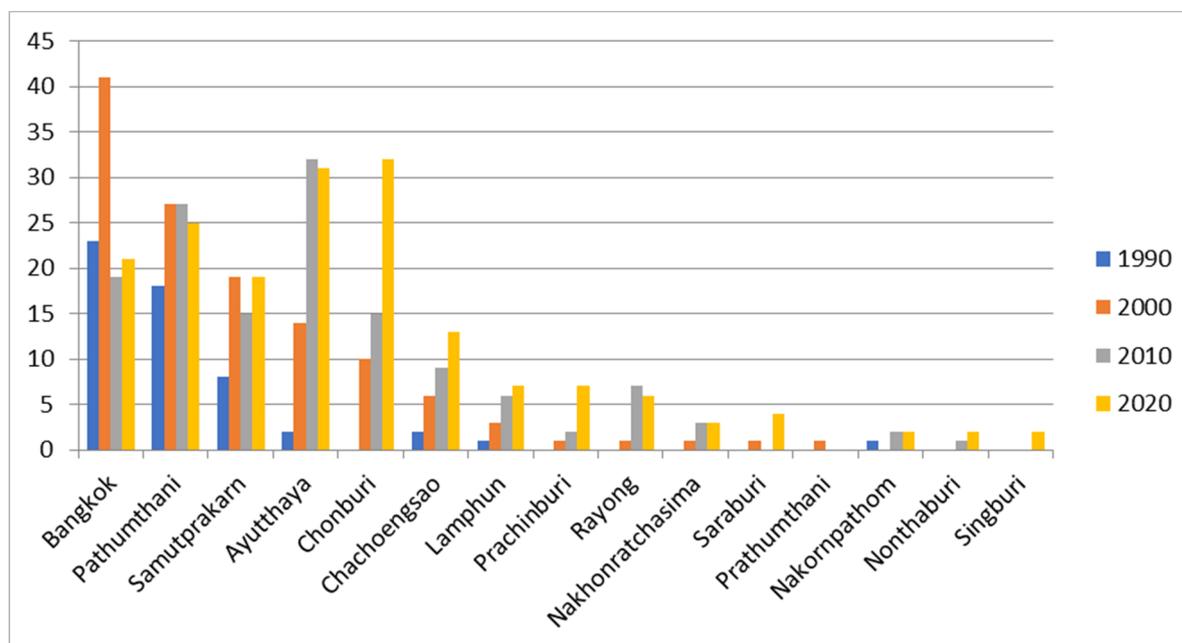
Most Japanese MNCs have entered the area from Bangkok to the Eastern Seaboard Industrial Zone, with the top nine provinces alone accounting for 92.0% (2020) of the total number (see Figure 12). The top nine prefectures are in the circled areas in Figure 13 and there are seven companies in Lamphun Province near Chiang Mai). The reason they have entered is that these areas are close to Bangkok and ports. Nevertheless, there have been very few advancements to neighboring provinces near Cambodia, Laos, and Myanmar (CLM) and, in fact, few MNCs have entered CLM. According to METI’s Survey of Overseas Business Activities of Japanese Companies, as of 2019, there were only a total of seven companies producing electrical and information communication equipment operating in CLM and Brunei. Therefore, it can be seen that there are not many examples of the ‘Thailand plus one’ concept with CLM for electrical and information communication equipment.<sup>26</sup>

We further explore the agglomeration changes in Thailand for those specific industries by examining the establishment census data collected by the NSO of Thailand in 2007 and 2012. Using the Geographical Information System (GIS) and visualization tools on the GSO website, we can extract some maps shown below.

The maps show the density of industrial concentration in each province in the central region of Thailand in the two major relevant industries to our study, namely, the manufacture of radio equipment and television equipment (TSIC 32), and the manufacture of machinery and equipment (TSCI 30). While the numbers on each province in the map represent the number of firms/establishments, the color shades show us the range of total employees working in that industry in those firms in total, with the darkest for provinces with over 4000 employees and the lightest being less than 500.

In the manufacturing industry of machinery and equipment, there was a big shift in economic activities from some provinces in the upper part of the central region such as Nakhon Ratchasima and Nakhon Sawan to the vicinity provinces near the Bangkok metropolitan area. In 2012, we find an intense concentration of this industry in Bangkok and three other provinces of Samprakan, Pathumthani, and Ayutthaya with over 4000 employees each. In particular, the number of establishments/companies in Bangkok also

reduced from 56 to 15, implying that the firm size on average did increase significantly. The changes in these four locations are very consistent with the top four provinces in Figure 12, suggesting an alignment of Japanese MNCs to the overall industry in Thailand.



**Figure 12.** Provinces shifts of Japanese electrical MNCs in Thailand. Data: Toyo Keizai, 1990, 2000, 2010, and 2020, *Kaigai Sinshutsu Kigyo Soran: Kuni Betsu Hen*, (Overseas Japanese Affiliated Companies: by Country), Toyo Keizai Shimposha.

Meanwhile, television and radio equipment manufacturing shows a less radical location shift, but the industry itself became denser around Bangkok and the Eastern seaboard area (eight provinces of Chonburi, Chachoengsao, Samut Prakan, Samut Sakhon, Nonthaburi, Nakhonpathom, Pathumthani, and Ayuthaya). The total number of establishments in this industry increased from 393 in 2007 to 470 in 2012, reflecting an attraction to firms due to intra-industry agglomerations and industry spillover effects.

This is also evidenced by a recent study (Bui and Preechametta 2019) on the concentration of manufacturing industries in three provinces of the Eastern Economic Corridor (EEC), namely, Chachoengsao, Chonburi, and Rayong, and two border provinces in the central region, namely, Sakaew and Trat, where the Special Economic Zones have been established. Over the period of 2006–2011, there were significant transformations in the manufacturing sector in EEC provinces. Two out of the three EEC provinces, Chachoengsao and Rayong, have become hubs for the automotive industry, with high concentrations of motor vehicle, trailer, semi-trailer, and other transport equipment manufacturing. The study calculated location quotients for each province by industry and showed that the indicators were fairly high, even greater than the central region's overall level, implying a shift in the location of automotive industry factories from other central provinces to EEC provinces to take the investment incentives and gain agglomeration benefits. The electronics and electrical appliance industries still maintain strong bases in these two provinces, while in Chonburi province, the number of electronics firms has fallen.



