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Ei Ei Thein¹

Kazuo Inaba²

Abstract

Following the political and economic reform in 2011, Myanmar's economy has been internationally recognized as having developing status with over 7% average GDP growth. This study's main objective is to examine Myanmar's basic economic structure and sectoral expansion during the economic reformation between 2010 and 2015 in comparison to those of other ASEAN countries.

The data for the analyses are taken from the Eora global database and the Asian Development Bank's (ADB's) database. During 2010–2015, the gross production expansion of Myanmar was 1.78 times, the highest growth record among the selected countries. Despite its high economic growth, Myanmar's economic structure does not show remarkable change within this period. Domestic demand dominates Myanmar's output growth and import and export shares in gross production are very low (around 1% export and 4% import). The petroleum, chemical and nonmetallic mineral industry shows high forward linkages. On the other hand, backward linkages are high in transport equipment.

Analysis of sectoral deviations from proportional growth (DPGs) shows that Myanmar's production growth is mainly attributed to the public administration and construction sectors, which boom because of increased investment and consumption.

Keywords: Economic structure, sectoral expansion, forward linkages, backward linkages, deviations from proportional growth

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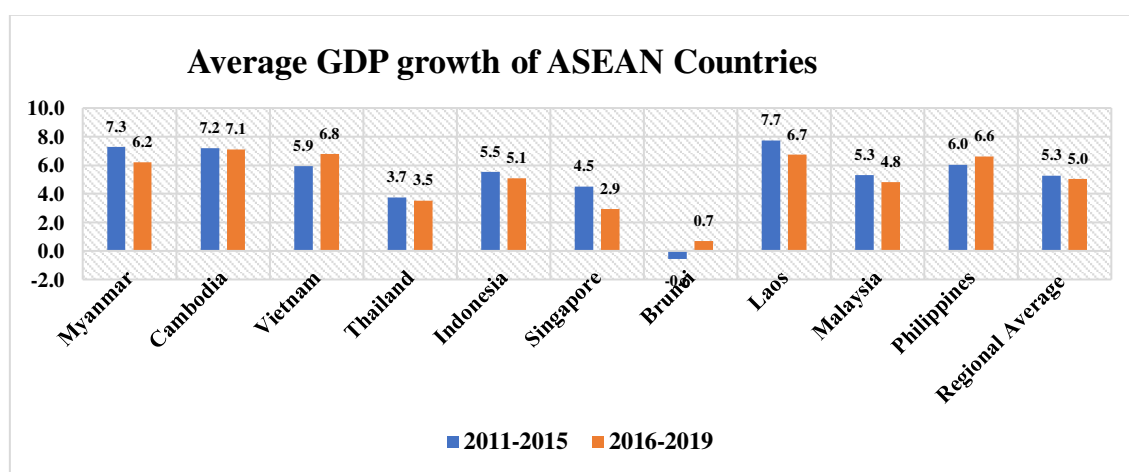
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1. Introduction

Myanmar began both political and economic reform in 2011 and became a newly prodemocratic nation in Asia in 2016. Since 2011, the Myanmar government has modernized the economy by improving the investment and business environment, liberalizing trade and foreign direct investment and encouraging the financial sector's development. Additionally, the government has placed a high priority on agricultural development and industrialization and reduced the extraction of natural resources. After beginning the economic reform, the Myanmar's economy was internationally recognized and lifted to developing status³ with 7% average GDP growth and a rise in GDP per capita, to 1,363 USD in 2019 from 879 USD in 2011⁴.

Figure 1 demonstrates the average GDP growth of ASEAN countries during 2011–2015 and 2016–2019. The ASEAN region's average GDP growth was slightly reduced to 5.0% (2016–2019) from 5.3% (2011–2015). In the transition period, 2011–2015, the Myanmar had the second-highest average growth with 7.3%. In the 2016–2019 period, Myanmar's average GDP growth slightly reduced to 6.2%, but it remained higher than the average regional growth.

Figure 1 Average GDP growth of ASEAN countries in the period 2011-2019



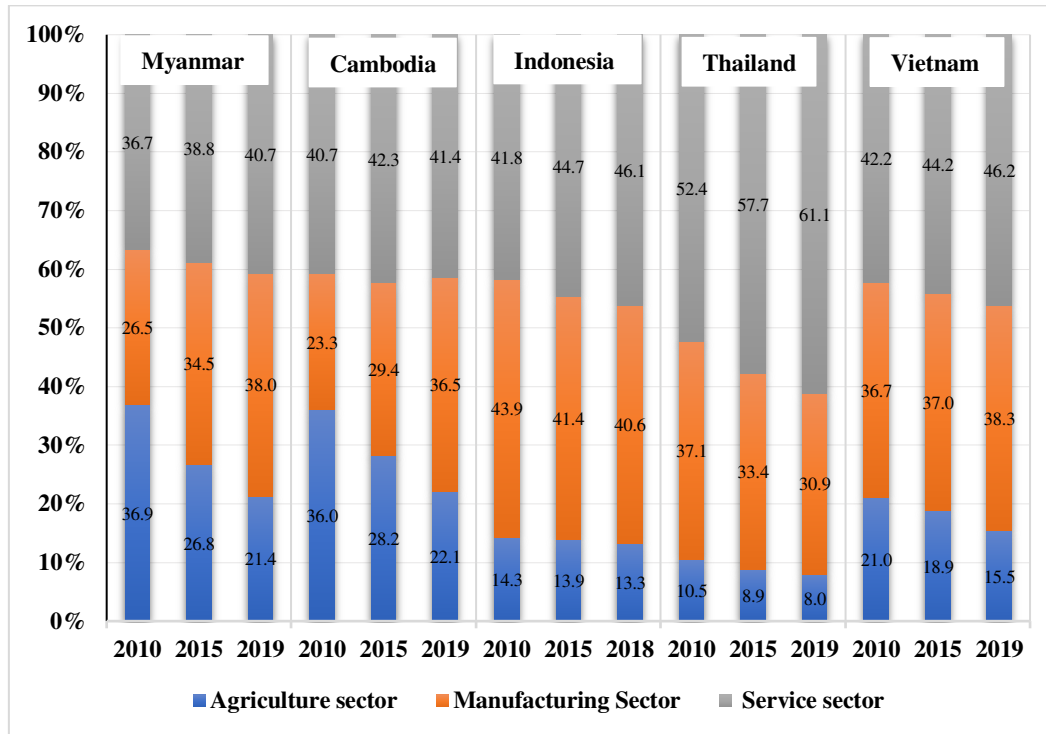
Source: Authors' adaptation of the data from the Asian Development Bank (ADB)
<https://kidb.adb.org/>

³ The World Development Indicators (December 2021) show that Myanmar's GDP growth rate before economic reformation (2001–2010) is the highest in the ASEAN region. This figure is consistent with the data in the Myanmar Statistical Yearbooks. However, Nomura and Shirane (2016) indicated that the GDP data in this period is unreliable because of overestimated national accounts under the military regime, fixed exchange rate and illegal trade.

⁴ <https://databank.worldbank.org/source/world-development-indicators#>

Figure 2 illustrates the economic structures of five ASEAN countries in the period 2010–2019. The agricultural GDP share steadily decreased in all these countries. Thailand dramatically expanded its share of the service sector within the 10-year period.

Figure 2. Economic structures of 5 ASEAN countries in the period 2010-2019



Source: Authors' adaptation of ADB's data.

Myanmar's economic structural change was similar to that of Vietnam during 2010–2019. The agriculture sector's GDP share decreased, whereas those of the manufacturing and service sectors increased. However, the GDP share of Myanmar's agricultural sector remained high, 1.5 times that of Vietnam, twice that of Indonesia and over 3 times that of Thailand. Despite the expansion of the service sector's GDP share in Myanmar in 2015, the degree of this share remained relatively low (38.8%), compared to 44.7% in Indonesia, 57.7% in Thailand and 44.2% in Vietnam.

