

Urata, Shujiro; Baek, Youngmin

**Working Paper**

## The determinants of participation in global value chains: A cross-country, firm-level analysis

ADB Working Paper Series, No. 1116

**Provided in Cooperation with:**

Asian Development Bank Institute (ADBI), Tokyo

*Suggested Citation:* Urata, Shujiro; Baek, Youngmin (2020) : The determinants of participation in global value chains: A cross-country, firm-level analysis, ADB Working Paper Series, No. 1116, Asian Development Bank Institute (ADBI), Tokyo

This Version is available at:

<https://hdl.handle.net/10419/238473>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



<https://creativecommons.org/licenses/by-nc-nd/3.0/igo/>



**ADB Working Paper Series**

**THE DETERMINANTS OF  
PARTICIPATION IN GLOBAL VALUE  
CHAINS: A CROSS-COUNTRY,  
FIRM-LEVEL ANALYSIS**

---

Shujiro Urata and Youngmin Baek

No. 1116  
April 2020

**Asian Development Bank Institute**

Shujiro Urata is a professor of economics at the Graduate School of Asia-Pacific Studies of Waseda University, Tokyo. Youngmin Baek is an assistant professor at the Institute of Asia-Pacific Studies of Waseda University.

The views expressed in this paper are the views of the author and do not necessarily reflect the views or policies of ADBI, ADB, its Board of Directors, or the governments they represent. ADBI does not guarantee the accuracy of the data included in this paper and accepts no responsibility for any consequences of their use. Terminology used may not necessarily be consistent with ADB official terms.

Working papers are subject to formal revision and correction before they are finalized and considered published.

The Working Paper series is a continuation of the formerly named Discussion Paper series; the numbering of the papers continued without interruption or change. ADBI's working papers reflect initial ideas on a topic and are posted online for discussion. Some working papers may develop into other forms of publication.

The Asian Development Bank refers to "China" as the People's Republic of China.

Suggested citation:

Urata, S. and Y. Baek. 2020. The Determinants of Participation in Global Value Chains: A Cross-Country, Firm-Level Analysis. ADBI Working Paper 1116. Tokyo: Asian Development Bank Institute. Available: <https://www.adb.org/publications/determinants-participation-global-value-chains>

Please contact the authors for information about this paper.

Email: [surata@waseda.jp](mailto:surata@waseda.jp), [baek@aoni.waseda.jp](mailto:baek@aoni.waseda.jp)

The authors thank Shandre Thangavelu and other participants of the ADBI workshop on Trade, Global Value Chains, and Small and Medium-Sized Enterprises held on 6–7 February 2020 at the Asian Development Bank Institute for their helpful comments.

Asian Development Bank Institute  
Kasumigaseki Building, 8th Floor  
3-2-5 Kasumigaseki, Chiyoda-ku  
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500  
Fax: +81-3-3593-5571  
URL: [www.adbi.org](http://www.adbi.org)  
E-mail: [info@adbi.org](mailto:info@adbi.org)

© 2020 Asian Development Bank Institute

**Abstract**

This paper attempts to identify the firm and country-related factors that determine a firm's probability of participating in global value chains (GVCs) and level of GVC participation by using data from the World Bank's Enterprise Surveys, covering 111 countries and 38,966 firms for the 2009–2018 period with a focus on small and medium-sized enterprises (SMEs). Our analysis shows that in terms of firm-related factors, high labor productivity, large firm size, foreign ownership, and high technological capability are important for a firm, and technological capability is particularly important for SMEs to enable them to participate in GVCs and to increase their level of engagement in GVC networks. As for country-related factors, openness to trade and foreign direct investment inflows, availability of educated people, well-developed infrastructure, efficient logistics, and good governance are found to facilitate firms' participation in GVCs and to increase the level of such participation. These attributes are particularly important for SMEs. Several policy recommendations and a future research agenda are discussed.

**Keywords:** global value chains, small and medium-sized enterprises

**JEL Classification:** F13, L11

## Contents

1.	INTRODUCTION .....	1
2.	BRIEF LITERATURE REVIEW .....	3
3.	GVC PARTICIPATION BY FIRMS .....	4
4.	HYPOTHESES .....	9
4.1	Firm Characteristics.....	9
4.2	Country Characteristics .....	11
5.	METHODOLOGY AND DATA .....	12
6.	ESTIMATION RESULTS .....	14
7.	CONCLUDING COMMENTS .....	24
	REFERENCES .....	26
	APPENDIX.....	28

## 1. INTRODUCTION

The world has been witnessing active construction of global value chains (GVCs) in recent decades. According to the World Bank (2020), the share of GVC trade in world trade increased rapidly from approximately 40% in the early 1990s to over 50% in 2007 before it declined somewhat after the global financial crisis in 2007–2008. Multinational corporations (MNCs) fragmented the production process into various stages of production and located these stages of production in various countries/locations where a particular stage can be conducted most efficiently, or at least cost-effectively, in order to achieve an efficient production system. Specifically, a production stage that requires labor-intensive operation is located in a low-wage country, while a production stage that requires high-skilled labor is located in a country where high-skilled labor is abundantly available.

GVCs have been actively formed in sectors that require several production stages such as machineries and textiles/apparel. GVCs take various forms involving both MNCs' affiliated and nonaffiliated firms. Active construction of GVCs has been made possible by a sharp decline in the cost of transportation and communication, which in turn is attributable to not only technological progress in transportation and communication services but also liberalization in trade and investment policies and deregulation in these sectors. Low transportation costs make it easier for MNCs to ship parts and components from one stage to another, while low communication costs enable MNCs to communicate with the firms involved in GVCs efficiently.

In East Asia, GVCs began to be constructed in the latter half of the 1980s. Faced with a sharp appreciation of the Japanese yen, Japanese MNCs actively set up their production base in Southeast Asian countries such as Thailand, where production costs were significantly lower than in Japan. Initially, GVCs had a rather simple production arrangement involving a few production stages. With the passage of time, MNCs began to construct GVCs with complicated production networks, as they learned to manage GVCs effectively through accumulating experience and as they found great opportunities to expand GVCs by exploiting diverse wage differentials among countries in East Asia, which were attributable to wide differences in the level of economic development among them. Although we realize that GVCs go beyond the production process to include research and development, marketing, logistics, and other activities, our analysis of GVCs focuses on the production process mainly because of data availability.

GVCs began to attract the attention of firm managers and policy makers, as participation and involvement in GVCs brings benefits to firms and countries. For the firms, involvement in GVCs expands business opportunities in foreign countries, or more specifically import sources and export destinations, which enables involved firms to increase efficiency/productivity. Moreover, involved firms can expect to acquire technology and management know-how through business interactions among the firms participating in GVCs. For the countries, the greater the involvement in GVCs by their firms, the higher the countries can expect economic growth to be. Because of these benefits that may be realized through GVCs, firms and countries are eager to find ways to get involved in GVCs.

In light of these developments regarding GVCs, the objective of this paper is to identify the factors related to firm and country characteristics that determine the probability and the level of GVC participation by firms using enterprise surveys conducted by the World Bank. We pay particular attention to small and medium-sized enterprises (SMEs) mainly for three reasons. One is their importance in regard to economic activities in many countries. In many countries, SMEs account for more than 95% in terms of the number

of firms, and more than 70% and 50% in terms of employment and value-added, respectively. Nurturing competitive SMEs would contribute to the realization of sustainable and inclusive economic growth. Another reason is their important role in supplying parts and components to large assembling firms in GVCs. GVCs involving various stages of production provide SMEs, whose scope of operation is limited because of their small size, with business opportunities to exploit their competitive advantage. The third reason for our focus on SMEs is their dynamism. Although they may be small in number, there are creative and competent SMEs that would grow and contribute to the economic development/growth of the countries. These SMEs with their great potentiality can successfully realize their potential by getting involved in GVCs. We would like to identify the obstacles that prevent SMEs from participating in GVCs and make suggestions/recommendations for overcoming the obstacles based on the findings.

Studies on GVC participation have been conducted using mainly two different approaches. One uses transaction data and the other uses firm-level data. The former is divided into two approaches, one using international trade data and the other using international, inter-industry, input-output (IO) data. Studies using international trade data examine the magnitude of trade in parts and components to evaluate the importance of GVCs by recognizing that the formation of GVCs leads to active trade in parts and components. These studies, which include Athukorala (2011), and Obashi and Kimura (2018), are performed at aggregate and sectoral levels. Studies using international input-output tables, which have been constructed by several organizations, including the Organisation for Economic Co-operation and Development (OECD), World Input-Output Data, and the EORA database<sup>1</sup> include Timmer et al. (2014) and Baldwin and Lopez-Gonzalez (2015). These studies consider backward and forward inter-industry, international linkages to measure the extent of GVC participation at sectoral levels. Studies using firm-level data can be divided into two types, one using the information about a firm's GVC participation and the other using a firm's data on imports and exports. The former generally utilizes the information from the survey asking about a firm's GVC participation. The other approach assumes that a firm participates in GVCs if it imports inputs and exports output. We review some studies using these approaches in the next section. In this study we take the latter approach, that is, a firm-level approach, to find out about the GVC participation of a number of countries by using the World Bank's enterprise surveys and attempt to identify the determinants of firms' GVC participation.

Our study extends earlier studies such as Harvie, Narjoko, and Oum (2010) and Wignaraja (2013) in terms of country coverage and issue coverage in that unlike earlier studies, which analyzed firm characteristics for the determination of a firm's GVC participation, we analyze country characteristics as well. An examination of country characteristics is useful for drawing policy recommendations. The remainder of the paper is organized as follows. Section II reviews studies on the determinants of GVC participation by firms. We also review those studies examining GVC participation at country level, albeit briefly. Section III examines the patterns of GVC participation for a number of countries in the world for which the data are available from the World Bank's enterprise surveys. Section IV presents hypotheses on the determinants of GVC participation by firms, and Section V discusses the methodology and data for the analysis. Section VI presents the results and discussions. Section VII concludes the paper.

---

<sup>1</sup> For the EORA database, see <https://worldmrio.com/>.

## 2. BRIEF LITERATURE REVIEW

This section reviews studies that examined the determinants of GVC participation by firms to set the stage for our analysis. Harvie, Narjoko, and Oum (2010) is one of the early studies on the issue with a focus on SMEs. The authors investigated the characteristics of SMEs participating in GVCs (the term “production networks” is used in their paper) by utilizing the results of a survey conducted on firms in Thailand, Indonesia, Malaysia, the Philippines, Viet Nam, Cambodia, the Lao People’s Democratic Republic (Lao PDR), and the People’s Republic of China (PRC) in 2009. The sample used for the analysis contained 780 firms with less than 200 employees. They stated that a firm participates in GVCs if it satisfies the following two conditions: (1) it supplies to any tier in a GVC; (2) it either imports intermediate inputs or exports some of its products. Harvie, Narjoko, and Oum (2010) et al. found by conducting an econometric analysis that high productivity, foreign ownership, favorable financial access, active innovation activity, and positive and challenging managerial/entrepreneurial attitudes are important for SMEs in participating in GVCs. They did not find firm size to be an important factor for SMEs’ GVC participation but it is found to be important for SMEs to upgrade their position in GVCs.

Wignaraja (2013) examined the factors affecting participation in GVCs by SMEs in five ASEAN countries, namely Malaysia, Thailand, the Philippines, Indonesia, and Viet Nam. Wignaraja conducted a firm-level econometric analysis by using the World Bank’s enterprise survey data covering 5,900 manufacturing enterprises from 2006 (Malaysia and Thailand) and 2008 (for the rest). Specifically, Wignaraja performed a probit estimation to explain GVC participation, which is captured by two binary variables. One binary variable takes unity if a firm is engaged in exporting directly or indirectly, otherwise zero. The other binary variable takes unity if a firm is a sustained exporter. Independent variables included firm size, foreign ownership, general managers’ educational background and business experience, workers’ educational background, ownership of foreign licenses, ISO certificates, patents, access to credit, and firm age. Wignaraja divided the sample into two groups, one including all firms and the other only SMEs (firms with less than 100 employees). Estimation results show that regressions applied to all firms in GVCs performed better than those applied to only sustained exporters. The results indicate that in all the regressions, firm size and foreign ownership are significantly positive, while firm age is significantly negative. Managers’ educational background is found to be significantly positive for the regression applied to all firms in GVCs. Workers’ educational background and ownership of foreign licenses, ISO certificates, and patents are found to be significantly positive for the regression applied to all firms and SME firms in GVCs. Access to finance is found to be positive and statistically significant for all firms and SMEs in GVCs.

Arudchelvan and Wignaraja (2015) analyzed the characteristics of SMEs involved in GVCs in Malaysia. Using the data obtained from a survey of 234 exporters and importers in Malaysia, Arudchelvan and Wignaraja conducted a probit estimation to identify the characteristics of SMEs participating in GVCs. A firm is considered to participate in GVCs if the firm responds positively to the question “Is your firm part of a regional/global supply chain?” Their analysis found that firm size, licensing of foreign technology, and research and development investment are positively associated with GVC participation, while firm age, foreign ownership, and labor productivity are not correlated with statistical significance.