**Figure 13.** Location map of Japanese electrical MNCs in Thailand. Data: Toyo Keizai, 2020, *Kaigai Sinshutsu Kigyō Soran: Kuni Betsu Hen*, (Overseas Japanese Affiliated Companies: by Country), Toyo Keizai Shimposha. Note: Original map is based on [https://en.wikipedia.org/wiki/Provinces\\_of\\_Thailand/](https://en.wikipedia.org/wiki/Provinces_of_Thailand/) (accessed on 1 January 2020).

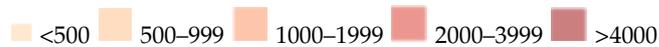
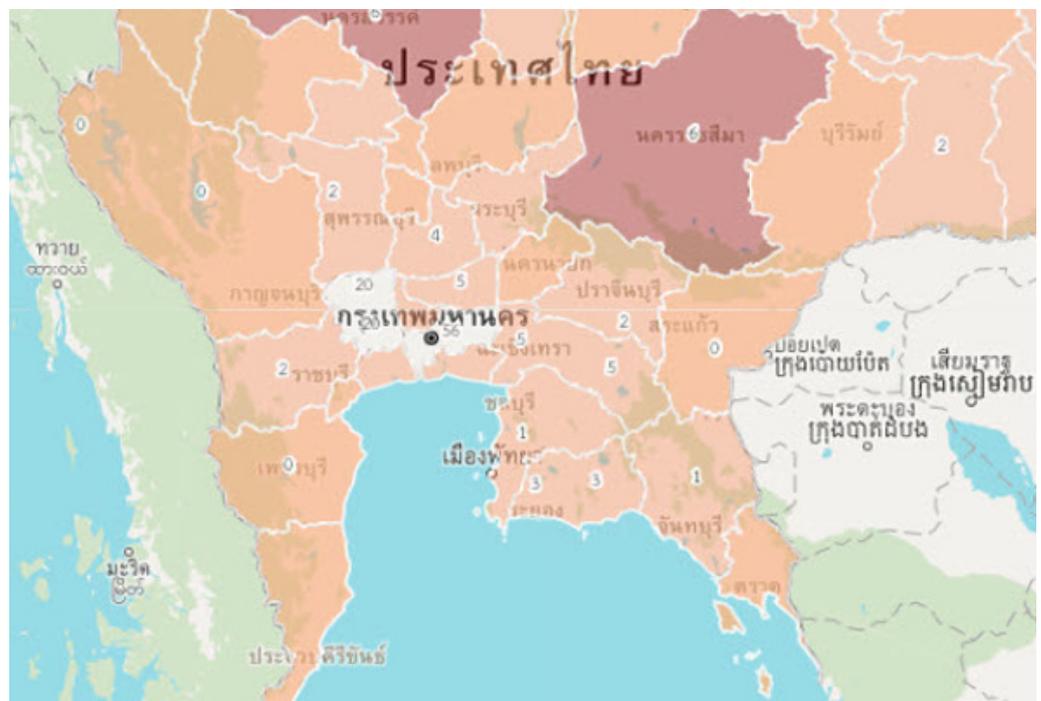
Meanwhile, in the two border provinces of Trat and Sakeaw, the agglomeration effects have not been seen in these heavy industries but rather in light industries such as textiles, garments, and food processing, which are more labor-intensive. Those manufacturing industries, indeed, reflect the objectives of the ‘Thailand plus One’ policy with respect to the labor supply from Cambodia. They shed light on the understanding of firms’ decisions concerning location. These decisions are strongly influenced by the agglomeration forces of the province despite other advantages in proximity and different investment privileges elsewhere.

Map A.9 Number of establishments/firms by province in the Central region (2007 and 2012) (TSIC 30: Manufacture of machinery and equipment) (accessed on 1 July 2019)