In terms of GDP contribution, the Myanmar's economic structure obviously changed during the transition period and was different from those of some ASEAN countries, as shown in Figure 2. The sanction of Western countries had a negative impact on Myanmar's investment inflow and foreign trade until 2015, which resulted in underdeveloped infrastructure and low level of industrialization. Hence, the Myanmar's economy highly relied on agricultural production, which still dominated GDP share at around 40% in 2010. Thus, Myanmar's GDP share of

agriculture remained high compared to those of other observed countries in 2015. Additionally, the economic reformation in Myanmar is the latest among the ASEAN regions (James and William 1999; Jayant and Peter 2013). However, Myanmar maintained economic growth above the regional average level. Analyses of the economic structure and growth pattern enable us to identify the major changes in Myanmar's economy during the economic reformation.

According to the (United Nations 1999), an input–output table illustrates the interrelationships between industries in an economy with respect to the production and uses of local products and imported products. Based on input–output models, backward and forward linkages allow the identification of key economic industries, and deviation from proportional growth (DPG) can reveal industrial growth patterns. To best our knowledge, we do not find any economic analysis based on input-output structures for Myanmar after 2001. This study intends (1) to build a base for further economic analyses, (2) to check the impacts of economic reformation on Myanmar's economy, and (3) to reopen the room of input-output structure-based economic analyses of Myanmar. This study examines the sources and pattern of Myanmar's economic growth during the transition period, 2010–2015, in comparison to four other ASEAN countries based on input–output techniques.

The next chapter reviews the previous literature regarding the patterns of industrial growth, whereas Chapter 3 explains the study's method and the design of the data used in the analyses. Chapter 4 discusses the Myanmar's economic structure and growth pattern in comparison with those of four other ASEAN countries, and Chapter 5 provides conclusions on the study's outcome.

2. Literature Review: Studying Industrial Growth Patterns

Previous studies using varied analyses of input–output tables have drawn attention to the key contributors to national and regional economies' growth. Górska (2015) analyzes the structure of production of Poland in comparison to some European countries by structuring the forward and backward linkages on input-output tables. This study highlights the structure of production differences among countries, which includes the identified key industries, the strength of linkages between industries and in effect the economic landscape of the country.

Ha and Trinh (2018) check the composition and pattern of the Vietnamese economy based on input-output tables of the period 2012–2016. The analyses highlight agriculture-forestry-fishery as the leading sector of Vietnamese production. Additionally, the study shows that the

induced impact of final demand has high dispersion on value added in the agricultural sector, while export has not much dispersion on value added.

Chenery (1960) proposes the DPG model when analyzing industrial growth by modifying the formal general equilibrium models, such as the Walrasian model and the Leontief input–output model. Chenery’s model evaluate over 50 countries around the world between 1950 and 1956 and showed the patterns of industrial growth and changes in individual sectors of production at different income levels.

Erik and Bart (1998) check the sensitivity of the structural decomposition techniques based on the Netherlands’ input–output data (1986–1992). They prove that the results of these methods are almost the same using two well-known techniques: average of two polar decompositions and midpoint weight of full set of decompositions.

Chenery et al. (1962) practically adopt the DPG analysis to review Japan’s industrial growth pattern during the period 1914–1954, when the Japanese economy changed from underdeveloped to developed. The study indicates the significant contribution of changes in supply conditions to Japan’s industrial growth.

Based on the DPG approach, Chen and Fujikawa (1992) examine the patterns of change in Japan’s output composition, including during the prewar period, in comparison with those of Korea and Taiwan. This study shows that the enlargement of manufacturing sectors significantly contributed to the growth of the Japanese, Korean and Taiwanese economies. Later, Japan’s growth pattern changed to investment and export expansion before moving to the expansion of service sectors fueled by changes in domestic demand.

Kanazawa (2005) extends the DPG analysis by adding domestic inflow and outflow data to the input–output table and checks the interregional differentials of China’s industrial structures. The study highlights the various combinations of differentials on the demand side of input–output tables that leads to interregional industrial structures gap in eight different regions in China.

With the DPG model, Das. T (2011) identifies the sources of deviational growth in India’s production in the post-reform subperiod (1993/1994–2003/2004) and the post-liberalization period (1993/1994–2006/2007). The results show that exports and imports had negative effects on the Indian economy during the liberalization period and positive effects after liberalization, whereas technology negatively contributed to economic growth throughout the observed periods.

Nguyen and Chen (2016) analyze the Vietnam’s economic growth pattern and sources compared to those of Korea, Taiwan and Japan in their economic growth eras. The results shows

that Vietnam's initial growth can be mainly attributed to the rapid expansion of manufacturing sectors, which is similar in Korea, Taiwan and Japan. However, compared to Korea, Taiwan and Japan, the pattern of the Vietnamese industrial growth is different in terms of gross investment.

Masum and Inaba (2019) examine the demand–supply structure of Bangladesh's textile clothing industry compared to those of its Asian competitors. Applying the DPG model based on noncompetitive-import-type input–output table, they conclude that final demand's contribution has outplayed the technical change effect, whereas export contribution and domestic demand expansion have played growth roles in Bangladesh between 2000 and 2011.

3. Methodology

3.1. Structure of Analyses

The development of input–output tables has stimulated the empirical economic analyses based on an economy's composition. The input-output table shows the allocation of output generated by each sector to meet the intermediate demand and final demand and the composition of the demand-supply pattern of an economy (Muryani and Rosario 2018). Backward and forward linkages allow to identify key industries in the economy, as well as important backward-linked and forward-linked sectors. The comparative analysis reveals the structure of production differs among the countries (Górska 2015).

Forward linkages are also known as input multipliers and backward linkages are also known as output multipliers (Górska 2015). We can identify the key sectors which lead to output growth based on forward and backward linkages of Leontief inverse matrix, $L = [I - (I - \widehat{M})A]^{-1}$, where I is identity matrix, \widehat{M} is the square matrix of import coefficients and A is the matrix of input coefficients. Forward linkages (FL) and backward linkages (BL) can be derived as follows.

$$FL = \sum_{j=1}^n l_{ij} \quad (1)$$

Where, $\sum_{j=1}^n l_{ij}$ is the sum of column vectors of Leontief inverse matrix and n is the number of industries. The higher the forward linkage of an industry, the bigger the supply-push effect on the economy. The forward linkages show the magnitude of increase in output in an industry if the final demand of all industries increases in 1 unit. Thus, the industry with the biggest forward linkage is vital to output growth.

$$BL = \sum_{i=1}^n l_{ij} \quad (2)$$

Where, $\sum_{i=1}^n l_{ij}$ is the sum of row vectors of Leontief inverse matrix. The higher the backward linkage of an industry, the larger the demand-pull effect on the economy. The backward linkage shows the amount of increase in total output of the economy if the final demand of an industry increases in 1 unit. Hence, the industry with highest backward linkage leads to output growth. Then, both forward and backward linkages can be normalized based on the proportion of sectoral intermediate output to total intermediate output.

$$FL_i^n = \frac{\sum_{j=1}^n l_{ij}}{\frac{1}{n} \sum_{i=1}^n l_{ij} \sum_{j=1}^n l_{ij}} \quad (3)$$

$$BL_i^n = \frac{\sum_{i=1}^n l_{ij}}{\frac{1}{n} \sum_{i=1}^n l_{ij} \sum_{j=1}^n l_{ij}} \quad (4)$$

DPG analysis is used to examine an economy's pattern of structural change and the magnitude of sectoral change that deviates from the average ratio of gross production expansion. The average ratio of production expansion can be calculated as follows:

$$\lambda = \frac{X^t}{X^{t-1}} \quad (5)$$

where λ = the average ratio of production expansion, X^t, X^{t-1} = the sums of the column vectors of gross production in periods t and $t - 1$.

