

## **Production Networks and Less Developed ASEAN Countries' Export Growth**

---

**OKABE Misa**

*Associate Professor, Faculty of Economics, Wakayama University*

---

### **Abstract**

For developing countries, it is an important challenge to maximize profits and minimize risks through participation in global value chains (GVCs). This paper focuses on the impact of participation in GVCs through trade in intermediate goods on developing countries' export growth. In particular, it examines the impact of GVC participation on the number, scale and distribution of exporting firms in Cambodia and Laos, based on exporting firms' dynamics data and international input-output aggregated by type of export goods of those two countries. As a result of the analysis, it is found that in Cambodia and Laos, the degree of participation in GVCs affects individual exporting firms' behavior and leads to changes in in the number, scale and distribution of exporting firms, thereby affecting the countries' export growth. The analysis results indicate that if developing countries are to increase the number and scale of exporting firms and to achieve export growth by promoting the growth of exporting firms with high productivity through efficient resource allocation, they need to implement trade and industrial policies while taking into consideration the impact of participation in GVCs on exporting firms' behavior.

Keywords: less developed ASEAN countries, distribution of exporting firms, GVC participation index, international input-output table

JEL Classification: F14, F61, F63, O53

---

### **I. Introduction**

As the production and sales networks of goods and services have developed globally, the global value chain (GVC) is becoming an important foundation for efficient production by many companies in the world. GVCs are increasing the scale and scope of production, and many countries are involved with GVCs directly or indirectly. Under such circumstances, it is a critical issue for either developed and developing countries to maximize the profit and minimize the risk from participation in GVCs. The opportunities to promote the catching-up process by the participation in GVCs, such as job creation and acquisition of new technology, is becoming a significant key of an economic development for modern developing countries.

Many previous studies on developing countries found that participation in GVCs brings about economic benefits. In fact, many developing countries have promoted inward foreign direct investment (FDI) of multinational firms that are directly participating in GVCs, in expectation of technology transfer and job creation. On the other hand, it is also necessary to

consider that participation in GVCs for a developing country involves risks and problems. For example, as UNCTAD (2013) pointed out, particularly in the case of the least developed countries, there is a possibility that local firms will remain locked into low-technology and labor-intensive production process in GVCs. In addition, global business fluctuations may hamper growth of small and low-technology local firms in GVCs. Several theoretical studies even show that GVCs expand the disparity of income and economic welfare between developed and developing countries.<sup>1</sup>

In preceding theoretical and empirical studies, there is no common result of promoting effect on the catch-up process of developing countries by participating in GVCs, that is, no common result of promoting GVCs to enhance the advancement of industrial structure by improving productivity of domestic firms in developing countries. Based on case studies in less-developed countries, UNCTAD (2013) concluded that whether the catch-up process of developing countries is promoted or not by participating in GVCs depends on the level of economic development and the social and economic system of the country.

Although a number of empirical studies using firm-level data tackle research on the impacts of participating in GVCs on growth rate and productivity of exporting firms (hereafter exporter) in developing countries, further accumulation of research of more various countries and industries are required to arrive at a conclusion that could be widely accepted. In particular, empirical studies of developing countries are still scarce. In order to promote the catch-up process, risk minimization and profit maximization of participating in GVCs is one of the most important challenges for many modern developing countries that are involved in GVCs directly or indirectly.

This paper examines the impact of participation in GVCs via exporting on the catch-up process of developing countries, particularly focusing on the impact on the number, export volume, and the distribution of exporters. To explain the fact that the export values of developing countries are smaller compared to their economic scale than that of developed countries, Fernandes, Freund and Pierola (2016) found that the number of exporters and export value per exporter, namely the extensive and intensive margin of export, are smaller and the exit rate is higher in developing countries than that in developed countries by empirical study using exporters' data of 70 countries. They point out that the absence of large-scale exporters which lead the total export value causes the smaller export value of developing countries. Due to distorted resource allocation such as limited access to finance and restrictions on market entries, an efficient resource allocation to promote growth of firms with high technological capability has not been realized yet in developing countries. In other words, it can be said that the key of export expansion of developing countries is to increase the number of exporters and export value per exporter and to remove the restrictions of growth of exporters with high technological capability.

As GVCs are expanding, a number of empirical studies that examined the impact of exporting on firms using firm-level data discovered that technological spillovers such as tech-

---

<sup>1</sup> See Antras, Garicano and Ross-Hanberg (2006) and Costinot, Vogel and Wand (2013).

nology transfer via intermediate imports and learning by exporting are caused by trade in GVCs. Furthermore, export in intermediate goods in GVCs brings opportunities to connect to broad chains which enable to expand export to the third countries in GVCs, therefore, export of intermediate goods in GVCs enables firms to acquire larger and stable demand especially in the case of industry characterized by economies of scale. Besides, the high entry barriers and entry cost to export market prevent low-productivity firms to enter since exporters must take on a production process responding to international standards. Therefore, the rate of exit could be reduced since only firms with high productivity entry to export market.

Conditions to enjoy technological spillovers such as sufficient technological infrastructure and human capital varies by industry. Whether an exporter can access to large and stable export market through participating in GVCs depends on the situation of each industry. Likewise, the cost and barriers associate with new entrants to GVCs differ from each industry and product.

Furthermore, the share of small-scale firms in export market is relatively high in developing countries. Therefore, the fluctuations of number of exporters is large since most small-scale exporters are vulnerable to global demand and supply shocks. The structure of exporters with a large share of small-scale exporters could obstruct a stable export growth.

The main purpose of this paper is to examine whether industries that participate in GVCs can realize stable growth or not and to determine the conditions for continuing export growth of developing countries by participating in GVCs. Focusing on the ASEAN region, where multilateral inter-process division of labor has been developed under the regional integration, we examine both direct and indirect impact of participation to GVCs on the dynamics of exporters such as the number, scale and entry and exit behavior of exporters of Cambodia and Laos, the less developed newer members of ASEAN. Compared to Thailand and Malaysia, which have participated deeply in GVCs and continued to achieve export growth, the export value of Cambodia and Laos are still small. We examine whether Cambodia and Laos can grow their export levels and catch-up with the preceding members by maximizing the benefits of participation in GVCs. Specifically, we analyze whether the higher degree of participation in GVCs increases the number and exporting scale of exporters and how the degree of participation in GVCs affects firm's entry and exit behavior and the distribution of exporters using aggregated exporters' data at product-level and international input-output tables.

The structure of this paper is as follows. In section II, we review related literature to the impact of participation in GVCs on economic and export growth in developing countries. Section III provides an overview of export structure, the distribution of exporters and the degree of participation in GVCs of Cambodia and Laos. In Section IV-1, we explain our estimation equation which explains the degree of participation in GVCs affects the behavior of exporters. Section IV-2 describes data and estimation methodology. Section IV-3 discusses each estimation results of Cambodia and Laos. Lastly, we summarize our findings in Section V.

## II. Related Literature

As for theoretical study on the impact of GVCs on economic growth in developing countries, Antras, Garicano and Ross-Hansberg (2006) show that globalization with GVCs fixes international division of labor such as knowledge-intensive services and labor-intensive manufacturing in a two-country (North-South) model. In addition, Costinot, Vogel and Wand (2013) present that countries with higher productivity and income level gain more profit by participating in the lower and higher value-added stage of GVCs. These theoretical studies suggest that the catch-up process of developing countries is not realized since the inequality of global income distribution between developed and developing countries, that is between countries which specialize in knowledge-intensive and labor-intensive production process in GVCs, will be widened by globalization with GVCs. Several studies apply trade liberalization in GVCs to the heterogeneous firm model by Melitz (2003), however there are no consensus on the impact of GVCs on the catch-up process of developing countries among these studies.

On the other hand, there are many empirical studies which examine the impact of participation in GVCs on productivity of exporters in developing countries along with expansion of availability of firm/plant-level data. For example, Amiti and Konings (2007) presents that tariff reduction in intermediate goods increases productivity of Indonesian firms using firm-level data. Likewise, Blalock and Veloso (2007) shows the participation in downstream production stages in GVCs can be a channel of technological transfer using Indonesian firm-level data. As an example of recent studies using the GVC participation rate calculated by international input-output tables, Kummritz (2016) finds that the participation in GVCs improves productivity of domestic production in both developed and developing countries using the index of GVC participation.

Most of previous empirical studies show the result that participation in GVCs increases firm-level productivity. In contrast, Dai, Maitra and Yu (2016) presents that productivity level of export firms which engage in processing process in the downstream in GVCs is lower than that of non-exporting firms using Chinese firm-level data. They explain the reason of this result that many firms with lower productivity enter export market since export promoting policies such as export subsidies reduce the entry cost to export market. In addition, based on case studies on least developed countries, UNCTAD (2013) states that the development level and economic system determines whether a least developed country derives a benefit from participation in GVCs or not.

This paper is related to a series of empirical studies above mentioned in terms of examining the impact of participating in GVCs in developing countries. However, few studies have attempted to investigate the impact of participation in GVCs on the dynamics of export market in developing countries by observing the number of exporters, export value per exporter, and the change in the distribution of exporters. Many of recent theoretical framework of international trade which is based on a heterogeneous firm model by Melitz (2003) build a trade model in which a few firms with high-productivity entry export market. Our study is

one of empirical studies which aims to fill in the gap between theoretical studies with a heterogeneous firms and empirical studies by clarifying the impact of participation in GVCs on the dynamics of exporters, such as the change of the distribution, the extensive and intensive margin of exporters for further understanding on the mechanism of economic development through trade liberalization.<sup>2</sup>

There are various factors that affect the dynamics of exporters, other than trade liberalization measures, industrial policies and business cycles. However, there have been little empirical studies due to limited availability of firm-level data, especially in developing countries. In addition, the impact of GVCs on the dynamics of exporting firms has not been investigated enough. This paper undertakes to examine the impact of participation in GVCs on the dynamics of exporters and discuss the possibility of export growth in developing countries in GVCs concerning with exporting firms in Cambodia and Laos as the less developed members of ASEAN using the Exporter Dynamic Database constructed and published by the World Bank.

