Shibata, Tsubasa ed. 2025. “Price Determination in the Thai Market: Insights from Input-Output Model and Survey Analysis”, BRC Research Report No.34, Bangkok Research Center, JETRO Bangkok / IDE-JETRO.

Chapter 1

Macro-Level Analysis of Global Inflation Factors: Insights from Input-Output Tables

Tsubasa Shibata[1]
and
Takashi Yano[2]

Abstract

This study analyzed the structural factors driving recent inflation trends by applying a factor decomposition analysis within the input-output (IO) framework. This method disaggregates price changes into key components and assesses the contributions of each factor. Employing the Multi-Regional Input-Output (MRIO) tables from the Asian Development Bank (ADB), we introduced two key approaches. First, we utilized a noncompetitive import-type IO model to capture trading partners’ influence on domestic prices in more detail. Second, we adjusted the original dollar-denominated MRIO tables using purchasing power parity (PPP) to re-evaluate them in international dollars, accounting for differences in relative price levels.

Our findings highlight shifts in price determinants before and after the COVID-19 pandemic. First, the influence of import prices has increased, even in regions where domestic productive factors previously dominated price formation. This suggests that supply chain disruptions, including the Russia-Ukraine conflict, have played an important role. Second, domestic factors in price determination have also increased, particularly in Asian Global South economies. This suggests that external shocks have prompted countries to adapt by reconsidering their dependence on imports and enhancing domestic production. Although our approach does not directly identify the specific causes of these shifts, one possibility is that the external pressures that intensified the impact of import prices in some regions may have also contributed to the strengthening of domestic factors in other regions, illustrating how economies have adapted to recent inflationary pressures.

Keywords: Factor Decomposition, MIRO, Cost-Push, Price Model

---

[1] Research fellow, Bangkok Research Center, Institute of Developing Economies (IDE-JETRO).
[2] Professor, Senshu University.
The views and opinion in this paper are those of the authors and do not represent the position of IDE-JETRO or Senshu Univeisity.

1. Introduction

This section captures the structural factors behind recent inflation by applying a factor decomposition analysis based on an equilibrium price model using the input-output (IO) framework. Factor decomposition analysis decomposes changes in a given variable into its underlying components, allowing for a quantitative assessment of each factor's contribution to changes in production and prices. This approach is similar to traditional growth accounting methods such as those proposed by Solow (1957) and Kendrick (1961), which decompose aggregate output growth into the contributions of input factors and technological progress.

The application of factor decomposition analysis within the IO framework has a long history tracing back to Leontief (1953). Since then, IO analysis has evolved within the field of input-output economics, gaining recognition as a method for capturing structural changes in the economy from a comparative static perspective. Although factor decomposition techniques based on production models have been widely applied, price-based decomposition analyses have received little attention. One of the main reasons for this is the data requirement: Price models require either price-based IO tables or both nominal and real IO tables to construct deflators, which have traditionally posed a constraint for researchers. However, in recent years, real IO tables have become increasingly available, facilitating a more detailed price analysis.

This study employed the Multi-Regional Input-Output (MRIO) tables published annually by the Asian Development Bank (ADB), covering 62 countries/regions and 35 industries from 2013 to 2021. The analysis creates deflator tables by utilizing original nominal and real tables to provide a comprehensive evaluation of price fluctuations.

Our proposed approach has two distinct features. First, we adopted a non-competitive import-type IO model based on international IO tables, explicitly considering the role of multiple import source countries. Traditional non-competitive import-type IO models classify inputs as either domestic or imported, often aggregating them into a single category. By contrast, our model maintains country-level disaggregation for imports, allowing us to identify which trading partners exert the greatest influence on domestic price changes.

Second, to account for differences in price levels across economies, we reevaluated the original dollar-denominated MRIO tables in terms of international dollars using purchasing power parity (PPP) adjustments. This enables cross-country comparisons that reflect the variations in relative price levels. Using this methodology, we identified the key factors contributing to price changes and analyze the structural shifts in price determinants before and after the COVID-19 pandemic.

Our findings highlight shifts in price determinants before and after the COVID-19 pandemic. The influence of import prices has increased, even in regions where domestic productive factors dominate price formation. This suggests that supply chain disruptions, including the Russia-Ukraine conflict, have played an important role. Additionally, domestic factors in price determination have also increased, particularly in Asian Global South economies. This suggests that external shocks have prompted countries to adapt by reconsidering their dependence on imports and enhancing domestic production. While our approach does not directly identify the specific causes of these shifts, the external pressures that intensified the impact of import prices may have also contributed to the strengthening of domestic factors, illustrating how economies have adapted to recent inflationary pressures.

The subsequent sections are organized as follows: Section 2 describes the data, including the input-output tables used in the analysis. Section 3 explains the equilibrium price model and the factor decomposition methodology. Section 4 presents the results, and the final section offers concluding remarks.

2. Data

This section describes the international IO tables used in our analysis.

2.1. Structure of the Input-Output Table

The international IO table contains statistical data on inter-industry transactions across national borders. This describes the flow of products supplied by industries as producers (outputs) and products received by industries as consumers (inputs). Thus, the rows of the input-output table represent the distribution of production, indicating the demand structure, whereas the columns represent the inputs required for each industry's production, indicating the cost structure. In general, an international IO table consists of the following four blocks (see Appendix A):

- **Intermediate transactions:** Includes transactions between industries across borders.
- **Final demand:** Includes household consumption, government expenditure, and exports.
- **Value-added:** Includes labor income and capital returns.
  (e.g., employee compensation, operating surplus, capital depreciation allowance, indirect taxes, and subsidies)

- **Total output:** Total production of each industry of each country.

However, it is important to note that the MRIO table used in this study differs from a standard IO table in that the value-added components are not disaggregated. Detailed breakdowns such as employee compensation and capital depreciation are not available because they are consolidated into a single category. Therefore, there are limitations to analyzing the detailed impact of value-added components.

2.2. Data Source

This study utilized the MRIO tables published by the ADB. The MRIO dataset consists of data from 62 countries/regions and 35 industries. We used annual MRIO tables, both in current and constant prices, covering 2007 to 2021.

2.3. Target Countries and Industries

This study focused on the Asian countries, with particular emphasis on Thailand. We selected 17 major countries that have significant trade relations with Thailand and grouped all other countries under the category "Rest of the World." A list of target countries is presented in Table 1.1. Additionally, for the purpose of analysis, the 35 industrial sectors were aggregated into 14 sectors. The corresponding sector maps are presented in Table 1.2.

Table 1.1. Classification of Countries/Regions

	Country	Code			
1	Australia	**AUS**	10	United Nation	**USA**
2	China	**CHN**	11	Malaysia	**MYS**
3	Germany	**DEU**	12	Philippines	**PHL**
4	Indonesia	**IDN**	13	Thailand	**THA**
5	India	**IND**	14	Vietnam	**VNM**
6	Japan	**JPN**	15	Lao Republic	**LAO**
7	Korea	**KOR**	16	Brunei	**BRN**
8	Russian Federation	**RUS**	17	Cambodia	**KHM**
9	Taipei	**TWN**	18	Rest of the World	**RoW**

Source: Created by the authors.

Table 1.2. Sector Correspondence Table

NO	Definition	Sector
1	Agriculture, hunting, forestry, and fishing	1
2	Mining and quarrying	2
3	Food, beverages, and tobacco	3
4	Textiles and textile products	3

6	Wood and products of wood and cork	3
7	Pulp, paper, paper products, printing, and publishing	3
8	Coke, refined petroleum, and nuclear fuel	3
9	Chemicals and chemical products	3
10	Rubber and plastics	3
11	Other nonmetallic minerals	3
12	Basic metals and fabricated metal	3
13	Machinery, nec	3
14	Electrical and optical equipment	3
15	Transport equipment	3
5	Leather, leather products, and footwear	3
16	Manufacturing, nec; recycling	3
17	Electricity, gas, and water supply	4
18	Construction	5
19	Sale, maintenance, and repair of motor vehicles and motorcycles; retail sale of fuel	6
20	Wholesale trade and commission trade, except for motor vehicles and motorcycles	6
21	Retail trade, except for motor vehicles and motorcycles; repair of household goods	6
22	Hotels and restaurants	7
23	Inland transport	8
24	Water transport	8
25	Air transport	8
26	Other supporting and auxiliary transport activities; activities of travel agencies	8
27	Post and telecommunications	9
28	Financial intermediation	10
29	Real estate activities	10
30	Renting of M&Eq and other business activities	10
31	Public administration and defense; compulsory social security	11
32	Education	12
33	Health and social work	13
34	Other community, social, and personal services	14
35	Private households with employed persons	14

Source: Created by the authors.

2.4. Modification of Price Tables

Price analysis requires price tables, and the MRIO provides both nominal and real tables. Using these, we created a deflator table by dividing the nominal table by the real table. Additionally, to enable international comparisons, we converted the data into international dollars based on PPP. The detailed calculation process for this conversion is provided in the Appendix B.

3. Model

This section first explains the price model for non-competitive import types based on an international IO table, followed by a description of the factor decomposition analysis using this model.

3.1. Price Model

We consider an international IO table with r countries and n sectors: All the variables in this model are in constant prices. The basic structure of this model follows accordingly—from the identity with respect to price, the price in sector i of country h is expressed as follows:

$$P_j^k(t) = \frac{\sum_{h=1}^{r}\sum_{i=1}^{n} P_i^h(t) XR_{ij}^{hk}(t) + VA_j^k(t)}{XXR_j^k(t)} \tag{1}$$

where $P_j^k(t)$ is the sectoral price in sector *j* of country *k*, $XXR_j^k(t)$ is the output in sector *i* of country *k*, $XR_{ij}^{hk}(t)$ is the intermediate goods delivered from sector *i* of country *h* to sector *j* of country *k*, and $VA_j^k(t)$ is the value-added in sector *j* of country *k*. t in all variables' mean times.