The value of the average ratio (λ) may be greater than 1. The higher the λ value is, the more expanded the industry is. On the other hand, if λ is less than 1, the industry is diminishing its output within the period at hand. Based on this average ratio, we can measure the magnitude of change in each industry from the average ratio of expansion of gross production. The DPG model defines an economy's structural change.

$$\delta X = X^t - \lambda X^{t-1} \quad (6)$$

Each component of δX is the DPG of each industry. The DPGs can be of three types: (i) zero DPG, (ii) positive DPG and (iii) negative DPG. The DPGs' signs illustrate an increase or decrease in industries' output shares compared to the average ratio (λ), which represents the proportional growth situation. If the DPG is zero, an industry's expansion is at the average ratio. A positive DPG means an industry's growth is higher than the average growth ratio of all industries. In contrast, a negative DPG represents an industry's lower expansion compared to the industrial average.

The DPGs can be decomposed in several factors based on the elements of the input–output table. According to Chenery (1960), the modified Leontief input–output model is as follows:

$$X_i^t - \sum_j a_{ij}^t X_j^t = Y_i^t + E_i^t - M_i^t \quad (i = 1, \dots, n; t = 1, 2, 3, \dots) \quad (7)$$

where X_i^t = the domestic production of commodity i in period t , Y_i^t = the domestic final demand of commodity i in period t , E_i^t = the exports of commodity i in period t , M_i^t = the imports of commodity i in period t and $\sum_j a_{ij}^t X_j^t$ = the intermediate use of commodity i in all sectors.

The solution of Equation (3) can be shown as Equation (4).

$$X_i^t = \sum_j l_{ij}^t (Y_i^t + E_i^t - M_i^t) \quad (8)$$

where $\sum_j l_{ij}^t$ represents the elements of the Leontief inverse matrix $L = [I - (I - \bar{M})A]^{-1}$, which represents the magnitude of the ultimate indirect and direct production repercussions on various industries when one unit of final demand is generated in a sector. To analyze in more detail each component's effects on industrial output expansion, the domestic final demand is divided into three categories: final consumption (C), investment (F) and changes in stock (S). Then, we add technological change (T), which is the intermediate output changed by the technological effect, to Equation (4). Hence, the production of periods t and $t - 1$ are as follows:

$$X_i^t = \sum_j l_{ij}^t (C_i^t + F_i^t + S_i^t + T_i^t + E_i^t - M_i^t) \quad (9)$$

$$X_i^{t-1} = \sum_j l_{ij}^{t-1} (C_i^{t-1} + F_i^{t-1} + S_i^{t-1} + T_i^{t-1} + E_i^{t-1} - M_i^{t-1}) \quad (10)$$

Then, Equation (5) is multiplied by λ to estimate the standard expansion pattern.

$$\lambda X_i^{t-1} = \sum_j l_{ij}^{t-1} (\lambda C_i^{t-1} + \lambda F_i^{t-1} + \lambda S_i^{t-1} + \lambda T_i^{t-1} + \lambda E_i^{t-1} - \lambda M_i^{t-1}) \quad (11)$$

The differences in production components between period t and period $t - 1$ can be measured based on the average production expansion between the two periods. Chenery (1962) named these differences as deviations from proportional expansion.

$$\delta X_i^{t,t-1} = X_i^t - \lambda X_i^{t-1} \quad (12-a)$$

$$\delta C_i^{t,t-1} = C_i^t - \lambda C_i^{t-1} \quad (12-b)$$

$$\delta F_i^{t,t-1} = F_i^t - \lambda F_i^{t-1} \quad (12-c)$$

$$\delta S_i^{t,t-1} = S_i^t - \lambda S_i^{t-1} \quad (12-d)$$

$$\delta T_i^{t,t-1} = T_i^t - \lambda T_i^{t-1} \quad (12-e)$$

$$\delta E_i^{t,t-1} = E_i^t - \lambda E_i^{t-1} \quad (12-f)$$

$$\delta M_i^{t,t-1} = M_i^t - \lambda M_i^{t-1} \quad (12-g)$$

The deviations in production level can be obtained using the above deviations merged with the modified Leontief input–output matrix.

$$\delta X_i^{t,t-1} = \sum_j l_{ij}^t (\delta C_i^{t,t-1} + \delta F_i^{t,t-1} + \delta S_i^{t,t-1} + \delta T_i^{t,t-1} + \delta E_i^{t,t-1} - \delta M_i^{t,t-1}) \quad (13)$$

Equation (13) expresses the deviations from the proportion of output expansion calculated using the sum of the effects of deviations in all production factors (final consumption, investment, changes in stock, technological change, exports and imports). These data indicate the magnitude and impact of changes in each component on economic growth.

The basic structure of input-output tables lets us know the supply-demand structures of Myanmar's economy. The results of backward and forward linkages [calculated by equation (1) to (4)] identify the leading industries to the production expansion of Myanmar during the observed period. Additionally, we use the DPG analysis to identify the factors which contribute to the expansion of each industry and to examine whether Myanmar's economic reformation has impacts on the industrial expansion. Generally, DPG analysis is used to analyze the change of the growth pattern of an economy between two periods. In this study, because of data limitations, we cannot examine the change of the growth pattern of Myanmar's economy. However, based on the DPG analysis, we check the growth pattern of Myanmar's economy within one period to get more awareness of the Myanmar's economic structure.

Because of data limitations, Myanmar's decomposition analyses are available for only one period (2010–2015) in contrast with those of the four other ASEAN countries: Cambodia, Vietnam, Indonesia and Thailand. We compare each component's share in the basic transaction tables, identify the key industries which lead each country's economy and the differences and changes in the economic structures among countries based on the above formulas.

3.2. Data Design

Despite wide use of input–output techniques in analyzing economic structures around the world in recent years, Myanmar still has not compiled its own input–output tables. According to Thwin et al. (2010), the Myanmar's latest input–output table (2000–2001) was constructed in 2010 with a non-surveyed method.

There are some worldwide databases, such as the ADB database, the Eora Global Database and the World Input–Output Database, that construct and provide regional and multiregional input–output tables. However, only the Eora Global Database compiles Myanmar’s input–output tables which include matrix of environmental factors. Because the study focuses on only economic structure, we delete environmental indicators and primary agricultural inputs from Eora’s original input–output tables. Then, we modify the tables to match the input–output structure design and adjust them to balance demand data and supply data.

The input–output data of other selected ASEAN countries are taken from the ADB’s database. The ADB organizes 35 industries in noncompetitive-type transaction tables, whereas the Eora’s input–output tables comprise 26 industries in competitive types. Accordingly, we integrate each selected country’s industries into 22 sectors. Data limitations make us use competitive-type transaction tables for Myanmar and noncompetitive-type transaction tables for other selected countries.