### **III. Export structure and the participation in GVCs of Cambodia and Laos.**

#### *III-1. Export structure and the distribution of exporters*

The trade volume of the new ASEAN members, namely Cambodia, Laos and Myanmar (hereafter CLM) is still smaller than that of the other ASEAN members. Figure 1 shows the export share of each ASEAN member out of total ASEAN export value to the world. The difference between CLM and the other ASEAN members, excluding Brunei, is quite apparent. Although the population of Cambodia is equal to 17%-51% of the population of Thailand, Malaysia and Vietnam, the export value is only in the range of 4%-6%. Likewise, while the population of Laos is equal to 7%-22% of the population of Thailand, Malaysia and Vietnam, the export value of Laos remains at less than 2% the size of these members. Vietnam, a new member of ASEAN, has achieved rapid export growth since the late 2000s. Surpassing Indonesia, Vietnam's export value ranked 4<sup>th</sup> in ASEAN in 2016, after Malaysia. The gap between Vietnam and CLM is continuing to expand.

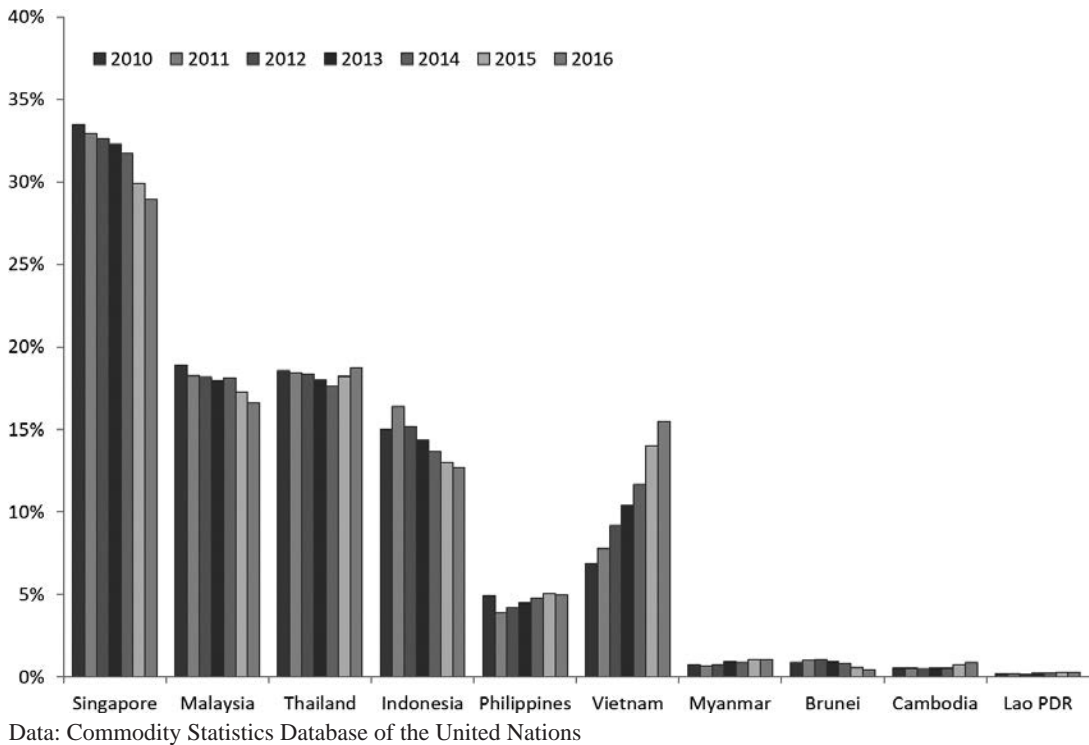
Looking at export growth, the export values of Cambodia, Laos and Myanmar have been growing in recent years as shown in Figure 2. The annual average growth rate of export value of Cambodia to the world has been above 15% after 2000. The export value in 2016 is more than eight times greater than in 2000. Myanmar's export value to the world has maintained even higher growth than Cambodia. Although Laos' export value is the smallest among these countries and its growth rate is more moderate, the export value after 2015 has increased more than 1.5 times since 2010.

While the export values for Cambodia and Laos have been increasing rapidly, the com-

---

<sup>2</sup> As for an example of such empirical studies by firm-level data, Baldwin and Forslid (2010) finds that trade liberalization decreases the extensive margin of export, namely "anti-variety effect". Besides, Gustafsson and Segerstrom (2010) presents that trade liberalization decreases productivity and innovation rate at firm-level.

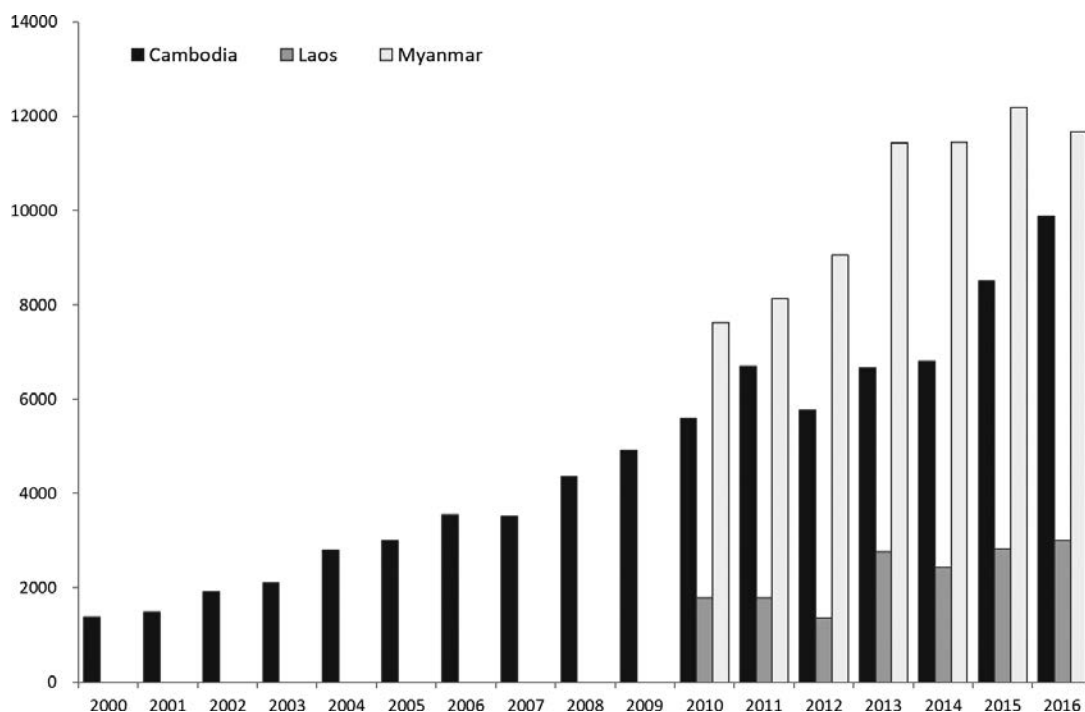
Figure 1. The share of export value in total export value of ASEAN to the world



ponents of export products have unchanged much. The major export products are primary commodities and labor-intensive goods. Tables 1 and 2 show the top 10 exported products at the HS 2-digit level in 2016 of Cambodia and Laos, respectively. In Cambodia, apparels and footwear rank among the top three export products, and the total value of the top three export categories accounts for 80% of total export value. Looking at these top three products at the HS 6-digit level, most products are final goods such as clothing products and footwears. This fact reflects that the driving force of Cambodia's exports is a labor-intensive sewing and processing industry. Other export products have also been increasing their export values, including electrical machinery and its parts rank at 4<sup>th</sup> and transportation equipment and its parts rank at 5<sup>th</sup> in 2016. Looking the details of these products at the HS 6-digit level, the major export products of these industries are labor intensive parts and components. Taking into consideration the fact that both import and export of parts and intermediate goods has been growing since 2000 in Cambodia, the growing labor-intensive manufacturing sectors, such as sewing in the apparel industry, manufacturing and processing of parts in the electrical and transportation equipment industry, have contributed to export expansion in Cambodia.

Regarding the components of export products of Laos, export in mineral resources ranks high, as shown in Table 2. Mineral resources such as mineral ores and copper account for 45% of total export value in 2016. Agricultural products such as fruits are also high in rank.

Figure 2. Export value to the world from Cambodia, Laos and Myanmar



Notes: The unit is a million US dollars. Data for Myanmar and Laos before 2010 were not available.

Data: Commodity Statistics Database of the United Nations

Table 1. Major exported products from Cambodia to the world in 2016

HS code	Product description	Export value (100 US\$)	Share	Top exported products at HS 6-digit
61	Articles of apparel, accessories (knit or crochet)	6,108,119	66.34%	Trousers, Skirts, T shirts & singlets (knit)
64	Footwear, gaiters and parts	781,779	8.49%	Footwear with leather, plastic and textile soles/uppers
62	Articles of apparel, accessories (not knit or crochet)	519,080	5.64%	Trousers, Skirts (not knit), Brassieres, babies garments
85	Electrical and electronic equipment, and parts	434,130	4.71%	Parts of line telephone, wiring sets, transformers
87	Vehicles other than railway, and parts	354,214	3.85%	Bicycles not motorised, radiators and parts of motorveh
10	Cereals	306,520	3.33%	Semi-milled, wholly milled and broken rice
71	Pearls, precious stones, metals, coins, etc	209,248	2.27%	Unwrought gold, unworked diamonds
43	Furskins and artificial fur	176,684	1.92%	Tanned or dressed mink furskins
40	Rubber and articles of rubber	167,400	1.82%	Natural rubber
42	Articles of leather, animal gut, harness, travel good	150,408	1.63%	Handbags, Containers

Data: Commodity Statistics Database of the United Nations

Both mineral resources and agricultural products are the major export products of Laos; the major destinations are Thailand and China. The export of mineral resources and agricultural products to neighboring countries supports growth in Laos. Additionally, electrical equipment and its parts, such as still cameras, wire telephones and television parts, stand third at the HS 2-digit level and account for about 14% of total export value. In consideration of growing export in electrical equipment, it seems like that firms in Laos are beginning to be