Lu et al. (2018) use the ratio of foreign value-added to total exports (i.e., foreign value-added ratio [FVAR]) to measure the level of GVC participation at firm level and identify their determinants by conducting an econometric analysis for PRC firms. The data are constructed by merging a detailed PRC transaction-level customs data set and a PRC industrial firm-level survey data set from 2000 to 2006. The sample size is in excess of 200,000. The main interest of the authors is the impact of productivity and financial constraint on GVC participation. They included a number of control variables, including firm size, R&D, firm age, market concentration, processing trade, state-owned enterprises (SOEs), foreign firms, and Hong Kong, China–Macau, China–Taipei, China (H–M–T) firms. They divided firms into continuous exporters and first-time exporters. They found that productivity increases GVC participation, while financial constraint reduces it. They also found that financial constraint affects first-time exporters but not continuous exporters. As for the impacts of control variables, the authors found that firm size, R&D, market concentration, processing trade, SOEs, foreign firms, and H–M–T firms have positive impacts on a firm’s GVC participation while firm age has a negative impact.

Before closing this section, let us very briefly review the studies that investigated the determinants of GVC participation by countries using the country-level data derived from international input-output tables. In the country-level studies, two definitions were used as proxy variables for GVC participation: backward participation, the share of foreign value-added embodied in the gross exports of a country; and forward participation, the share of domestic value-added embodied in exports of foreign countries in the gross exports of a country. Kowalski et al. (2015) analyzed the determinants of GVC participation both in terms of backward and forward participation using the data for 57 countries (OECD TiVA database) and 187 countries (EORA database). They found that openness to trade and investment as well as improvements of logistics and customs, intellectual property protection, infrastructure, and institutions can play an important role in promoting GVC participation. Ignatenko, Raei, and Mircheva (2019) conducted an econometric analysis of the determinants of GVC participation (backward participation) by countries by using the EORA database, which covers 189 countries, within a gravity model framework. They confirmed the findings of standard gravity literature in that economic size promotes GVC participation while distance discourages it. In addition, other structural factors, including a common border, common colonial heritage, common language, common currency, free trade agreements, and a stable exchange rate relationship, promote GVC participation. They also found that institutional features such as contract enforcement, rule of law, human capital, and the quality of infrastructure play important roles in determining GVC participation.

### 3. GVC PARTICIPATION BY FIRMS

Let us examine the pattern of engagement in foreign trade for the sample firms.<sup>2</sup> Among 38,966 sample firms, 17,743, or 45.5% of the firms, are not engaged in foreign trade (column 1, Table 1);<sup>3</sup> 24.4% of the total are engaged in imports but not exports (column 2); 9.5% are engaged in exports<sup>4</sup> (sum of columns 3 and 4) but not imports; and 20.7% of the firms are engaged in both imports and exports (sum of columns 5 and

---

<sup>2</sup> A list of sample countries is presented in Appendix Table 1.

<sup>3</sup> A detailed classification of the sample firms in terms of output sales and input procurement is presented in Appendix Table 2.

<sup>4</sup> Exports include both direct and indirect exports.

6), and we call these firms “GVC firms.” This share goes down to 13% if we exclude indirect exports.<sup>5</sup> These figures indicate that a sizable portion of the firms are not engaged in foreign trade. They also show that indirect export plays an important role in connecting firms with export markets. The proportion of GVC firms in the total number of firms (GVC firm ratio) is found to increase with firm size: firms with less than 4 employees (5.8%), 5~19 employees (9.0%), 20~99 employees (18.9%), 100–199 employees (33.7%), and more than 200 employees (47.5%). These findings indicate that SMEs, here defined as those with less than 199 employees, face greater obstacles to participating in GVCs.

**Table 1: Pattern of Engagement in Foreign Trade for the Sample Firms**

		1	2	3	4	5	6	GVC Firm (5+6)	Total
Sales	Domestic	○	○	×	○	×	○	×/○	
	Exports	×	×	○	○	○	○	○	
Inputs	Domestic	○	○	○	○	○	○	○	
	Imports	×	○	×	×	○	○	○	
Firm size	~4	329	155	8	12	1	30	31	535
(number of	5~19	8,203	4,000	196	534	142	1,130	1,272	14,205
employees)	20~99	6,738	3,631	281	1,192	361	2,391	2,752	14,594
	100~199	1,334	843	124	491	233	1,187	1,420	4,212
	200~	1,139	869	155	681	552	2,024	2,576	5,420
<b>Total</b>		<b>17,743</b>	<b>9,498</b>	<b>764</b>	<b>2,910</b>	<b>1,289</b>	<b>6,762</b>	<b>8,051</b>	<b>38,966</b>
Firm size	~4	1.9	1.6	1.0	0.4	0.1	0.4	0.4	1.4
(number of	5~19	46.2	42.1	25.7	18.4	11.0	16.7	15.8	36.5
employees)	20~99	38.0	38.2	36.8	41.0	28.0	35.4	34.2	37.5
	100~199	7.5	8.9	16.2	16.9	18.1	17.6	17.6	10.8
	200~	6.4	9.1	20.3	23.4	42.8	29.9	32.0	13.9
<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
Firm size	~4	61.5	29.0	1.5	2.2	0.2	5.6	5.8	100
(number of	5~19	57.7	28.2	1.4	3.8	1.0	8.0	9.0	100
employees)	20~99	46.2	24.9	1.9	8.2	2.5	16.4	18.9	100
	100~199	31.7	20.0	2.9	11.7	5.5	28.2	33.7	100
	200~	21.0	16.0	2.9	12.6	10.2	37.3	47.5	100
<b>Total</b>		<b>45.5</b>	<b>24.4</b>	<b>2.0</b>	<b>7.5</b>	<b>3.3</b>	<b>17.4</b>	<b>20.7</b>	<b>100</b>

Source: World Bank, Enterprise Surveys.

The number of GVC firms in the sample differs among the regions (Table 2). Asia has the largest number of GVC firms, registering 2,670 firms, followed by the Americas (2,154), Europe (1,694), and Africa (1,519). Oceania has the smallest number with only 14 firms. Of all the sample firms, 20.7% are GVC firms, as indicated earlier. There are substantial variations concerning the proportion of GVC firms in the total number of firms (hereafter “GVC firm ratio”) across regions. The highest GVC firm ratio is recorded by Europe at 36.2%, which is followed by the Americas (31.4%), Oceania (23.0%), and Africa (19.4%). Asia has the lowest ratio at 13.7%. Among the Asian subregions, Western Asia and Southeastern Asia show high GVC firm ratios at 24.3% and 20.2%, respectively, while Central Asia, Eastern Asia, and Southern Asia have substantially lower GVC ratios at 10.6%, 9.5%, and 8.6%, respectively. It should be noted that the relatively low GVC firm ratio observed in Asia may be unexpected, as Asia, particularly Eastern and Southeastern Asia, is regarded as a region where a

<sup>5</sup> See Appendix Table 2.

large number of MNCs have constructed GVCs.<sup>6</sup> To examine the degree of GVC participation, we computed a GVC participation index.<sup>7</sup> An examination of GVC participation index across the regions indicates a similar pattern observed by the GVC firm ratios. That is, very high GVC participation index for the firms in Europe, particularly Northern Europe. Among Asian subregions, Southeastern and Western Asia show a relatively high level of GVC participation indices.

**Table 2: GVC Firms by Region**

		Number of Firms			Share of GVC Firms (%)	GVC Participation Index
		GVC	Non-GVC	Total		
Africa	Northern Africa	469	1,737	2,206	21.3	0.0738
	Sub-Saharan Africa	1,050	4,558	5,608	18.7	0.0446
<b>Total</b>		<b>1,519</b>	<b>6,295</b>	<b>7,814</b>	<b>19.4</b>	<b>0.0529</b>
Americas	Latin America	2,154	4,710	6,864	31.4	0.0474
	<b>Total</b>	<b>2,154</b>	<b>4,710</b>	<b>6,864</b>	<b>31.4</b>	<b>0.0474</b>
Asia	Central Asia	56	473	529	10.6	0.0248
	Eastern Asia	171	1,625	1,796	9.5	0.0169
	Southeastern Asia	933	3,694	4,627	20.2	0.0771
	Southern Asia	844	9,009	9,853	8.6	0.0252
	Western Asia	666	2,077	2,743	24.3	0.0662
<b>Total</b>		<b>2,670</b>	<b>16,878</b>	<b>19,548</b>	<b>13.7</b>	<b>0.0425</b>
Europe	Eastern Europe	778	2,273	3,051	25.5	0.0651
	Northern Europe	427	168	595	71.8	0.2627
	Southern Europe	489	544	1,033	47.3	0.1287
<b>Total</b>		<b>1,694</b>	<b>2,985</b>	<b>4,679</b>	<b>36.2</b>	<b>0.1043</b>
Oceania	Melanesia	14	47	61	23.0	0.0887
<b>Total</b>		<b>14</b>	<b>47</b>	<b>61</b>	<b>23.0</b>	<b>0.0887</b>
World	Total	8,051	30,915	38,966	20.7	0.0529

Note: GVC index is computed as  $(\text{exports}/(\text{sales}) \times (\text{imports}/\text{sales}))$ .

Source: World Bank, Enterprise Surveys.

Table 3 shows the GVC participation of firms for the Asian sample countries. Among them, Lebanon has the highest GVC participation ratio at 47.8%, while Azerbaijan has the lowest ratio at 0.8%. GVC participation ratios for East Asian countries show wide variations and may be grouped as follows: Malaysia and Viet Nam (above 30%); the Philippines, Bangladesh, and Cambodia (22%–25%); Pakistan, Sri Lanka, and the Lao PDR (11%–13%), Indonesia, the PRC, Myanmar, Thailand, and India (below 10%). The low GVC participation for Thailand is surprising, as the Thai economy is highly dependent on trade and FDI. GVC participation index shows a similar pattern to GVC participation ratios, as the correlation coefficient between these two variables is as high as 0.812.

**Table 3: GVC Participation of Firms in Asian Countries**

<sup>6</sup> This unexpected and counterintuitive finding may reflect possible sampling biases in the World Bank's enterprise surveys. A detailed comparison of the sample firms in the surveys with those in national surveys needs to be conducted to examine this issue. Indeed, according to UNCTAD (2018), which reports the findings based on world input-output tables, South and East Asia have the highest level of GVC participation, particularly in the form of backward linkages. The sampling biases possibly present in our data are dealt with by including country and sector fixed effects in our estimation conducted in Section VI.

<sup>7</sup> A GVC index is computed as  $(\text{exports}/\text{total sales}) \times (\text{procurements from foreign countries}/\text{total procurements})$ .

			Number of Firms			Share of GVC Firms (%)	GVC Participation Index
		Subregion	GVC	Non-GVC	Total		
LBN	Lebanon	Western Asia	97	106	203	47.8	0.1403
JOR	Jordan	Western Asia	86	96	182	47.3	0.2399
MYS	Malaysia	Southeastern Asia	208	333	541	38.4	0.0551
ISR	Israel	Western Asia	62	107	169	36.7	0.1276
VNM	Viet Nam	Southeastern Asia	242	427	669	36.2	0.1527
PSE	Palestine	Western Asia	48	101	149	32.2	0.1168
TUR	Turkey	Western Asia	304	723	1,027	29.6	0.0553
TLS	Timor-Leste	Southeastern Asia	14	42	56	25.0	0.0922
PHL	Philippines	Southeastern Asia	239	737	976	24.5	0.1330
BGD	Bangladesh	Southern Asia	264	913	1,177	22.4	0.1125
KHM	Cambodia	Southeastern Asia	28	99	127	22.0	0.1935
ARM	Armenia	Western Asia	23	88	111	20.7	0.0500
KGZ	Kyrgyz Republic	Central Asia	15	86	101	14.9	0.0526
GEO	Georgia	Western Asia	13	88	101	12.9	0.0297
PAK	Pakistan	Southern Asia	101	698	799	12.6	0.0304
UZB	Uzbekistan	Central Asia	15	112	127	11.8	0.0121
LKA	Sri Lanka	Southern Asia	42	317	359	11.7	0.0511
NPL	Nepal	Southern Asia	28	215	243	11.5	0.0419
LAO	Lao PDR	Southeastern Asia	16	126	142	11.3	0.0522
IDN	Indonesia	Southeastern Asia	103	944	1,047	9.8	0.0204
PRC	PRC	Eastern Asia	161	1,515	1,676	9.6	0.0170
MMR	Myanmar	Southeastern Asia	33	321	354	9.3	0.0788
TJK	Tajikistan	Central Asia	10	102	112	8.9	0.0303
KAZ	Kazakhstan	Central Asia	16	173	189	8.5	0.0153
MNG	Mongolia	Eastern Asia	10	110	120	8.3	0.0143
YEM	Yemen	Western Asia	16	196	212	7.5	0.0109
THA	Thailand	Southeastern Asia	50	665	715	7.0	0.0119
AFG	Afghanistan	Southern Asia	8	123	131	6.1	0.0133
IND	India	Southern Asia	401	6,743	7,144	5.6	0.0086
IRQ	Iraq	Western Asia	16	454	470	3.4	0.0063
AZE	Azerbaijan	Western Asia	1	118	119	0.8	0.0003

Source: World Bank, Enterprise Surveys.