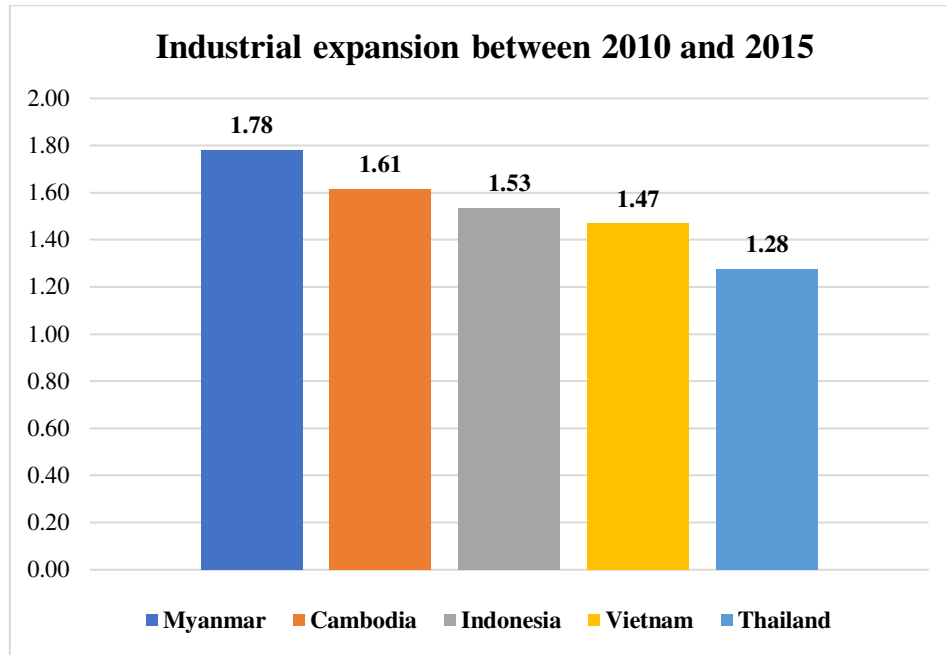
To adjust for the inflation between 2010 and 2015, we use deflated data in our calculation, in which the data is divided by purchasing power parity (*PPP*) and multiplied by the exchange rate (*EXT*) in each concerned year. PPP and EXT values are collected from the World Bank’s database and the Fxexchange Rate database⁵. However, there is a problem with Myanmar’s exchange rate data for the year 2010; Myanmar applied a fixed exchange rate policy (1 USD = 6.5 MMK) until 2011 while the market exchange rate (1 USD > 850 MMK) was 130 times the fixed rate. In 2012, Myanmar started using the market exchange rate because of economic reformation policies. Hence, we use 2012’s PPP and EXT values to deflate the 2010 data.

4. Study Outcome

Figure 3 expresses the production expansion of all five ASEAN countries between 2010 and 2015. The observed countries expanded their production at an average growth of 1.5 times in the 5-years period. Among the observed countries, Myanmar had the highest production expansion at 1.78 times.

⁵ <https://usd.fxexchangerate.com/>

Figure 3 Production expansion of ASEAN countries between 2010 and 2015



Source: Authors' calculations from EORA and ADB data.

4.1. Supply and Demand Patterns

Table 1 illustrates the selected countries' production patterns from the supply side. The results show that the supply-side structures of the selected countries do not show remarkable change between 2010 and 2015. Supply growth was obviously high (over 50% in all selected countries except Thailand). Myanmar had the highest supply growth, at 79.7%, followed by Cambodia (62.7%) and Indonesia (53.2%). However, Myanmar's amount of supply was only 296.3 billion USD in 2010 and 532.6 billion USD in 2015, the second-lowest amounts among the selected countries.

In all selected countries, the shares of domestic supply in total market supply are similar between 2010 and 2015. The domestic supply leads to the market with over 80% share in total supply, but its changes in share in total supply are small. Domestic output is a significant contributor to Myanmar's economy and represents the major market supply portion. However, the domestic supply share decreased from 99.7% to 98.7%, whereas imports' share increased from 0.3% to 1.3%. The share of imports in 2015 was noticeably very low in Myanmar (around 1%) compared to in Cambodia (14.9%), Vietnam (19.4%), Thailand (12.4%) and Indonesia (7.6%).

Table 1 Supply-side structures

Country	Year	Domestic supply (%)	Imports (%)	Total supply (\$ billion)	Supply growth (%)
Myanmar	2010	99.7	0.3	296.3	79.7
	2015	98.7	1.3	532.6	
Cambodia	2010	85.9	14.1	59.2	62.7
	2015	85.1	14.9	96.3	
Vietnam	2010	82.4	17.6	1054.6	50.0
	2015	80.6	19.4	1581.7	
Thailand	2010	86.2	13.8	2243.7	25.5
	2015	87.6	12.4	2816.6	
Indonesia	2010	92.2	7.8	3895.4	53.2
	2015	92.4	7.6	5969.5	

Source: Authors' calculations based on EORA's and ADB's input–output tables.

Table 2 demonstrates the demand-side patterns of the selected ASEAN countries. Each country's demand structure slightly changed between 2010 and 2015. The share of intermediate demand had 2% negative change in Myanmar and Vietnam between 2010 and 2015, whereas it demonstrated 1% positive change in Cambodia and Indonesia. The domestic consumption share increased by 0.6% in Myanmar and Vietnam, 2.5% in Thailand and 1.5% in Indonesia, but it decreased by 6.4% in Cambodia.

The Myanmar's share of capital investment remarkably increased from 0.2% in 2010 to 7.6% in 2015, whereas the other selected countries' investment shares decreased. In Myanmar, the domestic demand dominated the market with around 96% share of total market demand and did not change between 2010 and 2015. In the period 2010–2015, Myanmar's exports share was stable around 4%, whereas those of Cambodia, Vietnam and Thailand increased by 3%, 6% and 5%, respectively. Moreover, the Myanmar's share of exports in total demand in 2015 was obviously low (only 4%) compared to those of Cambodia (24%), Vietnam (26%), Thailand (22%) and Indonesia (11%). The shares of imports and exports in total output show that foreign trade was poorly developed in Myanmar prior to 2015.

Table 2 Demand-side structures

Country	Year	Intermediate demand (%)	Domestic final demand (%)				Exports (%)
			Domestic consumption	Changes in stocks	Investment	Total	
Myanmar	2010	59.7	29.9	6.3	0.2	36.4	3.9
	2015	57.6	30.5	0.3	7.6	38.4	4.0
Cambodia	2010	31.8	41.2	5.9	0.7	47.8	20.4
	2015	32.9	34.8	8.4	0.4	43.6	23.6
Vietnam	2010	47.6	21.1	9.9	1.4	32.4	20.0
	2015	45.3	21.7	7.3	-0.2	28.8	25.9
Thailand	2010	50.8	24.5	0.4	7.5	32.4	16.8
	2015	46.7	27.0	-2.9	7.5	31.6	21.8
Indonesia	2010	40.7	30.7	15.0	0.9	46.6	12.7
	2015	41.3	32.2	15.7	-0.2	47.7	11.1

Source: Authors' calculations based on Eora's and ADB's input-output tables.

4.2. Key Industries Identified by Backward and Forward Linkages

The results of backward and forward linkages of the five countries during 2010–2015 are shown in Table 7 and Table 8. Changes in inverse coefficients' magnitudes are not noticeable. Moreover, the key industries identified by backward and forward linkages in 2010 are almost the same as those in 2015. In Myanmar, forward linkages identify petroleum, chemical and nonmetallic mineral product sectors as the key economic sectors, and backward linkages highlight transport equipment as a key sector. In contrast, construction sector and service sectors have very low forward and backward linkage values, that differ from the results of other selected countries.

In Cambodia and Vietnam, the agriculture, forestry and fishing industry led the output growth from the demand side and food, beverages and the tobacco industry pushed the output growth from the supply side. In Thailand, the financial intermediation and business sector had the highest forward linkage, and the food, beverages and tobacco industry had the highest backward linkage. In Indonesia, backward linkages highlight that the electricity, gas and water industry led the economy in both 2010 and 2015. According to forward linkages, the leading sector of Indonesian economy changed from the petroleum, chemical and non-metallic mineral product sector in 2010 to the electricity, gas and water industry in 2015.