Table 2. Major exported products from Laos to the world in 2016

HS code	Product description	Export value (100 US\$)	Share	Top exported products at HS 6-digit
26	Ores, slag and ash	751,018	30.33%	Copper ores, lead ores, roasted iron pyrites
74	Copper and articles of copper	377,617	15.25%	Copper cathodes, copper alloys, wire of refined copper
85	Electrical and electronic equipment, and parts	342,091	13.82%	Still video cameras, telephone sets, parts for radio/tv
08	Edible fruit, nuts, peel of citrus fruit	227,317	9.18%	Bananas, guavas, mangoes, mangosteens
22	Beverages, spirits and vinegar	184,609	7.46%	Non-alcoholic beverages, beers
71	Pearls, precious stones, metals, coins, etc	146,213	5.91%	Unwrought gold, piezo-elec. quartz
28	Inorganic chemicals, precious metal compound, isoto	139,262	5.62%	Manganates and permanga
07	Edible vegetables and certain roots and tubers	117,702	4.75%	Manioc (cassava), sweet potatoes
62	Articles of apparel, accessories (not knit or crochet)	106,560	4.30%	Trousers
24	Tobacco and manufactured tobacco substitutes	83,394	3.37%	Cigarettes containing tobacco

Data: Commodity Statistics Database of the United Nations

involved in the labor-intensive sectors and production process in GVCs along with expanding production networks in ASEAN and East Asia.

Although the total export value of Cambodia and Laos is still smaller than that of other ASEAN members, their export values have been growing rapidly. Growth of production networks in East Asia for labor-intensive products supports the rapid increase in exports from Cambodia and Laos. An economic environment that encourages domestic firms to increase their productivity promotes more firms to enter the export market; it also supports the expansion of the production scale for firms with high productivity. These changes are ultimately necessary for sustainable export growth, realization of the catch-up process and the advancement of the industrial structure in Cambodia and Laos.

Next, we examine the dynamics and distribution of exporters in Cambodia and Laos using the Exporter Dynamics Database (hereafter EDD), constructed and published by the World Bank.<sup>3</sup> According to Fernandes, Freund and Pierola (2016), the distribution of export value of exporting firms is close to a Pareto distribution in developed countries; that is, the number of top exporters in terms of export value is small, but the share of their export value in the total export value is high. On the other hand, Fernandes, Freund and Pierola (2016) discovered that there are many small and medium size exporters and that the share of export value of top exporters is low in developing countries. To explain this difference in the dynamics of exporters between developed and developing countries, Fernandes, Freund and Pierola (2016) point out that efficient resource distribution provides export firms with high productivity, enabling them to grow faster and become large-scale exporters that lead export growth in developed countries.

Table 3 shows the data related to the dynamics and distribution of exporters in Cambodia from 2000 to 2009 and in Laos from 2006 to 2010 based on EDD previously mentioned. A key feature of the distribution of exporters in Cambodia is that there is a smaller number

<sup>3</sup> EDD is constructed by custom clearance data of 70 countries, including Cambodia and Laos at the HS 6-digit level, and published on the website of the World Bank (<http://microdata.worldbank.org/index.php/catalog/2545>). Sample periods vary by country. For details, see Cebeci, Fernandes, Freund and Pierole (2012).



Table 3. GVC Participation Index in each ASEAN member in 2015

	High Income Countries	Middle Income Countries	Upper-Low Income Countries	Low Income Countries	Cambodia	Laos
Number of exporters	21,906	11,447	3,075	909	536	527
Export value per exporter	3,823,479	2,802,720	1,959,803	1,325,251	4,049,447	1,477,528
Export value per exporter (median)	41,371	59,001	84,743	34,274	380,882	39,976
Export value per entrant (Mean)	330,996	300,350	279,118	154,768	621,736	166,059
Export value per exiter (Mean)	263,468	217,168	180,214	107,618	321,961	70,929
Growth rate of Incumbents	3.8%	3.4%	4.7%	4.3%	7.0%	14.1%
Growth rate of surviving entrant	33.8%	37.4%	47.3%	39.4%	60.1%	68.1%
HH index	1.7%	5.0%	6.3%	8.7%	1.2%	34.6%
Share of top 5% exporters in total export value	85.4%	83.3%	76.0%	81.0%	45.0%	88.8%
Share of top 25% exporters in total export value	98.3%	97.7%	96.2%	97.4%	88.4%	97.9%
Number of entrants	7,468	3,732	1,064	435	185	268
Firm entry rate	33.5%	35.0%	38.0%	47.2%	34.8%	47.6%
Number of exiters	6,998	3,575	1,032	382	168	197
Firm exit rate	32.5%	33.7%	36.9%	43.4%	32.7%	39.7%
Entrant 1st Year Survival Rate	39.6%	44.0%	43.7%	37.4%	45.6%	50.9%

Data: Eora-MURIO database

of exporters and a larger export value per exporters. Additionally, both entry and exit rates are lower, while the survival rate is higher. The feature of exporters in Cambodia is different from the average feature of developing countries presented by Fernandes, Freund and Pierola (2016). However, the share of export value in the total export value of the top 5% exporters and a bias of distribution are both small, similarly to the case of developing countries in Fernandes, Freund and Pierola (2016). To sum up, key features of exporters in Cambodia are (1) the small dispersion of export scale of exporters and (2) a few large-scale and stable exporters. Based on the above observations, we may conclude that the key to sustainable export growth and advancement of trade structure of Cambodia is providing the foundations for enhancing firms with higher productivity for the entry export market and promoting such exporters to grow more larger-scale exporters.

Looking at exporters in Laos, both the number of exporters and the export value per exporter are small, and both entry and exit rate are high. It can be said the distribution of exporters in Laos is a typical example of developing countries. Although export value per exporter is the same level as the average value of less-developed countries with a lower income level than Laos, the entry rate is higher than the exit rate and the survival rate of exporters is higher than the average of developing countries. Accordingly, it can be said that export growth in recent years in Laos has been supported by an increase in the number of exporters. In contrast to Cambodia, the share of export value of top 5% of exporters is higher than the average level of developing countries. According to an empirical study using firm-level data of developing countries by Freund and Pierola (2016), top five exporters, namely “export super stars” contribute export growth and diversification. Most export superstars in developing countries are multilateral firms established by the FDI. In the same

way, exports in Laos are supported by the large top exporters. In consideration of these features, it can be said that the key to sustainable export growth in Laos is to realize more efficient resource allocation, which facilitates firms with high productivity to enter the export market and supports exporters with high productivity to achieve sustainable growth.

### III-2. *The GVS participation Index*

An often-used index to measure the degree of participation in GVCs is the GVC Participation Index created by Koopman, Wang and Wei (2012). The GVC Participation Index is a measure of a country's involvement level in global production chains in which a value-added produced in a country is input into a production process of intermediate good in export partner exporting to the third country as intermediate input. The GVC Participation Index is computed by the value-added produced by each country included in exported intermediate goods using value-added ratio and export ratio of intermediate good based on international input-output tables.

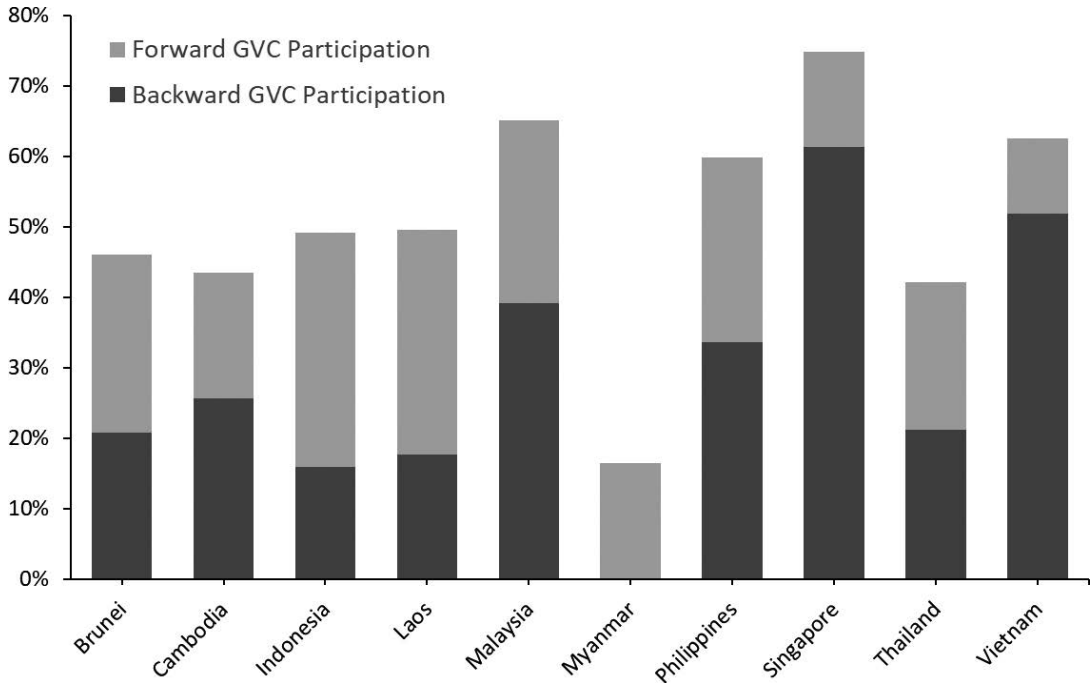
As the formula below shows, the calculation methods are as follows: the value-added produced by industry  $k$  in the home country which is exported and put into industry  $k$  in country  $j$  to produce intermediate goods and re-exported to the third country divided by total export value of industry  $k$  in home country is a share of "forward participation". In a similar way, value-added produced by industry  $k$  in country  $h$  which is used by industry  $k$  in home country to produce intermediate goods divided by total export value of industry  $k$  in home country is a share of "backward participation". The sum of forward and backward participation is the GVC Participation Index.

$$\text{GVC Participation Index}_{ijk} = \frac{V_{hk}}{E_{ik}} + \frac{V_{ik}}{E_{ik}}$$

Figure 3 shows the GVC Participation Index of each ASEAN member in 2015 calculated using international input-output tables. For Brunei, Indonesia, Myanmar and Laos, which have relatively high shares of export in mineral resources and agricultural products, the share of forward participation is higher than the share of backward participation. On the other hand, Malaysia, Singapore, Philippines and Vietnam, which engage in inter-process division of labor in production networks across ASEAN and East Asia, have a higher share of backward participation than forward participation.