The input coefficients are divided into two elements: technology and transaction inputs. The trade coefficients of intermediate goods for country *k* are defined as follows:

$$ax_{ij}^k(t) = \frac{\sum_{h=1}^{r} XR_{ij}^{hk}(t)}{XXR_j^k(t)} \tag{2}$$

and

$$mx_{ij}^{hk}(t) = \frac{XR_{ij}^{hk}(t)}{\sum_{h=1}^{r} XR_{ij}^{hk}(t)} \tag{3}$$

where $ax_{ij}^k(t)$ is the total input of goods *i* in sector *j* of country *k* and $mx_{ij}^{hk}(t)$ is the share of goods *i* of country *h* in the total input of goods *i* in sector *j* of country *k*. Thus, equation (2) is rewritten by the input coefficient matrix for country *k*.

$$\mathbf{A}_x^k(\boldsymbol{t}) = \begin{bmatrix} ax_{11}^k(t) & \cdots & ax_{1n}^k(t) \\ \vdots & \ddots & \vdots \\ ax_{n1}^k(t) & \cdots & mx_{nn}^k(t) \end{bmatrix} (n \times n) \tag{4}$$

The input coefficient matrix in the whole model is represented as:

$$\mathbf{A}_x(\boldsymbol{t}) = [\mathbf{A}_\mathbf{x}^\mathbf{1}(\boldsymbol{t}) \cdots \mathbf{A}_\mathbf{x}^\mathbf{r}(\boldsymbol{t})](n \times nr) \tag{5}$$

Similarly, the trade coefficient matrix of intermediate goods delivered from country *h* to country *k* and the corresponding matrix in the entire model, respectively, is expressed as:

$$\mathbf{M}_x^{hk}(\boldsymbol{t}) = \begin{bmatrix} mx_{11}^{hk}(t) & \cdots & mx_{1n}^{hk}(t) \\ \vdots & \ddots & \vdots \\ mx_{n1}^{hk}(t) & \cdots & mx_{nn}^{hk}(t) \end{bmatrix} (n \times n) \tag{6}$$

and

$$\mathbf{M}_x(t) = \begin{bmatrix} \boldsymbol{M}_x^{11}(\boldsymbol{t}) & \cdots & \boldsymbol{M}_x^{1r}(\boldsymbol{t}) \\ \vdots & \ddots & \vdots \\ \boldsymbol{M}_x^{r1}(\boldsymbol{t}) & \cdots & \boldsymbol{M}_x^{rr}(\boldsymbol{t}) \end{bmatrix} (nr \times nr) \tag{7}$$

The added value can also be defined by following the same procedure. The value-added coefficients in sector j of country k is as follows:

$$v_j^k(t) = \frac{V_j^k(t)}{XXR_j^k(t)} \tag{8}$$

Additionally, the value-added coefficients of country k can be represented in vector form as follows:

$$\mathbf{V_e^k(t)} = \left[\mathbf{v_1^k(t)} \cdots \mathbf{v_n^k(t)}\right](1 \times n) \tag{9}$$

Taking the above-mentioned factors into consideration, the domestic price for a non-competitive import-type model, composed of both domestic and import transactions, at time t can be expressed as:

$$\mathbf{p^D}(\boldsymbol{t}) = \mathbf{A^D}(\boldsymbol{t}) \otimes \mathbf{M^D}(\boldsymbol{t})\mathbf{p^D}(\boldsymbol{t}) + \mathbf{A^D}(\boldsymbol{t}) \otimes \mathbf{M^M}(\boldsymbol{t})\mathbf{p^M}(\boldsymbol{t}) + \mathbf{V_e^D(t)} \tag{10}$$

Here, $\mathbf{A^D}$ represents the domestic input coefficient matrix, which reflects the transaction within the domestic economy. $\mathbf{M^D}$ is the domestic trade coefficient matrix, which captures the flow of intermediate goods and services within the domestic economy. On the other hand, $\mathbf{M^M}$ denotes the import trade coefficient matrix, which reflects the flow of imported intermediate goods and services used in the domestic production process. Furthermore, $\mathbf{p^D}$ is the domestic price vector and $\mathbf{p^M}$ is the import price vector, and $\mathbf{V_e^D(t)}$ denotes the value-added vector for the corresponding domestic country. Additionally, $\otimes$ refers the adamar product. Solving for the domestic price then yields the following equation.

$$\mathbf{p^D}(\boldsymbol{t}) = [\mathbf{p^M}(\boldsymbol{t})\mathbf{A^D}(\boldsymbol{t}) \otimes \mathbf{M^M}(\boldsymbol{t}) + \mathbf{V_e^D(t)}][\mathbf{I} - \mathbf{A^D}(\boldsymbol{t}) \otimes \mathbf{M^D}(\boldsymbol{t})]^{-1} \tag{11}$$

where I is the identity matrix $(n \times n)$. As we apply this model to the international IO framework, it is important to note the domestic price vector for each endogenous country in the international IO tables. Therefore, we rewrite the domestic price matrix in Equation

(11) as $\mathbf{p}^{\mathbf{D}_k}(t)$. Additionally, the import price vector and trade coefficient matrix for the import region, as shown in Equation (11), are disaggregated for multiple countries. Thus, the model is rewritten as follows:

$$\begin{aligned}\mathbf{p}^{\mathbf{D}_k}(t) = {} & \mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{D}_k}(t)\mathbf{p}^{\mathbf{D}_k}(t) + \mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{M}_1}(t)\mathbf{p}^{\mathbf{M}_1}(t) + \cdots \\ & + \mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{M}_{r-1}}(t)\mathbf{p}^{\mathbf{M}_{r-1}}(t) + \mathbf{v}^{\mathbf{D}_k}(t)\mathbf{V}\mathbf{A}^{\mathbf{D}_k}(t)\end{aligned} \tag{12}$$

Rearranging equation (12) yields:

$$\mathbf{p}^{\mathbf{D}_k}(t) = \begin{bmatrix}\mathbf{p}^{\mathbf{M}_1}(t)\mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{M}_1}(t) + \cdots + \mathbf{p}^{\mathbf{M}_{r-1}}(t)\mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{M}_{r-1}}(t) \\ +\mathbf{v}^{\mathbf{D}_k}(t)\mathbf{V}\mathbf{A}^{\mathbf{D}_k}(t)\end{bmatrix} [\mathbf{I} - \mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{D}_k}(t)]^{-1} \tag{13}$$

In addition, we set $\mathbf{V}^{\mathbf{D}_k}(t) = [\mathbf{p}^{\mathbf{M}_1}(t)\mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{M}_1}(t) + \cdots + \mathbf{p}^{\mathbf{M}_{r-1}}(t)\mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{M}_{r-1}}(t) + \mathbf{v}^{\mathbf{D}_k}(t)\mathbf{V}\mathbf{A}^{\mathbf{D}_k}(t)]$ and $\mathbf{B}^{\mathbf{D}_k}(t) = [\mathbf{I} - \mathbf{A}^{\mathbf{D}_k}(t)\otimes\mathbf{M}^{\mathbf{D}_k}(t)]^{-1}$, obtaining the following:

$$\mathbf{p}^{\mathbf{D}_k}(t) = \mathbf{V}^{\mathbf{D}_k}(t)\mathbf{B}^{\mathbf{D}_k}(t) \tag{14}$$

3.2. Factor Decomposition

Considering the change between two points in time, the price change can be represented as follows:

$$\mathbf{p}^{\mathbf{D}_k}(t_s) - \mathbf{p}^{\mathbf{D}_k}(t_{s-1}) = \mathbf{V}^{\mathbf{D}_k}(t_s)\mathbf{B}^{\mathbf{D}_k}(t_s) - \mathbf{V}^{\mathbf{D}_k}(t_{s-1})\mathbf{B}^{\mathbf{D}_k}(t_{s-1}) \tag{15}$$

$$= \Delta\mathbf{V}^{\mathbf{D}_k}(t_s)\mathbf{B}^{\mathbf{D}_k}(t_{s-1}) + \Delta\mathbf{V}^{\mathbf{D}_k}(t_s)\mathbf{B}^{\mathbf{D}_k}(t_s) \tag{15a}$$

$$= \mathbf{V}^{\mathbf{D}_k}(t_s)\Delta\mathbf{B}^{\mathbf{D}_k}(t_s) + \mathbf{V}^{\mathbf{D}_k}(t_{s-1})\Delta\mathbf{B}^{\mathbf{D}_k}(t_s) \tag{15b}$$

Dietzenbacher and Los (1998) show that when there are multiple contributing factors, decomposition is not unique, applying the output model. The average of the two decompositions, Equations (15a) and (15b), is close to the average of the possible decompositions. Following their approach, we take the average of Equations (15a) and (15b) to decrease the bias. Hence, the price change between the two points in time can be rewritten as

$$\begin{aligned}\mathbf{p}^{\mathbf{D}_k}(t_s) - \mathbf{p}^{\mathbf{D}_k}(t_{s-1}) = {} & \frac{1}{2}\Delta\mathbf{V}^{\mathbf{D}_k}(t_s)[\mathbf{B}^{\mathbf{D}_k}(t_{s-1}) + \mathbf{B}^{\mathbf{D}_k}(t_s)] \\ & + \frac{1}{2}[\mathbf{V}^{\mathbf{D}_k}(t_{s-1}) + \mathbf{V}^{\mathbf{D}_k}(t_s)]\Delta\mathbf{B}^{\mathbf{D}_k}(t_s)\end{aligned} \tag{16}$$

In order to take into consideration decomposition factors on $\Delta\mathbf{B}^{\mathbf{dk}}(\boldsymbol{t_s})$, we set the following:

$$\Delta\mathbf{B}^{\mathrm{D_k}}(\boldsymbol{t_s})[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1} \quad (17)$$

$$\begin{aligned}&=[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}\\&\quad+[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1}[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1}\end{aligned} \quad (17a)$$

$$\begin{aligned}&=[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1}\\&\quad+[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1}\end{aligned} \quad (17b)$$

Taking the average of Equations (17a) and (17b), the equation of factor decomposition $\Delta\mathbf{B}^{\mathrm{D_k}}(\boldsymbol{t_s})$ can be written as:

$$\begin{aligned}\Delta\mathbf{B}^{\mathrm{D_k}}(\boldsymbol{t_s})=&\frac{\mathbf{1}}{\mathbf{2}}\left\{\begin{matrix}[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}\\+[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1}\end{matrix}\right\}\\&+\frac{\mathbf{1}}{\mathbf{2}}\left\{\begin{matrix}[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1}\\+[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_s})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})]^{-1}\end{matrix}\right\}\end{aligned} \quad (18)$$