4.3 Comparison of DPGs

The DPGs resulting from the input-output tables are measured in monetary units (million USD). We cannot compare the magnitude of industrial growth change in one country with those

in other countries in monetary units. Hence, we normalize the DPG results in monetary units to percentages, for which the results are divided by the total amount of positive DPGs and multiplied by 100. Thus, the normalized data easily identify an economy's leading sector and a country's degree of change in production sectors to those of other countries. The normalized DPGs of the five ASEAN countries based on four main sectors in the period 2010–2015 are illustrated in Table 3.

Table 3 Comparison of deviations from proportional growth by sector

Sectors	Normalized DPGs (%)				
	Myanmar	Cambodia	Vietnam	Thailand	Indonesia
Agriculture, hunting, forestry and fishing sector	4.2	-100.0	-56.4	0.1	-11.0
Manufacturing sector	-100.0	36.2	36.3	-87.8	-89.0
Construction sector	35.9	55.7	-43.6	-12.2	35.9
Service sector	59.9	8.1	63.7	99.9	64.1
Total DPGs	0.00	0.00	0.00	0.00	0.00

Source: Authors' calculations based on Eora and ADB data.

The sectoral output expansions differ from country to country in terms of DPGs. The Myanmar's and Indonesia's economies were led by enlargement of both the construction and service sectors, whereas the Thailand's economy was driven by the service sector alone. Whereas Myanmar had 4% positive deviation of agriculture in production, the other four countries had negative DPGs in the agricultural sector. Cambodia and Vietnam had expanded production in the manufacturing sector with over 36% positive deviation, whereas the manufacturing sector largely decreased its output share in Myanmar, Indonesia and Thailand. Within 5 years, the service sector's share hugely increased with positive DPGs of 59.9% in Myanmar, 63.7% in Vietnam, 99.9% in Thailand and 64.1% in Indonesia. However, its share in Cambodia showed only small change, 8.1% above the average level.

Table 4 expresses the normalized DPGs of 22 industries in Myanmar compared to in the other four ASEAN countries. The composition of each country's normalized DPGs is shown in detail in Appendices 2–7.

During 2010–2015, the public administration sector dominated the Myanmar's production with 52.7% positive deviation, whereas the economies of Cambodia and Indonesia were mainly supported by the construction sector. The education, health and other service sector

was the largest contributor to Vietnamese output expansion with 30.3% positive deviation, and the financial intermediation and business sector held the biggest share of positive DPGs in Thailand at 22.4%.

The contribution of the agriculture, forestry and fishing industry to output expansion was very small, with a positive deviation of 2.7% in Myanmar and 0.7% in Thailand. Agriculture noticeably reduced its output expansion share, at -87.1% DPG in Cambodia, -31.8% DPG in Vietnam and -9% DPG in Indonesia. The combined share of the mining and quarrying sector and the petroleum, chemical and nonmetallic mineral production sector decreased, accounting for -67.1% deviation in Indonesia followed by Thailand at -52.1% and Myanmar at -20.5%. The food, beverage and tobacco sector increased its share with positive deviations of 16.9% and 6.5% in Vietnam and Indonesia, respectively, whereas it decreased output growth share in Myanmar at -11.3% DPG and in Thailand -13.1% DPG.

As shown in Table 4, in terms of DPGs, Myanmar's output growth can be largely explained through the impact of the public administration sector and the construction sector with 75.8% positive deviation from average growth, followed by the education, health and other service sectors with 13.8% positive deviation. In contrast, the financial intermediation and business sector and the petroleum, chemical and nonmetallic mineral products sector decreased in shares of production, accounting for deviations of -25.2% and -18.3%, respectively.

In Cambodia, the construction sector dominated the output expansion with 48.5% of positive deviation, followed by 12.4% in the textiles and wearing apparel sector and 9.7% DPG in the financial intermediation and business sector. In contrast, the expansion of the agriculture, forestry and fishing industry was 87.1% lower than standard growth.

With over 60% positive deviation, the wholesale trade and education, health and other service sectors supported the enlargement of Vietnamese production, whereas the agriculture, forestry and fishing sector and the construction sector shrank their production with -56.3% DPG. In Indonesia, whereas the construction and transport sectors contributed to production expansion with 55.4% higher DPG than the standard level, the mining and quarrying sector had deviation under the standard level at 42.5%. In Thailand, output expansion was distributed among all service sectors, and the highest contributor was the financial intermediation and business sector with 22.5% positive deviation.

Table 4 Comparison of deviations from proportional growth by industry

Industries	Normalized DPGs				
	Myanmar	Cambodia	Vietnam	Thailand	Indonesia
Agriculture, hunting, forestry and fishing	2.72	-87.08	-31.80	0.07	-9.13
Mining and quarrying	-2.17	8.98	-3.98	-31.92	-42.33
Food beverage and tobacco	-11.33	6.04	16.88	-13.08	6.46
Textile and wearing apparel	-3.11	12.45	1.24	-3.73	-5.89
Wood and paper	-6.16	1.37	1.76	-1.52	-9.87
Petroleum, chemical and non-metallic mineral products	-18.30	3.08	-1.99	-20.21	-24.78
Metal products	-8.86	1.62	-4.79	-5.16	-0.59
Electrical and machinery	-8.90	-0.06	-3.48	0.56	2.67
Transport equipment	-4.53	0.57	2.54	-10.58	1.02
Other manufacturing and recycling	-0.71	-3.62	2.28	-2.20	-1.78
Electricity, gas and water	-0.28	1.11	10.00	3.92	1.35
Construction	23.09	48.53	-24.55	-11.61	29.85
Maintenance and repair	-0.03	0.00	2.14	1.53	2.03
Wholesale trade	3.65	1.97	29.59	4.93	-2.12
Retail trade	-4.59	0.15	0.00	4.14	-1.19
Hotels and restaurants	-5.12	1.76	1.07	16.57	5.78
Transport	0.38	7.48	-6.06	14.31	25.53
Post and telecommunications	3.61	-3.52	-10.97	8.92	-2.12
Financial intermediation and business activities	-25.23	9.73	-12.38	22.36	12.18
Public administration	52.73	-4.61	2.03	6.76	1.45
Education, health and other services	13.83	-5.96	30.34	15.91	11.68
Private households and others	-0.70	0.00	0.13	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00

Source: Authors' calculations based on EORA and ADB data.

4.3. Effect of Demand Factors' Deviations on Output Growth

Table 5 compares the direction and degree of each final demand component which affects the selected countries' economic expansion during 2010–2015 in terms of DPG.

Table 5 Effects of demand factors' deviations on output growth

Description	Myanmar	Cambodia	Vietnam	Thailand	Indonesia
Consumption	42.22	–89.62	30.05	35.08	28.23
Investment	330.71	–3.56	–42.66	–58.03	–21.89
Inventory change	–265.93	36.12	–65.29	–1.91	13.87
Technology change	–66.77	20.58	–36.15	–85.18	11.03
Exports	4.33	49.16	172.43	81.79	–34.11
Imports	44.56	12.68	58.39	–28.25	–2.87
Total DPG	0	0	0	0	0

Source: Authors' calculation based on Eora and ADB data.

Domestic consumption positively contributed to production in all selected countries except Cambodia. Whereas investment had the greatest positive effect (330.7%) on production in Myanmar, it had a negative effect in the other selected countries. Inventory change and technology change positively contributed to Cambodia's economy with 56.7% DPG and Indonesia's economy with 24.9% DPG, whereas they negatively contributed to the economies of other observed countries. The export component had the largest degrees of positive effect on production in Cambodia, Vietnam and Thailand, but it had the largest negative effect (34.1%) on Indonesian production. Imports positively influenced the output expansion of Myanmar, Cambodia and Vietnam, whereas it had negative effects in Thailand and Indonesia.