In Cambodia, the share of backward participation is slightly higher than forward participation. This reflects the characteristics of the export structure of Cambodia, where labor-intensive and lower value-added sectors, in particular the apparel, food and electrical equipment industries, account for a large part of export sectors. According to the WTO (2016), the annual growth rate of the GVC Participation Index from 1995 to 2011 was 16%. This figure is much higher than the 13% and 8% average rates in developing countries and developed countries, respectively. Cambodia's GVC Participation Index in 2015 is close to the average rate of all ASEAN members. This suggests that production and export are growing gradually in GVCs in East Asia. In contrast, Laos has a relatively high share of forward par-

Figure 3. Summary of the dynamics of exporters by country group, Cambodia and Laos



Data: Exporter Dynamics Database by the World Bank Group

ticipation, and the share is higher than the average of ASEAN members. However, the share of backward participation is still low in each industry. This reflects that Laos’s participation in inter-process division of labor in production networks, namely import and export in intermediate goods, is still low. In terms of GVC participation and export structure, the composite of GVC participation in Cambodia and Laos are contrasting. The next section discusses the impact of GVC participation on the dynamics of exporters in Cambodia with higher backward participation and Laos with high forward participation.

#### IV. The impact of participation in GVCs on exporters

##### IV-1. Firm’s export behavior

A firm that maximizes profit enters the export market if the expected profit from exporting is greater than zero. Based on a dynamic model of the export decision-making process by a profit-maximizing firm by Bernard and Jensen (2004), a firm starts exporting if the expected profit, or the present value of the future sum of profits by exporting, is greater than sunk cost, namely if the export market entry cost meets the criteria presented in the following equation:

$$p_t q_{it} + \delta (E_t[V_{it+1} | q_{it} > 0] - E_t[V_{it+1} | q_{it} = 0]) > c_{it}(X_t, Z_{it}, q_{it}) + N_{it} \cdot (1 - Y_{it-1}) \quad (1)$$

where,  $p_t$  is the export price,  $q_{it}$  is the export value of firm  $i$ ,  $X_t$  is a vector of exogenous

factors that affect export profit, such as the exchange rate and trade policy.  $Z_{it}$  is a vector of specific factors of firm  $i$ , such as the technology level of firm  $i$ .  $N_{it}$  is the sunk cost of export market entry, and  $Y_{it}$  is a binary variable denoted as one if firm  $i$  starts to export at year  $t$  and zero otherwise. We use the following model in which a firm's entry to the export market is determined by expected profit and export market entry cost in the same way as Bernard and Jensen (2004).

$$Y_{it} = \begin{cases} 1 & \text{if } \alpha X_t + \beta Z_{it} - N(1 - Y_{i,t-1}) + \varepsilon_{it} > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

We use the following equation for estimation assuming that the firm's export behavior determines the number of exporters and the firm's export behavior is determined by the distribution of exporter's scale, the firm's entry and exit rate to/from exporting market, and exogenous environmental factors inherent to each industry.

$$\begin{aligned} \text{Exportdynamics}_{ijt}^{kl} \\ = F(GDP_{jt}, GDPPC_{jt}, Distance_{ij}, FTA_{ijt}, GDPVol_{jt}, GVCForward_{ijt}^k, \\ GVCBackward_{ijt}^k, Yeardummy_t, HSdummy_t, Industrydummy_k) \end{aligned} \quad (3)$$

where,  $i, j, t, k$ , and  $l$  represent the home country, export partner country, year, industry, and product at the HS 2-digit level, respectively.  $X_t$  is a vector of exogeneous factors, namely the destination country's real GDP ( $GDP_{jt}$ ), real GDP per capita ( $GDPPC_{jt}$ ) and real GDP volatility ( $GDPVol_{jt}$ ), which represent the size of the export market, the income level, and the demand change risk of the export partner country respectively. As for other exogeneous factors, we use geographical distance ( $Distance_{ij}$ ) and Free Trade Agreement ( $FTA_{ijt}$ ) between home country and export partner country. Dummy variables for industry ( $Industrydummy_k$ ), year ( $Yeardummy_t$ ), and product at the HS 2-digit level ( $HSdummy_t$ ) are used to capture various exogeneous factors, such as industrial regulations and policies, technological innovation at the industry or product level and macroeconomic policy and business cycles at the nation-wide level.

Our major interest is the impact of participation in GVCs. We use the degree of forward GVC participation and backward GVC participation as explanatory variables for the degree of participation in GVCs. The degree of participation in GVCs of an industry, including a firm's exported product, is regarded as an exogeneous condition for each firm. The reason for this assumption is that a firm in the home country exporting to country  $j$  a product included in industry  $k$  has little influence on forward and backward participation in GVCs of industry  $k$ , since these participation degrees depend on productivity in the production of a source country's value-added of intermediate goods imported by industry  $k$  and the choice of importing intermediate goods by industry  $k$  in country  $j$ .

Forward GVC participation is the share of value-added included in export of industry  $k$  of the home country that is used as intermediate goods in industry  $k$  of an export partner country and that will furthermore be exported to a third country. The higher the degree of forward GVC participation, the larger and more stably the industry can export, since the in-

dustry can export to not only export partner countries but also to many third countries in GVCs. The material industry, such as primary and natural resource sectors or the manufacturing industry producing high-tech parts, is mentioned as an example of an industry with a high forward GVC participation. Industries with higher forward GVC participation than other industries include the agriculture and fishing sectors in Cambodia and the agriculture and mining sectors in Laos.

In addition, high forward GVC participation implies that the industry is more involved in supply chains connecting with the export partner country and the third countries. Therefore, it is considered that an exporter in the industry with higher forward GVC participation is more affected by the size, income level and business cycles of the export partner country. Likewise, industry with higher forward GVC participation may facilitate more firms to enter the export market by reduction of export market entry cost, such as import tariff reduction by an export partner country. In addition, the higher forward GVC participation increases opportunities for firms to receive information of technology from their clients. Taking all indirect effects from forward GVC participation into account, we add interaction terms of the degree of forward GVC participation with GDP, GDP per capita, GDP volatility of export partner country, distance and FTA between home country and export partner country as explanatory variables.

On the other hand, the degree of backward GVC participation represents the share of value-added produced in import partner country, which is used to produce intermediate goods to export from the home country. Compared to forward GVC participation, backward GVC participation is higher in the case of developing countries, since more firms are involved in labor-intensive production processes in the downstream of GVCs. It is conceivable for the case of developing countries that both entry and exit rates are higher, since a lower entry cost to export market in labor-intensive production processes facilitates more firms to enter while firms with low productivity exit. In contrast, it is possible that backward GVC participation provides firms in home country more opportunities to improve productivity by technology spillovers via imported high-tech intermediate products. According to UNCTAD (2013), there are two possible impacts of backward GVC participation in labor-intensive industries of developing countries. One is possibility that backward GVC participation brings opportunities for industrial upgrading through technology dissemination. The other is possibility that backward GVC participation remains the industry in low-technology production process, namely locked-into low value-added production process. UNCTAD (2013) points out that the potential impact of GVC participation depends on the nature of the GVCs itself and the business and institutional environment in home country. Therefore, it is expected that the impact of backward GVC participation on exporters' dynamics varies by industry and exported product

EDD does not include information of exporter's import. Hence, we use the share of value-added imported from the world which is used for production in each industry in home country as the degree of backward GVC participation. This index, explanatory variable  $GVCBackward_{ijt}$  is used to estimate the impact of backward GVC participation on exporters

dynamics in Cambodia and Laos.

#### *IV-2. Data and estimation methodology*

As for dependent variables, we use aggregated exporter data at the HS 2-digit level of Cambodia and Laos from EDD published by the World Bank instead of firm-level data. Using EDD, we can utilize the number, average export size of exporters, entry and exit rate, and the number of entry and exit firms at product level by export partner country yearly. For estimation, we use exporters' data at the HS 2-digit level by export partner country from 2000 to 2009 for Cambodia and from 2006 to 2010 for Laos. As for data of Cambodia, the available maximum number of export partner country and product at the HS 2-digit level are 169 countries and 93 products. Total number of observations for estimation is 8714, which is the maximum number times 10 years minus missing data and dropped data due to inconsistency with classification of each explanatory variable. As for data of Laos, the available number of country and product are 101 countries and 89 products. In the same way as Cambodia, due to missing and inconsistency, the number of observations for estimation of Lao is 2034 to the maximum.

Dependent variables, variables related to the dynamics of exporters, are classified into three groups. First, the extensive and intensive margin of export, namely the number of exporters and export value and export growth per exporter are used as variables which capture export growth. Export value per exporter and the average export growth of exporters by incumbent, exiting, and surviving exporter are used to measure the growth and dynamic change of export market at the level of the HS 2-digit and partner country. Next, we use the entry, exit and survival rate of exporters in year  $t+1$  to measure the dynamics of distribution of exporters in each market at the level of the HS 2-digit and partner country. Lastly, the Herfindahl-Hirschman Index (hereafter HHI) which measure the market concentration, and the rate of entrant firms to the total export value in each market at the level of the HS 2-digit and partner country is used to measure the competition environment of the market.