2012



2007



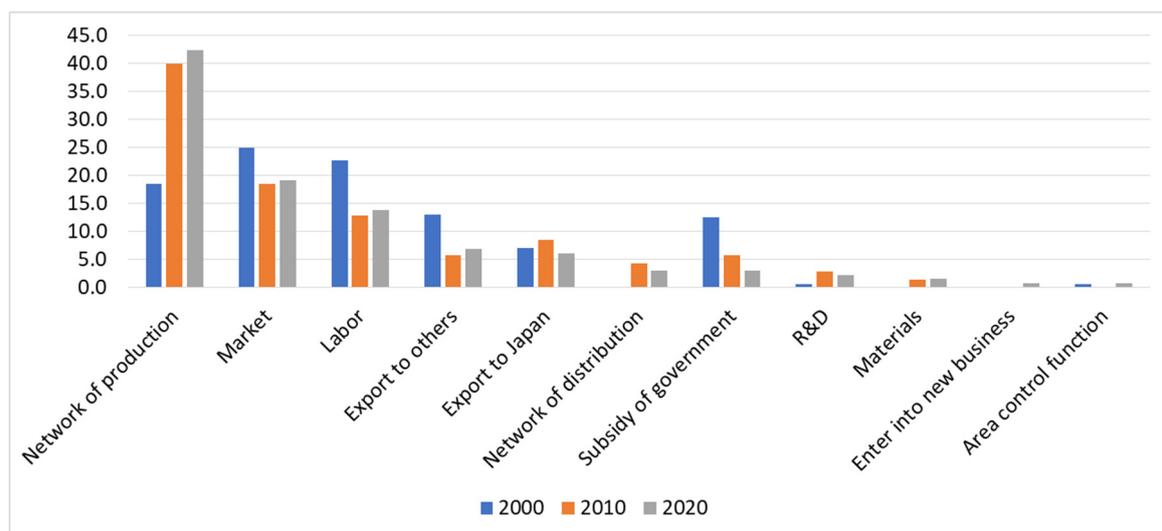


### 6.3. Evidence on Regional Value Chains

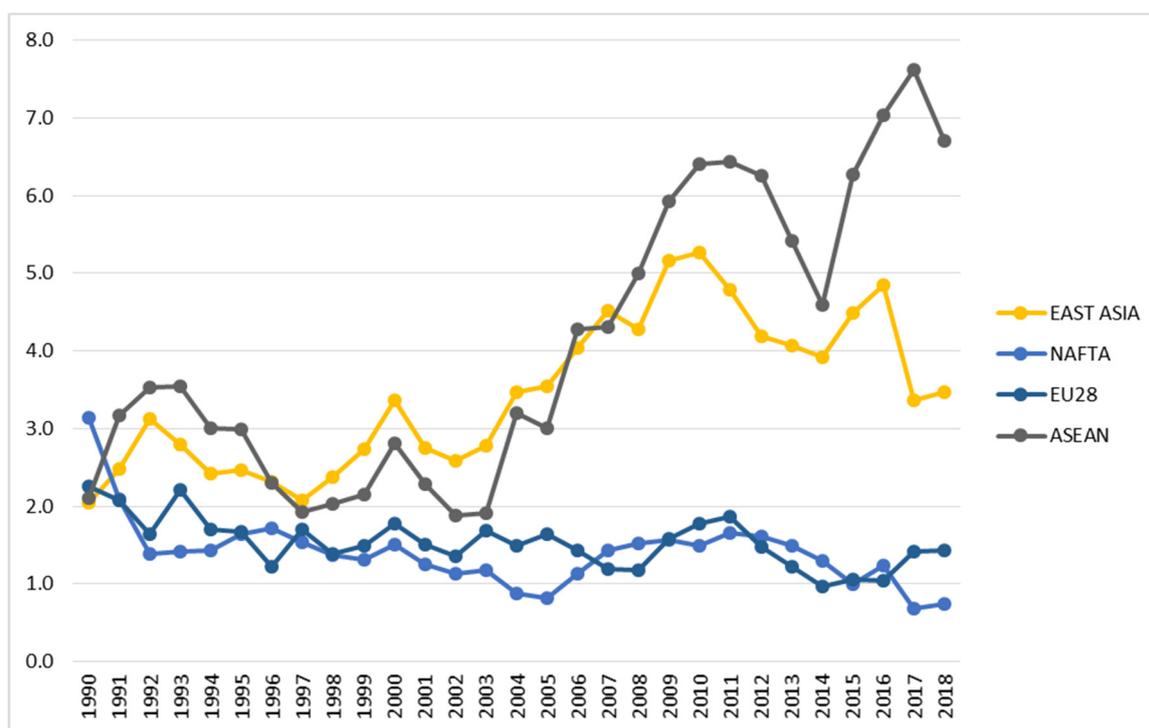
What is the purpose of Japanese MNCs advancing in Thailand? Although, as of 2000, there were a large number of companies entering the country to benefit from the low-wage labor, in 2010, the percentage of companies aiming to utilize these production networks greatly increased, while the percentage of those aiming to export to third countries declined considerably (Figure 14). This means that regional production networks or RVCs become important, for example, for procuring parts from companies already in the district and for selling manufactured parts mainly in the district. This is also a factor in the rapid increase in FDI in Thailand since 2010, as seen in Figure 1, and it is also considered that the capital/labor ratio of Japanese MNCs in Thailand has increased sharply since 2010, as illustrated in Figure 11.

On the other hand, as can be seen in Figure 4, Malaysia, which had a higher number of MNCs than Thailand in terms of electric and information communication machinery, has also seen a decline in the number of Japanese MNCs operating abroad, and as shown in Figure 10, the amount of FDI per Japanese MNC has also remained at a low level. According to a questionnaire survey of Japanese MNCs doing business overseas (JETRO 2020b, pp. 49–50), 18.2% of Japanese MNCs selected Thailand and 5.1% selected Malaysia for ‘agglomeration of related industries (easy local procurement)’, while 31.3% selected Thailand and 20.5% selected Malaysia for ‘agglomeration of customer companies’ as the attractive and strong points of each country (multiple responses), indicating that the attractiveness of such agglomeration is one of the motivations for Japanese MNCs to enter Thailand.<sup>27</sup>

This expansion of the regional production network can be verified by separating Thailand’s exports of electrical machinery into intermediate and final goods, and looking at changes in the ratio of intermediate to final goods. According to Figure 15, although the ratio has not changed much for exports from Thailand to NAFTA (North American Free Trade Agreement) and the EU, the ratio for ASEAN has expanded rapidly, followed by the ratio for East Asia. This suggests that the importance of regional production networks, especially nearby production networks, is increasing.



**Figure 14.** Purposes of Japanese electrical MNCs in Thailand (%). Data: Toyo Keizai, 2000, 2010, and 2020, *Kaigai Sinshutsu Kigyo Soran: Kuni Betsu Hen*, (Overseas Japanese Affiliated Companies: by Country), Toyo Keizai Shimposha.



**Figure 15.** Export of electrical machinery from Thailand (ratio of intermediate goods to final goods). Data: RIETI-TID 2018.

## 7. Policy Implications

Another factor that has contributed to such changes in the economic environment is the progress in FTAs (Free Trade Agreements) in this region. In East and Southeast Asia, ASEAN economic integration is gradually progressing and the AEC (ASEAN Economic Community) was established in 2015. The first six countries, namely, Indonesia, Singapore, Thailand, the Philippines, Brunei, and Malaysia, have already eliminated tariffs on over 99% of items, while the four newer countries, Cambodia, Vietnam, Myanmar, and Laos, also eliminated tariffs, excluding on sensitive items, and achieved zero tariffs on over 98% of items in 2018.

Other FTAs that may have a significant impact on the region include the CPTPP (Comprehensive and Progressive Agreement for Trans-Pacific Partnership) and the RCEP (Regional Comprehensive Economic Partnership). Only four ASEAN countries (Singapore, Brunei, Vietnam, and Malaysia) signed the CPTPP in March 2018. However, the RCEP was originally proposed by ASEAN and all ASEAN countries are participating in the negotiations concerning it. The RCEP was signed in November 2020 by 15 of the 16 countries negotiating the agreement, excluding India. While the RCEP agreement is comprehensive, covering a range of topics, the level of liberalization, including the elimination of tariffs, has not necessarily been high, as China, and India, which eventually left, have been reluctant to commit to high levels of liberalization.

On the other hand, the liberalization of the CPTPP is high level, and the CPTPP covers a wide range of topics. For example, labor, environment, government procurement, and state-owned enterprises are not covered by the AEC or RCEP. As a result, even though indiscriminate liberalization has been achieved within the ASEAN region since the AEC became effective, there is a situation where some countries participating in the CPTPP can easily access each other's markets. This also applies to the RCEP.