Similarly, we decompose $\Delta\mathbf{V}^{\mathrm{D_k}}(\boldsymbol{t_s})$ such that $\Delta\mathbf{V}^{\mathrm{D_k}}(\boldsymbol{t_s})=\mathbf{V}^{\mathrm{D_k}}(\boldsymbol{t_s})-\mathbf{V}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})$, thus obtaining:

$$\begin{aligned}\mathbf{V}^{\mathrm{D_k}}(\boldsymbol{t_s})-\mathbf{V}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})=&\begin{bmatrix}\mathbf{p}^{\mathrm{M_1}}(\boldsymbol{t_s})\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{M_1}}(\boldsymbol{t_s})+\cdots\\+\mathbf{p}^{\mathrm{M_{r-1}}}(\boldsymbol{t_s})\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{M_{r-1}}}(\boldsymbol{t_s})+\\+\mathbf{v}^{\mathrm{D_k}}(\boldsymbol{t_s})\mathbf{VA}^{\mathrm{D_k}}(\boldsymbol{t_s})\end{bmatrix}\\&-\begin{bmatrix}\mathbf{p}^{\mathrm{M_1}}(\boldsymbol{t_{s-1}})\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{M_1}}(\boldsymbol{t_{s-1}})+\cdots\\+\mathbf{p}^{\mathrm{M_{r-1}}}(\boldsymbol{t_{s-1}})\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{M_{r-1}}}(\boldsymbol{t_{s-1}})+\\+\mathbf{v}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\mathbf{VA}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\end{bmatrix}\end{aligned} \quad (19)$$

Decomposing these terms into each factor and considering the average of each factor lead to the following equation:

$$\mathbf{V}^{\mathrm{D_k}}(\boldsymbol{t_s})-\mathbf{V}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})$$

$$=(\mathbf{1/2})[\mathbf{p}^{\mathrm{M_1}}(\boldsymbol{t_s})-\mathbf{p}^{\mathrm{M_1}}(\boldsymbol{t_{s-1}})]\begin{bmatrix}\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{M_1}}(\boldsymbol{t_s})\\+\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{M_1}}(\boldsymbol{t_{s-1}})\end{bmatrix}+\cdots$$

$$\cdots+(\mathbf{1/2})[\mathbf{p}^{\mathrm{M_{r-1}}}(\boldsymbol{t_s})-\mathbf{p}^{\mathrm{M_{r-1}}}(\boldsymbol{t_{s-1}})]\begin{bmatrix}\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_s})\otimes\mathbf{M}^{\mathrm{M_{r-1}}}(\boldsymbol{t_s})\\+\mathbf{A}^{\mathrm{D_k}}(\boldsymbol{t_{s-1}})\otimes\mathbf{M}^{\mathrm{M_{r-1}}}(\boldsymbol{t_{s-1}})\end{bmatrix}$$

$$+(1/4)\begin{bmatrix}\mathbf{p}^{\mathrm{M_1}}(t_s)\\+\mathbf{p}^{\mathrm{M_1}}(t_{s-1})\end{bmatrix}[\mathbf{A}^{\mathrm{D_k}}(t_s)-\mathbf{A}^{\mathrm{D_k}}(t_{s-1})]\otimes\begin{bmatrix}\mathbf{M}^{\mathrm{M_1}}(t_s)\\+\mathbf{M}^{\mathrm{M_1}}(t_{s-1})\end{bmatrix}+\cdots$$

$$\cdots+(1/4)\begin{bmatrix}\mathbf{p}^{\mathrm{M_{r-1}}}(t_s)\\+\mathbf{p}^{\mathrm{M_{r-1}}}(t_{s-1})\end{bmatrix}[\mathbf{A}^{\mathrm{D_k}}(t_s)-\mathbf{A}^{\mathrm{D_k}}(t_{s-1})]\otimes\begin{bmatrix}\mathbf{M}^{\mathrm{M_{r-1}}}(t_s)\\+\mathbf{M}^{\mathrm{M_{r-1}}}(t_{s-1})\end{bmatrix}$$

$$+(1/4)\begin{bmatrix}\mathbf{p}^{\mathrm{M_1}}(t_s)\\+\mathbf{p}^{\mathrm{M_1}}(t_{s-1})\end{bmatrix}\begin{bmatrix}\mathbf{A}^{\mathrm{D_k}}(t_s)\\+\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\end{bmatrix}\otimes[\mathbf{M}^{\mathrm{M_1}}(t_s)-\mathbf{M}^{\mathrm{M_1}}(t_{s-1})]+\cdots$$

$$\cdots+(1/4)\begin{bmatrix}\mathbf{p}^{\mathrm{M_{r-1}}}(t_s)\\+\mathbf{p}^{\mathrm{M_{r-1}}}(t_{s-1})\end{bmatrix}\begin{bmatrix}\mathbf{A}^{\mathrm{D_k}}(t_s)\\+\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\end{bmatrix}\otimes[\mathbf{M}^{\mathrm{M_{r-1}}}(t_s)-\mathbf{M}^{\mathrm{M_{r-1}}}(t_{s-1})]$$

$$+[v^{dk}(t_s)-v^{dk}(t_{s-1})] \tag{20}$$

The following equation is derived by substituting Equation (20) into the initial equation.

$$p^{d1}(t_s)-p^{d1}(t_{s-1})$$

$$=(1/4)[\mathbf{p}^{\mathrm{M_1}}(t_s)-\mathbf{p}^{\mathrm{M_1}}(t_{s-1})]\begin{bmatrix}\mathbf{A}^{\mathrm{D_k}}(t_s)\otimes\mathbf{M}^{\mathrm{M_1}}(t_s)\\+\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\otimes\mathbf{M}^{\mathrm{M_1}}(t_{s-1})\end{bmatrix}\begin{bmatrix}\mathbf{B}^{\mathrm{D_k}}(t_{s-1})\\+\mathbf{B}^{\mathrm{D_k}}(t_s)\end{bmatrix}+\cdots$$

$$\cdots+(1/4)[\mathbf{p}^{\mathrm{M_{r-1}}}(t_s)-\mathbf{p}^{\mathrm{M_{r-1}}}(t_{s-1})]\begin{bmatrix}\mathbf{A}^{\mathrm{D_k}}(t_s)\otimes\mathbf{M}^{\mathrm{M_{r-1}}}(t_s)\\+\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\otimes\mathbf{M}^{\mathrm{M_{r-1}}}(t_{s-1})\end{bmatrix}\begin{bmatrix}\mathbf{B}^{\mathrm{D_k}}(t_{s-1})\\+\mathbf{B}^{\mathrm{D_k}}(t_s)\end{bmatrix} \tag{a}$$

$$+(1/8)\begin{bmatrix}\mathbf{p}^{\mathrm{M_1}}(t_s)\\+\mathbf{p}^{\mathrm{M_1}}(t_{s-1})\end{bmatrix}[\mathbf{A}^{\mathrm{D_k}}(t_s)-\mathbf{A}^{\mathrm{D_k}}(t_{s-1})]\otimes\begin{bmatrix}\mathbf{M}^{\mathrm{M_1}}(t_s)\\+\mathbf{M}^{\mathrm{M_1}}(t_{s-1})\end{bmatrix}\begin{bmatrix}\mathbf{B}^{\mathrm{D_k}}(t_{s-1})\\+\mathbf{B}^{\mathrm{D_k}}(t_s)\end{bmatrix}+\cdots$$

$$\cdots+(1/8)\begin{bmatrix}\mathbf{p}^{\mathrm{M_{r-1}}}(t_s)\\+\mathbf{p}^{\mathrm{M_{r-1}}}(t_{s-1})\end{bmatrix}[\mathbf{A}^{\mathrm{D_k}}(t_s)-\mathbf{A}^{\mathrm{D_k}}(t_{s-1})]\otimes\begin{bmatrix}\mathbf{M}^{\mathrm{M_{r-1}}}(t_s)\\+\mathbf{M}^{\mathrm{M_{r-1}}}(t_{s-1})\end{bmatrix}\begin{bmatrix}\mathbf{B}^{\mathrm{D_k}}(t_{s-1})\\+\mathbf{B}^{\mathrm{D_k}}(t_s)\end{bmatrix} \tag{b}$$

$$+(1/8)\begin{bmatrix}\mathbf{p}^{\mathrm{M_1}}(t_s)\\+\mathbf{p}^{\mathrm{M_1}}(t_{s-1})\end{bmatrix}\begin{bmatrix}\mathbf{A}^{\mathrm{D_k}}(t_s)\\+\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\end{bmatrix}\otimes[\mathbf{M}^{\mathrm{M_1}}(t_s)-\mathbf{M}^{\mathrm{M_1}}(t_{s-1})]\begin{bmatrix}\mathbf{B}^{\mathrm{D_k}}(t_{s-1})\\+\mathbf{B}^{\mathrm{D_k}}(t_s)\end{bmatrix}+\cdots$$

$$\cdots+(1/8)\begin{bmatrix}\mathbf{p}^{\mathrm{M_{r-1}}}(t_s)\\+\mathbf{p}^{\mathrm{M_{r-1}}}(t_{s-1})\end{bmatrix}\begin{bmatrix}\mathbf{A}^{\mathrm{D_k}}(t_s)\\+\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\end{bmatrix}\otimes[\mathbf{M}^{\mathrm{M_{r-1}}}(t_s)-\mathbf{M}^{\mathrm{M_{r-1}}}(t_{s-1})]\begin{bmatrix}\mathbf{B}^{\mathrm{D_k}}(t_{s-1})\\+\mathbf{B}^{\mathrm{D_k}}(t_s)\end{bmatrix} \tag{c}$$

$$+(1/2)[v^{dk}(t_s)-v^{dk}(t_{s-1})]\begin{bmatrix}B^{d1}(t_{s-1})\\+B^{d1}(t_s)\end{bmatrix} \tag{d}$$

$$+(1/4)\begin{bmatrix}\mathbf{V}^{\mathrm{D_k}}(t_{s-1})\\+\mathbf{V}^{\mathrm{D_k}}(t_s)\end{bmatrix}\left\{\begin{matrix}[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(t_s)\otimes\mathbf{M}^{\mathrm{D_k}}(t_s)]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\otimes\mathbf{M}^{\mathrm{D_k}}(t_s)]^{-1}\\+[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(t_s)\otimes\mathbf{M}^{\mathrm{D_k}}(t_{s-1})]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\otimes\mathbf{M}^{\mathrm{D_k}}(t_{s-1})]^{-1}\end{matrix}\right\}\ \text{(e)}$$

$$+(1/4)\begin{bmatrix}\mathbf{V}^{\mathrm{D_k}}(t_{s-1})\\+\mathbf{V}^{\mathrm{D_k}}(t_s)\end{bmatrix}\left\{\begin{matrix}[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(t_s)\otimes\mathbf{M}^{\mathrm{D_k}}(t_s)]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(t_s)\otimes\mathbf{M}^{\mathrm{D_k}}(t_{s-1})]^{-1}\\+[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\otimes\mathbf{M}^{\mathrm{D_k}}(t_s)]^{-1}-[\mathbf{I}-\mathbf{A}^{\mathrm{D_k}}(t_{s-1})\otimes\mathbf{M}^{\mathrm{D_k}}(t_{s-1})]^{-1}\end{matrix}\right\}\ \text{(f)}$$

(21)

The terms in the above equation have the following economic meaning: (a) represents the import input price factor, (c) represents the trade factor of import input productivity, and (d) represents the value-added factor. The sum of (b) and (e) represents the change in industrial structure (inverse matrix) as the domestic technological change factor. Finally, (f) represents the change in the industrial structure (inverse matrix) as the domestic trade change factor.