Consumption, investment and exports had positive effects on the Myanmar's economy, whereas inventory change and technology change negatively contributed. The effects of domestic consumption and investment raised the shares of the public administration and construction sectors, as shown in Appendices; Table 9. However, technology's negative effect reflects the reduction of the shares in the electrical and machinery sector and the food, beverage and tobacco sector.

5. Conclusion

This study analyzes the pattern and sources of the Myanmar's economic growth in the period 2010–2015 compared to four other ASEAN countries based on input–output analyses. The compositions of supply and demand and patterns of industrial growth in the five ASEAN

countries during 2010–2015 were discussed in Chapter 4. In the transition period, Myanmar had the largest output expansion among the observed countries, with a magnitude of 1.78 times. Despite its production growth, Myanmar’s demand and supply structures do not show remarkable change in this period.

Over 95% of Myanmar’s market demand is dominated by domestic demand. Although Myanmar’s government opened the country to international trade in 2011, import substitution and exports’ share in production are relatively low compared to other countries. An underdeveloped international payment system and the sanction of Western countries might contribute to a poor international trade record during this period. Economic reformation did not show any noticeable impacts on the economic structure in the period 2010–2015. However, from 2013 onward, with the development of the financial sector and an international payment system, international trade data has been improved, as illustrated in Table 6.

Table 6 Exports and imports of Myanmar during economic reformation (million USD)

Items	2011	2012	2013	2014	2015	2016	2017	2018	2019
Exports	6723.6	7157.4	8081.7	9592.1	11037.2	17051.2	19350.8	21663.3	24119.4
Imports	6073.5	6299.3	9723.7	11888.6	14460.9	22962.3	25267.4	24703.8	22795.2

Source: ADB

In terms of forward and backward linkages, construction sector and almost all service sectors have low contribution to output growth in the observed years. However, increased investment results in the high output growth in these sectors during 2010-2015. Thus, concerning DPGs, the growth pattern highlights the service sectors. The growth rates of all manufacturing industries were under the average growth of all production sectors. Despite governmental encouragement of industrialization, the Myanmar’s manufacturing DPG did not express remarkable improvement despite the highest forward and backward linkages of the petroleum, chemical and nonmetallic mineral product sector and the transport equipment sector. Moreover, technology change did not contribute to industrial growth in the period 2010-2015. However, advanced technology is expected to increase in Myanmar with growing foreign investment inflow after the foreign investment law revision in 2012. Hence, industrialization’s future improvement is anticipated.

In the economic reformation period, Myanmar’s growth pattern has been influenced by enlarged production of the construction and service sectors due to increased investment and final consumption. This pattern is consistent with the GDP proportion in the period 2010–2015. The growth of service sectors is noticeably high and noticeably contributes to production growth.

During the economic reform, as part of the infrastructure development, international organizations, such as the World Bank and the ADB, provided support funds to Myanmar's construction projects. According to Myanmar's Central Statistical Organization (2015, pp. 499–500), the country's government largely raised both capital investment and expenditure funds for the construction and public administration sectors after 2011. This government spending would contribute to the growth of the service and construction sectors. The agriculture sector maintains its output at 4% above the average growth level despite decreasing its GDP share.

In summary, the economic reformation does not show any impacts on Myanmar's economic structure, international trade or industrialization within the 5 years in question. During this transition period, the construction and service sectors boomed because of increased government consumption and capital investment and formed a growth pattern (See in Appendices; Table 9). Although the consequences of economic reformation are expected to be apparent in the subsequent period, data limitations prevent us from extending the observation period. Until 2019, the foreign investment inflow trend and trade data show the potential for future industrialization and production growth. Moreover, the government is implementing new economic policies established in 2016 and the Myanmar Sustainable Development Plan (2018–2030) drawn up in 2018. Additionally, international organizations, such as the World Bank, the Japan International Cooperation Agency and the ADB, provide both technical and financial assistance to Myanmar's development. Accordingly, under normal conditions, the Myanmar's economy is expected to be further developed in the future.

This study explains Myanmar's economic composition and sources of economic growth in the transition period. To understand more about the pattern of growth and the effect of economic reformation on industrialization, further analyses based on input–output models are required for an extended observation period.

Abbreviations

ADB: Asian Development Bank; ASEAN: Association of Southeast Asian Nations; DPG: Deviation from proportional growth; EXT: Exchange rate; GDP: Gross Domestic Products; OECD: Organization for Economic Co-operation and Development; PPP: Purchasing power parity.

Authors' contributions

Both authors read and approved the final manuscript.

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Availability of data

The datasets generated during the current study are available in the Asian Development Bank's database <https://data.adb.org/taxonomy/term/211> and Eora Global database <https://worldmrrio.com/countrywise/>

Declaration**Competing interests**

The authors declared that there are no competing interests regarding the writing of this paper.

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Appendices

See Tables Table 7, Table 8, Table 9, Table 10, Table 11, Table 12 and Table 13.

Table 7 Forward linkages of 5 ASEAN countries between 2010 and 2015

Sectors	Myanmar		Cambodia		Vietnam		Indonesia		Thailand	
	2010	2015	2010	2015	2010	2015	2010	2015	2010	2015
Agriculture, hunting, forestry, and fishing	1.07	1.08	2.06	1.67	1.79	1.70	1.37	1.33	1.02	1.07
Mining and quarrying	0.32	0.33	0.88	0.97	1.03	0.98	1.41	1.25	0.71	0.55
Food beverage and tobacco	0.95	0.98	0.97	1.03	1.28	1.23	1.07	1.06	1.06	1.06
Textile and wearing apparel	0.84	0.87	1.04	0.99	1.08	1.00	0.72	0.71	0.82	0.85
Wood and paper	1.65	1.66	0.85	0.83	1.31	1.33	1.16	1.05	0.89	0.87
Petroleum, chemical and non-metallic mineral products	3.32	3.31	0.62	0.65	1.36	1.31	1.47	1.33	2.15	2.04
Metal products	2.62	2.59	0.83	0.83	1.04	0.99	0.80	0.80	1.44	1.37
Electrical and machinery	2.61	2.40	0.67	0.67	1.00	1.02	0.77	0.82	0.84	0.84
Transport equipment	1.45	1.39	0.74	0.73	0.82	0.90	0.83	0.83	0.78	0.78
Other manufacturing and recycling	0.49	0.50	0.73	0.71	0.80	0.83	0.67	0.66	0.74	0.75
Electricity, gas and water	0.37	0.39	1.17	1.05	0.93	0.99	1.44	1.48	1.31	1.33
Construction	0.56	0.55	1.00	1.12	0.76	0.83	0.89	0.99	0.61	0.63
Maintenance and repair	0.33	0.34	0.75	0.74	0.69	0.72	0.85	0.85	0.57	0.61
Wholesale trade	1.09	1.14	1.44	1.42	1.18	1.23	1.31	1.32	1.33	1.23
Retail trade	0.37	0.39	0.76	0.76	0.66	0.68	1.04	1.04	1.24	1.25
Hotels and restaurants	0.41	0.43	0.97	1.15	0.76	0.77	0.76	0.79	0.68	0.71
Transport	0.77	0.81	1.45	1.48	1.04	1.01	1.03	1.16	0.86	0.93
Post and telecommunications	0.69	0.73	1.15	1.06	0.86	0.85	0.90	0.89	0.78	0.84
Financial intermediation and business activities	1.07	1.04	1.33	1.65	1.56	1.51	1.33	1.46	2.30	2.36
Public administration	0.33	0.34	0.78	0.77	0.66	0.69	0.70	0.70	0.60	0.63
Education, health and other services	0.36	0.37	1.03	0.96	0.72	0.75	0.84	0.85	0.68	0.71
Private households and others	0.33	0.35	0.75	0.74	0.66	0.68	0.64	0.64	0.58	0.61

Source: Authors' calculations based on EORA and ADB data.