As for the major explanatory variables, we compute the forward and backward GVC participation indexes explained in Section III-2 using the Eora26 dataset from Eora-Murio database as variables which measure the degree of GVC participation of each industry.<sup>4</sup> Using Eora 26, which covers 26 industries of 187 countries from 1990 to 2015, we compute the forward and backward GVC participation indexes in agriculture, fishing, mining, and seven manufacturing sectors in Cambodia and Laos by industry, export partner country, and year using intermediate input/output from/to home and foreign countries, final goods input/output from/to home and foreign countries and value-added of each sector.

---

<sup>4</sup> Eora-Murio (Multi-Region Input-Output) database is the global supply chain database including a time series for 1990-2015 of high-resolution input-output tables for 190 countries. This database project was funded by the Australian Research Council and constructed by the core Eora team led by Professor Manfred Lenzen. The data is available at the website of Eora Global MRIO (<http://www.worldmrio.com/>). See also, Lenzen, Kanemoto, Moran and Geschke (2012), and Lenzen, Moran, Kanemoto and Geschke (2013) for further details.

Regarding other explanatory variables, the real GDP and real GDP per capita of each export partner are used from the World Development Indicators (hereafter WDI) of the World Bank. GDP volatility is calculated by real GDP from WDI computing a standard deviation of past three years. GDP and GDP per capita of the Republic of China are from National Account Statistics of Statistical Bureau of the Republic of China.<sup>5</sup> Geographical distance between Phnom Penh/Vientiane and the largest city of export partner country is from GeoDist database of Research and Expertise on the World Economy (Le Centre d'études prospectives et d'informations internationales (CEPII)).<sup>6</sup>

Dependent variables of the estimation equation are the number of exporter and the average export value per exporter, the rate of entry and exit, HH index and the ratio of export value of entrants in total export value at HS 2-digit level by export partner country. This product-partner-year panel data are pooled for estimation. Product, industry and year dummies are added to the estimation equation to capture exogenous factors. Sample periods, from 2000 to 2010 includes several global economic events having effects on Cambodia and Laos such as the abolition of the quota system of The Multi-Fibre Arrangement in 2004, and the global financial crisis in 2009, hence these exogenous events are captured by year dummies.

The forward and backward GVC Participation Indexes are computed by industry. There is a possibility of a reverse causality that exporter's behavior affects the degree of GVC participation at industry level in the case of industry with a few numbers of exporters. In order to avoid such simultaneity, we apply the two-stage least square method using one-year lag of forward and backward GVC participation and each interaction terms of forward GVC participation as instrumental variables.

We use four pooled datasets to ensure some large number of samples, namely all industries, manufacturing industry, textile and apparel industry and electrical and general machinery industry. Table 4 and 5 shows estimation results of all industries, manufacturing industry, textile and apparel industry and electrical and general machinery industry of Cambodia, and all industries, manufacturing industry, textile and apparel industry and electrical and machinery industry of Laos.

### IV-3 Estimation Results

#### IV-3-1. Cambodia

##### (1) The impact of participation in GVCs on Growth of Export Market

Table 4 shows the estimation results of each industry in Cambodia, using the number of exporters and the average export value per exporter at the HS 2-digit level as the dependent

<sup>5</sup> GDP and GDP per capita are used from the website of Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Republic of China (<https://eng.stat.gov.tw/>).

<sup>6</sup> CEPII constructs the database of geographic bilateral data for 225 countries. This database is available online at: [http://www.cepii.fr/CEPII/en/bdd\\_modele/bdd.asp](http://www.cepii.fr/CEPII/en/bdd_modele/bdd.asp)

Table 4. Estimation results on the number of exporters and export value per exporter/entrant, Cambodia

	Number of exporters				Export value per exporter				Export value per entrant			
	All industries	Manufacturing	Textile & apparel	Electrical & general machinery	All industries	Manufacturing	Textile & apparel	Electrical & general machinery	All industries	Manufacturing	Textile & apparel	Electrical & general machinery
ln (GDP j)	0.359*** (0.0257)	0.358*** (0.0271)	0.393*** (0.0274)	-0.652* (0.381)	0.682*** (0.0662)	0.630*** (0.0679)	0.574*** (0.0574)	1.952** (0.922)	0.523*** (0.0839)	0.427*** (0.0845)	0.374*** (0.0744)	1.504 (1.156)
ln (GDP per capita j)	0.121*** (0.0431)	0.203*** (0.0467)	0.249*** (0.0522)	1.140*** (0.275)	0.250** (0.111)	0.328*** (0.116)	0.694*** (0.107)	-0.434 (0.806)	0.0788 (0.148)	0.3025** (0.148)	0.596*** (0.140)	-1.090 (1.047)
ln (Distance)	-0.400*** (0.0233)	-0.390*** (0.0250)	-0.297*** (0.0343)	-0.549*** (0.0791)	-0.158*** (0.0595)	-0.0989 (0.0607)	0.0493 (0.0653)	-0.620* (0.335)	-0.297*** (0.0704)	-0.284*** (0.0714)	-0.0740 (0.172)	-0.372 (0.410)
FTA	-0.310*** (0.0871)	-0.280*** (0.100)	-0.465*** (0.123)	1.073** (0.514)	-0.641*** (0.213)	-0.498** (0.233)	-0.189 (0.242)	-1.184 (1.525)	-0.484* (0.249)	-0.464* (0.264)	-0.172 (0.291)	0.0331 (1.801)
ln (GDP volatility)	0.322** (0.131)	0.277* (0.146)	0.274* (0.141)	0.0163 (0.969)	0.721** (0.317)	0.704** (0.338)	0.424 (0.298)	3.804** (1.910)	0.729 (0.449)	0.597 (0.465)	0.0379 (0.448)	5.615** (2.467)
ln (Forward GVC Participation)	1.778*** (0.689)	2.370*** (0.869)	2.343 (2.137)	0.998 (2.375)	14.41*** (2.050)	21.57*** (2.376)	35.70*** (4.444)	6.032 (8.362)	9.865*** (2.466)	11.93*** (2.758)	31.83*** (5.470)	7.942 (9.786)
ln (Backward GVC Participation)	-0.571 (1.759)	0.70 (1.933)	2.935 (2.066)	12.19 (13.99)	-12.75*** (4.586)	-12.37** (4.828)	-2.923 (4.853)	-50.83* (28.56)	-12.58** (6.366)	-10.81* (6.555)	0.786 (7.078)	-61.78* (33.72)
Forward GVC * GDP	-0.373*** (0.0712)	-0.342*** (0.0749)	-0.169** (0.0846)	1.806** (0.899)	-0.677*** (0.185)	-0.403** (0.191)	0.159 (0.181)	-4.172* (2.246)	-0.265 (0.232)	0.0480 (0.236)	0.502** (0.233)	-3.092 (2.813)
Forward GVC * GDP per capita	-0.188* (0.113)	-0.376*** (0.121)	-0.118 (0.156)	-2.756*** (0.635)	-0.424 (0.306)	-0.768** (0.317)	-1.700*** (0.335)	-0.105 (1.909)	-0.192 (0.414)	-0.796* (0.411)	-1.565*** (0.444)	0.995 (2.385)
Forward GVC * Distance	0.000730*** (5.59e-05)	0.000792*** (5.80e-05)	0.000986*** (6.74e-05)	0.00168*** (0.000574)	0.000507*** (0.000144)	0.000601*** (0.000146)	0.00110*** (0.000142)	5.14e-06 (0.00234)	0.000551*** (0.000166)	0.000529*** (0.000169)	0.000886*** (0.000175)	0.000625 (0.00260)
Forward GVC * FTA	0.0255 (0.235)	-0.0665 (0.263)	0.446 (0.404)	-2.929** (1.217)	0.709 (0.596)	0.154 (0.642)	-1.718** (0.818)	0.0762 (4.003)	-0.0561 (0.700)	-0.263 (0.732)	-1.690* (1.000)	-2.814 (4.810)
Forward GVC * GDP Volatility	-1.168*** (0.367)	-1.018** (0.403)	-1.077** (0.436)	-0.103 (2.608)	-2.936*** (0.928)	-2.925*** (0.975)	-1.873* (0.973)	-10.30** (5.034)	-3.141** (1.319)	-2.728** (1.351)	-0.784 (1.453)	-14.37** (6.353)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product dummies (HS 2-digit)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-5.946*** (0.729)	-6.907*** (0.759)	-8.623*** (0.722)	11.98** (5.372)	-6.496*** (1.824)	-6.015*** (1.737)	-10.73*** (1.489)	-12.32 (19.47)	-0.206 (2.388)	0.785 (2.239)	-6.903*** (2.044)	10.57 (22.84)
Number of observations	4,150	3,827	2,148	340	2,742	2,579	1,642	182	2,253	2,137	1,370	157
R squared	0.474	0.482	0.557	0.507	0.415	0.434	0.554	0.185	0.300	0.308	0.396	0.175

Notes: Figures in the parenthesis are standard errors. \*\*\*, \*\* and \* denotes the significant level at 1%, 5% and 10%.

variable to examine the impact of GVC participation on the export market growth. Objects necessary to expand Cambodia's exports must be an increase of the number of exporters and growth of the top exporters since the aspects of exporters in Cambodia are the fewer number of exporters, larger export value per exporter, and the smaller variance of the distribution of exporter's export value, as described in Section III-1,

On the whole, the results suggest that the number of exporters and the export value per exporter are increased by larger GDP and GDP per capita of export partner country and lower transportation cost between Cambodia and export partner country measured by geographical distance. The larger demand of export partner country is a possible increasing factor of the number of exporters since it increases the expected profit from exporting and decreases the cost of entry to export market.

In the case of textile and apparel industry, the estimated coefficient of GDP per capita is positive and statistically significant. This positive coefficient presents that the higher income level of export partner country increases the number of exporters and the export value per exporter increases more in Cambodia's textile and apparel industry. This result implies that exports to the large markets in Europe and North America is one of promoting factors which support the rapid growth in textile and apparel industry in Cambodia. On the other hand, the effect of FTA between Cambodia and export partner depends on industry. While the number of exporters in all industries, manufacturing and textile and apparel industry are reduced by FTA, the number of exporters in general and electrical machinery are increased by FTA.