In addition, the CPTPP has adopted full cumulative origin regulations to maintain the production network deployed in the East and Southeast Asia region. This rule is called the 'accumulation of production activities'. According to this rule, even if components produced outside the CPTPP are used, as long as the products are processed inside the

CPTPP, they are regarded as local CPTPP products. Therefore, even if goods manufactured from components produced in Thailand are processed in the CPTPP region, they are regarded as products of the region and exported to CPTPP member countries under favorable conditions. Therefore, even after the CPTPP comes into effect, the production network including non-participating countries such as Thailand will be maintained for now.

In contrast, the RCEP's rules of origin adopted a partial accumulation system at the time of signature, allowing 'accumulation of goods' in which raw materials produced in a country within the region are regarded as having an intra-regional origin, but not as 'accumulation of production activities'. In other words, if raw materials produced in a country outside the RCEP region are used to produce intermediate goods, the value added of those goods cannot be included in the intra-regional origin ratio. Therefore, for exports using intermediate goods produced in a non-regional country, even if a lower intra-regional tariff rate were applied in a free trade zone that adopts a full accumulation system, such as the CPTPP, a favorable intra-regional tariff rate may not be applied in the RCEP, which adopts a partial accumulation system. Nevertheless, since the RCEP includes all ASEAN countries in addition to Japan, China, and South Korea, it is unlikely that this will exclude ASEAN countries, including Thailand, from the production network.<sup>28</sup>

However, in any case, as long as the CPTPP has a higher level of liberalization than the RCEP, it cannot be denied that the attractiveness of non-participating countries as production bases will be inferior to that of participating countries. Therefore, non-participating countries such as Thailand will be negatively affected by the agreement in the long run. In order for Thailand to achieve economic development while playing a role at the heart of the production network in Southeast Asia, it is essential for it to participate in the CPTPP or to join the FTAAP (Free Trade Area of the Asia Pacific), which will be as liberalized as the CPTPP in the future.

Moreover, as discussed in Section 2, Gereffi and Sturgeon (2013) categorized industrial policy into three types. In the model of this paper, we can say that, in recent years, there has been more than the 'horizontal type' (industry 1 to 3) and the 'vertical type' (from the low-tech to the high-tech sector of an industry) as shown in the TFG model in Figure 8; RVC-oriented industrial policy as indicated in the FFG model in Figure 9 is becoming important. In addition, Taglioni and Winkler (2014), mentioned above, listed three priority areas, but what is important is, as illustrated in Figure 9, to enter  $L_1$  in Phase II, then increase the degree of participation to  $L_1 + L_2$ , and in Phase III, expand the scope of industry and sector such as development to  $M_2$  and  $M_3$ .

By doing so, it is possible to enter a specific process that is narrower in scope than a specific industry, which also makes it easier for firms in the follower countries to enter. Along with that, as Baldwin (2016) points out, the risk of industrial policy may be reduced. However, even if the countries can enter a specific process, how to expand the range of production and how to further enhance it is more difficult to determine than in the TFG patterns. These patterns can be path-dependent or country/region-specific, and difficult steering is required for both corporate strategy and policy-making. In addition, another important point is how to keep dominating the indispensable processes that provide high profit. Under these circumstances, as Baldwin (2014) points out, adjustment of international production facilities and policies for tangible and intangible property are also important, but more important are the efforts of firms and government to move to a new stage. Although the division of labor has deepened from the full set type (Figure 8) to the FFG type (Figure 9), the essential mechanism of economic development and catch-up has hardly changed. Basically, while preparing the macroeconomic and infrastructure environment, there is no choice but to introduce technology and capital from MNCs, etc., accumulate human and physical capital, and raise the economic development stage according to the environment of the home country.

From the perspective of the Japanese government, it is necessary to support the construction of an appropriate production network through FTAs, etc., and to implement measures for smooth production and distribution within that network, with reference to

the systematic, dynamic, and evolutionary FFG discussed in this paper. In addition, the development of port facilities and industrial parks in the Eastern Seaboard Industrial Zone with the support of Japan and other countries has also contributed significantly to the subsequent development.<sup>29</sup> Moreover, comprehensive measures such as increasing Japanophilia are important in building networks, and it is also necessary to support Japanese companies so that they can stay in higher-level processes and industries and evolve into more advanced processes and industries.<sup>30</sup>

## 8. Concluding Remarks and Limitations

As described above, Japanese MNCs in the electrical industries have gradually shifted their production bases to follower countries, as shown in a variant of the third flying geese model (or the fourth flying geese model). In addition, regional networks of division of labor are being formed through the evolutionary development of fragmentation. Under these circumstances, the agglomeration effect is large in a specific area of Thailand, the number of Japanese companies and the amount of capital per company is tending to increase, and the area from Bangkok to the Eastern Seaboard Industrial Zone is playing an important role in the network of Japanese companies. This behavioral pattern of Japanese MNCs can be explained by the new FFG model that incorporates the concept of the division of labor and intra-regional agglomeration.<sup>31</sup>

As Baldwin (2016) discusses, with the fragmentation and offshoring of the production process, there is no need to build up whole supply chains in a country, which would entail a major change in development policy. In order for Thailand to become a developed country without being caught by the middle-income trap, it will be necessary for more advanced industries and processes to enter the country. In addition, as discussed in this paper, it is desirable to effectively use comparative advantage and intra-regional agglomeration effects while making good use of FDI from developed countries and intra-regional production networks. At the same time, Thailand will also need the capability to structurally transform traditional systems and policies.

Moreover, although it could not be discussed in detail in this paper, the construction of such a production network is inseparable from political issues. As the battle for hegemony between the United States and China intensifies, the question of how to build a production network that is advantageous to the country is becoming important from an economic and political point of view. FFG, which is a systematic, dynamic, and evolutionary model, is extremely important in devising government policies and corporate strategies.

Clearly, the development patterns discussed in this paper also differ depending on the industry and product architecture; therefore, other industries may have different dynamics. Furthermore, it is possible to perform more microscopic analysis, for example, on the strategic behavior of each company, and make comparisons with other countries. In addition, although it is difficult to obtain detailed and long-term individual data on MNCs in Japan, detailed verification should be conducted of MNCs in other countries. Although the current paper is scoped within a theoretical framework, it can be tested with econometric techniques and more empirical data available from a specific country or industry. In such cases, the systematic and dynamic viewpoints of this framework can be illuminated more specifically for some more targeted policy implications. This is one of the interesting areas for research extension.