4. Results

In this section, we present the results of the factor decomposition analysis of price determination based on the international input-output framework. This chapter examines these results at the national level. Appendix C includes the sectoral factor decomposition results for Thailand. Because of the large volume of results, we focus on key sectors and include only the following: sector 1 (Agriculture, Forestry, and Fisheries), sector 3 (manufacturing), sector 5 (construction), sector 6 (Wholesale and Retail Trade), and sector 7 (Hotels and Restaurants). The following section provides a detailed examination of the national-level results.

- **Principal Component Analysis (PCA)**

To gain deeper insight into the key drivers of price fluctuations across countries, we further analyzed the factor decomposition results using Principal Component Analysis (PCA). The factor decomposition analysis shows the annual changes in the five cost factors for the 17 countries and the rest of the world.

(1) the import input price factor (PM)
(2) the trade factor of import (MX)
(3) the value-added factor (VA)
(4) the domestic technological factor (AX)
(5) the domestic trade change factor (DX)

A five-level evaluation based on their relative magnitudes was applied to extract the main patterns of the price fluctuation factors, and PCA was conducted. PCA extracts important elements from multiple variables and identifies their common features. In this analysis, key patterns of price fluctuations were extracted from the five cost factors. PCA was conducted for two periods: pre-COVID-19 (2013–2018) and post-COVID-19 (2018–2021), allowing for a comparison of the changes in the impact on price fluctuations. The analysis focused on the macro-level of countries and regions rather than the industry level. The results are shown in Figure 1.1.

- **PCA Axis Interpretation: Pre- and Post-COVID-19 Changes**

Before interpreting the results for each country/region shown in the scatter plot in Figure 1.1, it is important to clarify how the axes of the PCA, which define price fluctuation factors, changed before and after COVID-19.

In the pre-COVID-19 PCA, the factors driving price fluctuations were classified relatively clearly.

- **Horizontal axis (PC1)**: "Domestic productivity factor" (on the right)
  "Trade (import and domestic) factor" (on the left)
- **Vertical axis (PC2)**: "Value-added factor" (on top)
  "Import price factor" (on the bottom)

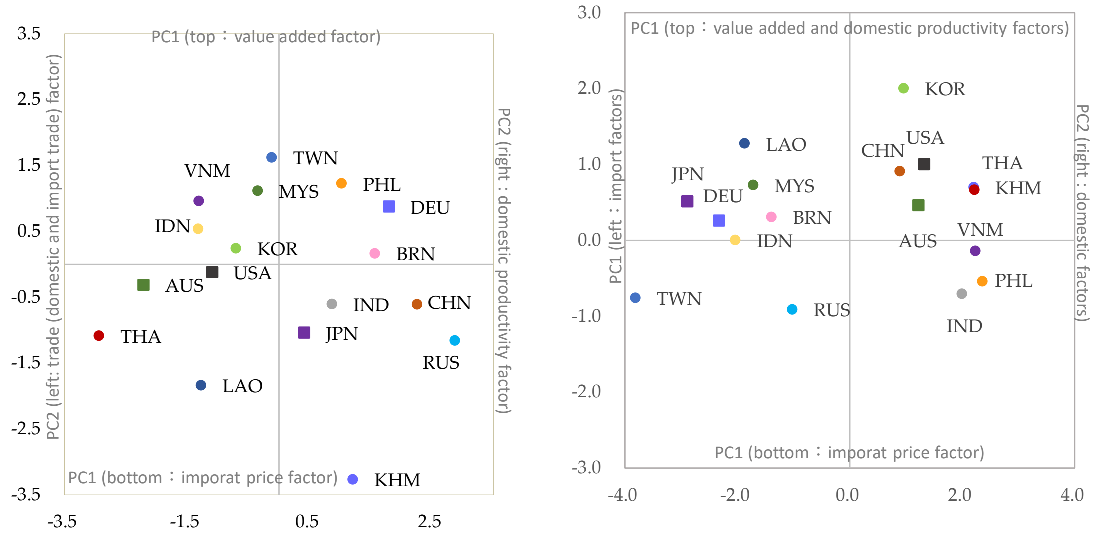
However, post-COVID-19, the relationships between these factors shifted, and the factors causing price fluctuations became more intricately interconnected.

- **Horizontal axis (PC1)**: "Domestic productivity factor" and "Domestic trade factor of inputs," namely **"Domestic factors"** (on the right)
  "Import trade factor" and "Import price factor," namely **"import factors"** (on the left)
- **Vertical axis (PC2)**: "Value-added factors" and "Domestic productivity factor" (on top)
  "Import price factors" (on the bottom)

The importance of the "domestic productivity factor" increased, and a new element was added to the traditional price fluctuation mechanism. This indicates that there was a structural change in the factors represented by the PCA axes before and after COVID-19. Next, we closely examined the PCA results for each country and region.

Figure 1.1. Main factors determining price fluctuations

(i) Before COVID-19 (ii) After COVID-19



Source: Computed by the authors using ADB's MRIO framework.

- **Changes in Country/Region Positions in PCA Scatter Plot**

Notably, the PCA axes changed before and after COVID-19, making a direct comparison of the plots difficult. Thus, changes in country/regional positions should be interpreted in light of these shifts in axis definitions. Rather than focusing on the exact position of each country/region in the scatter plots, we should concentrate on the factors that influenced these movements and shifts in the relative positioning among countries.

Before COVID-19, Thailand (THA) was positioned to the far left of the PCA, where both domestic and foreign "trade factors" significantly impacted price formation. However, post-COVID-19, Thailand shifted, reflecting a stronger influence from "domestic factors," including "domestic productivity factor" and "domestic value-added factor." This finding suggests that the relative importance of these domestic factors has increased. Similarly, Cambodia (KHM) experienced a shift to the area "domestic factors" after COVID-19. This shift indicates greater reliance on domestic factors for price formation. Moreover, both Vietnam (VNM) and the Philippines (PHL) experienced a shift, indicating a stronger influence from "domestic factors." They also had a slight impact from "import price factors."

Interestingly, Thailand, Cambodia, and Vietnam were positioned closer to each other after COVID-19. Prior to the pandemic, these countries were located in separate and distinct regions of the plot, but post-COVID-19, their relative positions moved closer together, suggesting similar shifts in the factors driving their price formation.

In contrast, Japan (JPN) and the United States (USA) were positioned near the origin before COVID-19, with diverse factors interacting in complex ways and pulling them in all directions. After COVID-19, Japan moved to an area where the influence of "import factors" became more pronounced. However, the United States moved to an area where the influence of "domestic factors" became more significant.

Additionally, Russia (RUS) moved a significant shift post-COVID-19, moving to a position where the influence of not only "import factors" but also "import price factors" became notably stronger. This shift could reflect changes in international trade relations and the economic sanctions imposed following the invasion of Ukraine.

5. Conclusion

This study conducted a factor decomposition analysis using the international input-output framework (MRIO) to model price determination. We observed two distinct features of the factors driving price changes after COVID-19.

Our findings are as follows. First, the influence of import prices increased. The impact of import prices on price formation has strengthened even in countries and regions where domestic productive factors were once the main drivers of price movements. This suggests that external factors, such as supply chain disruptions, including the Russia-Ukraine conflict, played a significant role in price dynamics. Second, the importance of domestic productivity factors increased. In Thailand, Cambodia, and Vietnam, there was a noticeable shift toward domestic factors as the primary drivers of price formation. This suggests that external shocks have prompted countries and regions to adapt by reconsidering import dependency and enhancing domestic production.

These two findings suggest that the same external pressures that intensified the impact of import prices in some regions may have also contributed to the strengthening of domestic factors in others, illustrating the potential pathways through which economies responded to recent inflationary pressures.

However, there are some challenges to our approach. Although the IO price model is useful for analyzing cost-push factors, it does not consider demand-side influences. Consequently, it cannot explain inflation driven by demand. Therefore, future research should extend this framework to simultaneously capture demand-side factors for a more comprehensive analysis. This challenge will be a key focus of our future studies.

References

Abe, S. 2023. *Introduction to Price Index Theory: An Invitation to Index and Aggregation Theory*. Tokyo: Nihon Hyoronsha (in Japanese).

Asian Development Bank, n.d. *Multiregional Input–Output Tables in Current Prices (2007-2022)*. Asian Development Bank.

Asian Development Bank, n.d. *Multiregional Input–Output Tables in Constant Prices (2007-2022)*. Asian Development Bank.

Bernanke, B., and Blanchard, O. 2023. “What Caused the U.S. Pandemic-Era Inflation?”, *Hutchins Center Working Papers*. No.86, June 2023.

Cabral, L. 2023. *Economics of Firms: Introduction to Industrial Organization*. Tokyo: Nihon Hyoronsha (in Japanese).

Celasun, O., Hansen, N.J.H., Mineshima, A., Spector, M., and Zhou, J. 2022. “Supply Bottlenecks: Where, Why, How Much, and What Next?” *IMF Working Paper* No. 2022/031. International Monetary Fund.