Sectoral shares of GVC firms and the proportion of GVC firms in the total number of firms (GVC firm ratio) by sector are shown for the entire sample (world) and for Asia in Table 4. For the entire sample, garments (15.3%), food (14.7%), chemicals (10.6%), fabricated metals (9.8%), plastics and rubber (8.3%), machinery and equipment (8.0%), and textiles (7.7%) account for a large proportion of the total number of GVC firms, with each exceeding 7% of the total. A similar pattern is observed for the sample firms in Asia, with the notable exception of electronics, which is recorded to account for 8.8% of the total. The GVC firm ratios differ among sectors. High GVC firm ratios are observed for precision instruments (34.2%), garments (29.8%), leather (28.4%), other transport equipment (28.0%), chemicals (27.9%), and machinery and equipment (25.9%), each accounting for more than a quarter of the firms in each sector. Turning to the case of Asia, one finds that the GVC firm ratio is lower than the world average, as seen before. The GVC firm ratio exceeds 25% in three sectors, i.e., garments (29.4%), leather (28.3%), and precision instruments (25.6%). GVC participation index at sectoral level shows a more or less similar pattern to that observed for the GVC firm ratios.

**Table 4: Sectoral Distribution of GVC Firms**

		World			
		# of GVC Firms	GVC Firm Ratio (%)	Sectoral Share (%)	GVC Participation Index
15	Food	1,181	16.1	14.7	0.0245
16	Tobacco	30	17.3	0.4	0.0458
17	Textiles	623	23.7	7.7	0.0727
18	Garments	1,233	29.8	15.3	0.1449
19	Leather	230	28.4	2.9	0.0912
20	Wood	145	14.5	1.8	0.0335
21	Paper	83	17.2	1.0	0.0370
22	Publishing, printing, and recorded media	149	11.4	1.9	0.0231
23	Refined petroleum product	22	22.4	0.3	0.0615
24	Chemicals	856	27.9	10.6	0.0427
25	Plastics and rubber	668	23.8	8.3	0.0570
26	Nonmetallic mineral products	323	11.8	4.0	0.0214
27	Basic metals	175	13.7	2.2	0.0279
28	Fabricated metal products	790	20.3	9.8	0.0460
29	Machinery and equipment	641	25.9	8.0	0.0470
31	Electronics (31 and 32)	380	24.2	4.7	0.0755
33	Precision instruments	88	34.2	1.1	0.1013
34	Motor vehicles	139	13.8	1.7	0.0249
35	Other transport equipment	21	28.0	0.3	0.1245
36	Furniture	274	14.8	3.4	0.0341
<b>Total</b>		<b>8,051</b>	<b>20.7</b>	<b>100</b>	<b>0.0529</b>

  

		Asia			
		# of GVC Firms	GVC Firm Ratio (%)	Sectoral Share (%)	GVC Participation Index
15	Food	300	9.5	11.2	0.0179
16	Tobacco	4	2.9	0.1	0.0079
17	Textiles	244	15.9	9.1	0.0514
18	Garments	538	29.4	20.1	0.1651
19	Leather	114	28.3	4.3	0.0933
20	Wood	26	7.0	1.0	0.0161
21	Paper	27	8.7	1.0	0.0256
22	Publishing, printing, and recorded media	29	6.1	1.1	0.0126
23	Refined petroleum product	5	8.3	0.2	0.0199
24	Chemicals	259	17.0	9.7	0.0313
25	Plastics and rubber	206	12.5	7.7	0.0355
26	Nonmetallic mineral products	147	8.7	5.5	0.0161
27	Basic metals	63	6.2	2.4	0.0120
28	Fabricated metal products	156	10.1	5.8	0.0281
29	Machinery and equipment	150	12.3	5.6	0.0216
31	Electronics (31 and 32)	236	19.7	8.8	0.0627
33	Precision instruments	30	25.6	1.1	0.0759
34	Motor vehicles	69	8.9	2.6	0.0167
35	Other transport equipment	4	10.0	0.1	0.0453
36	Furniture	63	12.1	2.4	0.0363
<b>Total</b>		<b>2,670</b>	<b>13.7</b>	<b>100</b>	<b>0.0425</b>

Note: GVC index is computed as (exports)/(sales)x(imports/sales).

Source: World Bank, Enterprise Surveys.

## 4. HYPOTHESES

This section presents the hypotheses to be tested concerning the determinants of GVC participation by firms. Previous studies have found various characteristics of the firms that participate in GVCs by undertaking an econometric approach, which regresses a firm's GVC participation (dependent variable) on a set of independent variables (firm characteristics). We adopt the same approach but extend earlier studies in several ways. First, we extend the country coverage to include all the countries available from the World Bank's enterprise surveys. Second, we examine the determinants of not only the probability of GVC participation but also the level of GVC participation by firms. Third, we attempt to identify similarities and differences in the firm characteristics between SMEs and large firms in their GVC participation by explicitly considering firm sizes. Earlier studies mostly focused on SMEs. Fourth, we consider country characteristics explicitly in the analysis. Such analysis would provide useful information for policymakers, as many policies are generally formulated and implemented at national government level. In the remaining part of this section, we first discuss the hypotheses concerning firm characteristics and then turn to those concerning country characteristics.

### 4.1 Firm Characteristics<sup>8</sup>

#### Productivity

A firm's productivity is an important factor in its participation in GVCs. This observation can be supported by both theoretical and empirical studies. The theory of heterogeneous firms developed by Melitz (2003) shows that only highly productive firms can become exporters by overcoming sunk export market entry costs such as market research and advertising. In other words, productive firms self-select into the export market. A number of empirical studies have supported the prediction of the Melitz model. Amiti and Konings (2007) and Mallick and Yang (2013) showed that more productive firms can become exporters in their studies of Indonesia and India, respectively. Many empirical studies have focused on firms' exports not on imports mainly because of data availability. Examining US data, Bernard et al. (2007) found that importers have similar characteristics to exporters. Indeed, they found that firms that simultaneously export and import register high labor productivity. In their studies of GVC participation by firms, both Harvie, Narjoko, and Oum (2010) and Lu et al. (2018) found a positive impact of labor productivity with statistical significance. Based on these earlier studies, we expect positive impact of labor productivity on GVC participation by firms.

#### Firm Size

SMEs face greater difficulty in participating in GVCs than large firms for several reasons. First, SMEs are in a disadvantageous situation vis-à-vis production and sales due to their small-scale production and sales, which make it difficult for SMEs to exploit the benefits arising from scale economies. Second, SMEs are more constrained in terms of the availability of various resources, including financial and human resources, that are required to deal with fixed costs, such as obtaining market information for participating in GVCs. In the case of financial resources, for example, lenders such as banks prefer to deal with large firms, which tend to borrow large amounts of funds, given that the cost of processing a loan application is more or less the same regardless of the size of the

---

<sup>8</sup> Harvie, Narjoko, and Oum (2010) and Wignaraja (2013) provide good discussions on the relationships between characteristics of firms and GVC participation.

loan. Moreover, credit risk tends to be higher for SMEs than larger firms. Previous studies, including Wignaraja (2013) and Lu et al. (2018), found a positive relationship between firm size and GVC participation. Accordingly, we expect firm size to have a positive impact on GVC participation.

### **Firm Age**

One can hypothesize a positive relationship between firm age and GVC participation. Old firms are competitive as they have survived in tough competition. Old firms have accumulated experiences such as obtaining useful information about possible procurement sources of parts and components and sales destinations of their output, which would help them participate in GVC networks. One could alternatively postulate the opposite relation, that is, a negative correlation between firm age and GVC participation. This is because young firms tend to be more agile than old firms in adopting new production systems such as GVCs, in order to survive and grow in the market. Wignaraja (2013) and Lu et al. (2018) found a significantly negative relationship, while Harvie, Narjoko, and Oum (2013) did not find any statistically significant relationship.

### **Foreign Ownership**

Foreign ownership of a firm is likely to be positively correlated with GVC participation, as one of the main objectives of multinational corporations (MNCs) establishing a foreign affiliate is to construct GVCs. MNCs interested in export-oriented GVCs set up a production base in developing countries, where products are assembled with imported parts and components and then exported. Having discussed the high likelihood of a positive correlation between foreign ownership and GVC participation, there are cases where such a relationship may not take place. For example, MNCs with a motive of expanding local sales set up an affiliate that does not export but sells locally, indicating that not all firms with foreign ownership participate in GVCs. Earlier studies, including Harvie, Narjoko, and Oum (2010) and Wignaraja (2013), found a positive relationship between foreign ownership and GVC participation. We expect foreign ownership to have a positive correlation.

### **Government Ownership**

Government ownership is expected to have a negative impact on GVC participation as firms owned by the government tend to suffer from inefficiency and low productivity due to a lack of competition and soft budget constraint. Very few studies have examined this relationship. In their study of the PRC, Lu et al. (2018) found a positive impact of state-owned enterprises (SOEs) on GVC participation. This unexpected finding may be due to a special characteristic of the Chinese economic system of state capitalism, under which SOEs may be given special treatment in terms of engaging in international trade. A detailed examination of the issue is warranted.

### **Technological Level and Workers' Skill**

Participation in GVCs requires possession of a high technological capability and management skills, because a firm is expected to perform satisfactorily by meeting a high technical level and by managing the complex and sophisticated operations, which is demanded by MNCs. Specifically, ownership of foreign technical licenses and a highly qualified workforce facilitates a firm to participate in GVCs. Harvie, Narjoko, and Oum (2010) and Wignaraja (2013) found a statistically positive relationship between a firm's technological level and workers' skill on the one hand, and GVC participation on

the other. We therefore expect to find a similar positive relationship between these variables.

### **Access to Finance**

Access to finance is an important factor for overcoming sunk trade cost, which was discussed earlier in relation to productivity. In addition to the sunk cost, exporters need trade finance to pay for variable costs including costs of intermediate goods and labor because the receipt from the export sales tends to lag for a relatively long period compared to domestic sales. Empirical evidence supports the importance of availability of finance for exports. For example, Manova (2013) found that financial constraint hinders export by examining a large panel of bilateral trade for 27 industries in the period 1985–1995 covering 107 countries. As for the studies on GVC participation by firms, Harvie, Narjoko, and Oum (2013) and Lu et al. (2018) found a significantly negative impact of financial constraint on GVC participation. Wignaraja (2013) found that access to credit makes it easier for SMEs and all firms to participate in GVCs. Harvie, Narjoko, and Oum argue that financial constraint is particularly severe for SMEs because of their disadvantage vis-à-vis large firms, resulting from market imperfection such as incomplete information. Based on these earlier studies, we expect access to finance to have a positive impact on GVC participation.

## **4.2 Country Characteristics**

For analyzing a favorable country environment for participating in GVC, we mainly draw findings from the earlier studies using input-output data, which were discussed above. In addition, studies on the determinants of FDI location provide useful information because a large number of GVCs have been constructed through FDI by MNCs.<sup>9</sup>

### **Openness to Trade and FDI**

Restrictions on imports discourage GVC participation because they make it difficult for firms to practice efficient procurement and they reduce the incentive to export. Openness to FDI promotes GVC participation among firms because in an open FDI environment MNCs are attracted to undertake FDI, and to construct GVCs. Kowalski et al. (2015) found that tariff protection reduces GVC participation, while FDI openness increases it. Ignatenko, Raei, and Mircheva (2019) found that membership in preferential trade agreements promotes GVC participation. Based on the results from the earlier studies, we expect openness to trade and FDI to have a positive impact on GVC participation.

### **Education**

Following our discussions on the importance of a high level of technological know-how and skill among workers in participating GVCs, we argue that availability of people with a high educational level is an important factor for a firm in that country in participating in GVCs. Kowalski et al. (2015) found that a high share of tertiary graduates in the total number of workers has a positive impact on value-added created through GVCs. Ignatenko, Raei, and Mircheva (2019) also showed that human capital has a positive impact on GVC participation. Following the findings from previous research, we expect education to have a positive impact on GVC participation.

---

<sup>9</sup> See, for example, Urata and Kawai (2000) for the case of the locational determinants of Japanese FDI.



## Infrastructure

Well-developed infrastructure facilitates business activities including international trade and FDI. Indeed, the availability of well-developed infrastructure such as the transportation system has been argued to have contributed to an expansion of trade and FDI in the PRC, as it increases physical connectivity in the country and region. Both Kowalski et al. (2015) and Ignatenko, Raei, and Mircheva (2019) found that infrastructure, and particularly its quality, plays an important role in GVC participation. Kowalski et al. showed that a good-quality electricity supply is particularly important for developing countries. Urata and Kawai (2000) found that good infrastructure has a positive impact on attracting Japanese FDI in their study of the locational determinants of Japanese outward FDI. We expect infrastructure to have a positive impact on GVC participation.

## Logistics

The availability of efficient and reliable logistics enables firms to participate in GVCs as it reduces trade cost. The importance of well-developed and well-functioning logistics has increased for firms engaged in GVCs, because it enables MNCs that have developed a complex system of GVCs to maximize their benefits by saving delivery time. Kowalski et al. (2015) found that a high logistics performance in customs increases GVC participation. We expect good logistics to have a positive impact on GVC participation.

## Governance

A reliable, fair, and transparent business environment is key for active business activities, including international trade and FDI. Without it, businesses cannot perform efficiently. Kowalski et al. (2015) found that institutional quality and intellectual property protection are important factors for GVC participation, particularly in developing countries. Ignatanko, Raei, and Mircheva (2019) found that rule of law and contract enforcement have a positive impact on GVC participation. Based on the findings of these earlier studies, we expect governance to play an important role in GVC participation.

## 5. METHODOLOGY AND DATA

We perform two kinds of regression analyses for two dependent variables, GVC participation ratio and GVC participation index. The set of independent variables, which are used for the estimation, is the same and is shown in Appendix Table 3. They include those on firm characteristics and those on country characteristics.