While the U.S. and European countries are the largest destinations of exported knit wear from Cambodia, ASEAN members, China and Japan are the largest destinations of export in general and electrical machinery from Cambodia. The result suggests that only FTA with the major export destination countries has a positive impact on the number of exporters.

Taking a look at the impact of GVCs participation at industry on the number of exporters and export value per exporter, the coefficient of forward GVC participation on the number and the average export value per exporters in general and electrical machinery industry is positive and statistically significant. This suggests that the higher forward GVC participation increases the number of exporters and export value per exporter. Considering fewer number of exporters compared to the average of developing countries, forward GVC participation is one of keys to promote export growth in Cambodia.

As for backward GVC participation, there is no clear impact of backward GVC participation on the number of exporters, however, it has a reducing impact on export value per exporter. Besides, the higher backward GVC participation decreases the export value per new entrants. As will be discussed in Section IV-3-1-(2), this implies that backward GVC participation increases the rate of entry and facilitates more smaller exporters to enter in export markets.

Using the interaction terms of forward GVC participation and other explanatory variables, we examine the indirect impact of forward GVC participation on exporter growth. Estimated coefficients of interaction variables of forward GVC participation with economic scale and income level of export partner countries are negative and statistically significant in most cases. This result suggests that the number of exporters and export value per exporter increases in Cambodia when export partner country is small and developing countries, at the same time the place producing goods which uses value-added produced in Cambodia as intermediate products. This implies that the participation in GVCs as an exporter of intermediate goods to relatively small developing countries enhances the increase of number of exporters in Cambodia.

As for the interaction term of forward GVC participation with GDP volatility of export partner country, the estimated coefficient is negative and statistically significant. This suggests that business cycles are small and stable economic fluctuations is a facilitating factor of growth of the number of exporters and export value per exporter in industries with the higher degree of forward GVC participation. In other words, the key factor of promoting export for industries in the upstream of GVCs such as the primary products in Cambodia is stable economic fluctuations in export partner countries.

## (2) The impact of participation in GVCs on the distribution of exporters

Next, Table 5 shows the estimation results of the impacts of GVCs participation and other factors on the rate of both entry and exit and the distribution of exporters. Impact of GDP, namely the size of economy of export partner country on the rate of entry and exit are negative and statistically significant in all industries, manufacturing industries and textile and apparel industry. Likewise, the income level of export partner country increases the rate of

Table 5. Estimation results on the rate of entry, exit and survival, HHI and share of entrants' export, Cambodia

	Entry rate			Exit rate			Survival rate (2nd year)			HHI Index			Share of entrants in Total export value				
	All industries	Manufacturing	Textile & apparel & machinery	All industries	Manufacturing	Textile & apparel & machinery	All industries	Manufacturing	Textile & apparel & machinery	All industries	Manufacturing	Textile & apparel & machinery	All industries	Manufacturing	Textile & apparel & machinery		
ln (GDP <sub>t</sub> )	-0.108*** (0.0157)	-0.103*** (0.0162)	-0.0955*** (0.0167)	-0.0874*** (0.0125)	-0.0863*** (0.0129)	-0.0858*** (0.0133)	0.218 (0.134)	-0.0979* (0.0564)	-0.0791 (0.0545)	-0.0896* (0.0251)	-0.239*** (0.0237)	-0.251*** (0.0250)	-0.259*** (0.0547)	-0.308*** (0.0560)	-0.287*** (0.0543)	0.177 (0.559)	
ln (GDP per capita <sub>t</sub> )	0.0133 (0.0275)	-0.0100 (0.0282)	-0.0632* (0.0323)	-0.090698 (0.0219)	-0.0929 (0.0226)	-0.0653** (0.0262)	-0.251* (0.133)	-0.0170 (0.129)	-0.0560 (0.126)	-0.0521 (0.117)	-0.0405 (0.0736)	-0.0779* (0.0468)	-0.0356 (0.0959)	-0.122 (0.0619)	-0.161 (0.0743)	-0.330 (0.445)	
ln (Distance)	0.0136 (0.0138)	0.00311 (0.0144)	-0.0104 (0.0201)	0.0428*** (0.0109)	0.0283** (0.0119)	0.00945 (0.0185)	0.0446 (0.0281)	0.174*** (0.0593)	0.164*** (0.0619)	0.122* (0.0713)	0.186*** (0.0202)	0.172*** (0.0285)	-0.0250 (0.0480)	-0.0691 (0.0494)	-0.0743 (0.0654)	0.129 (0.129)	
FTA	0.0958* (0.0501)	0.0720 (0.0543)	0.0899 (0.0705)	0.0543 (0.0396)	0.0483 (0.0449)	0.0586 (0.0610)	-0.565*** (0.208)	-0.271 (0.195)	-0.348* (0.209)	-0.0833 (0.240)	0.0240 (0.0724)	0.0174 (0.105)	0.0948 (0.174)	-1.256*** (0.413)	0.300 (0.186)	0.303 (0.229)	-0.535 (0.695)
ln (GDP volatility)	-0.280*** (0.0870)	-0.292*** (0.0931)	-0.291*** (0.0948)	-0.145* (0.0759)	-0.161* (0.0859)	-0.174** (0.0850)	0.598 (0.548)	-0.390 (0.297)	-0.335 (0.309)	-0.222 (0.266)	-0.369*** (0.108)	-0.342*** (0.118)	-0.347*** (0.130)	-0.376 (0.320)	-0.547* (0.308)	1.044 (1.416)	
ln (Forward GVC Participation)	-2.353*** (0.443)	-3.096*** (0.507)	-3.274*** (0.234)	-1.662*** (0.308)	-2.513*** (0.386)	-3.505*** (0.108)	-0.802 (0.791)	-5.316** (2.359)	-7.878*** (3.028)	-1.592* (0.829)	-1.426** (0.697)	-1.592* (0.829)	-3.717* (1.939)	-10.92*** (1.742)	-4.293 (4.022)	0.165 (3.696)	
ln (Backward GVC Participation)	3.302*** (1.165)	3.241*** (1.232)	3.153** (1.386)	1.200 (1.015)	1.332 (1.127)	1.179 (1.262)	-10.11 (7.886)	7.567 (5.417)	6.270 (5.792)	3.027 (5.484)	3.466** (1.558)	2.666 (1.684)	1.645 (2.118)	4.777 (4.230)	5.404 (4.502)	-19.43 (20.67)	
Forward GVC * GDP	0.182*** (0.0436)	0.154*** (0.0450)	0.0444 (0.0525)	0.103*** (0.0377)	0.0907*** (0.0344)	-0.09005 (0.0401)	-0.612* (0.327)	0.0656 (0.196)	-0.0295 (0.194)	-0.0397 (0.209)	0.327*** (0.0628)	0.307*** (0.0666)	0.152* (0.0789)	0.551*** (0.154)	0.298* (0.171)	-0.493 (1.335)	
Forward GVC * GDP per capita	-0.141* (0.0732)	-0.0733 (0.0981)	0.00147 (0.0343)	-0.0513 (0.0563)	-0.0114 (0.0568)	0.0753 (0.0740)	0.530 (0.323)	-0.220 (0.400)	-0.0633 (0.387)	-0.424 (0.377)	-0.0510 (0.104)	0.0382 (0.110)	-0.0657 (0.146)	-0.149 (0.255)	0.0519 (0.319)	0.391 (1.027)	
Forward GVC * Distance	-0.000155*** (3.10e-05)	-0.000178*** (3.17e-05)	-0.000228*** (3.86e-05)	-0.000177*** (2.42e-05)	-0.000190*** (2.51e-05)	-0.000230*** (3.10e-05)	-0.000420 (0.00283)	-0.000168 (0.00150)	-0.000230 (0.00158)	-0.000511 (0.00182)	-0.000340*** (4.90e-05)	-0.000378*** (5.10e-05)	0.000537*** (6.20e-05)	-0.0002231** (0.000108)	0.000479*** (0.000125)	-0.00121 (0.000971)	
Forward GVC * FTA	-0.225* (0.136)	-0.145 (0.145)	-0.0325 (0.237)	-0.104 (0.104)	-0.0869 (0.115)	-0.0415 (0.200)	1.413*** (0.491)	1.036 (0.643)	1.284* (0.679)	0.220 (0.894)	0.390* (0.202)	0.407* (0.224)	0.264 (0.357)	3.270*** (1.084)	-0.510 (0.498)	-1.421 (2.517)	
Forward GVC * GDP Volatility	0.904*** (0.247)	0.930*** (0.261)	1.050*** (0.269)	0.455** (0.210)	0.500** (0.233)	0.582** (0.261)	-1.543 (1.447)	1.807* (1.077)	1.613 (1.112)	1.307 (1.053)	1.286** (0.315)	1.195*** (0.340)	1.313*** (0.424)	1.202 (0.896)	1.887* (0.965)	-2.517 (3.803)	
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Product dummies (HS 2-digit)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Constant	0.495 (0.660)	1.383** (0.582)	1.567*** (0.459)	-4.369 (2.833)	1.377*** (0.416)	1.848*** (0.381)	-0.881 (1.587)	-0.781 (2.116)	-0.430 (2.293)	0.183 (2.442)	3.328*** (0.620)	3.964*** (0.606)	4.968*** (5.274)	5.195*** (1.602)	5.968*** (1.490)	2.382 (8.888)	
Number of observations	2,969	2,785	1,622	4,047	3,711	1,933	339	405	385	299	2,742	2,579	1,642	2,785	1,622	241	
R-squared	0.262	0.270	0.259	0.358	0.368	0.409	0.153	0.288	0.261	0.270	0.354	0.360	0.395	0.180	0.191	0.093	

Notes: Figures in the parenthesis are standard errors. \*\*\*, \*\*, \* and \* denotes the significant level at 1%, 5% and 10%.

both entry and exit of exporters in textile and apparel industry. This result presents that the rate of both entry and exit are enhanced when the size of economy and the level of income of export partner country is small and low. The reason for this may be that lower technological barriers and trade cost in developing countries increase the number of new entrants but also the number of exiting firms since such low barriers and cost induces firms with low productivity to enter the export market. In contrast, it is possible that the rate of both entry and exit are low when technological barriers and trade cost to developed country are high.