Dietzenbacher, E., and Bart, Los, B. 1998. “Structural decomposition techniques: sense and sensitivity.” *Economic Systems Research.* Vol.10(4), pp.307-323.

Heijdra, B. J. 2017. *Foundations of Modern Macroeconomics (3rd ed.)*. New York: Oxford University Press.

Hoen, A. R. 2002. *An Input-Output Analysis of European Integration*. Amsterdam: Elsevier.

Kalemli-Özcan, S., Silva, A., and Yildirim, M. A. 2022. “Global Supply Chain Pressures, International Trade, and Inflation.” *NBER Working Papers* 30240. National Bureau of Economic Research, Cambridge, MA.

Yano, T. and Kosaka, H. 2003. “Trade Patterns and Exchange Rate Regimes: Testing the Asian Currency Basket Using an International Input-Output System.” *Developing Economies*. Vol.41(1), pp.3–36.

Yano, T. and Kosaka, H. 2015. “Development of a Multi-Country Multi-Sectoral Model in International Dollars.” In *New Solutions in Legal Informatics, Economic Sciences and Mathematics*, eds. Munenori Kitahara and Kazuaki Okamura. Fukuoka: Kyushu University Press. pp. 59-84.

Shibata, Tsubasa ed. 2025. "Price Determination in the Thai Market: Insights from Input-Output Model and Survey Analysis", BRC Research Report No.34, Bangkok Research Center, JETRO Bangkok / IDE-JETRO.

Appendix A. Overall Image of a Standard International Input-Output Table

		Intermediate demand				Final demand				Exports to the ROW	Statistical discrepancy	Output
		Country 1	Country 2	⋯	Country *r*	Country 1	Country 2	⋯	Country *r*			
Intermediate input	Country 1	$\mathbf{X}^{11}$	$\mathbf{X}^{12}$	…	$\mathbf{X}^{1r}$	$\mathbf{F}^{11}$	$\mathbf{F}^{12}$	…	$\mathbf{F}^{1r}$	$\mathbf{E}^{1}$	$\mathbf{Q}^{1}$	$\mathbf{XX}^{1}$
	Country 2	$\mathbf{X}^{21}$	$\mathbf{X}^{22}$	…	$\mathbf{X}^{2r}$	$\mathbf{F}^{21}$	$\mathbf{F}^{22}$	…	$\mathbf{F}^{2r}$	$\mathbf{E}^{2}$	$\mathbf{Q}^{2}$	$\mathbf{XX}^{2}$
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Country *r*	$\mathbf{X}^{r1}$	$\mathbf{X}^{r2}$	…	$\mathbf{X}^{rr}$	$\mathbf{F}^{r1}$	$\mathbf{F}^{r2}$	…	$\mathbf{F}^{rr}$	$\mathbf{E}^{r}$	$\mathbf{Q}^{r}$	$\mathbf{XX}^{r}$
International freight and insurance		$\mathbf{B}^{1}$	$\mathbf{B}^{2}$	…	$\mathbf{B}^{r}$							
Imports from the ROW		$\mathbf{M}^{1}$	$\mathbf{M}^{2}$	…	$\mathbf{M}^{r}$							
Duties		$\mathbf{D}^{1}$	$\mathbf{D}^{2}$	…	$\mathbf{D}^{r}$							
Value added	Wages	$\mathbf{WG}^{1}$	$\mathbf{WG}^{2}$	…	$\mathbf{WG}^{r}$							
	Operating surplus	$\mathbf{YC}^{1}$	$\mathbf{YC}^{2}$	…	$\mathbf{YC}^{r}$							
	Depreciations	$\mathbf{DP}^{1}$	$\mathbf{DP}^{2}$	…	$\mathbf{DP}^{r}$							
	Indirect tax less subsidies	$\mathbf{TX}^{1}$	$\mathbf{TX}^{2}$	…	$\mathbf{TX}^{r}$							
Output		$\mathbf{XX}^{1}$	$\mathbf{XX}^{2}$	…	$\mathbf{XX}^{r}$							

Source: Created by the authors.

Appendix B. Calculation of IO Table in International Dollars

It is necessary to use economic data in international dollars to compare price levels internationally. Since purchasing power parities for GDP and sectoral value-added deflators are publicly available, we employed the following approach to construct multi-regional IO tables at constant prices and international dollars. We assumed that each multi-regional IO table contains *n* sectors and *r* economies.

First, the value-added deflator in sector j of economy k in international dollars (PVA_j^k) was expressed as:

$$PVA_j^k = \left(\frac{PPP^{*k}}{e^k}\right) PVA\$_j^k, \qquad j = 1, 2, \ldots, n;\ k = 1, 2, \ldots, r \qquad \text{(B.1)}$$

where PPP^{*k} is the purchasing power parity of economy k in the base year, e^k is the exchange rate of economy k and $PVA\$_j^k$ is the value-added deflator in sector j of economy k in U.S. dollars. Equation (B.1) enabled us to compute the sectoral value-added deflator for each endogenous economy.

Based on double deflation, the value-added deflator in sector j of economy k in international dollars was written as:

$$PVA_j^k = \frac{X_j^k - \sum_{h=1}^{r}\sum_{i=1}^{n} X_{ij}^{hk} - \sum_{h=1}^{r} TAX_j^{hk}}{\frac{X_j^k}{P_j^k} - \sum_{h=1}^{r}\sum_{i=1}^{n}\frac{X_{ij}^{hk}}{P_i^h} - \sum_{h=1}^{r}\frac{TAX_j^{hk}}{P_j^k}}, \qquad j = 1, 2, \ldots, n,\ k = 1, 2, \ldots, r \qquad \text{(B.2)}$$

where X_j^k is the total output in sector j of economy k in current prices and U.S. dollars, X_{ij}^{hk} is intermediate goods in sector j of economy k delivered from sector i of economy h in current prices and U.S. dollars, TAX_j^{hk} is taxes less subsidies on intermediate and final products in sector j of economy k delivered from economy h in current prices and U.S. dollars, and P_i^h are prices in sector i of country h in international dollars.

Rearranging equation (B.2) for P_j^k resulted in:

$$P_j^k = \frac{X_j^k - \sum_{h=1}^{r} TAX_j^{hk}}{\sum_{h=1}^{r}\sum_{i=1}^{n}\frac{X_{ij}^{hk}}{P_i^h} + \frac{X_j^k - \sum_{h=1}^{r}\sum_{i=1}^{n} X_{ij}^{hk} - \sum_{h=1}^{r} TAX_j^{hk}}{PVA_j^k}}, \qquad j = 1, 2, \ldots, n,\ k = 1, 2, \ldots, r \qquad \text{(B.3)}$$

Using equation (B.3), we formed a simultaneous equation system with $n \times r$ endogenous variables. Solving this system yielded all the sectoral prices in international dollars. Applying double deflation to the computed prices resulted in multi-regional IO tables in constant prices and international dollars.

Appendix C. Selected Sectoral Factor Decomposition Results in Thailand

Sector 1. Agriculture, hunting, forestry, and fishing (unit: percentage)

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Trade factor of import (MX)															
AUS	0.6	-2.3	-0.6	0.6	-3.2	0.4	0.0	-0.2	-0.4	-1.0	3.8	-1.3	1.6	-3.1	0.2
CHN	-1.5	-6.7	-1.4	1.6	0.0	-2.2	0.8	1.3	3.7	3.0	25.4	3.4	2.5	-3.3	-16.8
DEU	0.0	-1.5	-0.3	0.3	-0.2	0.0	0.1	0.0	-0.2	0.7	6.5	1.3	-8.2	-3.0	1.3
IDN	0.2	-1.1	-0.4	-0.2	0.0	0.5	-1.0	2.6	1.5	1.5	3.5	-0.3	-3.1	-6.2	-1.8
IND	0.3	-0.4	-0.4	0.0	0.3	0.5	0.2	0.2	0.2	0.1	5.8	0.1	-1.0	-4.0	-5.5
JPN	-0.5	3.8	-0.1	4.1	-2.3	7.4	1.6	2.1	16.7	4.8	21.2	1.5	-36.4	6.0	-19.1
KOR	1.5	0.4	-0.4	0.4	-0.7	-0.8	0.2	0.5	2.9	0.2	10.1	-1.5	9.3	-6.2	-2.2
RUS	0.4	-1.6	-0.2	2.1	-2.2	1.9	0.3	-0.7	12.1	1.2	-5.7	-0.5	0.1	4.3	2.1
TWN	0.2	-0.5	-0.2	1.4	-0.9	-1.8	-0.2	1.1	2.1	1.0	4.0	-0.4	-3.7	-7.1	-3.6
USA	1.1	-2.0	-0.9	1.5	-3.4	-0.1	0.1	1.1	2.9	0.9	30.9	-1.9	-32.2	6.3	-3.7
MYS	-0.5	-3.7	-0.8	0.4	-1.4	-1.9	-0.4	1.1	-1.4	3.2	2.9	-1.5	-3.2	-2.6	-2.5
PHL	-0.1	-0.2	-0.3	0.4	-0.8	1.6	-0.3	0.1	-1.0	0.9	-3.1	0.3	-1.8	-1.7	0.2
THA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VNM	0.9	2.7	0.4	-1.7	0.2	1.9	0.0	0.4	-5.2	0.2	1.1	0.4	5.7	4.4	-1.6
LAO	-0.2	-1.0	0.1	-1.7	0.0	-0.3	-0.1	-0.3	-7.0	6.6	-4.8	-1.1	2.0	-1.6	-0.5
BRN	0.0	-0.1	0.0	0.0	2.8	-2.8	-0.1	0.2	-4.3	-0.4	-0.3	0.0	0.4	-0.3	0.2
KHM	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.4	0.0	0.2	-0.1	6.5	4.7	-0.4
RoW	2.9	38.9	8.3	11.7	-12.1	3.6	3.2	-6.7	5.4	6.0	20.0	-2.0	-45.6	-80.3	-32.1
Import input price factor (PM)															
AUS	0.1	0.6	0.3	0.4	0.1	-0.6	0.2	0.7	-0.1	0.3	0.5	-0.2	0.9	-4.6	-0.7
CHN	1.3	0.2	0.5	1.4	0.8	0.8	0.1	0.8	9.7	0.7	2.9	-1.5	-4.2	-24.5	-0.3
DEU	0.1	0.2	0.0	0.1	-0.2	0.3	0.0	0.4	-0.1	0.0	0.4	-0.1	1.0	-1.7	0.9
IDN	0.2	0.1	0.2	0.2	-0.2	-0.5	0.2	0.4	-0.2	0.2	-0.2	0.0	-1.1	-1.9	-0.7
IND	0.1	0.1	0.1	0.1	-0.3	-0.2	0.0	0.0	0.5	0.2	0.2	-0.1	-1.1	-2.9	0.1
JPN	1.0	-3.3	0.1	0.6	-0.2	-9.1	0.7	1.3	-15.5	-1.1	1.1	0.3	7.3	0.3	9.1
KOR	-0.3	0.5	0.2	0.2	-0.1	0.3	0.0	0.2	0.4	0.3	0.4	-0.5	-0.4	-3.0	1.9
RUS	0.7	2.1	0.2	0.5	0.4	0.0	0.4	2.3	6.6	1.8	0.6	0.0	-1.8	-1.9	-0.7
TWN	0.1	0.5	0.1	-0.2	-0.4	0.3	-0.1	0.0	1.2	0.3	-0.2	-0.2	0.2	-2.1	-0.7
USA	0.0	0.2	0.1	0.3	0.5	0.1	0.0	-0.1	1.0	0.1	0.4	0.0	-0.9	-5.4	-3.5
MYS	0.4	1.1	0.4	0.4	0.0	-0.3	0.1	1.1	3.0	0.0	0.9	-0.2	-0.9	-1.7	-0.2
PHL	0.1	0.2	0.0	0.1	0.1	0.0	0.0	0.1	1.0	-0.2	-0.1	0.0	0.2	0.0	0.1
THA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VNM	0.6	0.1	0.0	0.2	0.1	0.1	0.0	0.1	-0.3	0.1	0.2	-0.1	-0.7	-4.1	-0.3
LAO	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	-0.5	0.2	0.1	0.0	-0.1	0.6	1.6
BRN	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.2	1.2	0.1	0.1	0.0	-0.3	-0.4	-0.3
KHM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	-0.3	-0.1	-0.1
RoW	3.3	5.5	0.6	3.5	-2.5	0.8	0.5	10.0	31.7	4.9	4.2	-0.7	-12.5	-33.8	-10.6
Value-added factor (VA)															
	55.2	19.0	65.1	117.9	67.9	93.7	76.8	79.4	89.8	64.1	112.8	73.0	80.0	67.0	101.4
Domestic trade change factor (DX)															
	-2.7	-8.4	-0.5	-11.2	13.3	-3.8	-1.7	-4.5	-17.4	-25.3	-83.7	4.8	61.6	75.6	66.7
Domestic technological factor (AX)															
	34.5	56.5	29.6	-35.8	44.7	10.3	18.6	5.0	-39.2	24.1	-62.2	29.1	80.0	138.4	22.0
Price Change (ΔP)															
	17.2	-6.9	32.8	13.0	4.0	3.3	-14.4	-7.4	-0.8	4.9	3.8	7.7	1.0	-1.3	-2.6