Beginning with firm characteristics, we have nine variables. Labor productivity is measured by sales revenue divided by the number of employees. Firm size is measured by the number of employees. A firm with less than 200 employees is classified as an SME, while a firm with more than 200 employees is classified as a large firm. Firm age is the number of years in operation. Foreign ownership is the share of equity held by foreign companies. Government ownership is the share of equity held by the government. Quality certification is the ownership of internationally recognized quality certification. Skilled labor is the proportion of skilled labor in total labor (skilled labor share). Financial access is measured by the proportion of external funds in a firm's total purchase of fixed assets. We expect the coefficients on labor productivity, firm size, foreign ownership, quality certification, skilled labor, and financial access to be positive, and that on government ownership to be negative. The expected sign of the estimated coefficient on firm age is not determined a priori.

The values of these independent variables for GVC firms and non-GVC firms are shown in Table 5 and their difference is tested by t-test. The results of the t-test indicate that GVC firms have higher values than non-GVC firms for all the variables except skilled labor. Specifically, GVC firms have higher labor productivity, a larger size, a longer operation period, higher foreign and government ownership ratios, a higher share of quality certificate holding, greater access to finance, and a lower skilled labor share than non-GVC firms.

**Table 5: Sample Firm Characteristics: GVC vs Non-GVC Firms**

	GVC Firms	Non-GVC Firms	GVC Firms – Non-GVC Firms	t-statistic
Labor_productivity	9.37	8.51	0.85	29.77***
Firm_size	4.53	3.34	1.19	71.06***
Firm_age	30.42	24.11	6.31	30.22***
Foreign_ownership	19.55	3.88	15.68	54.10***
Government_ownership	1.23	0.63	0.60	6.79***
Quality_certification	0.52	0.26	0.26	44.81***
Skilled_labor	62.82	63.12	-0.30	-0.91
Financial_access	33.60	27.56	6.04	8.78***

Note: \*\*\* Indicates statistical significance at 99% level.

Source: Computed by the authors.

Turning to country characteristics, we have five variables. Openness to trade and foreign direct investment are measured by simple average tariff rates (nonagricultural products, MFN applied) and foreign direct investment share (inward FDI stock as % of GDP), respectively. Education is measured by gross enrollment ratio for secondary school. Electricity consumption measured by electricity consumption (kilowatts per hour) per capita is a proxy for hard infrastructure. An abundant supply of electricity is required for business operation, particularly in manufacturing. Logistics performance is taken from the logistics performance index, which is obtained from an assessment of quality of trade and transport-related infrastructure (1 = low to 5 = high). Governance is measured by political risk, which is computed by taking the first principal component of six political risk-related variables, i.e. voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. The value for governance is constructed in such a way that high value indicates better governance. The expected signs of the estimated coefficients for all the variables, that is, trade and FDI openness, education, electricity consumption, and governance, are positive.

For the estimation of GVC ratio, we conduct a probit estimation (1) and for GVC participation index we conduct a tobit estimation (2), as shown below.

For the estimation of GVC participation ratio (probit estimation):

$$\begin{aligned}
 \Pr(GVC_{ict} = 1|Z_{ict}) = \Phi & \left( \alpha + \beta_1 Labor_{productivity}_{ict} + \beta_2 Firm_{size}_{ict} + \right. \\
 & \beta_3 Firm_{age}_{ict} + \beta_4 Foreign_{ownership}_{ict} + \\
 & \beta_5 Government_{ownership}_{ict} + \beta_6 Quality_{certification}_{ict} + \\
 & \beta_7 Skilled_{labor}_{ict} + \beta_8 Financial_{access}_{ict} + \gamma_1 Tariffs_{ct} + \\
 & \gamma_2 FDI_{share}_{ct} + \gamma_3 Education_{ct} + \gamma_4 Electricity_{consumption}_{ct} + \\
 & \left. \gamma_5 Logistics_{performance}_{ct} + \gamma_6 Governance_{ct} + \eta_c + \delta_k + \mu_t + \varepsilon_{ijt} \right)
 \end{aligned}
 \tag{1}$$

For the estimation of GVC participation index (tobit estimation):

$$\begin{aligned}
GVCindex_{ijt}^* &= GVCindex_{ijt}^*, \text{ if } 0 < GVCindex_{ijt}^* < 1 \\
GVCindex_{ijt}^* &= 0, \text{ if } GVCindex_{ijt}^* \leq 0 \\
GVCindex_{ijt}^* &= 1, \text{ if } GVCindex_{ijt}^* \geq 1
\end{aligned}$$

$$\begin{aligned}
GVCindex_{ict}^* &= \alpha + \beta_1 Labor_{productivity}_{ict} + \beta_2 Firm_{size}_{ict} + \beta_3 Firm_{age}_{ict} + \\
&\beta_4 Foreign_{ownership}_{ict} + \beta_5 Government_{ownership}_{ict} + \\
&\beta_7 Skilled_{labor}_{ict} + \beta_8 Financial_{access}_{ict} + \gamma_1 Tariffs_{ct} + \\
&\gamma_2 FDI_{share}_{ct} + \gamma_3 Education_{ct} + \gamma_4 Electricity_{consumption}_{ct} + \\
&\gamma_5 Logistics_{performance}_{ct} + \gamma_6 Governance_{ct} + \eta_c + \delta_k + \mu_t + \\
&\varepsilon_{ijt} \tag{2}
\end{aligned}$$

where *i* is firm, *c* is country, and *t* is time.

In the analysis, we use the data obtained from three data sets from the World Bank, namely Enterprise Surveys, Global Development Indicators, and Logistics Performance Index. We also use the data obtained from the Political Risk Services' International Country Risk Guide. We cover 111 countries during the 2009–2018 period, for which the data from the World Bank's Enterprise Surveys are available. We use one survey result for one country for the year, for which the largest number of observations is available during the sample period. A description of the data and data construction are presented in Appendix Tables 1 and 3.<sup>10</sup>

## 6. ESTIMATION RESULTS

We estimate equation (1) with probit estimation and equation (2) with tobit estimation separately.<sup>11</sup> The results of the estimation are shown in Tables 6 and 7. Table 6A shows the results of probit and tobit estimations for GVC participation and GVC participation index, covering all the firms in the world. Tables 6B (GVC participation) and 6C (GVC participation index) report the results with SME dummy variables, to show the differences in the impacts of explanatory variables between SMEs and large firms. Tables 7A, 7B, and 7C, which correspond to Tables 6A, 6B, and 6C, show the results for the firms in Asia only.<sup>12</sup>

The results in Table 6A show that the estimated coefficients for labor productivity, firm size, foreign ownership, and quality certification are positive and statistically significant in all regressions for both GVC participation and GVC participation index. These findings, which are consistent with our expectation and with earlier studies, indicate that high labor productivity, a large firm size, high foreign ownership, and the presence of high technological capability enable firms not only to participate in GVCs but to increase the level of GVC participation.

<sup>10</sup> See Appendix Table 4 for more information about correlation coefficients among the variables.

<sup>11</sup> We conducted the Heckman two-stage correction method to correct for a potential selection bias. In the estimation, a binary variable of a firm's application for an import permit is used for a firm-level selection variable. The inverse Mills ratio, which is computed from the estimation, is not statistically significant (Appendix Table 5). This finding justified our approach of estimating two equations separately.

<sup>12</sup> We conducted an analysis for several sectors including garments and machineries and the results are basically similar to those for all the sectors and thus they are not reported or analyzed.

**Table 6A: Regression Results: GVC Participation (Probit Estimation) and GVC Index (Tobit Estimation) for All Firms**

World	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<b>Probit</b>							
<b>Variables</b>	<b>GVC Participation</b>							
Labor_productivity	0.057*** (0.006)	0.058*** (0.009)	0.056*** (0.005)	0.067*** (0.005)	0.083*** (0.006)	0.046*** (0.005)	0.064*** (0.005)	0.064*** (0.005)
Firm_size	0.356*** (0.009)	0.340*** (0.013)	0.297*** (0.008)	0.282*** (0.008)	0.274*** (0.008)	0.296*** (0.008)	0.288*** (0.008)	0.286*** (0.008)
Firm_age	0.001* (0.001)	0.002** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.003*** (0.001)	0.004*** (0.001)	0.004*** (0.001)
Foreign_ownership	0.008*** (0.000)	0.008*** (0.001)	0.010*** (0.000)	0.009*** (0.000)	0.010*** (0.000)	0.009*** (0.000)	0.009*** (0.000)	0.010*** (0.000)
Government_ownership	-0.003** (0.001)	-0.001 (0.002)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)
Quality_certification	0.408*** (0.025)	0.427*** (0.036)	0.330*** (0.023)	0.375*** (0.023)	0.320*** (0.023)	0.344*** (0.024)	0.328*** (0.024)	0.357*** (0.023)
Skilled_labor	0.000 (0.000)	0.001 (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Financial_access		0.001*** (0.000)						
Tariffs			-0.059*** (0.003)					
FDI_share				0.003*** (0.000)				
Education					0.006*** (0.001)			
Electricity_consumption						0.212*** (0.011)		
Logistics_performance							0.090*** (0.020)	
Governance								0.102*** (0.020)
Constant	-3.949*** (0.325)	-3.894*** (0.457)	-2.418*** (0.084)	-3.195*** (0.078)	-3.869*** (0.098)	-4.495*** (0.111)	-3.309*** (0.097)	-3.083*** (0.082)
LR chi2	9,877.51	4,556.96	7,338.86	7,016.41	6,783.71	6,984.86	6,304.69	6,773.69
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Country Dummy	Yes	Yes	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Left-censored								
Right-censored								
Observations	28,476	11,199	28,315	28,434	27,035	26,382	25,751	26,750
Pseudo R2	0.3386	0.3293	0.2538	0.2411	0.247	0.257	0.241	0.248

*continued on next page*

Table 6A *continued*

World	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Tobit							
Variables	GVC Index							
Labor_productivity	0.015*** (0.002)	0.012*** (0.003)	0.016*** (0.002)	0.021*** (0.002)	0.027*** (0.002)	0.014*** (0.002)	0.021*** (0.002)	0.019*** (0.002)
Firm_size	0.117*** (0.003)	0.095*** (0.004)	0.112*** (0.003)	0.108*** (0.003)	0.102*** (0.003)	0.110*** (0.003)	0.108*** (0.003)	0.103*** (0.003)
Firm_age	-0.001*** (0.000)	-0.001** (0.000)	0.000* (0.000)	0.000** (0.000)	0.000* (0.000)	0.000 (0.000)	0.000* (0.000)	0.000* (0.000)
Foreign_ownership	0.003*** (0.000)	0.002*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)
Government_ownership	-0.001*** (0.000)	-0.001** (0.001)	-0.001 (0.000)	-0.000 (0.000)	-0.001 (0.000)	-0.001* (0.000)	-0.001 (0.000)	0.000 (0.000)
Quality_certification	0.110*** (0.008)	0.094*** (0.010)	0.089*** (0.009)	0.111*** (0.009)	0.089*** (0.009)	0.100*** (0.009)	0.097*** (0.009)	0.105*** (0.009)
Skilled_labor	0.000 (0.000)	0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Financial_access		0.000* (0.000)						
Tariffs			-0.024*** (0.001)					
FDI_share				0.001*** (0.000)				
Education					0.002*** (0.000)			
Electricity_consumption						0.067*** (0.004)		
Logistics_performance							0.011 (0.008)	
Governance								0.030*** (0.007)
Constant	-1.341*** (0.119)	-1.090*** (0.142)	-0.859*** (0.033)	-1.217*** (0.032)	-1.453*** (0.039)	-1.590*** (0.044)	-1.172*** (0.039)	-1.113*** (0.033)
LR chi2	9,839.06	4,639.12	7,191.65	6,819.88	6,406.2	6,695.59	6,088.67	6,444.46
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Country Dummy	Yes	Yes	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Left-censored	22,617	7,779	22,438	22,511	21,467	20,827	20,450	21,207
Right-censored	262	121	258	22,511	236	251	229	210
Observations	28,559	11,232	28,315	261	27,035	26,382	25,751	26,750
Pseudo R2	0.373	0.3861	0.2755	0.2594	0.2605	0.2727	0.2593	0.2666

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 6B: Regression Results with SME Dummy Variables:  
GVC Participation for All Firms**