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## Notes

- 1 Asian NIES (Asian New Industrializing Economies) is Korea, Taiwan, Hong Kong, and Singapore; ASEAN 4 (Association of South-East Asian Nations) means Malaysia, Thailand, Indonesia, and the Philippines; CLMV indicates Cambodia, Laos, Myanmar, and Vietnam.
- 2 For more information on ‘China Plus One’, see also [Oizumi \(2013\)](#).
- 3 The sharp decline in the number of withdrawals in 2019 in China may be due to a wait-and-see approach to the US–China trade conflict, or it may be a temporary phenomenon. However, we need to keep a close eye on longer-term and structural trends.
- 4 [Watanabe \(2011\)](#) has also given some suggestions on the problems of the flying geese theory.
- 5 In addition, since China, which has a very large scale in terms of both production and market, has developed, there have been various debates regarding to which areas (including Africa) the factories utilizing low-wage labor will be relocated. See, for example, [Ozawa and Bellak \(2011\)](#), [Lin \(2013\)](#), and [Brautigam et al. \(2018\)](#) for the discussion. Moreover, [Lin \(2012\)](#) proposes ‘a new structural economics’ and insists that ‘[t]he new approach also considers structural differences between countries at different levels of development and tries to explain them’ (p. 9). Furthermore, as we can find from [Lin \(2012, p. 222\)](#), who discusses the flying geese theory in detail, his new approach has a close relationship to our theory. This paper also adopts this new structural analysis. See also [Suenaga \(2002\)](#) and [Bui \(2016\)](#) for the structural approach.
- 6 According to [Fujita \(2010\)](#), ‘spatial economics’ has seen a process of theoretical development for almost two centuries since ([von Thunen \[1826\] 1966](#)). Many prominent economists have contributed to its development, expanded on a wide variety of ideas, and invented many theoretical tools in this field.
- 7 In addition to the effects of the forward and backward linkages, the agglomeration forces include economies of scale (increasing returns), thick markets (high-income levels, large population sizes), the formation of a labor market that contains workers with specialized skills, the supply of inexpensive and specialized non-tradable goods, knowledge spillover due to use of tools for reducing the difficulty of communication, external economies of technologies, diversity of goods such as consumer goods, capital goods, intermediate goods and public goods, promotion of innovation, etc. On the other hand, the dispersion forces include the existence of immobile factors, the increase in wages, increase in land rent (costs of land acquisition for factories, office rents, housing expenses, etc.) and commuting costs, traffic congestion, serious environmental pollution, other external diseconomies, and so on. See [Fujita et al. \(1999, p. 344\)](#) and [Fujita \(2003, pp. 213–32\)](#).
- 8 One industrial sector is completely agglomerated within the city. Therefore, the city specializes in the production of one good.
- 9 The forward linkage generates the effect that the supply of various intermediate goods from the upstream process improves the productivity of firms (industries) in the downstream process and attracts more firms (industries) to the region. Thus, it leads to the backward linkage effect where the expansion of the demand for the intermediate goods induces an increase in the supply in the upstream process and realizes economies of scale. In these models, the agglomeration effect is caused by the positive feedback process of circular causality of effects of both the forward and backward linkages. See [Hirschman \(1958\)](#) on the forward and backward linkage effects.
- 10 See also [Ito et al. \(2007\)](#) for empirical analysis in this regard.
- 11 When consigning production to another company, inefficiency arises because the contract for production consignment must be an incomplete contract. However, there are also inefficiencies that can arise when producing in-house. Which production method is more efficient depends on the nature of the intermediate goods produced. For more details, see [Antràs and Helpman \(2004\)](#) and [Antràs \(2016\)](#).
- 12 On static and dynamic theories of the division of labor and economic development, see also [Suenaga \(2015\)](#).
- 13 See also pioneering studies such as [Dicken \(1998\)](#) in this regard.
- 14 Various discussions have been held on these points from the perspective of service link costs. See also [Jones and Kierzkowski \(1990\)](#) and [Kimura and Ando \(2005\)](#) for more information.