Table 8 Backward linkages of 5 ASEAN countries between 2010 and 2015

Sectors	Myanmar		Cambodia		Vietnam		Indonesia		Thailand	
	2010	2015	2010	2015	2010	2015	2010	2015	2010	2015
Agriculture, hunting, forestry, and fishing	1.15	1.08	0.89	0.89	1.12	1.10	0.78	0.77	0.84	0.85
Mining and quarrying	0.54	0.55	0.91	0.89	0.90	0.89	0.83	0.82	1.14	1.15
Food beverage and tobacco	1.37	1.46	1.29	1.27	1.41	1.39	1.19	1.17	1.20	1.28
Textile and wearing apparel	1.33	1.43	1.12	1.10	1.15	1.10	0.99	0.97	1.08	1.12
Wood and paper	1.41	1.47	1.10	1.11	1.33	1.32	1.16	1.15	0.96	0.96
Petroleum, chemical and non-metallic mineral products	1.66	1.72	1.05	1.05	1.05	1.05	1.07	1.08	1.17	1.06
Metal products	1.84	1.89	0.93	0.95	0.95	0.93	1.08	1.09	1.03	1.08
Electrical and machinery	1.65	1.60	1.02	0.92	0.99	0.97	0.99	1.03	1.02	1.06
Transport equipment	2.05	1.96	0.87	0.90	1.10	1.11	0.99	1.01	1.04	1.02
Other manufacturing and recycling	1.24	1.22	0.87	0.88	1.23	1.22	1.11	1.09	1.09	1.08
Electricity, gas and water	0.83	0.78	1.17	1.19	0.80	0.83	1.49	1.48	0.98	0.94
Construction	0.89	0.85	0.94	0.97	1.02	1.02	1.12	1.12	1.11	1.05
Maintenance and repair	0.57	0.56	0.75	0.74	0.92	0.93	0.87	0.90	1.13	1.14
Wholesale trade	0.60	0.59	0.98	1.01	0.89	0.91	0.90	0.90	0.90	0.89
Retail trade	0.52	0.51	0.98	1.00	0.66	0.68	0.90	0.90	0.90	0.89
Hotels and restaurants	0.77	0.77	1.22	1.21	1.11	1.11	1.13	1.13	1.10	1.12
Transport	0.67	0.65	0.97	0.97	0.96	0.96	1.04	1.02	1.05	1.03
Post and telecommunications	0.52	0.50	1.06	1.07	1.08	1.06	0.91	0.92	0.99	1.02
Financial intermediation and business activities	0.44	0.45	1.08	1.09	0.93	0.93	0.87	0.87	0.94	0.92
Public administration	0.69	0.67	1.10	1.10	0.82	0.84	0.94	0.96	0.84	0.84
Education, health and other services	0.49	0.50	0.95	0.94	0.87	0.90	1.00	0.99	0.91	0.91
Private households and others	0.78	0.79	0.75	0.74	0.71	0.73	0.64	0.64	0.58	0.61

Source: Authors' calculations based on EORA and ADB data.

Table 9 Myanmar's DPG decomposition (2010-2015)

Sectors	DPGs	Deviations of					
		Consumption (δC)	Investment (δI)	Inventory change (δJ)	Technology change (δT)	Export (δE)	Import (δM)
Agriculture, hunting, forestry, and fishing	2.72	-0.62	-0.25	0.47	-3.36	6.46	-0.01
Mining and quarrying	-2.17	-0.03	-0.16	0.24	-0.06	-0.63	1.52
Food beverage and tobacco	-11.33	-3.63	-0.72	1.05	-7.12	0.13	1.03
Textile and wearing apparel	-3.11	-0.55	0.58	-0.33	-1.72	-0.88	0.20
Wood and paper	-6.16	-0.31	0.02	0.09	-5.25	-0.03	0.67
Petroleum, chemical and non-metallic mineral products	-18.30	-1.81	0.26	-0.05	-15.24	-0.01	1.45
Metal products	-8.86	-0.04	1.46	-0.78	-9.04	0.02	0.49
Electrical and machinery	-8.90	-0.09	52.52	-40.59	-19.17	-0.05	1.52
Transport equipment	-4.53	-0.74	17.64	-12.58	-7.95	-0.02	0.88
Other manufacturing and recycling	-0.71	-0.62	3.37	-1.99	-0.95	-0.10	0.42
Electricity, gas and water	-0.28	-1.03	0.00	0.00	1.28	0.00	0.52
Construction	23.09	5.37	148.83	-124.11	-5.25	-0.03	1.71
Maintenance and repair	-0.03	-0.23	0.46	-0.32	0.13	-0.01	0.07
Wholesale trade	3.65	-3.64	17.41	-12.61	4.47	-0.06	1.92
Retail trade	-4.59	-6.04	5.00	3.61	1.60	0.00	1.53
Hotels and restaurants	-5.12	-4.19	0.00	0.00	0.41	-0.04	1.31
Transport	0.38	-2.02	2.47	-1.76	3.48	-0.22	1.56
Post and telecommunications	3.61	-2.50	10.60	-7.87	5.22	-0.07	1.77
Financial intermediation and business activities	-25.23	-14.69	21.76	-15.61	-7.63	-0.01	9.06
Public administration	52.73	59.75	42.42	-40.04	-0.48	-0.04	8.88
Education, health and other services	13.83	20.23	7.04	5.51	0.01	-0.07	7.88
Private households and others	-0.70	-0.35	0.00	0.00	-0.15	-0.01	0.17
Total	0.00	42.22	330.71	265.93	-66.77	4.33	44.56

Source: Authors' calculations based on EORA and ADB data.

Table 10 Cambodia's DPG decomposition (2010-2015)

Sectors	DPGs	Deviations of					
		Consumption (δC)	Investment (δI)	Inventory change (δJ)	Technology change (δT)	Export (δE)	Import (δM)
Agriculture, hunting, forestry, and fishing	-87.08	-72.25	-1.90	-1.83	-32.13	23.86	2.81
Mining and quarrying	8.98	4.29	0.00	0.00	2.92	0.32	-1.44
Food beverage and tobacco	6.04	-3.10	-0.15	-0.03	4.83	6.05	1.56
Textile and wearing apparel	12.45	-2.31	-1.28	-0.03	-5.97	29.75	7.72
Wood and paper	1.37	0.14	-0.03	0.02	-0.37	0.43	-1.18
Petroleum, chemical and non-metallic mineral products	3.08	-0.28	-0.11	-0.18	-0.25	0.99	-2.90
Metal products	1.62	0.41	-0.10	-0.29	1.09	0.53	0.02
Electrical and machinery	-0.06	0.02	0.00	0.01	0.05	0.05	0.19
Transport equipment	0.57	-0.35	0.00	-0.24	-0.11	0.54	-0.71
Other manufacturing and recycling	-3.62	-0.11	0.00	-0.14	0.09	0.03	3.49
Electricity, gas and water	1.11	5.72	0.00	0.00	-4.65	0.05	0.01
Construction	48.53	-0.30	0.00	39.55	11.42	-2.20	-0.06
Maintenance and repair	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wholesale trade	1.97	-7.30	0.00	-0.72	3.20	6.01	-0.78
Retail trade	0.15	-0.12	0.00	-0.02	0.06	0.12	-0.10
Hotels and restaurants	1.76	8.26	0.00	0.02	15.91	-16.79	5.63
Transport	7.48	-2.83	0.00	-0.02	7.15	-0.24	-3.42
Post and telecommunications	-3.52	-0.83	0.00	0.00	-2.47	2.27	2.48
Financial intermediation and business activities	9.73	-9.21	0.00	0.00	19.60	-1.49	-0.84
Public administration	-4.61	-1.92	0.00	0.00	-0.70	-2.02	-0.02
Education, health and other services	-5.96	-7.55	0.00	0.03	0.90	0.89	0.23
Private households and others	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	-89.62	-3.56	36.12	20.58	49.16	12.68

Source: Authors' calculations based on EORA and ADB data.