World	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Probit							
<b>Variables</b>	<b>GVC Participation</b>							
Labor_productivity	0.047*** (0.011)	0.037** (0.016)	0.051*** (0.011)	0.055*** (0.011)	0.065*** (0.012)	0.042*** (0.012)	0.059*** (0.012)	0.058*** (0.011)
Firm_size	0.292*** (0.031)	0.282*** (0.041)	0.259*** (0.029)	0.253*** (0.029)	0.250*** (0.030)	0.277*** (0.031)	0.259*** (0.030)	0.253*** (0.030)
Firm_age	0.002* (0.001)	0.002 (0.001)	0.005*** (0.001)	0.005*** (0.001)	0.005*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.005*** (0.001)
Foreign_ownership	0.007*** (0.001)	0.007*** (0.001)	0.010*** (0.001)	0.009*** (0.001)	0.009*** (0.001)	0.009*** (0.001)	0.009*** (0.001)	0.010*** (0.001)
Government_ownership	-0.002 (0.002)	-0.001 (0.003)	-0.001 (0.002)	-0.000 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	0.000 (0.002)
Quality_certification	0.277*** (0.051)	0.313*** (0.070)	0.182*** (0.048)	0.209*** (0.048)	0.186*** (0.050)	0.163*** (0.050)	0.211*** (0.052)	0.185*** (0.049)
Skilled_labor	0.001 (0.001)	0.002 (0.001)	0.000 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)	0.001 (0.001)
Financial_access		0.002** (0.001)						
Tariffs			- 0.035*** (0.007)					
FDI_share				0.003*** (0.001)				
Education					0.004*** (0.001)			
Electricity_consumption						0.149*** (0.026)		
Logistics_performance							-0.104** (0.043)	
Governance								0.005 (0.036)
SME	-0.582** (0.231)	-0.704** (0.321)	-0.051 (0.234)	-0.322 (0.222)	-0.551** (0.251)	-0.751** (0.294)	1.024*** (0.268)	-0.256 (0.227)
SME*Labor_productivity	0.013 (0.012)	0.027 (0.018)	0.007 (0.012)	0.014 (0.012)	0.023* (0.013)	0.005 (0.013)	0.006 (0.013)	0.007 (0.012)
SME*Firm_size	0.081** (0.033)	0.083* (0.045)	0.039 (0.031)	0.032 (0.031)	0.020 (0.032)	0.011 (0.033)	0.030 (0.033)	0.029 (0.032)
SME*Firm_age	-0.001 (0.001)	0.000 (0.002)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)
SME*Foreign_ownership	0.002** (0.001)	0.002* (0.001)	-0.000 (0.001)	-0.000 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)
SME*Government_ownership	-0.002 (0.003)	0.001 (0.004)	0.001 (0.002)	0.001 (0.002)	0.002 (0.003)	0.002 (0.002)	0.002 (0.002)	0.001 (0.002)
SME*Quality_certification	0.164*** (0.056)	0.145* (0.078)	0.186*** (0.053)	0.208*** (0.053)	0.170*** (0.055)	0.227*** (0.056)	0.147** (0.057)	0.215*** (0.055)
SME*Skilled_labor	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.000 (0.001)	-0.001 (0.001)
SME*Financial_access		-0.001 (0.001)						
SME*Tariffs			- 0.028*** (0.007)					
SME*FDI_share				-0.001 (0.001)				
SME*Education					0.002* (0.001)			
SME*Electricity_consumption						0.075*** (0.028)		
SME*Logistics_performance							0.245*** (0.047)	
SME*Governance								0.113*** (0.036)
Constant	- 3.464*** (0.386)	- 3.350*** (0.540)	- 2.343*** (0.228)	- 2.895*** (0.218)	- 3.367*** (0.250)	- 3.810*** (0.285)	- 2.440*** (0.257)	- 2.825*** (0.223)
LR chi2	9,904.89	4,576.65	7,374.12	7,041.71	6,810.45	7,017.28	6,354.7	6,807.85
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Country Dummy	Yes	Yes	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,476	11,199	28,315	28,434	27,035	26,382	25,751	26,750
Pseudo R2	0.340	0.331	0.255	0.242	0.248	0.258	0.243	0.249

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 6C: Regression Results with SME Dummy Variables:  
GVC Index for All Firms**

World	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Tobit							
Variables	GVC Index							
Labor_productivity	0.004 (0.004)	0.002 (0.004)	0.008** (0.004)	0.009** (0.004)	0.015*** (0.004)	0.009** (0.004)	0.012*** (0.004)	0.011*** (0.004)
Firm_size	0.088*** (0.009)	0.071*** (0.010)	0.085*** (0.010)	0.085*** (0.010)	0.076*** (0.010)	0.085*** (0.010)	0.085*** (0.010)	0.075*** (0.010)
Firm_age	-0.001*** (0.000)	-0.001*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Foreign_ownership	0.002*** (0.000)	0.002*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.003*** (0.000)
Government_ownership	-0.002*** (0.001)	-0.002*** (0.001)	-0.001* (0.001)	-0.001 (0.001)	-0.001* (0.001)	-0.001* (0.001)	-0.001** (0.001)	-0.001 (0.001)
Quality_certification	0.037*** (0.016)	0.035* (0.019)	-0.002 (0.017)	0.010 (0.017)	0.012 (0.018)	-0.001 (0.018)	0.013 (0.018)	0.008 (0.017)
Skilled_labor	0.001** (0.000)	0.001** (0.000)	0.001* (0.000)	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001** (0.000)
Financial_access		0.000 (0.000)						
Tariffs			-0.014*** (0.002)					
FDI_share				0.002*** (0.000)				
Education					-0.000 (0.000)			
Electricity_consumption						0.018* (0.009)		
Logistics_performance							-0.077*** (0.015)	
Governance								-0.016 (0.013)
SME	-0.391*** (0.072)	-0.387*** (0.085)	-0.206** (0.081)	-0.345*** (0.079)	-0.550*** (0.088)	-0.721*** (0.103)	-0.654*** (0.094)	-0.329*** (0.077)
SME*Labor_productivity	0.014*** (0.004)	0.014*** (0.005)	0.011** (0.004)	0.015*** (0.004)	0.016*** (0.005)	0.007 (0.005)	0.011** (0.005)	0.011** (0.004)
SME*Firm_size	0.040*** (0.010)	0.038*** (0.012)	0.033*** (0.011)	0.030*** (0.011)	0.030*** (0.011)	0.028** (0.011)	0.028** (0.011)	0.033*** (0.011)
SME*Firm_age	0.001** (0.000)	0.001** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001* (0.000)	0.001** (0.000)	0.001*** (0.000)	0.001** (0.000)
SME*Foreign_ownership	0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)	0.001** (0.000)
SME*Government_ownership	0.001 (0.001)	0.003** (0.001)	0.001 (0.001)	0.001* (0.001)	0.002* (0.001)	0.002* (0.001)	0.002** (0.001)	0.002* (0.001)
SME*Quality_certification	0.093*** (0.018)	0.076*** (0.022)	0.115*** (0.019)	0.129*** (0.020)	0.098*** (0.020)	0.128*** (0.020)	0.106*** (0.021)	0.122*** (0.020)
SME*Skilled_labor	-0.001** (0.000)	-0.000 (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001** (0.000)	-0.001* (0.000)	-0.001 (0.000)	-0.001*** (0.000)
SME*Financial_access		-0.000 (0.000)						
SME*Tariffs			-0.013*** (0.003)					
SME*FDI_share				-0.000 (0.000)				
SME*Education					0.002*** (0.001)			
SME*Electricity_consumption						0.061*** (0.010)		
SME*Logistics_performance							0.115*** (0.017)	
SME*Governance								0.054*** (0.013)
Constant	-1.038*** (0.135)	-0.803*** (0.159)	-0.685*** (0.079)	-0.931*** (0.077)	-0.986*** (0.088)	-0.981*** (0.099)	-0.638*** (0.090)	-0.836*** (0.076)
LR chi2	9,962.27	4,713.6	7,341.71	6,945.1	6,547.87	6,848.66	6,256.75	6,583.94
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Country Dummy	Yes	Yes	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Left-censored	22,617	7,779	22,438	22,511	21,467	20,827	20,450	21,207
Right-censored	262	121	258	261	236	251	229	210
Observations	28,559	11,232	28,315	28,434	27,035	26,382	25,751	26,750
Pseudo R2	0.3777	0.3923	0.2813	0.2642	0.2662	0.279	0.2665	0.2724

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 7A: Regression Results: GVC Participation (Probit Estimation) and GVC Index (Tobit Estimation) for Firms in Asia**

Asia	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<b>Probit</b>							
<b>Variables</b>	<b>GVC Participation</b>							
Labor_productivity	0.054*** (0.009)	0.060*** (0.015)	0.058*** (0.008)	0.072*** (0.008)	0.076*** (0.008)	0.059*** (0.009)	0.054*** (0.009)	0.074*** (0.008)
Firm_size	0.348*** (0.013)	0.335*** (0.021)	0.338*** (0.012)	0.321*** (0.012)	0.314*** (0.012)	0.335*** (0.013)	0.338*** (0.013)	0.335*** (0.013)
Firm_age	0.002** (0.001)	0.004** (0.002)	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)	0.002 (0.001)	0.002* (0.001)
Foreign_ownership	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.012*** (0.001)
Government_ownership	-0.004* (0.002)	-0.000 (0.004)	-0.004** (0.002)	-0.005** (0.002)	-0.008*** (0.003)	-0.006*** (0.002)	-0.005** (0.002)	-0.003 (0.002)
Quality_certification	0.365*** (0.038)	0.387*** (0.061)	0.352*** (0.037)	0.391*** (0.036)	0.370*** (0.037)	0.356*** (0.038)	0.329*** (0.038)	0.365*** (0.038)
Skilled_labor	-0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Financial_access		0.001* (0.001)						
Tariffs			-0.073*** (0.007)					
FDI_share				0.006*** (0.001)				
Education					0.002* (0.001)			
Electricity_consumption						0.200*** (0.022)		
Logistics_performance							0.285*** (0.037)	
Governance								0.484*** (0.055)
Constant	-3.833*** (0.334)	-3.800*** (0.476)	-2.321*** (0.140)	-3.371*** (0.129)	-3.459*** (0.219)	-4.336*** (0.198)	-3.724*** (0.162)	-2.492*** (0.144)
LR chi2	4,090.12	1,630.09	3,722.41	3,698.28	3,200.81	3,508.49	3,356.29	3,617.27
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Country Dummy	Yes	Yes	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Left-censored								
Right-censored								
Observations	15,696	4,959	15,655	15,773	15,094	14,542	14,160	14,913
Pseudo R2	0.3299	0.3222	0.3039	0.2978	0.281	0.305	0.301	0.310



Table 7A *continued*

Asia	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Tobit							
Variables	GVC Index							
Labor_productivity	0.020*** (0.004)	0.018*** (0.006)	0.022*** (0.004)	0.027*** (0.004)	0.032*** (0.004)	0.027*** (0.004)	0.025*** (0.004)	0.025*** (0.004)
Firm_size	0.146*** (0.006)	0.128*** (0.008)	0.150*** (0.006)	0.145*** (0.006)	0.141*** (0.006)	0.148*** (0.006)	0.150*** (0.006)	0.142*** (0.006)
Firm_age	-0.000 (0.000)	0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Foreign_ownership	0.006*** (0.000)	0.005*** (0.000)	0.006*** (0.000)	0.006*** (0.000)	0.006*** (0.000)	0.006*** (0.000)	0.006*** (0.000)	0.006*** (0.000)
Government_ownership	-0.002* (0.001)	-0.000 (0.001)	-0.002** (0.001)	-0.003*** (0.001)	-0.004*** (0.001)	-0.003*** (0.001)	-0.003** (0.001)	-0.002* (0.001)
Quality_certification	0.134*** (0.017)	0.117*** (0.024)	0.119*** (0.017)	0.133*** (0.017)	0.133*** (0.017)	0.130*** (0.017)	0.117*** (0.018)	0.124*** (0.017)
Skilled_labor	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.001*** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.000 (0.000)
Financial_access		0.000 (0.000)						
Tariffs			-0.023*** (0.003)					
FDI_share				0.003*** (0.000)				
Education					-0.001** (0.001)			
Electricity_consumption						0.030*** (0.010)		
Logistics_performance							0.053*** (0.017)	
Governance								0.190*** (0.023)
Constant	-1.670*** (0.156)	-1.425*** (0.196)	-1.100*** (0.066)	-1.480*** (0.064)	-1.498*** (0.107)	-1.543*** (0.092)	-1.472*** (0.078)	-1.033*** (0.065)
LR chi2	4,378.42	1,832.21	3,930.35	3,935.55	3,382.22	3,747.03	3,654.57	3,835.16
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Country Dummy	Yes	Yes	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Left-censored	13,661	3,943	13,580	13,661	13,198	12,579	12,376	12,933
Right-censored	154	69	151	154	131	149	149	129
Observations	15,773	4,970	15,655	15,773	15,094	14,542	14,272	14,913
Pseudo R2	0.3581	0.3641	0.3264	0.3219	0.3055	0.3293	0.3302	0.3378

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 7B: Regression Results with SME Dummy Variables:  
GVC Participation for All Firms in Asia**