- 15 ‘Vertical division of labor’ means, for example, division of labor between agriculture and industry and division of labor  
between crude and refined cotton cloth. On the other hand, ‘horizontal division of labor’ refers to the division of labor between  
shipbuilding and the automobile industry and the division of labor between commercial vehicles and passenger cars. For the  
concept of division of labor, see [Akamatsu \(1965\)](#), pp. 129–30) and [Suenaga \(2012, 2015\)](#).
- 16 [Kimura \(2009\)](#) also examines in detail the relationship between transaction types and costs.
- 17 The magnitude of transportation costs in the narrow and broad senses is not included here.
- 18 It is possible to use the capital/labor ratio on the vertical axis, but in this paper, we explicitly use the term ‘technology’, which is  
the most important factor in economic development.
- 19 In addition, the boundaries of low, middle, and high technology sectors (or processes) were not as clear as they are now.
- 20 See also [Khan and Jomo \(2000\)](#) for economic development and rent seeking.
- 21 [Gereffi et al. \(2005\)](#) classify the production networks in GVCs into five types: Market type, Modular type, Relational type,  
Captive type, and Hierarchy type. In such production networks, there are cases where there are no core firms, as shown by the  
Market type, but in many cases, the MNCs of the leading countries play an important role.
- 22 See also [Lin \(2013\)](#) on this point.
- 23 In this paper, for convenience, we distinguish between TFG and FFG models, but this classification is not adequate, because  
[Akamatsu \(1945\)](#) has already discussed the international division of labor, for example, in the cotton industry. See also [Suenaga  
\(2020\)](#) for the international division of labor in the cotton industry. [Ozawa \(2019\)](#) insists that ‘Japan is the very last latecomer that  
managed to forge ahead largely by means of its old-style H-L (Alexander Hamilton–Friedrich List) strategy both prior to and  
immediately after World War II. By contrast, the NIEs and China have effectively crafted their own new catch-up models by  
capitalizing on MNC-driven global capitalism’ (p. 112).
- 24 However, this does not mean that China does not follow the flying geese theory. China itself has made progress through  
using the same pattern of flying geese theory, but the scale of supply and demand is too large, which has greatly disrupted the  
developmental patterns of other countries.
- 25 [Baldwin and Okubo \(2014\)](#) point out that the RVCs are often more important than the GVCs. [Baldwin \(2016\)](#) emphasizes the  
importance of being able to make a day trip and focuses on the regional clusters of Germany and Central and Eastern Europe,  
the USA and Mexico, and Japan and South-East Asia.
- 26 A recent study by [Bui \(2019\)](#) on the production network between Thailand and the CLMV with respect to the role of MNCs  
describes an interesting case of a Japanese MNC in the automobile industry that had been in Thailand for several decades  
and had recently expanded operations to Cambodia successfully. The strong linkage between the regional headquarters in  
Thailand with a nearby subsidiary was more evident in the production and transfer phases. In each stage of production,  
including procurement, in-house part processing, assembly and inspection, and the quality assurance service, there was always  
involvement by the Thai regional technicians to assist the infant factory in Cambodia. Some labor-intensive parts that were  
produced in Thailand in the early 2000s have been produced in Cambodia since 2015, and by 2020, some other mature products  
with higher levels of automation that were previously produced in Thailand would be made in Cambodia. The Thai subsidiary  
was gradually phased out as the Cambodian subsidiary expanded. Meanwhile, in that time, Thailand had been able to produce  
more high-end products, requiring a higher level of technical expertise.
- 27 As for other items, Malaysia significantly outperforms Thailand in infrastructure and political/social aspects, but there are no  
major differences between the two countries in other economic and institutional items. In addition, according to [JETRO \(2020a\)](#),  
pp. 100–1), the annual real cost of local workers for Japanese manufacturing MNCs is higher in Thailand (US\$8135) than in  
Malaysia (US\$7048).
- 28 However, under the RCEP, the introduction of a full accumulation system will be considered after all signatories have brought  
the agreement into force.
- 29 See also [Mieno \(2013\)](#) for the Eastern Seaboard Industrial Zone.
- 30 See also [Suenaga \(2018\)](#) for Japan’s innovation policy.
- 31 In addition, as the FFG theory suggests, although we were unable to cover it in detail in this paper, Japanese MNCs are  
withdrawing from Malaysia, which is less attractive for agglomeration, and are rapidly moving into Vietnam, where wages are  
lower. This is not exact, but it corresponds to the situation in Figure 9, for example, in Phase III, where Japan (the headquarters)  
plays the role of the red circle, while Thailand (and Japanese subsidiaries) plays the core role of the blue circle, and Vietnam is  
becoming a representative country of the yellow circle as Thailand’s labor costs and technological level become more advanced.

## References

- Abramovitz, Moses. 1989. *Thinking about Growth: And Other Essays on Economic Growth and Welfare*. Cambridge: Cambridge University Press.
- Akamatsu, Kaname. 1945. *Keizai Shin Titsuzyo No Keisei Genri*. Tokyo: Risosya. (In Japanese)
- Akamatsu, Kaname. 1961. A Theory of Unbalanced Growth in the World Economy. *Weltwirtschaftliches Archiv* 86: 196–217.
- Akamatsu, Kaname. 1965. *Sekai Keizai Ron*. Tokyo: Kunimoto Shobo. (In Japanese)