Source: Computed by the authors using ADB’s MRIO framework.

Sector 3. Manufacturing (unit: percentage)

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Trade factor of import (MX)															
AUS	4.8	-6.9	-3.9	3.8	11.0	-0.3	0.0	1.7	1.6	-1.2	8.6	-54.3	-3.6	0.5	2.9
CHN	-3.9	-15.8	-7.2	11.7	0.7	-11.8	4.7	18.5	-6.9	7.1	17.7	62.7	-9.3	-3.3	-79.7
DEU	0.4	-3.6	-1.4	2.0	1.3	-1.5	1.1	1.9	-0.7	1.5	3.6	8.2	4.6	0.2	-2.9
IDN	1.1	-3.1	-2.2	0.1	-0.7	1.1	-4.3	15.7	1.9	3.2	5.1	-17.1	6.9	9.1	-0.6
IND	2.0	-1.3	-1.8	1.8	-0.2	0.9	1.4	2.8	-1.3	0.5	4.1	-3.0	-1.0	2.6	-15.0
JPN	-1.7	22.9	2.8	25.2	12.1	39.9	25.0	27.9	25.5	11.9	19.7	-47.7	17.5	7.6	-63.9
KOR	13.5	3.6	-3.3	2.5	3.9	-4.6	3.2	8.0	6.8	0.7	8.0	-44.5	-5.0	5.2	-13.7
RUS	1.1	-4.3	-1.2	3.3	3.8	-0.6	0.0	0.3	2.0	1.8	4.3	-35.8	-0.6	-5.4	17.6
TWN	0.9	-0.5	-0.6	5.6	4.2	-9.7	-4.2	11.1	1.1	2.2	4.5	-12.9	1.8	5.5	-4.4
USA	5.5	-5.9	-5.2	6.3	9.3	-2.1	0.9	11.2	-1.3	2.3	17.5	-48.5	7.4	-6.6	-11.7
MYS	-4.5	-7.6	-2.0	5.5	19.5	6.3	-3.8	10.3	-0.6	6.7	1.8	-53.8	2.8	-0.7	-8.6
PHL	0.0	0.9	-0.9	1.3	1.8	3.9	-1.2	1.0	-3.6	1.8	-1.6	4.4	1.6	3.3	3.7
THA	0.7	0.2	0.0	-0.6	0.2	1.1	-0.5	0.8	-2.3	-0.1	4.8	5.2	-4.7	-4.9	-15.5
VNM	0.6	0.0	0.1	-1.6	0.0	-0.8	-0.2	-0.3	-1.0	3.9	0.4	-8.5	0.8	1.8	-1.2
LAO	-0.2	-0.3	-0.2	-0.1	-14.1	-19.8	-0.6	-1.0	-2.6	0.0	-0.4	-1.1	-0.8	0.3	0.9
BRN	0.2	0.1	0.0	0.0	0.0	0.3	-0.2	0.2	-0.4	0.1	0.1	-2.8	-2.2	-1.4	-0.7
KHM	13.0	102.1	40.1	68.8	49.4	1.7	32.1	-82.5	27.4	18.8	17.4	-18.1	29.3	45.7	-205.2
RoW	4.8	-6.9	-3.9	3.8	11.0	-0.3	0.0	1.7	1.6	-1.2	8.6	-54.3	-3.6	0.5	2.9
Import input price factor (PM)															
AUS	0.3	2.1	2.2	1.7	0.0	-2.1	1.5	6.0	-0.6	0.4	0.7	-5.4	-1.3	5.8	-6.0
CHN	5.8	1.3	2.3	5.0	-1.4	2.1	0.5	8.1	14.6	1.5	2.8	-29.8	3.3	18.1	-1.8
DEU	0.5	0.6	-0.2	0.4	0.7	1.2	0.0	3.7	-0.2	0.1	0.3	-1.1	-0.5	0.9	2.8
IDN	1.3	0.4	1.2	1.1	0.8	-2.2	1.4	3.6	-0.3	0.4	-0.1	0.9	1.0	2.1	-5.3
IND	0.2	0.6	0.6	0.1	0.8	-1.0	0.2	0.4	1.0	0.3	0.1	-2.4	0.7	2.0	0.4
JPN	6.8	-13.8	1.0	3.1	0.9	-45.6	8.6	15.4	-29.0	-2.5	1.3	5.9	-5.9	-0.7	49.7
KOR	-3.0	2.8	1.8	1.2	0.2	2.0	-0.6	3.1	0.9	0.9	0.5	-12.9	0.4	2.2	8.7
RUS	2.0	3.7	0.7	1.0	-0.5	0.1	1.3	8.3	3.9	1.5	0.5	-0.1	2.4	2.4	-5.0
TWN	0.3	1.4	0.4	-0.7	1.0	0.8	-0.7	0.1	1.5	0.4	-0.2	-4.1	0.0	1.4	-2.8
USA	0.0	0.0	0.3	0.9	-1.2	0.3	-0.2	-0.6	1.2	0.2	0.4	-1.2	0.7	2.8	-11.1
MYS	3.1	4.2	2.4	2.5	-0.1	-1.4	0.7	14.1	6.2	0.2	1.1	-4.6	0.9	1.5	-1.6
PHL	0.4	0.5	0.2	0.1	-0.2	-0.1	0.2	0.7	0.9	-0.3	0.0	0.3	-0.2	0.0	0.6
THA	0.3	0.1	0.0	0.1	-0.1	0.1	-0.1	0.3	0.1	0.1	0.1	-1.5	0.5	3.2	-2.0
VNM	0.2	0.1	0.2	0.1	0.1	0.1	0.0	0.0	-0.1	0.1	0.0	-0.4	0.1	-0.2	3.0
LAO	0.1	0.2	0.0	0.1	-0.3	-0.3	0.1	1.6	1.2	0.1	0.2	-0.3	0.4	0.6	-3.0
BRN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.0	-0.1
KHM	16.1	16.8	3.3	17.2	3.7	-0.8	7.8	104.3	52.9	11.2	5.3	-14.7	16.1	31.6	-85.5
RoW	0.3	2.1	2.2	1.7	0.0	-2.1	1.5	6.0	-0.6	0.4	0.7	-5.4	-1.3	5.8	-6.0
Value-added factor (VA)															
	36.5	2.5	47.1	115.8	30.0	69.1	51.6	81.8	49.0	57.7	50.8	116.6	43.3	25.0	96.4
Domestic trade change factor (DX)															
	-17.4	-30.1	-1.4	-81.4	-59.7	7.1	-24.5	-40.9	-22.7	-49.3	-87.8	241.2	-30.8	-52.3	300.5
Domestic technological factor (AX)															
	13.1	26.1	24.6	-103.7	23.2	66.5	-1.1	-137.7	-25.8	15.6	8.4	81.3	23.3	-6.0	160.2
Price Change (ΔP)															
	9.8	-6.7	16.1	9.6	-4.3	2.8	-5.3	-2.6	-1.8	9.3	13.2	1.1	-4.3	5.5	-1.9

Source: Computed by the authors using ADB's MRIO framework.