Asia	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Probit							
<b>Variables</b>	<b>GVC Participation</b>							
Labor_productivity	0.065*** (0.015)	0.060** (0.024)	0.057*** (0.015)	0.064*** (0.015)	0.070*** (0.015)	0.066*** (0.017)	0.058*** (0.018)	0.074*** (0.015)
Firm_size	0.290*** (0.039)	0.288*** (0.057)	0.295*** (0.039)	0.286*** (0.039)	0.274*** (0.040)	0.302*** (0.041)	0.309*** (0.041)	0.284*** (0.040)
Firm_age	0.003 (0.002)	0.004 (0.003)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)
Foreign_ownership	0.011*** (0.001)	0.011*** (0.002)	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.010*** (0.001)	0.010*** (0.001)	0.011*** (0.001)
Government_ownership	-0.003 (0.003)	-0.003 (0.004)	-0.005* (0.003)	-0.006** (0.003)	-0.009*** (0.003)	-0.006** (0.003)	-0.006** (0.003)	-0.002 (0.003)
Quality_certification	0.133* (0.071)	0.196* (0.111)	0.143** (0.069)	0.190*** (0.069)	0.229*** (0.073)	0.155** (0.075)	0.139* (0.075)	0.163** (0.072)
Skilled_labor	0.001 (0.001)	0.002 (0.002)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)	0.001 (0.001)
Financial_access		0.001 (0.001)						
Tariffs			-0.055*** (0.013)					
FDI_share				0.005*** (0.002)				
Education					-0.000 (0.002)			
Electricity_consumption						0.095** (0.041)		
Logistics_performance							0.186*** (0.063)	
Governance								0.494*** (0.071)
SME	-0.312 (0.317)	-0.446 (0.489)	-0.135 (0.345)	-0.404 (0.314)	-0.610* (0.359)	-1.277*** (0.433)	-0.646* (0.372)	-0.407 (0.322)
SME*Labor_productivity	-0.016 (0.018)	-0.000 (0.029)	0.001 (0.018)	0.012 (0.017)	0.009 (0.018)	-0.010 (0.020)	-0.006 (0.020)	0.001 (0.018)
SME*Firm_size	0.074* (0.044)	0.078 (0.068)	0.053 (0.044)	0.047 (0.043)	0.048 (0.045)	0.041 (0.046)	0.034 (0.046)	0.068 (0.045)
SME*Firm_age	-0.001 (0.002)	0.000 (0.003)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.002 (0.002)	0.001 (0.002)	0.000 (0.002)
SME*Foreign_ownership	0.001 (0.001)	0.000 (0.002)	0.001 (0.001)	0.001 (0.001)	0.001 (0.002)	0.001 (0.001)	0.001 (0.002)	0.002 (0.002)
SME*Government_ownership	-0.001 (0.004)	0.010 (0.007)	0.001 (0.004)	0.002 (0.004)	0.005 (0.005)	0.001 (0.004)	0.002 (0.004)	-0.002 (0.005)
SME*Quality_certification	0.300*** (0.080)	0.244* (0.126)	0.276*** (0.078)	0.263*** (0.078)	0.181** (0.082)	0.260*** (0.084)	0.242*** (0.085)	0.261*** (0.082)
SME*Skilled_labor	-0.002 (0.001)	-0.002 (0.002)	-0.002* (0.001)	-0.003* (0.001)	-0.003** (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.003* (0.001)
SME*Financial_access		-0.000 (0.001)						
SME*Tariffs			-0.024* (0.014)					
SME*FDI_share				0.001 (0.002)				
SME*Education					0.004 (0.002)			
SME*Electricity_consumption						0.145*** (0.044)		
SME*Logistics_performance							0.138** (0.067)	
SME*Governance								-0.011 (0.053)
Constant	-3.551*** (0.429)	-3.467*** (0.624)	-2.161*** (0.322)	-3.036*** (0.299)	-2.925*** (0.382)	-3.357*** (0.406)	-3.201*** (0.352)	-2.139*** (0.309)
LR chi2	4,113.03	1,640.76	3,749.08	3,720.82	3,221.41	3,541.67	3,379.04	3,639.04
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Country Dummy	Yes	Yes	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,696	4,959	15,655	15,773	15,094	14,542	14,160	14,913
Pseudo R2	0.332	0.324	0.3061	0.2996	0.282	0.308	0.303	0.312

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 7C: Regression Results with SME Dummy Variables:  
GVC Index for All Firms in Asia**

Asia	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Tobit							
<b>Variables</b>	<b>GVC Index</b>							
Labor_productivity	0.016** (0.006)	0.011 (0.009)	0.015** (0.006)	0.014** (0.006)	0.021*** (0.006)	0.024*** (0.007)	0.022*** (0.007)	0.016*** (0.006)
Firm_size	0.108*** (0.016)	0.091*** (0.020)	0.113*** (0.016)	0.115*** (0.016)	0.104*** (0.017)	0.119*** (0.017)	0.123*** (0.017)	0.104*** (0.016)
Firm_age	-0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Foreign_ownership	0.005*** (0.000)	0.004*** (0.000)	0.005*** (0.000)	0.005*** (0.000)	0.006*** (0.000)	0.005*** (0.000)	0.005*** (0.000)	0.004*** (0.000)
Government_ownership	-0.002 (0.001)	-0.002 (0.002)	-0.003** (0.001)	-0.003** (0.001)	-0.004** (0.001)	-0.003** (0.002)	-0.003*** (0.001)	-0.002 (0.001)
Quality_certification	0.000 (0.029)	-0.004 (0.040)	-0.012 (0.029)	-0.004 (0.029)	0.034 (0.031)	0.007 (0.031)	-0.005 (0.032)	-0.001 (0.029)
Skilled_labor	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)
Financial_access		0.000 (0.000)						
Tariffs			-0.007 (0.005)					
FDI_share				0.002*** (0.001)				
Education					-0.003*** (0.001)			
Electricity_consumption						-0.034** (0.017)		
Logistics_performance							-0.019 (0.026)	
Governance								0.193*** (0.029)
SME	-0.416*** (0.130)	-0.489*** (0.176)	-0.217 (0.147)	-0.475*** (0.135)	-0.677*** (0.156)	-0.997*** (0.185)	-0.651*** (0.160)	-0.482*** (0.132)
SME*Labor_productivity	0.007 (0.007)	0.011 (0.011)	0.010 (0.008)	0.019** (0.008)	0.016** (0.008)	0.004 (0.009)	0.004 (0.009)	0.014* (0.007)
SME*Firm_size	0.051*** (0.018)	0.057** (0.024)	0.046** (0.019)	0.040** (0.019)	0.045** (0.019)	0.037* (0.019)	0.032 (0.020)	0.050*** (0.019)
SME*Firm_age	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.002 (0.001)	0.001 (0.001)	0.001 (0.001)
SME*Foreign_ownership	0.002*** (0.001)	0.001 (0.001)	0.001** (0.001)	0.001*** (0.001)	0.001* (0.001)	0.001** (0.001)	0.002*** (0.001)	0.002*** (0.001)
SME*Government_ownership	0.001 (0.002)	0.007** (0.003)	0.002 (0.002)	0.002 (0.002)	0.001 (0.002)	0.002 (0.002)	0.002 (0.002)	0.001 (0.002)
SME*Quality_certification	0.175*** (0.033)	0.161*** (0.046)	0.178*** (0.034)	0.184*** (0.034)	0.130*** (0.036)	0.161*** (0.036)	0.157*** (0.037)	0.164*** (0.034)
SME*Skilled_labor	-0.001 (0.001)	-0.001 (0.001)	-0.001** (0.001)	-0.001** (0.001)	-0.001** (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001* (0.001)
SME*Financial_access		0.000 (0.001)						
SME*Tariffs			-0.023*** (0.006)					
SME*FDI_share				0.001 (0.001)				
SME*Education					0.003*** (0.001)			
SME*Electricity_consumption						0.093*** (0.019)		
SME*Logistics_performance							0.110*** (0.029)	
SME*Governance								-0.011 (0.022)
Constant	-1.337*** (0.188)	-1.063*** (0.239)	-0.899*** (0.137)	-1.107*** (0.128)	-0.938*** (0.169)	-0.800*** (0.170)	-0.966*** (0.149)	-0.655*** (0.125)
LR chi2	4,439.24	1,869.18	4,022.58	4,010.63	3,447.95	3,833.95	3,727.29	3,912.7
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Country Dummy	Yes	Yes	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Left-censored	13,661	3,943	13,580	13,661	13,198	12,579	12,376	12,933
Right-censored	154	69	151	154	131	149	149	129
Observations	15,773	4,970	15,655	15,773	15,094	14,542	14,272	14,913
Pseudo R2	0.3631	0.3715	0.3341	0.328	0.3115	0.337	0.3368	0.3446

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The estimated coefficients of firm age show an interesting pattern. They are positive and statistically significant in the case of GVC participation but they show negative signs in some estimations in the case of GVC participation index. These somewhat inconsistent results may indicate that old firms have a higher chance of participating in GVC as they can overcome obstacles with accumulated business experience, but this experience may not be so important for increasing the level of GVC participation. Indeed, there may be some cases where relatively young firms are more successful in increasing their GVC engagement after they joined GVCs, because they tend to be more aggressive in their business behavior. Government ownership shows expectedly negative signs and they are statistically significant in some cases.

Skilled labor is found unexpectedly to have negative relationships in the case of GVC participation and GVC participation index, although the relationships are not stable or statistically significant. This finding may reflect the strategy of MNCs that they assign unskilled labor-intensive tasks in developing countries in their GVC framework.

Financial access is found to be significantly positive, indicating the importance of financial access in participating in GVCs and increasing the level of participation in GVCs. Because of the limited number of observations, financial access is included in only one model specification. This finding is consistent with our expectation and with the earlier studies.

It should be noted that our regression results do not necessarily indicate a causal relationship between explanatory variables and dependent variables. There is possible two-way causality between dependent variables and some explanatory variables. For example, high labor productivity may be achieved by participating in GVCs, while high labor productivity enables a firm to participate in GVCs. The problem of two-way causality, or endogeneity, cannot be dealt with appropriately by using cross-country data, which are used in our analysis. Panel data are required to deal with the problem appropriately and an analysis using a panel data set is a future research agenda.

Turning to the results on the country characteristics, we find that all the estimated coefficients are positive and statistically significant except for logistics performance in the case of GVC index. The estimated sign on logistics performance is expectedly positive but not significant. These findings, except for those on logistics performance, are consistent with those from the earlier studies and confirm the importance of openness to trade and foreign direct investment inflows, availability of educated workers, well-developed infrastructure, efficient logistics, and good governance for firms to participate in and increase involvement in GVCs. These findings have important policy implications for the government, which will be discussed in the last section.

We examined whether the effects of explanatory variables on GVC participation are different for SMEs vis-à-vis large firms by introducing SME dummy variables and interacting explanatory variables with them. The results of the estimation for GVC participation and GVC participation index are shown in Tables 6B and 6C, respectively. The results show that SMEs have a lower probability of GVC participation and a lower level of GVC participation than large firms, as indicated by the negative and statistically significant estimated coefficients on the SME dummy variable. Having high technological capability is more important in participating and increasing the level of GVC participation for SMEs than for large firms. Firm size and foreign ownership tend to be more important for SMEs in participating and increasing participation in GVCs than for large firms. High labor productivity, a long operation period, and government ownership are important for SMEs in increasing the level of GVC participation. Having a high proportion of skilled labor does not contribute much to increasing GVC participation. Indeed, skilled labor is more important for large firms in increasing

the level of GVC participation. The result of financial access concerning SMEs is not consistent with our expectation, as the estimated coefficient on the interaction term between financial access and the SME dummy turns out to be negative, albeit insignificant. One possible reason for this may be the inappropriate proxy for financial access. A further investigation is warranted on this issue.

Turning to country-specific attributes, we find that a high level of openness to trade, availability of educated people, good infrastructure, efficient logistics, and good governance have greater impacts on GVC participation and the level of GVC participation for SMEs than for large firms. We do not find any significant differences in the patterns concerning the impacts of openness to FDI on GVC participation, either in terms of probability or the level, between SMEs and large firms.

The results of the estimation using the data for the firms in Asia are shown in Tables 7A, 7B, and 7C. The results are very similar to those obtained by using the data for all the firms in the world, and thus we only discuss the results that are different from those obtained by using all the firms in the world. Beginning with Table 7A, we find the estimated coefficients on firm age become insignificant in the case of GVC index. Government ownership becomes significantly negative for most estimations in the case of GVC participation, indicating that government ownership makes it more difficult for a firm to participate in GVCs in Asia, compared to the case of all firms in the world. Estimated coefficients on education turn out to be significantly negative in the case of GVC participation index, which is inconsistent with our expectation.

As for the results of the estimation using SME dummy variables, we find that for SMEs firm age is not important for increasing the level of GVC participation for Asian SMEs, unlike the case of SMEs across the world.

## 7. CONCLUDING COMMENTS

This paper attempts to identify the factors related to firm and country characteristics that determine a firm's participation in global value chains (GVCs) and the level of GVC participation. We conducted an econometric analysis by using the data obtained from the World Bank's Enterprise Surveys, which cover 111 countries and 38,966 firms for the 2009–2018 period. Our analysis is performed by using the data for all the firms in the world and those in Asia only.

We found that 8,051 firms, i.e., 20.7% of the entire sample, are GVC firms that are engaged both in importing inputs and exporting, which is the definition of a GVC firm adopted in this paper. As regards firm characteristics determining a firm's GVC participation, our investigation shows the importance of high labor productivity, a large firm size, foreign ownership, and high technological capability for a firm to participate in GVCs and to increase the level of engagement in GVC networks. High technological capability is particularly important for SMEs. A large firm size is found to increase the level of GVC participation for SMEs. A long operation period is found to be important for increasing the level of GVC participation for SMEs across the world, but not for SMEs in Asia. For SMEs in Asia, foreign ownership is found to be important for increasing GVC participation. In terms of the attributes of countries, countries with a high level of openness to trade and foreign direct investment (FDI), an abundance of educated people, well-developed infrastructure, efficient logistics, and good governance are found to make it easier for firms to participate in GVCs and to increase the level of GVC participation. These attributes, except for the openness to FDI, are particularly important for SMEs.