- Ang, Yuen Yuen. 2018. Domestic Flying Geese: Industrial Transfer and Delayed Policy Diffusion in China. *China Quarterly* 234: 420–43. [[CrossRef](#)]
- Antràs, Pol. 2016. *Global Production: Firms, Contracts, and Trade Structure*. Princeton: Princeton University Press.
- Antràs, Pol, and Elhanan Helpman. 2004. Global Sourcing. *Journal of Political Economy* 112: 552–80. [[CrossRef](#)]
- Baldwin, Richard. 2014. *Multilateralising 21st Century Regionalism*. Paris: OECD Conference Centre.
- Baldwin, Richard. 2016. *The Great Convergence: Information Technology and the New Globalization*. Harvard: Harvard University Press.
- Baldwin, Richard, and Toshihiro Okubo. 2014. Networked FDI: Sales and Sourcing Patterns of Japanese Foreign Affiliates. *World Economy* 37: 1051–80. [[CrossRef](#)]
- Brainard, Lael. 1997. An Empirical Assessment of the Proximity-Concentration Trade-off between Multinational Sales and Trade. *American Economic Review* 87: 520–44.
- Brautigam, Deborah, Tang Xiaoyang, and Ying Xia. 2018. What Kinds of Chinese ‘Geese’ Are Flying to Africa? Evidence from Chinese Manufacturing Firms. *Journal of African Economies* 27: i29–i51. [[CrossRef](#)]
- Bui, Thi Minh-Tam. 2016. *The Development of Special Economic Zones in East Asia and Implications of Thailand*. Policy Note. Bangkok: School of Economics and Public Policy, Srinakharinwirot University, vol. 3, pp. 1–8.
- Bui, Thi Minh-Tam. 2019. SEZ Development in Cambodia, Thailand and Vietnam and the Regional Value Chains. In *EEC Development and Transport Facilitation Measures in Thailand, and the Development Strategies by the Neighboring Countries*; Edited by Daisuke Hiratsuka. BRC Research Report; Bangkok: Bangkok Research Center, JETRO Bangkok/IDE-JETRO, chp. 5, pp. 82–117.
- Bui, Thi Minh-Tam, and Arayah Preechametta. 2019. Will manufacturing investors go to border zones? The case of central Thailand. *International Journal of Emerging Markets ahead-of-print*. [[CrossRef](#)]
- Damijan, Jože P., and Matija Rojec. 2007. Foreign Direct Investment and Catching Up of New EU Member States: Is There a Flying Geese Pattern? *Applied Economics Quarterly* 53: 91–118.
- Dicken, Peter. 1998. *Global Shift: Transforming the World Economy*, 3rd ed. London: Paul Chapman Publishing Ltd.
- Dixit, Avinash K., and Joseph E. Stiglitz. 1977. Monopolistic competition and optimum product diversity. *American Economic Review* 67: 297–308.
- Fujita, Masahisa. 2003. Kukan Keizaigaku no Shiten kara mita Sangyo Kurasuta Seisaku no Igi to Kadai. In *Nihon No Sangyo Kurasuta Senryaku*. Edited by Yoko Ishikura, Masahisa Fujita, Noboru Maeda, Kazuyori Kanai and Akira Yamazaki. Tokyo: Yuhikaku, chp. 6, pp. 211–61. (In Japanese)
- Fujita, Masahisa. 2010. Kukan Keizaigaku no Hatten. In *Gendai Keizaigaku no Thoryu 2010*. Edited by Shinsuke Ikeda, Masao Ogaki, Akihisa Shibata, Takatoshi Tabuchi and Yasuo Maeda. Tokyo: Toyo Keizai Shinposya, pp. 3–53. (In Japanese)
- Fujita, Masahisa, and Jacques-François Thisse. 2002. *Economics of Agglomeration: Cities, Industrial Location, and Globalization*. Cambridge: Cambridge University Press.
- Fujita, Masahisa, and Jacques-François Thisse. 2013. *Economics of Agglomeration: Cities, Industrial Location, and Globalization*, 2nd ed. Cambridge: Cambridge University Press.
- Fujita, Masahisa, Paul Krugman, and Anthony J. Venables. 1999. *The Spatial Economy: Cities, Regions and International Trade*. Cambridge: MIT Press.
- Gereffi, Gary, and Timothy Sturgeon. 2013. Global Value Chain-Oriented Industrial Policy: The Role of Emerging Economies. In *Global Value Chains in a Changing World*. Edited by Deborah K. Elms and Patrick Low. Geneva: World Trade Organization, chp. 14, pp. 329–60.
- Gereffi, Gary, John Humphrey, and Timothy Sturgeon. 2005. The Governance of Global Value Chains. *Review of International Political Economy* 12: 78–104. [[CrossRef](#)]
- Helpman, Elhanan. 1984. A Simple Theory of International Trade with Multinational Corporations. *Journal of Political Economy* 92: 451–71. [[CrossRef](#)]
- Helpman, Elhanan, Marc Melitz, and Stephen Yeaple. 2004. Export Versus FDI with Heterogeneous Firms. *American Economic Review* 94: 300–16. [[CrossRef](#)]
- Hirschman, Albert O. 1958. *The Strategy of Development*. New Haven: Yale University Press.
- Ito, Banri, Eiichi Tomiura, and Ryuhei Wakasugi. 2007. *Dissecting Offshore Outsourcing and R&D: A Survey of Japanese Manufacturing Firms*; RIETI Discussion Paper Series 07-E-060; Tokyo: Research Institute of Economy, Trade and Industry.
- JETRO. 2020a. *FY2019 Survey on Overseas Business Development of Japanese Companies*; Tokyo: JETRO. (In Japanese)
- JETRO. 2020b. *FY2020 Survey of Japanese Companies Operating Overseas (Asia & Oceania)*; Tokyo: JETRO. (In Japanese)
- Jones, Ronald W., and Henryk Kierzkowski. 1990. The Role of Service in Production and International Trade: A Theoretical Framework. In *The Political Economy of International Trade*. Edited by Ronald Jones and Anne Krueger. Oxford: Basil Blackwell, chp. 3, pp. 31–48.
- Kamińska, Teresa. 2016. Is the ‘Flying Geese’ Paradigm Useful to Explain Advancement in the European Union by Means of FDI Phenomenon? *Journal of International Studies* 9: 9–24. [[CrossRef](#)] [[PubMed](#)]
- Kemanai, Yuji. 1998. Hakenkoku America no Ruiseki Saimu Mondai. In *Ruiseki Saimu to Tyoki Hado*. Edited by Shiro Shiraishi, Yuji Kemanai and Toshinobu Mikami. Tokyo: Sekai Shoin, chp. 7, pp. 181–205. (In Japanese)
- Khan, Mushtaq H., and Kwame Sundaram Jomo, eds. 2000. *Rents, Rent-Seeking and Economic Development: Theory and Evidence in Asia*. Cambridge: Cambridge University Press.