Sector 5. Construction (unit: percentage)

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Trade factor of import (MX)															
AUS	3.7	-4.9	-4.0	2.1	-32.5	-1.2	-1.0	-1.2	1.3	-1.1	4.3	-5.6	-0.6	7.5	5.1
CHN	-2.2	-13.0	-9.2	16.4	36.1	-16.9	1.7	3.6	-2.4	6.7	7.2	18.3	-6.6	18.7	84.7
DEU	0.2	-2.9	-1.7	1.4	-5.4	-0.5	0.4	0.4	-0.4	1.7	3.1	3.9	5.4	4.5	4.3
IDN	0.8	-1.5	-2.0	-0.6	4.9	1.4	-3.7	4.7	0.5	3.2	3.3	-0.5	3.3	14.3	18.3
IND	1.8	-0.3	-2.0	2.4	5.8	1.8	0.9	0.8	-0.6	0.5	1.6	2.5	2.1	7.7	25.6
JPN	-0.7	23.0	3.0	14.2	-32.4	24.7	12.8	6.5	6.2	12.3	18.7	-2.0	40.0	18.6	198.8
KOR	9.9	2.0	-4.8	0.3	-11.0	-2.9	1.3	1.6	1.4	0.4	7.7	-9.0	-4.7	18.1	18.3
RUS	0.5	-1.9	-0.8	1.8	-11.6	-0.3	-0.2	0.3	0.3	1.3	3.4	-3.1	0.6	-8.7	-10.0
TWN	1.0	1.2	-0.2	4.3	-18.5	-6.2	-3.5	3.3	0.5	2.5	5.0	-3.1	3.8	18.8	0.2
USA	3.6	-1.7	-4.1	6.1	-41.1	0.6	-0.1	3.7	1.0	2.6	14.3	-4.2	7.5	-6.7	7.1
MYS	-1.5	8.2	0.9	4.3	-29.5	-3.8	1.8	3.8	-1.3	4.7	10.0	-16.7	4.4	7.0	29.7
PHL	-0.1	0.3	-1.3	1.1	-8.2	2.1	-0.9	0.2	-0.4	1.9	-1.3	2.6	1.2	5.6	-0.2
THA	0.6	0.1	-0.2	-0.4	-0.3	0.5	-0.3	0.3	-0.4	0.1	4.0	1.3	-3.3	-9.1	24.7
VNM	0.7	-0.6	0.5	-3.2	4.2	-1.1	0.0	-0.4	-0.4	6.9	-1.4	-1.6	0.8	3.5	0.7
LAO	-0.1	-0.1	-0.1	0.0	28.9	-5.9	-0.3	0.0	-0.3	-0.1	0.3	0.6	-1.2	1.0	-2.9
BRN	0.1	0.1	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.1	0.1	-0.2	-3.3	-4.2	0.5
KHM	5.6	62.5	43.4	31.1	-142.8	32.9	19.0	1.9	4.3	37.7	30.5	-24.0	25.3	154.4	22.2
RoW	3.7	-4.9	-4.0	2.1	-32.5	-1.2	-1.0	-1.2	1.3	-1.1	4.3	-5.6	-0.6	7.5	5.1
Import input price factor (PM)															
AUS	0.4	1.8	2.4	1.3	-1.7	-1.4	1.3	2.2	-0.4	0.6	0.6	-0.8	-1.2	11.4	3.9
CHN	4.9	1.7	3.0	5.3	8.0	1.7	0.5	3.8	4.9	2.7	3.1	-6.3	4.2	50.9	1.6
DEU	0.4	0.4	-0.4	0.3	-3.2	0.8	0.0	1.2	0.0	0.1	0.3	-0.2	-0.7	2.6	-3.0
IDN	1.0	0.4	1.4	0.8	-3.5	-1.5	1.0	1.0	-0.1	0.4	-0.1	0.2	1.0	4.5	3.8
IND	0.2	0.6	0.7	0.2	-6.1	-1.1	0.3	0.2	0.4	0.6	0.1	-0.4	0.8	4.7	-0.3
JPN	5.3	-12.4	1.2	2.5	-3.9	-29.5	5.8	4.7	-6.7	-3.1	1.3	1.3	-7.2	-1.2	-54.6
KOR	-2.2	2.4	2.2	0.9	-1.0	1.2	-0.4	0.9	0.2	1.1	0.5	-2.5	0.4	5.7	-8.2
RUS	1.0	2.1	0.6	0.6	1.6	0.1	0.7	1.8	0.6	1.3	0.4	0.0	2.1	4.7	3.6
TWN	0.3	1.4	0.5	-0.7	-5.2	0.6	-0.6	0.1	0.4	0.6	-0.2	-0.9	0.0	4.2	2.8
USA	0.0	-0.4	0.2	0.6	5.1	0.2	-0.2	-0.1	0.2	0.3	0.4	-0.1	0.6	6.0	8.9
MYS	2.4	3.4	2.4	1.7	0.6	-1.0	0.5	3.2	1.1	0.1	1.0	-1.0	0.9	3.7	1.4
PHL	0.3	0.5	0.3	0.1	1.3	-0.1	0.1	0.2	0.2	-0.3	0.0	0.1	-0.3	0.1	-0.7
THA	0.2	0.1	0.0	0.1	0.4	0.1	0.0	0.1	0.0	0.1	0.1	-0.3	0.5	7.1	1.7
VNM	0.2	0.1	0.4	0.2	-1.3	0.1	0.0	0.0	0.0	0.2	0.0	-0.1	0.1	-0.4	-2.2
LAO	0.0	0.1	0.0	0.0	0.6	-0.1	0.0	0.2	0.1	0.1	0.1	-0.1	0.6	2.0	2.8
BRN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1
KHM	9.2	11.9	3.3	9.7	-19.9	0.9	3.3	23.5	8.8	9.7	4.2	-2.9	13.0	64.0	41.4
RoW	0.4	1.8	2.4	1.3	-1.7	-1.4	1.3	2.2	-0.4	0.6	0.6	-0.8	-1.2	11.4	3.9
Value-added factor (VA)															
	30.7	2.2	47.3	131.5	-23.7	57.4	39.7	43.4	34.5	71.1	56.8	42.9	50.0	44.8	-21.2
Domestic trade change factor (DX)															
	-14.0	-32.1	-3.6	-50.9	125.9	-5.4	-12.8	-22.6	-3.5	-62.3	-82.8	41.9	-48.9	-197.9	-356.6
Domestic technological factor (AX)															
	35.6	45.8	20.6	-85.4	279.6	51.7	33.2	6.7	50.0	-4.7	3.4	70.0	9.2	-168.2	47.8
Price Change (ΔP)															
	13.4	-7.6	13.2	12.1	1.0	4.2	-7.4	-8.3	-7.5	7.1	13.0	5.9	-3.8	2.2	2.2

Source: Computed by the authors using ADB's MRIO framework.

Sector 6. Sale, Wholesale, Retail (unit: percentage)

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Trade factor of import (MX)															
AUS	1.2	-385.1	0.2	-3.7	-6.5	-0.4	-4.0	1.2	-0.4	0.3	0.9	-1.2	0.4	-9.9	1.0
CHN	-1.1	-520.5	-4.5	5.6	4.1	-5.0	3.9	7.5	2.0	4.5	10.8	4.8	8.7	-33.4	-8.3
DEU	0.0	-292.4	-1.5	0.9	-0.2	-1.5	0.0	1.0	0.1	1.1	1.8	2.6	2.9	-3.9	0.4
IDN	0.7	-99.7	-1.7	1.5	3.3	1.1	-11.3	9.5	-2.9	1.7	-0.4	0.1	2.6	-15.2	-0.6
IND	0.8	-26.0	-1.2	0.9	1.4	0.2	1.8	0.9	0.1	0.3	2.7	1.0	2.0	-7.9	-1.8
JPN	-1.3	2668.6	-2.8	10.6	-0.8	14.3	23.2	12.5	-11.8	7.8	5.0	0.7	6.7	-5.5	-4.4
KOR	3.1	133.8	-1.6	0.8	-2.7	-2.0	2.3	2.1	-2.1	0.4	4.0	-1.4	-1.9	-15.6	-1.0
RUS	0.2	-207.1	-0.6	1.0	-1.5	-0.7	-1.5	0.3	-0.6	0.5	1.1	-0.4	0.5	6.0	1.0
TWN	0.7	263.5	-1.3	4.3	-3.1	-5.8	-9.0	6.0	-0.9	1.9	0.6	-0.1	2.4	-10.3	-0.3
USA	2.2	4.9	-3.1	4.8	-11.2	-2.0	-0.5	5.8	-1.6	1.9	9.6	0.8	11.4	-3.4	0.3
MYS	-2.0	-96.8	-1.0	3.2	-11.0	-3.8	-4.6	2.8	0.7	2.0	1.0	-1.2	2.6	-4.1	-0.2
PHL	0.5	98.3	-1.4	1.3	-3.2	1.8	-2.1	0.6	1.3	1.1	-1.2	0.7	2.0	-8.2	-0.1
THA	0.5	49.6	0.2	-0.8	-0.3	1.0	-3.1	0.6	1.5	0.0	1.4	0.6	-0.2	6.6	-1.2
VNM	0.3	33.9	-0.1	-0.7	0.3	-0.4	-0.1	-0.2	0.2	2.5	1.1	-1.0	3.4	-26.3	-0.3
LAO	-0.1	-18.6	-0.1	0.0	11.9	-5.7	-0.7	-0.1	0.8	0.0	-0.1	0.0	-0.2	-0.8	0.1
BRN	0.1	4.7	0.0	0.0	0.0	0.1	-0.3	0.0	0.2	0.1	-0.1	-0.1	-3.0	9.0	0.0
KHM	6.6	6199.0	33.2	36.8	-66.6	17.6	105.4	-35.1	-16.7	3.5	17.1	-3.4	23.5	-215.6	-15.3
RoW	1.2	-385.1	0.2	-3.7	-6.5	-0.4	-4.0	1.2	-0.4	0.3	0.9	-1.2	0.4	-9.9	1.0
Import input price factor (PM)															
AUS	0.2	132.9	1.4	1.4	0.2	-1.0	2.4	2.4	0.1	0.2	0.2	-0.2	-0.4	-8.2	-0.2
CHN	2.4	140.3	1.5	3.1	2.2	1.1	0.4	2.7	-6.5	0.6	1.4	-2.0	1.7	-43.0	0.0
DEU	0.3	42.8	-0.2	0.3	-1.1	0.6	-0.2	1.6	0.1	0.0	0.2	-0.1	-0.5	-3.9	0.5
IDN	0.7	51.6	1.0	1.3	-2.1	-2.1	5.3	2.4	0.2	0.2	-0.1	0.1	0.4	-3.3	-0.3
IND	0.1	50.7	0.3	0.1	-1.0	-0.4	0.2	0.2	-0.3	0.1	0.1	-0.1	0.5	-5.8	0.0
JPN	3.2	-1345.1	0.8	2.3	-1.2	-21.3	15.9	6.5	14.4	-1.1	0.6	0.4	-3.4	-0.3	4.7
KOR	-0.8	161.4	0.8	0.5	-0.2	0.6	-0.9	0.8	-0.3	0.2	0.2	-0.7	0.1	-5.4	0.8
RUS	0.4	166.5	0.3	0.4	0.4	0.2	1.6	1.9	-0.9	0.3	0.1	0.0	0.7	-3.4	-0.3
TWN	0.2	197.1	0.4	-0.7	-2.0	0.5	-2.1	0.1	-1.1	0.3	-0.1	-0.2	-0.1	-4.3	-0.3
USA	0.0	-82.6	0.1	0.5	1.9	0.2	-0.6	-0.4	-0.4	0.1	0.2	0.1	-0.1	-7.8	-1.2
MYS	1.1	273.4	1.4	1.4	0.2	-0.5	1.1	4.1	-2.3	0.0	0.4	-0.2	0.4	-3.1	0.0
PHL	0.3	82.8	0.2	0.2	0.6	-0.1	0.4	0.4	-0.6	-0.1	0.0	0.0	-0.2	-0.2	0.1
THA	0.1	9.7	0.0	0.1	0.3	0.1	-0.3	0.2	-0.1	0.1	0.1	-0.1	0.2	-5.7	-0.1
VNM	0.1	10.7	0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.1	1.1	1.0
LAO	0.0	8.3	0.0	0.0	0.3	-0.1	0.1	0.4	-0.4	0.0	0.0	0.0	0.1	-0.9	-0.2
BRN	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-0.2	0.0
KHM	5.7	1339.8	2.1	10.1	-12.7	2.5	7.7	34.4	-20.4	3.3	1.7	-1.4	4.6	-66.6	-3.4
RoW	0.2	132.9	1.4	1.4	0.2	-1.0	2.4	2.4	0.1	0.2	0.2	-0.2	-0.4	-8.2	-0.2
Value-added factor (VA)															
	43.2	-9019.0	53.3	239.7	39.0	108.4	146.8	95.3	34.8	90.3	84.2	69.7	61.3	65.3	80.2
Domestic trade change factor (DX)															
	-7.5	-3673.3	-1.8	-42.4	47.2	-2.0	-45.1	-21.1	17.3	-22.8	-40.3	0.5	-49.4	259.2	23.8
Domestic technological factor (AX)															
	38.0	3741.5	25.7	-185.0	114.2	4.4	-132.0	-47.1	96.2	-1.3	-4.3	31.8	19.8	275.1	25.5
Price Change (ΔP)															
	10.5	0.0	9.7	5.5	1.2	2.2	-1.1	-2.5	1.4	8.1	9.9	6.7	-2.7	-0.7	-6.4