Although there are some differences in the analyses using the data covering all the firms in the world and those covering firms in Asia only, indicating the need to conduct further investigation to identify the differences among the countries, we found a number of important factors in common for a firm to participate in GVCs and to increase the level of GVC participation, as noted above. Based on these findings, we can provide several recommendations for firms and governments in order for a firm to participate in GVCs and to increase GVC participation. For firms, developing and improving technological capability is very important, particularly so for SMEs. Closely related to this point, increasing labor productivity contributes significantly to achieving these two objectives. Attracting foreign investment is also useful, as it brings not only technology but also overseas procurement and sales networks. For governments, we strongly recommend providing and improving education, and building and improving the quality of infrastructure, logistics, and governance. These policies are especially important for SMEs. The importance of providing technical assistance to firms, especially SMEs, should also be noted. In order for the government to achieve these objectives, they need to formulate appropriate policies, which in many cases include difficult policy reform, and implement them with strong political leadership and determination as well as appropriate international cooperation with international organizations and foreign donors. We should also add the importance of achieving and maintaining an open trade and FDI environment for firms to participate in GVCs and to increase the level of GVC participation. Unilateral trade and FDI liberalization, as well as joining bilateral and multilateral free trade agreements, would be very effective for achieving these objectives.

Before ending the paper, we would like to point out its shortcomings, which would lead to a possible future research agenda. We analyzed the data covering 111 countries in order to grasp a broad picture of GVC participation in the world, and thus we did not give attention to the issues related to specific countries. As such, this study should be complemented by country studies. Another drawback, which is due to the shortage of data, is the inability to examine the causal relationship between firm attributes and GVC participation. One example is the relationship between labor productivity and GVC participation, whose causal relationship could go both ways. To overcome this drawback, we need to undertake a panel data analysis, for which appropriate data are required.

## REFERENCES

- Amiti, Mary, and Jozef Konings. (2007). "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia." *American Economic Review*, 97 (5), pp. 1611–1638.
- Arudchelvan, Menaka, and Ganeshan Wignaraja. (2015) SME Internationalization through Global Value Chains and Free Trade Agreements: Malaysian Evidence, ADBI Working Paper Series, No. 515 also in Ganeshan Wignaraja ed. *Production Networks and Enterprises in East Asia: Industry and Firm-level Analysis*, Springer, Tokyo, pp. 207–227.
- Athukorala, Prema-Chandra (2011) "Production Networks and Trade Patterns in East Asia: Regionalization or Globalization?" *Asian Economic Papers*, 10 (1), pp. 65–95.
- Baldwin, Richard, E. and J. Lopez-Gonzalez (2015) "Supply-Chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses," *The World Economy*, 38 (11), pp. 1682–1721.
- Bernard, Andrew B., J. Bradford Jensen, Stephen J. Redding and Peter K. Schott (2007) "Firms in International Trade," *Journal of Economic Perspectives*, 21 (3), pp. 105–30.
- Harvie, Charles, Dionisius Narjoko, and Sothea Oum (2010) Firm Characteristic Determinants of SME Participation in Production Networks, ERIA Discussion Paper Series, ERIA-DP-2010-11.
- Harvie, Charles, Dionisius Narjoko, and Sothea Oum (2013) Small and Medium Enterprises' Access to Finance: Evidence from Selected Asian Economies, ERIA Discussion Paper Series, ERIA-DP-2013-23.
- Ignatenko, Anna, Faezeh Raei, and Borislava Mircheva (2019) Global Value Chains: What are the Benefits and Why Do Countries Participate? IMF Working Paper 19/18, January.
- Kowalski, Przemyslaw, Javier Lopez Gonzalez, Alexandros Ragoussis, and Cristian Ugarte (2015) Participation of Developing Countries in Global Value Chains: Implications for Trade and Trade-related Policies, OECD Trade Policy Papers No. 179.
- Lu, Yue, Huimin Shi, Wei Luo, and Bin Liu (2018) "Productivity, Financial Constraints, and Firms' Global Value Chain Participation: Evidence from China," *Economic Modelling*, 73, pp.184–194.
- Mallick, Sushanta, and Yong Yang (2013) "Productivity Performance of Export Market Entry and Exit: Evidence from Indian firms," *Review of International Economics*, 21(4), pp. 809–824.
- Manova, Kalina (2013) "Credit Constraints, Heterogeneous Firms, and International Trade," *The Review of Economic Studies*, 80 (2), pp. 711–744.
- Melitz, Marc j. (2003) "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71 (6), pp. 1695–1725.
- Obashi, Ayako, and Fukunari Kimura (2018) Are Production Networks Passé in East Asia? Not Yet, ERIA Discussion Paper Series, ERIA-DP-2018-03.

- Timmer, Marcel P., Abdul Azeez Erumban, Bart Los, Robert Stehrer, and Gaatzen J. de Vries (2014) "Slicing Up Global Value Chain," *Journal of Economic Perspectives*, 28 (2), pp. 99–118.
- UNCTAD (2018) *Global Value Chains and Industrial Development Lessons from China, South-East and South Asia*, [https://www.unido.org/sites/default/files/files/2018-06/EBOOK\\_GVC.pdf](https://www.unido.org/sites/default/files/files/2018-06/EBOOK_GVC.pdf).
- Urata, Shujiro and Hiroki Kawai (2000) "The Determinants of the Location of Foreign Direct Investment by Japanese Small and Medium-sized Enterprises," *Small Business Economics* 15, pp. 79–103.
- Wignaraja, Ganeshan (2013) "Can SMEs Participate in Global Production Networks? Evidence from ASEAN Firms," in Deborah K. Elms and Patrick Low, eds. *Global Value Chains in a Changing World*, World Trade Organization Publications.
- World Bank (2020) *Trading for Development in the Age of Global Value Chains*, World Development Report, Washington, DC. <https://www.worldbank.org/en/publication/wdr2020>.



## APPENDIX

**Appendix Table 1: Sample Countries and Number of Sample Firms**

No	Country Name	Region	Year						
			Subregion	Total	2009	2010	2011	2012	2013
					2,308	4,867	1,186	2,915	11,251
1	Afghanistan	Asia	Southern Asia						
2	Albania	Europe	Southern Europe						95
3	Angola	Africa	Sub-Saharan Africa				80		
4	Argentina	Americas	Latin America and the Caribbean				689		
5	Armenia	Asia	Western Asia						111
6	Azerbaijan	Asia	Western Asia						119
7	Bangladesh	Asia	Southern Asia						1,177
8	Belarus	Europe	Eastern Europe						
9	Bosnia and Herzegovina	Europe	Southern Europe						109
10	Botswana	Africa	Sub-Saharan Africa				62		
11	Brazil	Americas	Latin America and the Caribbean		1,301				
12	Bulgaria	Europe	Eastern Europe						101
13	Burkina Faso	Africa	Sub-Saharan Africa		67				
14	Burundi	Africa	Sub-Saharan Africa						
15	Cambodia	Asia	Southeastern Asia						
16	Cameroon	Africa	Sub-Saharan Africa						
17	Chad	Africa	Sub-Saharan Africa						
18	Chile	Americas	Latin America and the Caribbean				683		
19	Colombia	Americas	Latin America and the Caribbean				640		
20	Costa Rica	Americas	Latin America and the Caribbean				257		
21	Côte d'Ivoire	Africa	Sub-Saharan Africa		120				
22	Croatia	Europe	Southern Europe						111
23	Czechia	Europe	Eastern Europe						96
24	Democratic Republic of the Congo	Africa	Sub-Saharan Africa						238
25	Djibouti	Africa	Sub-Saharan Africa						47
26	Dominican Republic	Americas	Latin America and the Caribbean						
27	Ecuador	Americas	Latin America and the Caribbean						
28	Egypt	Africa	Northern Africa						1,806
29	El Salvador	Americas	Latin America and the Caribbean						
30	Estonia	Europe	Northern Europe						77
31	Eswatini	Africa	Sub-Saharan Africa						
32	Ethiopia	Africa	Sub-Saharan Africa						
33	Gabon	Africa	Sub-Saharan Africa		23				
34	Gambia	Africa	Sub-Saharan Africa						
35	Georgia	Asia	Western Asia						101
36	Ghana	Africa	Sub-Saharan Africa						369
37	Greece	Europe	Southern Europe						
38	Guatemala	Americas	Latin America and the Caribbean				289		
39	Guinea	Africa	Sub-Saharan Africa						
40	Honduras	Americas	Latin America and the Caribbean						
41	Hungary	Europe	Eastern Europe						91
42	India	Asia	Southern Asia						
43	Indonesia	Asia	Southeastern Asia						
44	Iraq	Asia	Western Asia					470	
45	Israel	Asia	Western Asia						169
46	Jamaica	Americas	Latin America and the Caribbean				70		
47	Jordan	Asia	Western Asia						182
48	Kazakhstan	Asia	Central Asia						189
49	Kenya	Africa	Sub-Saharan Africa						
50	Kyrgyz Republic	Asia	Central Asia						101
51	Lao People's Democratic Republic (PDR)	Asia	Southeastern Asia						
52	Latvia	Europe	Northern Europe						101
53	Lebanon	Asia	Western Asia						203
54	Lesotho	Africa	Sub-Saharan Africa						

*continued on next page*

Appendix Table 1 *continued*

No	Country Name	Region	Year					
			Subregion\Total	2009	2010	2011	2012	2013
				2,308	4,867	1,186	2,915	11,251
55	Liberia	Africa	Sub-Saharan Africa					
56	Lithuania	Europe	Northern Europe					94
57	Malawi	Africa	Sub-Saharan Africa					
58	Malaysia	Asia	Southeastern Asia					
59	Mali	Africa	Sub-Saharan Africa					
60	Mauritania	Africa	Sub-Saharan Africa					
61	Mauritius	Africa	Sub-Saharan Africa	128				
62	Mexico	Americas	Latin America and the Caribbean		967			
63	Moldova	Europe	Eastern Europe					101
64	Mongolia	Asia	Eastern Asia					120
65	Montenegro	Europe	Southern Europe					43
66	Morocco	Africa	Northern Africa					104
67	Mozambique	Africa	Sub-Saharan Africa					
68	Myanmar	Asia	Southeastern Asia					
69	Namibia	Africa	Sub-Saharan Africa					
70	Nepal	Asia	Southern Asia					243
71	Nicaragua	Americas	Latin America and the Caribbean					
72	Nigeria	Africa	Sub-Saharan Africa					
73	North Macedonia	Europe	Southern Europe					112
74	Pakistan	Asia	Southern Asia					799
75	Palestine	Asia	Western Asia					149
76	Panama	Americas	Latin America and the Caribbean		101			
77	Papua New Guinea	Oceania	Melanesia					
78	Paraguay	Americas	Latin America and the Caribbean					
79	People's Republic of China (PRC)	Asia	Eastern Asia				1,676	
80	Peru	Americas	Latin America and the Caribbean		668			
81	Philippines	Asia	Southeastern Asia					
82	Plurinational State of Bolivia	Americas	Latin America and the Caribbean					
83	Poland	Europe	Eastern Europe					155
84	Republic of Kosovo	Europe	Southern Europe					67
85	Romania	Europe	Eastern Europe					169
86	Russian Federation	Europe	Eastern Europe				1,239	
87	Serbia	Europe	Southern Europe					106
88	Sierra Leone	Africa	Sub-Saharan Africa					
89	Slovakia	Europe	Eastern Europe					90
90	Slovenia	Europe	Southern Europe					82
91	Solomon Islands	Oceania	Melanesia					
92	South Sudan	Africa	Sub-Saharan Africa					
93	Sri Lanka	Asia	Southern Asia			359		
94	Sudan	Africa	Northern Africa					
95	Sweden	Europe	Northern Europe					
96	Tajikistan	Asia	Central Asia					112
97	Tanzania	Africa	Sub-Saharan Africa					335
98	Thailand	Asia	Southeastern Asia					
99	Timor-Leste	Asia	Southeastern Asia					
100	Togo	Africa	Sub-Saharan Africa					
101	Trinidad and Tobago	Americas	Latin America and the Caribbean		81			
102	Tunisia	Africa	Northern Africa					213
103	Turkey	Asia	Western Asia					1,027
104	Uganda	Africa	Sub-Saharan Africa					366
105	Ukraine	Europe	Eastern Europe					691
106	Uzbekistan	Asia	Central Asia					127
107	Venezuela	Americas	Latin America and the Caribbean		68			
108	Viet Nam	Asia	Southeastern Asia	669				
109	Yemen	Asia	Western Asia		212			
110	Zambia	Africa	Sub-Saharan Africa					353
111	Zimbabwe	Africa	Sub-Saharan Africa			357		