The estimated coefficient of forward GVC participation, namely the direct impact of forward GVC participation on entry and exit rate, is negative and statistically significant in all industries, manufacturing industries, textile and apparel industry. Besides, the impact of forward GVC participation on the rate of survival of the 2<sup>nd</sup> year of new entrants and the share of export value of entrants in total export value are negative and statistically significant. The results suggest that existing exporters are a driving force of export growth in industries in which many exporters produce and export intermediate goods and participate in the upstream of GVCs, while contribution of new entrants to export growth in these industries are small.

On the contrary, backward GVC participation increases the rate of entry in all industries in which many exporters participate in downstream of GVCs. In other words, they process and export final goods by importing intermediate containing value-added produced in foreign countries. On the other hand, the backward GVC participation has no impact on the rate of exit, while backward GVC participation tends to proceed oligopoly in export market. In other words, it raises HH index in the export market. To summarize, the rate of entrants is high in industries with high degree of backward GVC participation while the rate of exiting exporters is not affected by backward GVC participation. In addition, the share of export value of large exporters to total export is high in industries with the high degree of backward GVC participation. There is a possibility that the increase of backward GVC participation in industry facilitates domestic firms with potential to export to enter the exports market and to grow more.

Taking a consideration of estimated coefficient of interaction term of forward GVC participation with other variables, the higher forward GVC participation increases the rate of entry and exit into/from export market and HH index in whole manufacturing industry when export partner country has a large GDP. This result suggests that exporters with higher productivity have opportunities to grow and top exporters increase their export value in industries with higher forward GVC participation.

#### IV-3-2. Laos

##### (1) The impact of participation in GVCs on Growth of Export Market

Table 6 shows estimation results of factors of the change in the number of exporters and export value per exporter and growth rate of exporters in Laos. As with Cambodia, the estimated coefficient of GDP of export partner is positive while the estimated coefficient of geo-

Table 6. Estimation results on the number of exporters and export value per exporter/entrant, Laos

	Number of exporters			Export value per exporter			Export value per entrant		
	All industries	Manufacturing	Textile & apparel	All industries	Manufacturing	Textile & apparel	All industries	Manufacturing	Textile & apparel
ln (GDP j)	0.296*** (0.0505)	0.410*** (0.0688)	0.494*** (0.0763)	0.345*** (0.107)	0.378*** (0.143)	0.349*** (0.173)	0.00897 (0.136)	-0.119 (0.188)	-0.158 (0.206)
ln (GDP per capita j)	-0.271*** (0.0996)	-0.194 (0.173)	0.478* (0.269)	-0.213 (0.225)	0.595 (0.453)	2.286*** (0.705)	-0.245 (0.294)	-0.324 (0.619)	0.846 (0.884)
ln (Distance)	-0.655*** (0.0591)	-0.689*** (0.0646)	-0.554*** (0.0903)	-0.399*** (0.158)	-0.561*** (0.184)	-0.283 (0.253)	-0.268 (0.209)	-0.341 (0.254)	0.157 (0.333)
FTA	-0.408** (0.187)	-0.670*** (0.255)	-0.790*** (0.292)	-0.228 (0.437)	-0.0471 (0.549)	-0.464 (0.681)	-1.103* (0.574)	-0.682 (0.763)	-0.819 (0.857)
ln (GDP volatility)	0.222 (0.147)	0.371 (0.294)	0.582* (0.306)	-0.00412 (0.284)	-0.615 (0.557)	0.421 (0.601)	-0.000892 (0.368)	-0.0153 (0.750)	1.100 (0.712)
ln (Forward GVC Participation)	0.397 (1.258)	-4.730** (2.275)	-3.400 (4.311)	4.805 (3.042)	-24.61*** (7.704)	-28.57* (15.45)	2.136 (4.038)	-5.992 (10.10)	5.504 (18.43)
ln (Backward GVC Participation)	-3.340 (2.437)	-4.768 (3.810)	-1.479 (4.423)	2.966 (5.399)	15.48* (8.032)	23.23* (12.28)	-1.833 (6.978)	0.580 (10.78)	-1.618 (14.76)
Forward GVC * GDP	-0.418*** (0.139)	-0.787*** (0.181)	-1.231*** (0.220)	0.185 (0.380)	-0.652 (0.480)	0.425 (0.738)	1.175** (0.476)	1.314** (0.632)	2.307** (0.900)
Forward GVC * GDP per capita	0.835*** (0.253)	0.769* (0.411)	-0.482 (0.598)	-1.207** (0.599)	-2.067* (1.093)	-6.477*** (1.682)	-0.873 (0.773)	-0.372 (1.480)	-4.220** (2.090)
Forward GVC * Distance	0.000180 (0.000153)	3.57e-05 (0.000166)	0.000406* (0.000213)	0.000747* (0.000403)	0.000697 (0.000439)	0.00157*** (0.000605)	0.000160 (0.000522)	0.000340 (0.000595)	0.000892 (0.000722)
Forward GVC * FTA	1.237** (0.535)	1.785** (0.699)	1.982** (0.953)	-0.678 (1.249)	-1.808 (1.547)	-0.893 (2.375)	1.956 (1.625)	0.731 (2.155)	3.773 (3.165)
Forward GVC * GDP Volatility	-0.596 (0.473)	-0.866 (0.812)	-1.301 (0.911)	-0.171 (0.974)	1.817 (1.640)	0.808 (2.208)	-0.178 (1.280)	-0.0589 (2.241)	-1.667 (2.729)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product dummies (HS 2-digit)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.970 (1.496)	-1.597 (2.094)	-11.73*** (3.476)	6.096* (3.173)	-1.219 (5.081)	-23.15*** (8.580)	14.70*** (4.039)	19.43*** (6.939)	6.885 (10.74)
Number of observations	752	590	287	463	349	182	422	316	162
R squared	0.483	0.475	0.380	0.685	0.711	0.551	0.447	0.429	0.395

Notes: Figures in the parenthesis are standard errors. \*\*\*, \*\* and \* denotes the significant level at 1%, 5% and 10%.

graphic distance is negative. In other words, the larger economic scale of export partner country and the smaller cost of trade are increasing factors of the number of exporters and the export value per exporter, namely the extensive and intensive margin of export in Laos.

As for the degree of participation in GVCs, higher GVC participation reduces export value per exporter while backward GVC participation increases it. Looking at the interaction terms of GVC participation and other variables, the number of exporters is increased by forward GVC participation when export partner country has smaller GDP, high income level and the distance to export partner is larger. This result implies that the number of exporters is increased more in industries with higher forward GVC participation such as agriculture and mining industry when export partner countries are developed, small and far countries such as export partners in Europe. Considering that the major exporting industries in Laos are primary products, the key factor to increase the number of exporters and export value is to promote export by expanding export partners to developed countries in other regions, such as the EU. In addition, the estimate coefficient of interaction term of forward GVC participation and FTA is positive and statistically significant. This means that the number of exporters is increased by higher forward GVC participation when export partner country is also an FTA partner. Trade liberalization under an FTA could be an increasing factor of the number and growth rate of exporters which export primary products participating in the upstream of GVCs.

## (2) The impact of participation in GVCs in the distribution of exporters

Table 7 shows the estimation results regarding the determinants of the rate of entry and exit of exporter and the distribution of export value of exporter in Laos. The estimated coefficient of GDP of export partner country and geographical distance is negative and positive respectively on the rate of entry, exit and survival of exporters/products into/from/in export market. In addition, the estimated coefficient of income level of export partner country is positive on the rate of survival of entrants. To sum up, these results mean that the rate of entry and exit of exporters are higher when GDP of export partner country is smaller, and the geographical distance is farther while the rate of survival of entrants is higher when the income level of export partner country is higher. On the other hand, the rate of exit of exporters are higher when FTA is formed between Laos and the export partner country. It is considered that FTA reduces entry cost of export market and facilitate more firms with lower productivity to enter the export market, then the rate of exit rate of exporters rises.

The smaller GDP of the export partner and the larger distance between Lao and the export partner country increases the rate of entry and exit, while the number of surviving exporters is also increased, then the export market will be more competitive. The estimated coefficient of FTA is positive and statistically significant. This result suggests possibility that trade liberalization could be an increasing factor of growth of exporters in Laos.

Regarding the interaction terms of forward GVC participation, the coefficient of forward GVC participant and GDP or export partner country is positive and statistically significant on the rate of entry and exit and the share of export value of new entrants to total export value. This result suggests that the higher forward GVC participation increases the rate of both entry and exit of exporters; it also seems that the entry rate of larger exporters and growth rate of entrants when GDP of export partner country is large. The higher forward GVC participation promotes new firms to enter the exports market when the export partner country is a large economy. As a result, more firms with lower productivity enter the market and the rate of exit becomes high, while fast-growing larger entrants support the growth of export value. Moreover, the result of interaction term of forward GVC participation with FTA presents that the HH index is reduced by forward GVC participation when FTA is formed with export partner country. This result indicates that export market in industry with higher forward GVC participation could be more competitive under trade liberalization by FTA.