Table 11 Vietnam's DPG decomposition (2010-2015)

Sectors	DPGs	Deviations of					
		Consumption (δC)	Investment (δI)	Inventory change (δJ)	Technology change (δT)	Export (δE)	Import (δM)
Agriculture, hunting, forestry, and fishing	-31.80	-13.01	-14.75	-3.37	-9.33	13.53	4.87
Mining and quarrying	-3.98	-1.02	-5.12	0.00	-6.90	9.01	-0.06
Food beverage and tobacco	16.88	6.91	-10.30	-0.01	-10.41	33.27	2.58
Textile and wearing apparel	1.24	-4.53	-6.16	0.00	-9.74	31.63	9.96
Wood and paper	1.76	3.03	-1.02	-0.01	1.66	2.66	1.56
Petroleum, chemical and non-metallic mineral products	-1.99	-0.16	8.73	0.00	-9.15	11.95	13.35
Metal products	-4.79	0.11	5.47	0.00	-5.52	4.71	9.56
Electrical and machinery	-3.48	0.28	-11.21	-6.96	2.18	24.04	11.82
Transport equipment	2.54	8.82	-4.24	-9.47	3.58	3.98	0.12
Other manufacturing and recycling	2.28	1.29	-2.47	-3.42	1.36	6.97	1.44
Electricity, gas and water	10.00	3.36	0.03	0.00	6.71	0.07	0.17
Construction	-24.55	8.67	-1.61	-38.82	7.11	0.10	0.00
Maintenance and repair	2.14	2.15	0.00	0.00	-0.06	0.04	-0.01
Wholesale trade	29.59	1.80	0.00	-2.21	8.03	22.09	0.12
Retail trade	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hotels and restaurants	1.07	-0.16	0.00	0.00	-1.36	2.81	0.23
Transport	-6.06	-2.36	0.00	-0.82	-5.53	2.11	-0.35
Post and telecommunications	-10.97	-7.10	0.00	0.00	-3.95	0.33	0.25
Financial intermediation and business activities	-12.38	-5.53	-0.01	-0.19	-5.53	1.57	2.69
Public administration	2.03	2.00	0.00	0.00	0.02	0.02	0.00
Education, health and other services	30.34	28.39	0.00	0.00	0.46	1.57	0.08
Private households and others	0.13	0.12	0.00	0.00	0.01	0.00	0.00
Total	0.00	30.05	-42.66	-65.29	-36.15	172.43	58.39

Source: Authors' calculations based on EORA and ADB data.

Table 12 Thailand's DPG decomposition (2010-2015)

Sectors	DPGs	Deviations of					
		Consumption (δC)	Investment (δI)	Inventory change (δJ)	Technology change (δT)	Export (δE)	Import (δM)
Agriculture, hunting, forestry, and fishing	0.07	-9.69	-0.33	0.00	-4.30	6.36	-8.03
Mining and quarrying	-31.92	0.00	-5.25	0.00	2.00	0.67	29.33
Food beverage and tobacco	-13.08	-15.41	-2.90	0.00	-3.50	6.96	-1.76
Textile and wearing apparel	-3.73	-2.50	-0.70	0.00	-1.52	0.42	-0.56
Wood and paper	-1.52	-0.20	0.67	0.01	-3.40	0.35	-1.05
Petroleum, chemical and non-metallic mineral products	-20.21	26.51	-43.95	0.00	-20.51	17.16	0.02
Metal products	-5.16	0.47	-2.62	9.68	-31.51	-3.87	-22.70
Electrical and machinery	0.56	-0.03	0.48	0.00	-5.02	0.50	-4.64
Transport equipment	-10.58	-1.94	0.37	-1.69	-5.92	-2.19	-0.78
Other manufacturing and recycling	-2.20	-0.13	-0.78	0.00	-1.63	0.29	-0.06
Electricity, gas and water	3.92	3.07	-0.86	0.00	1.71	0.12	0.11
Construction	-11.61	-0.08	0.00	-11.30	-0.33	0.11	0.00
Maintenance and repair	1.53	0.03	0.00	0.00	-0.12	0.16	-1.46
Wholesale trade	4.93	-1.17	-0.90	0.39	-11.43	17.88	-0.16
Retail trade	4.14	2.41	-1.32	0.66	-1.96	4.13	-0.22
Hotels and restaurants	16.57	6.80	0.00	0.00	0.42	9.17	-0.18
Transport	14.31	-4.03	-0.53	0.14	-5.41	9.92	-14.24
Post and telecommunications	8.92	1.78	0.00	0.00	2.55	4.06	-0.53
Financial intermediation and business activities	22.36	10.90	0.00	0.21	4.81	5.80	-0.65
Public administration	6.76	6.68	0.00	0.00	0.08	0.00	0.00
Education, health and other services	15.91	11.60	0.00	0.00	-0.19	3.80	-0.70
Private households and others	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	35.08	-58.03	-1.91	-85.18	81.79	-28.25

Source: Authors' calculations based on EORA and ADB data.

Table 13 Indonesia's DPG decomposition (2010-2015)

Sectors	DPGs	Deviations of					
		Consumption (δC)	Investment (δI)	Inventory change (δJ)	Technology change (δT)	Export (δE)	Import (δM)
Agriculture, hunting, forestry, and fishing	-9.13	0.94	-3.36	-3.53	-1.35	-0.83	1.00
Mining and quarrying	-42.53	0.00	-0.63	-0.38	-17.13	-23.57	0.62
Food beverage and tobacco	6.46	0.44	0.31	0.00	0.36	7.08	1.73
Textile and wearing apparel	-5.89	4.60	-9.66	0.10	-1.18	0.20	-0.04
Wood and paper	-9.87	-0.14	-0.20	-0.01	-8.55	-1.12	-0.16
Petroleum, chemical and non-metallic mineral products	-24.78	-4.37	-1.89	-0.08	-6.56	-5.15	6.73
Metal products	-0.59	-0.05	-0.13	-0.17	2.06	-2.97	-0.67
Electrical and machinery	2.67	1.25	-0.55	-1.36	3.19	-2.93	-3.08
Transport equipment	1.02	-0.24	0.09	-1.04	-0.14	1.29	-1.06
Other manufacturing and recycling	-1.78	-1.32	-0.33	-1.00	-0.96	1.81	-0.02
Electricity, gas and water	1.35	-0.11	0.18	0.00	1.30	-0.01	0.01
Construction	29.85	0.00	-2.92	24.61	8.24	-0.42	-0.32
Maintenance and repair	2.03	0.83	-0.26	-0.22	1.66	0.01	-0.02
Wholesale trade	-2.12	-1.05	-1.29	-1.58	1.81	-0.06	-0.06
Retail trade	-1.19	-0.61	-0.76	-0.90	1.14	0.12	0.18
Hotels and restaurants	5.78	2.81	0.00	0.00	3.27	-2.25	-1.95
Transport	25.53	13.53	-0.44	-0.22	12.91	-1.75	-1.50
Post and telecommunications	-2.12	-1.32	0.00	0.00	-0.40	-0.83	-0.43
Financial intermediation and business activities	12.18	1.99	0.00	-0.09	9.32	-1.81	-2.76
Public administration	1.45	1.71	0.00	-0.01	-0.17	-0.36	-0.28
Education, health and other services	11.68	9.37	-0.08	-0.26	2.44	-0.56	0.78
Private households and others	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	28.23	-21.89	13.87	11.03	-34.11	-2.87

Source: Authors' calculations based on EORA and ADB data.

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