Source: Computed by the authors using ADB’s MRIO framework.

Sector 7. Hotels and restaurants (unit: percentage)

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Trade factor of import (MX)															
AUS	2.4	119.8	-2.8	1.1	-22.7	-0.2	1.0	2.4	0.0	0.0	3.4	-3.3	-1.3	-7.2	0.3
CHN	-2.6	307.8	-5.8	6.6	1.3	-8.4	15.2	14.8	3.2	5.4	8.1	3.9	16.8	-97.3	-6.3
DEU	0.1	79.9	-1.6	1.4	-2.1	-0.5	2.2	1.4	0.1	0.9	2.5	1.1	3.1	-12.6	0.7
IDN	0.7	50.5	-1.9	2.3	5.2	2.1	-13.4	17.3	-6.3	3.3	-1.7	-0.8	2.9	-28.0	-0.3
IND	0.8	15.8	-1.6	2.4	2.1	0.2	3.0	1.4	0.9	0.5	2.3	0.0	0.8	-17.7	-1.6
JPN	-1.2	-308.1	0.4	15.6	-13.8	18.9	31.8	13.5	-11.7	6.0	7.6	-0.6	11.4	-10.0	-7.0
KOR	4.2	-30.7	-2.0	1.5	-4.8	-2.4	4.0	3.1	-2.4	0.3	4.0	-2.4	-2.8	-16.7	-1.2
RUS	0.4	114.2	-1.7	1.9	-3.2	1.4	-1.9	1.4	-2.0	1.0	1.5	-1.6	-0.5	14.6	1.8
TWN	0.5	1.6	-0.5	4.6	-5.9	-5.9	-6.0	6.2	-0.7	1.4	1.7	-0.6	1.8	-15.9	-0.3
USA	3.7	110.0	-4.4	5.3	-21.8	-1.7	4.8	10.4	0.1	2.2	13.1	-1.4	10.4	35.8	-1.0
MYS	-2.1	79.3	-0.5	4.4	-22.9	-4.4	-6.6	4.5	-3.3	2.6	1.6	-2.1	1.6	-0.9	-0.7
PHL	-0.1	-4.9	-0.9	1.2	-3.7	2.5	-2.2	1.4	1.5	1.1	-0.9	0.6	1.2	-8.4	0.3
THA	0.4	5.2	-0.4	-1.4	-0.1	2.2	-3.7	2.1	3.3	0.1	1.2	0.9	-3.9	9.1	-0.2
VNM	0.3	-2.2	0.0	-1.8	0.3	-0.7	-0.2	-0.2	0.5	2.7	0.9	-1.0	2.2	-17.2	0.0
LAO	-0.1	5.5	-0.1	-0.1	23.7	-12.1	-1.0	-0.4	1.4	-0.1	-0.1	0.0	-0.5	-1.7	0.2
BRN	0.1	-3.7	0.0	0.0	-0.4	1.0	-1.4	0.6	0.7	0.3	-0.3	-0.3	-2.7	8.0	-0.1
KHM	8.5	-2061.6	39.5	41.7	-66.2	-4.9	97.5	-71.5	-11.8	5.0	21.3	-2.4	13.7	-189.0	-28.4
RoW	2.4	119.8	-2.8	1.1	-22.7	-0.2	1.0	2.4	0.0	0.0	3.4	-3.3	-1.3	-7.2	0.3
Import input price factor (PM)															
AUS	0.1	-39.6	2.3	2.0	0.4	-1.6	2.9	3.5	0.4	0.3	0.3	-0.4	-0.8	-18.6	-0.6
CHN	3.4	-24.6	2.4	5.5	3.5	1.9	1.1	4.5	-7.7	0.8	1.5	-2.2	2.0	-54.3	-0.1
DEU	0.3	-9.2	-0.2	0.4	-1.3	0.9	-0.1	2.0	0.1	0.0	0.2	-0.1	-0.5	-4.4	0.5
IDN	0.9	-10.8	1.5	2.2	-3.7	-3.9	6.9	4.9	0.4	0.5	-0.1	0.1	0.7	-7.1	-0.6
IND	0.1	-11.3	0.6	0.2	-2.6	-1.1	0.6	0.3	-0.8	0.3	0.1	-0.2	0.6	-8.8	0.0
JPN	2.8	208.6	0.8	2.4	-1.2	-24.5	12.9	6.9	12.4	-1.1	0.5	0.4	-3.5	0.8	4.7
KOR	-1.0	-35.2	1.1	0.8	-0.3	0.9	-0.8	1.2	-0.3	0.3	0.2	-0.8	0.2	-6.4	0.8
RUS	0.7	-59.4	0.6	0.8	0.7	0.1	2.5	4.4	-1.8	0.7	0.2	0.0	1.4	-7.2	-0.5
TWN	0.2	-25.0	0.3	-0.7	-1.9	0.6	-1.4	0.1	-0.7	0.2	-0.1	-0.3	0.0	-4.6	-0.3
USA	0.0	-11.8	0.5	1.4	3.0	0.3	-0.3	-0.3	-0.8	0.2	0.2	0.0	0.4	-14.6	-1.9
MYS	1.3	-64.0	1.9	2.1	-0.1	-0.9	1.2	6.6	-2.7	0.1	0.5	-0.3	0.6	-5.2	-0.2
PHL	0.3	-10.9	0.2	0.2	0.6	-0.1	0.4	0.4	-0.5	-0.1	0.0	0.0	-0.2	-0.2	0.1
THA	0.4	-3.2	0.0	0.2	0.6	0.3	-0.4	0.5	-0.2	0.1	0.1	-0.1	0.4	-14.1	-0.2
VNM	0.1	-2.2	0.2	0.1	-0.2	0.0	-0.1	0.0	0.0	0.1	0.0	-0.1	0.1	1.1	0.7
LAO	0.0	-2.5	0.0	0.0	0.5	-0.2	0.2	0.8	-0.6	0.1	0.1	0.0	0.3	-2.1	-0.3
BRN	0.0	-0.2	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.1	0.0	0.2	-0.3	0.0
KHM	8.5	-333.7	3.1	14.6	-11.3	1.6	10.0	51.5	-25.2	5.2	2.6	-1.3	10.4	-120.2	-9.0
RoW	0.1	-39.6	2.3	2.0	0.4	-1.6	2.9	3.5	0.4	0.3	0.3	-0.4	-0.8	-18.6	-0.6
Value-added factor (VA)															
	41.4	1341.0	68.5	253.3	21.5	107.5	144.4	108.8	17.5	80.1	78.[illegible]	62.9	69.7	27.2	68.8
Domestic trade change factor (DX)															
	-8.1	587.2	-3.5	-54.7	71.8	12.2	-55.3	-27.9	17.7	-27.8	-45.5	10.6	-43.2	318.8	32.4
Domestic technological factor (AX)															
	32.4	128.2	4.0	-217.5	154.9	19.0	-147.7	-76.6	119.3	7.3	-5.7	41.9	6.7	375.3	49.5
Price Change (ΔP)															
	10.6	0.2	9.5	5.2	1.1	2.0	-1.4	-2.3	1.6	7.9	11.2	6.6	-2.6	-0.6	-6.5

Source: Computed by the authors using ADB’s MRIO framework.