As described in Section III-1, the characteristics of export market in Laos are: small number of exporters, small export value per exporter, high entry and exit rate, and a large share of top exporters in total export value. The estimated results show that the impact of GVC participation on the number of exporters, export value per exporter, the distribution of exporters differ widely according to the type of export partner country. A key factor of export expansion of Laos is an increase in the number of exporters, export value per exporter, the rate of survival of entrants. Export partner countries, in particular developed countries in other regions, could be a significant factor to increase the number of exporters of the major export goods, namely the primary product export in Laos. Besides, there is a possibility that forward GVC participation enhances more firms to enter the exports market and to promote

Table 7. Estimation results on the rate of entry, exit and survival, HHL, Laos

	Entry rate		Exit rate		Share of entrants in total export value		HH Index	
	All industries	Textile & apparel	All industries	Textile & apparel	All industries	Textile & apparel	All industries	Textile & apparel
ln (GDP <sub>t</sub> )	-0.0828*** (0.0298)	-0.161*** (0.0458)	-0.130*** (0.0254)	-0.231*** (0.0383)	-0.444*** (0.116)	-0.758*** (0.167)	-0.0834* (0.0554)	-0.120*** (0.0477)
ln (GDP per capita <sub>t</sub> )	-0.0269* (0.0647)	-0.0274 (0.120)	0.0927* (0.0519)	0.033* (0.0808)	-0.110 (0.251)	-1.741*** (0.657)	0.0714 (0.0895)	0.407** (0.175)
ln (Distance)	0.221*** (0.0397)	0.234*** (0.0440)	0.215*** (0.0251)	0.205*** (0.0264)	0.569*** (0.154)	0.499*** (0.224)	0.378*** (0.0630)	0.191** (0.0710)
FTA	0.164 (0.122)	0.140 (0.164)	0.206** (0.100)	0.154 (0.212)	-0.242 (0.474)	-0.460 (0.660)	0.786*** (0.174)	0.933*** (0.212)
ln (GDP volatility)	0.00565 (0.0902)	-0.0227 (0.195)	-0.120 (0.0829)	-0.256 (0.163)	-0.106 (0.350)	0.422 (0.713)	0.0227 (0.113)	-0.0487 (0.215)
ln (Forward GVC Participation)	0.827 (0.827)	3.159 (3.126)	0.350 (0.572)	1.383* (0.791)	0.329 (3.213)	9.381 (6.172)	0.212 (1.210)	3.956 (5.634)
ln (Backward GVC Participation)	-0.237 (1.493)	-5.475* (3.053)	0.748 (1.264)	1.750 (2.011)	-0.536 (5.798)	-4.614 (8.961)	-0.152 (2.147)	0.618 (3.099)
Forward GVC * GDP	0.168** (0.0838)	0.391*** (0.108)	0.253*** (0.0663)	0.506*** (0.0943)	1.110*** (0.325)	1.940*** (0.437)	-0.166 (0.151)	-0.00985 (0.185)
Forward GVC * GDP per capita	-0.161 (0.159)	-0.154 (0.278)	-0.346*** (0.128)	-0.440*** (0.194)	0.0267 (0.618)	1.434 (1.118)	0.0414 (0.238)	-0.808* (0.422)
Forward GVC * Distance	-0.000115 (9.78e-05)	-7.28e-05 (0.000147)	-0.000151 (7.22e-05)	-0.00020*** (7.71e-05)	-0.000475 (0.000380)	-0.000371 (0.000536)	-5.08e-05 (0.000160)	-0.000205 (0.000221)
Forward GVC * FTA	-0.302 (0.340)	-0.251 (0.443)	-0.433 (0.265)	-0.348 (0.389)	0.767 (1.322)	1.342 (1.784)	1.017 (2.389)	-1.914*** (0.497)
Forward GVC * GDP Volatility	0.0411 (0.294)	0.0664 (0.477)	0.435* (0.260)	0.693 (0.442)	0.410 (1.140)	-0.118 (1.922)	-1.884 (2.288)	-0.0201 (0.653)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product dummies (HS 2-digit)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.465 (0.912)	2.497* (1.382)	0.354 (0.818)	1.665 (1.182)	7.668** (3.543)	20.76*** (5.565)	37.03*** (8.355)	-0.893 (3.129)
Number of observations	551	424	769	698	551	424	349	182
R squared	0.249	0.299	0.330	0.373	0.327	0.374	0.278	0.451

Notes: Figures in the parenthesis are standard errors. \*\*\*, \*\*, \* and \* denotes the significant level at 1%, 5% and 10%.

export growth under trade liberalization of FTA. Promotion of FTAs with the large and high-income economies in other regions such as Europe and North America is also an important factor to facilitate export growth in Laos.

## **V. Conclusions**

We examined the impact of participation in GVCs on export growth in Cambodia and Laos using data on exporter's dynamics and international input-output tables. GVCs that are developing and expanding in the world are the foundation for the production of goods and services. GVCs have promoted economic development in developing countries by accelerating technology and information transfer and increasing job opportunities. In Cambodia and Laos, the degree of GVC participation, which is computed by exported value-added in total export value in intermediate goods, is certainly not low. Manufacturing sectors, which engage in labor-intensive production process, participate mainly in the downstream of GVCs, while the primary industry such as agriculture and mining are involved in the upstream of GVCs. Both Cambodia and Laos are considered as having already participated in global chains of production in value-added.

As a result of estimation using the number of exporters, export value per exporter, the distribution of exporters and the degree of GVC participation, we found that GVC participation at the industry level has significant impacts on the number of exporters, export value per exporter, the distribution of exporters and growth of export by changing firms' exporting behavior in Cambodia and Laos. For example, a higher degree of forward GVC participation increases the number of exporters and export value per exporter in Cambodia. Furthermore, both the number of exporters and export value per exporter in Cambodia are increased in industries with high forward GVC participation when they export to countries with less economic fluctuation. On the other hand, the key factors of increase in the number of exporters and export value per exporter in Laos is the higher forward GVC participation in export to developed countries. In addition, the GDP and income level of export partners as well as FTAs are factors that promote an increased effect of GVC participation on the number of exporters, export value per exporter and export growth in some industries in Laos.

The impact of GVC participation on the dynamics of exporters varies from industry and country. There are some differences between Cambodia and Laos. Although Cambodia and Laos share some characteristics in economic conditions, such as being a less-developed country and just starting the catch-up process in ASEAN, the structures of export and the characteristics of exporters are quite different. These differences could be the reason for the different impact of GVC participation on the dynamics of exporters between Cambodia and Laos. These differences suggest that the impact of GVC participation on export growth depends significantly on the export and production structure of each country. In order to clarify the mechanism, future research that includes a more detailed analysis using data at the firm-level or with a wider coverage of countries is required.

Division of labor within production processes has been promoted globally along with

the progress of trade liberalization and economic integration. In such situations, participation in international trade itself is participation in GVCs. Maximizing the benefits and minimizing the risk from participation in GVCs is an important matter not only for less-developed countries but also for any country that participates in GVCs. Trade and industrial policies need to be implemented in consideration of the impact of GVCs on the dynamics of exporters to ensure a suitable environment for increasing the number of exporters and the export value per exporter as well as promoting sustainable growth of exporters with high productivity under the efficient allocation of resources.

## References

- Amiti, M. and J. Konings (2007), "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia." *American Economic Review*, Vol. 97, No. 5, pp. 1611-1638.
- Antras, P., L. Garicano, and E. Rossi-Hansberg (2006), "Offshoring in a Knowledge Economy", *The Quarterly Journal of Economics*, Vol. 121, No. 1, pp. 31-77.
- Baldwin, R.E., R. Forslid (2010), "Trade Liberalization with Heterogeneous Firms", *Review of Development Economics*, Vol. 14, Issue 2, pp. 161-176.
- Bernard, A.B., and J.B. Jensen (2004), "Why Some Firms Export", *Review of Economics and Statistics*, Vol. 86, Issue 2, pp. 561-569.
- Blalock, G., F.M. Veloso (2007), "Imports, Productivity Growth, and Supply Chain Learning", *World Development*, Volume 35, Issue 7, pp. 1134-1151.
- Cebeci, T., A.M. Fernandes, C. Freund, M.D. Pierola (2012), "Exporter Dynamics Database", *Policy Research Working Paper*, WPS6229, The World Bank.
- Costinot, A., J. Vogel and S. Wang (2013), "An Elementary Theory of Global Supply Chains", *Review of Economic Studies*, Vol. 80, No. 1, pp. 109-144.
- Dai, M., M. Maitra and M. Yu (2016), "Unexceptional Exporter Performance in China? The Role of Processing Trade", *Journal of Development Economics*, Vol. 121, pp. 177-189.
- Fernandes, A.M., C. Freund, M.D. Pierola (2016), "Exporter Behavior, Country Size and Stage of Development: Evidence from the Exporter Dynamics Database", *Journal of Development Economics*, Vol. 119, pp. 121-137.
- Freund, C., and M.D. Pierola (2016), "The Origins and Dynamics of Export Superstars", *Inter-American Development Bank Working Paper Series*, No. IDB-WP-741.
- Gustafsson, P., and P. Segerstrom (2010), "Trade Liberalization and Productivity Growth", *Review of International Economics*, Vol. 18, Issue 2, pp. 207-228.
- Koopman, R., Z. Wang, and S.J. Wei (2012), "Estimating Domestic Content in Exports When Processing Trade is Pervasive", *Journal of Development Economics*, Vol. 99, Issue 1, pp. 178-189.
- Kummritz, V. (2016), "Do Global Value Chains Cause Industrial Development?" *CTEI Working Papers Series*, No. 01-2016, Centre for Trade and Economic Integration, The Graduate Institute Geneva.



- Lenzen, M., K. Kanemoto, D. Moran, and A. Geschke (2012), “Mapping the Structure of the World Economy”, *Environmental Science and Technology*, Vol. 46, Issue 15, pp. 8374-8381.
- Lenzen, M., D. Moran, D., K. Kanemoto and A. Geschke (2013) “Building EORA: A Global Multi-Region Input-Output Database at High Country and Sector Resolution”, *Economic Systems Research*, Vol. 25, Issue 1, pp. 20-49.
- Melitz, M. J. (2003), “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity”, *Econometrica*, Vol. 71, No. 6, pp. 1695-1725
- Organization for Economic Co-operation and Development (2012) Mapping Global Value Chains, TAD/TC/WP/RD.
- United Nations Conference on Trade and Development (2013), “World Investment Report 2013: Global Value Chains: Investment and Trade for Development”, United Nations.
- World Trade Organization (2016) “Trade in Value-added and Global Value Chains: Statistical Profiles”, WTO, January 2016 (<https://www.tralac.org/news/article/8937-wto-releases-new-statistical-profiles-onglobal-value-chains.html>).