- Kimura, Fukunari. 2009. Expansion of the Production Networks into the Less Developed ASEAN Region: Implications for Development Strategy. In *Plugging into Production Networks: Industrialization Strategy in Less Developed Southeast Asian Countries*. Edited by Ikuo Kuroiwa. Singapore: ISEAS Publishing, chp. 2, pp. 15–35.
- Kimura, Fukunari, and Mitsuyo Ando. 2005. Two-dimensional Fragmentation in East Asia: Conceptual Framework and Empirics. *International Review of Economics and Finance* 14: 317–48. [CrossRef]
- Kimura, Fukunari, Yuya Takahashi, and Kazunobu Hayakawa. 2007. Fragmentation and Parts and Components Trade: Comparison between East Asia and Europe. *North American Journal of Economics and Finance* 18: 23–40. [CrossRef]
- Kojima, Kiyoshi. 2003. *The Flying Geese Theory of Economic Development*. Kure: Bunshindo, vol. 1. (In Japanese)
- Krugman, Paul R. 1991a. *Geography and Trade*. Cambridge: MIT Press.
- Krugman, Paul R. 1991b. Increasing returns and economic geography. *Journal of Political Economy* 99: 483–99. [CrossRef]
- Krugman, Paul R., and Anthony J. Venables. 1995. Globalization and the inequality of nations. *Quarterly Journal of Economics* 110: 857–80. [CrossRef]
- Lee, Keun. 2016. *Economic Catch-Up and Technological Leapfrogging: The Path to Development and Macroeconomic Stability in Korea*. Cheltenham: Edward Elgar.
- Lin, Justin Yifu. 2012. *The Quest for Prosperity: How Developing Economies Can Take Off*. Princeton: Princeton University Press.
- Lin, Justin Yifu. 2013. From Flying Geese to Leading Dragons: New Opportunities and Strategies for Structural Transformation in Developing Countries. In *The Industrial Policy Revolution II*. Edited by Joseph E. Stiglitz, Justin Lin Yifu and Ebrahim Patel. London: Palgrave, pp. 50–70.
- Markusen, James. 1984. Multinationals, Multi-plant Economies, and the Gains from Trade. *Journal of International Economics* 16: 205–26. [CrossRef]
- Markusen, James, and Anthony J. Venables. 2000. The Theory of Endowment, Intra-industry and Multi-national Trade. *Journal of International Economics* 52: 209–34. [CrossRef]
- Marshall, Alfred. 1920. *Principles of Economics*. London: Macmillan.
- Melitz, Marc. 2003. The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica* 71: 1695–725. [CrossRef]
- Mieno, Fumiharu. 2013. The Eastern Seaboard Development Plan and Industrial Cluster in Thailand: A Quantitative Overview. In *Aid as Handmaiden for the Development of Institutions*. Edited by Machiko Nissanke and Yasutami Shimomura. London: Palgrave Macmillan, chp. 3, pp. 81–105.
- National Statistical Office of Thailand. n.d. Industrial and Business Census 2007 and 2012. Available online: <http://statgis.nso.go.th> (accessed on 1 July 2019).
- Oizumi, Keiichiro. 2013. Kakudai suru Shinkokoku Tozyoukoku Yunyuu Sizhou wo dou Kouryaku suruka. *Kan Taiheiyō Business Zhouho RIM* 13: 95–117. (In Japanese)
- Ozawa, Terutomo. 2016. *The Evolution of the World Economy: The 'Flying-Geese' Theory of Multinational Corporations and Structural Transformation*. Cheltenham: Edward Elgar.
- Ozawa, Terutomo. 2019. The Flying-Geese Theory: Reassessed and Reformulated in New Structuralist Perspective. In *The Oxford Handbook of Structural Transformation*. Edited by Célestin Monga and Justin Yifu Lin. Oxford: Oxford University Press, chp. 5, pp. 109–26.
- Ozawa, Terutomo, and Christian Bellak. 2011. Will the World Bank's Vision Materialize? Relocating China's Factories to Sub-Saharan Africa, Flying-Geese Style. *Global Economy Journal* 11: 1850234. [CrossRef]
- Ozawa, Terutomo, Sergio Castello, and Ronnie J. Phillips. 2001. The Internet Revolution, the "McLuhan" Stage of Catch-up, and Institutional Reforms in Asia. *Journal of Economic Issues* 35: 289–98. [CrossRef]
- Petri, Peter A. 2012. The Determinants of Bilateral FDI: Is Asia Different? *Journal of Asian Economics* 23: 201–9. [CrossRef]
- Puga, Diego, and Anthony J. Venables. 1996. The spread of industry: Spatial agglomeration in economic development. *Journal of the Japanese and International Economies* 10: 440–64. [CrossRef]
- Radelet, Steven, and Jeffrey Sachs. 1997. Asia's Reemergence. *Foreign Affairs* 76: 44–59. [CrossRef]
- Ruan, Jianqing, and Xiaobo Zhang. 2014. "Flying Geese" in China: The Textile and Apparel Industry's Pattern of Migration. *Journal of Asian Economics* 34: 79–91. [CrossRef]
- Shiozawa, Yoshinori. 2017. The New Theory of International Values: An Overview. In *A New Construction of Ricardian Theory of International Values*. Edited by Yoshinori Shiozawa, Toshihiro Oka and Taichi Tabuchi. Singapore: Springer, pp. 3–76.
- South, Robert B. 2016. The Flying Geese Metaphor: Export-Oriented Manufactures in Mexico. *Regional Studies* 50: 1483–95. [CrossRef]
- Suenaga, Keiichiro. 2002. Economic Development and Government: Toward a Theory of Economic Structural Change. Ph.D. thesis, Meiji University, Tokyo, Japan. (In Japanese)
- Suenaga, Keiichiro. 2012. The Flying-Geese Theory, Division of Labor, and Catching-up. *The Review of Economics and Political Science* 80: 303–22. (In Japanese)
- Suenaga, Keiichiro. 2015. The Division of Labour and Economic Development: An Evolutionary Approach. *Research Paper of Japan Academy for International Trade and Business* 4: 1–20.
- Suenaga, Keiichiro. 2018. Catching up and Innovation in the Asia Pacific: An Evolutionary Approach. In *Innovation in the Asia Pacific: From Manufacturing to Knowledge Economies*. Edited by Thomas Clarke and Keun Lee. Berlin/Heidelberg: Springer, chp. 4, pp. 83–100.

- Suenaga, Keiichiro. 2020. Evolution of Division of Labour in the British Cotton and Machine Industries during the 'Invisible Hand' Era. *Review of Economics and Political Science* 88: 647–62.
- Taglioni, Daria, and Deborah Winkler. 2014. Making Global Value Chains Work for Development. *Economic Premise* 143: 1–10.
- Tokunaga, Suminori, Yuko Akune, Maria Ikegawa, and Mitsuru Okiyama. 2015. *Wagakuni Seizogyo no Sangyo Shuseki to Higashi Asia niokeru Nikkei Takokuseki Kigyo no Supply Chain Global ka no Keizaiteki Yoin Bunseki*; RIETI Policy Discussion Paper Series 15-P-021; Tokyo: Research Institute of Economy, Trade and Industry. (In Japanese)
- Venables, Anthony J. 1996. Equilibrium locations of vertically linked industries. *International Economic Review* 37: 341–59. [[CrossRef](#)]
- von Thunen, Johann Heinrich. 1966. *Der Isolierte Staat in Beziehung auf Land-wirtschaft und National Okonomie [The Isolated State]*. Oxford: Pergammon Press. First published 1826.
- Wang, Fei, Junjie Xia, and Jiajun Xu. 2020. To Upgrade or to Relocate? Explaining Heterogeneous Responses of Chinese Light Manufacturing Firms to Rising Labor Costs. *China Economic Review* 60: 101333. [[CrossRef](#)]
- Watanabe, Tadashi. 2011. A Research on the Flying Geese Theory and Production Fragmentation. *Journal of Economics* 34: 41–58. (In Japanese)
- World Bank. 1993. *The East Asian Miracle: Economic Growth and Public Policy*. New York: Oxford University Press.
- Yeaple, Stephen. 2003. The Complex Integration Strategies of Multinationals and Cross Country Dependencies in the Structure of Foreign Direct Investment. *Journal of International Economics* 60: 293–314. [[CrossRef](#)]
- Yeung, Henry Wai-Chung, and Neil M. Coe. 2015. Toward a Dynamic Theory of Global Production Networks. *Economic Geography* 91: 29–58. [[CrossRef](#)]