*continued on next page*

Appendix Table 1 *continued*

No	Country Name	Region	Year					
			Subregion\Total	2014	2015	2016	2017	2018
				8,963	3,040	2,306	488	1,642
1	Afghanistan	Asia	Southern Asia	131				
2	Albania	Europe	Southern Europe					
3	Angola	Africa	Sub-Saharan Africa					
4	Argentina	Americas	Latin America and the Caribbean					
5	Armenia	Asia	Western Asia					
6	Azerbaijan	Asia	Western Asia					
7	Bangladesh	Asia	Southern Asia					
8	Belarus	Europe	Eastern Europe					318
9	Bosnia and Herzegovina	Europe	Southern Europe					
10	Botswana	Africa	Sub-Saharan Africa					
11	Brazil	Americas	Latin America and the Caribbean					
12	Bulgaria	Europe	Eastern Europe					
13	Burkina Faso	Africa	Sub-Saharan Africa					
14	Burundi	Africa	Sub-Saharan Africa	60				
15	Cambodia	Asia	Southeastern Asia			127		
16	Cameroon	Africa	Sub-Saharan Africa			98		
17	Chad	Africa	Sub-Saharan Africa					68
18	Chile	Americas	Latin America and the Caribbean					
19	Colombia	Americas	Latin America and the Caribbean					
20	Costa Rica	Americas	Latin America and the Caribbean					
21	Côte d'Ivoire	Africa	Sub-Saharan Africa					
22	Croatia	Europe	Southern Europe					
23	Czechia	Europe	Eastern Europe					
24	Democratic Republic of the Congo	Africa	Sub-Saharan Africa					
25	Djibouti	Africa	Sub-Saharan Africa					
26	Dominican Republic	Americas	Latin America and the Caribbean			109		
27	Ecuador	Americas	Latin America and the Caribbean				102	
28	Egypt	Africa	Northern Africa					
29	El Salvador	Americas	Latin America and the Caribbean			403		
30	Estonia	Europe	Northern Europe					
31	Eswatini	Africa	Sub-Saharan Africa			57		
32	Ethiopia	Africa	Sub-Saharan Africa		359			
33	Gabon	Africa	Sub-Saharan Africa					
34	Gambia	Africa	Sub-Saharan Africa					76
35	Georgia	Asia	Western Asia					
36	Ghana	Africa	Sub-Saharan Africa					
37	Greece	Europe	Southern Europe					308
38	Guatemala	Americas	Latin America and the Caribbean					
39	Guinea	Africa	Sub-Saharan Africa			24		
40	Honduras	Americas	Latin America and the Caribbean			91		
41	Hungary	Europe	Eastern Europe					
42	India	Asia	Southern Asia	7,144				
43	Indonesia	Asia	Southeastern Asia		1,047			
44	Iraq	Asia	Western Asia					
45	Israel	Asia	Western Asia					
46	Jamaica	Americas	Latin America and the Caribbean					
47	Jordan	Asia	Western Asia					
48	Kazakhstan	Asia	Central Asia					
49	Kenya	Africa	Sub-Saharan Africa					447
50	Kyrgyz Republic	Asia	Central Asia					
51	Lao People's Democratic Republic (PDR)	Asia	Southeastern Asia					142
52	Latvia	Europe	Northern Europe					
53	Lebanon	Asia	Western Asia					
54	Lesotho	Africa	Sub-Saharan Africa			75		
55	Liberia	Africa	Sub-Saharan Africa				74	
56	Lithuania	Europe	Northern Europe					

*continued on next page*

Appendix Table 1 *continued*

No	Country Name	Region	Year					
			Subregion\Total	2014	2015	2016	2017	2018
57	Malawi	Africa	Sub-Saharan Africa	134				
58	Malaysia	Asia	Southeastern Asia		541			
59	Mali	Africa	Sub-Saharan Africa			99		
60	Mauritania	Africa	Sub-Saharan Africa	46				
61	Mauritius	Africa	Sub-Saharan Africa					
62	Mexico	Americas	Latin America and the Caribbean					
63	Moldova	Europe	Eastern Europe					
64	Mongolia	Asia	Eastern Asia					
65	Montenegro	Europe	Southern Europe					
66	Morocco	Africa	Northern Africa					
67	Mozambique	Africa	Sub-Saharan Africa					283
68	Myanmar	Asia	Southeastern Asia			354		
69	Namibia	Africa	Sub-Saharan Africa	134				
70	Nepal	Asia	Southern Asia					
71	Nicaragua	Americas	Latin America and the Caribbean			110		
72	Nigeria	Africa	Sub-Saharan Africa	820				
73	North Macedonia	Europe	Southern Europe					
74	Pakistan	Asia	Southern Asia					
75	Palestine	Asia	Western Asia					
76	Panama	Americas	Latin America and the Caribbean					
77	Papua New Guinea	Oceania	Melanesia		23			
78	Paraguay	Americas	Latin America and the Caribbean				117	
79	People's Republic of China (PRC)	Asia	Eastern Asia					
80	Peru	Americas	Latin America and the Caribbean					
81	Philippines	Asia	Southeastern Asia		976			
82	Plurinational State of Bolivia	Americas	Latin America and the Caribbean				118	
83	Poland	Europe	Eastern Europe					
84	Republic of Kosovo	Europe	Southern Europe					
85	Romania	Europe	Eastern Europe					
86	Russian Federation	Europe	Eastern Europe					
87	Serbia	Europe	Southern Europe					
88	Sierra Leone	Africa	Sub-Saharan Africa				77	
89	Slovakia	Europe	Eastern Europe					
90	Slovenia	Europe	Southern Europe					
91	Solomon Islands	Oceania	Melanesia		38			
92	South Sudan	Africa	Sub-Saharan Africa	88				
93	Sri Lanka	Asia	Southern Asia					
94	Sudan	Africa	Northern Africa	83				
95	Sweden	Europe	Northern Europe	323				
96	Tajikistan	Asia	Central Asia					
97	Tanzania	Africa	Sub-Saharan Africa					
98	Thailand	Asia	Southeastern Asia			715		
99	Timor-Leste	Asia	Southeastern Asia		56			
100	Togo	Africa	Sub-Saharan Africa			44		
101	Trinidad and Tobago	Americas	Latin America and the Caribbean					
102	Tunisia	Africa	Northern Africa					
103	Turkey	Asia	Western Asia					
104	Uganda	Africa	Sub-Saharan Africa					
105	Ukraine	Europe	Eastern Europe					
106	Uzbekistan	Asia	Central Asia					
107	Venezuela	Americas	Latin America and the Caribbean					
108	Viet Nam	Asia	Southeastern Asia					
109	Yemen	Asia	Western Asia					
110	Zambia	Africa	Sub-Saharan Africa					
111	Zimbabwe	Africa	Sub-Saharan Africa					

Source: World Bank, Enterprise Surveys.

**Appendix Table 2: Patterns of Sales and Procurements for the Sample Firms**

		1	2	3	4	5	6	7	8	9	10
Sales	Domestic	○	○	×	×	×	○	○	○	×	×
	Direct exports	×	×	○	○	×	○	○	×	○	○
	Indirect exports	×	×	×	○	○	×	○	○	×	○
Inputs	Domestic inputs	○	○	○	○	○	○	○	○	○	○
	Imports	×	○	×	×	×	×	×	×	○	○
Firm size (number of employees )	~4	329	155	4	0	4	5	2	5	0	0
	5~19	8,203	4,000	81	17	98	246	68	220	64	22
	20~99	6,738	3,631	158	36	87	691	153	348	221	50
	100~199	1,334	843	94	8	22	317	70	104	165	33
	200~	1,139	869	119	20	16	482	90	109	429	54
<b>Total</b>		<b>17,743</b>	<b>9,498</b>	<b>456</b>	<b>81</b>	<b>227</b>	<b>1,741</b>	<b>383</b>	<b>786</b>	<b>879</b>	<b>159</b>
Firm size (number of employees )	~4	1.9	1.6	0.9	0.0	1.8	0.3	0.5	0.6	0.0	0.0
	5~19	46.2	42.1	17.8	21.0	43.2	14.1	17.8	28.0	7.3	13.8
	20~99	38.0	38.2	34.6	44.4	38.3	39.7	39.9	44.3	25.1	31.4
	100~199	7.5	8.9	20.6	9.9	9.7	18.2	18.3	13.2	18.8	20.8
	200~	6.4	9.1	26.1	24.7	7.0	27.7	23.5	13.9	48.8	34.0
<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100.0</b>	<b>100</b>	<b>100</b>	<b>100</b>
Firm size (number of employees )	~4	61.5	29.0	0.7	0.0	0.7	0.9	0.4	0.9	0.0	0.0
	5~19	57.7	28.2	0.6	0.1	0.7	1.7	0.5	1.5	0.5	0.2
	20~99	46.2	24.9	1.1	0.2	0.6	4.7	1.0	2.4	1.5	0.3
	100~199	31.7	20.0	2.2	0.2	0.5	7.5	1.7	2.5	3.9	0.8
	200~	21.0	16.0	2.2	0.4	0.3	8.9	1.7	2.0	7.9	1.0
<b>Total</b>		<b>45.5</b>	<b>24.4</b>	<b>1.2</b>	<b>0.2</b>	<b>0.6</b>	<b>4.5</b>	<b>1.0</b>	<b>2.0</b>	<b>2.3</b>	<b>0.4</b>
		<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>GVC</b>	<b>Non-GVC</b>	<b>Total</b>	
Sales	Domestic	×	○	○	○	×	×				
	Direct exports	×	○	○	×	×	×				
	Indirect exports	○	×	○	○	×	×				
Inputs	Domestic inputs	○	○	○	○	○	○				
	Imports	○	○	○	○	○	×				
Firm size (number of employees )	~4	1	17	2	11	0	0	31	504	535	
	5~19	56	533	220	377	0	0	1,272	12,933	14,205	
	20~99	90	1,396	431	564	0	0	2,752	11,842	14,594	
	100~199	35	791	225	171	0	0	1,420	2,792	4,212	
	200~	69	1,445	331	248	0	0	2,576	2,844	5,420	
<b>Total</b>		<b>251</b>	<b>4,182</b>	<b>1,209</b>	<b>1,371</b>	<b>0</b>	<b>0</b>	<b>8,051</b>	<b>30,915</b>	<b>38,966</b>	
Firm size (number of employees )	~4	0.4	0.4	0.2	0.8	–	–	0.4	1.6	1.4	
	5~19	22.3	12.7	18.2	27.5	–	–	15.8	41.8	36.5	
	20~99	35.9	33.4	35.6	41.1	–	–	34.2	38.3	37.5	
	100~199	13.9	18.9	18.6	12.5	–	–	17.6	9.0	10.8	
	200~	27.5	34.6	27.4	18.1	–	–	32.0	9.2	13.9	

<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>100</b>	<b>100</b>
Firm size	~4	0.2	3.2	0.4	2.1	0.0	0.0	5.8	94.2	100
(number of	5~19	0.4	3.8	1.5	2.7	0.0	0.0	9.0	91.0	100
employees	20~99	0.6	9.6	3.0	3.9	0.0	0.0	18.9	81.1	100
)	100~199	0.8	18.8	5.3	4.1	0.0	0.0	33.7	66.3	100
	200~	1.3	26.7	6.1	4.6	0.0	0.0	47.5	52.5	100
<b>Total</b>		<b>0.6</b>	<b>10.7</b>	<b>3.1</b>	<b>3.5</b>	<b>0.0</b>	<b>0.0</b>	<b>20.7</b>	<b>79.3</b>	<b>100</b>

Source: World Bank, Enterprise Surveys.

**Appendix Table 3: Basic Statistics**

	<b>Variable</b>	<b>Definition of Variables</b>	<b>Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>
Firm level	GVC_participation	GVC participation dummy, see the main text for the definition	38,966	0.207	0.405
	GVC_index	GVC index, see footnote 7 for the definition	38,966	0.053	0.169
	Labor_productivity	Logarithm of labor productivity based on value added	32,358	8.689	2.119
	Firm_size	Logarithm of total employees	38,850	3.582	1.422
	Firm_age	Number of years in operation	38,564	25.409	16.702
	Foreign_ownership	The share of equity owned by foreign firm (%)	37,855	7.152	23.789
	Government_ownership	The share of equity owned by government (%)	37,867	0.752	6.998
	Quality_certification	Ownership of internationally recognized quality certification	38,476	0.317	0.465
	Skilled_labor	Proportion of skilled labor to total labor	35,242	63.059	24.824
Financial_access	Proportion of external funds to purchase fixed assets	15,336	29.355	39.002	
Country level	Tariffs	Simple average tariff rates (nonagricultural products, MFN applied)	105	8.340	4.330
	FDI_share	Foreign Direct Investment share (inward FDI stock as % of GDP)	109	44.731	44.208
	Education	Gross enrollment ratio for secondary school (%)	103	73.918	26.738
	Electricity_consumption	Logarithm of electric power consumption (kWh per capita)	83	7.251	1.226
	Logistics_performance	Logistics performance index Quality of trade and transport-related infrastructure (1=low to 5=high)	89	2.461	0.565
	Governance	1st principal component of 6 political risks (Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption)	86	-0.252	0.736
	<b>Variable</b>	<b>Definition of Variables</b>	<b>Min</b>	<b>Max</b>	<b>Data Source</b>
Firm level	GVC_participation	GVC participation dummy, see the main text for the definition	0	1	Enterprise Surveys
	GVC_index	GVC index, see footnote 7 for the definition	0	1	
	Labor_productivity	Logarithm of labor productivity based on value added	-4.160	20.581	
	Firm_size	Logarithm of total employees	0	10.309	
	Firm_age	Number of years in operation	0	218	
	Foreign_ownership	The share of equity owned by foreign firm (%)	0	100	
	Government_ownership	The share of equity owned by government (%)	0	99	
	Quality_certification	Ownership of internationally recognized quality certification	0	1	
	Skilled_labor	Proportion of skilled labor to total labor	0	100	
Financial_access	Proportion of external funds to purchase fixed assets	0	100		
Country level	Tariffs	Simple average tariff rates (nonagricultural products, MFN applied)	0.7	22	World Tariff Profiles (WTO)
	FDI_share	Foreign Direct Investment share (inward FDI stock as % of GDP)	2.992	310.599	UNCTAD
	Education	Gross enrollment ratio for secondary school (%)	11	133	World development indicators (World Bank)
	Electricity_consumption	Logarithm of electric power consumption (kWh per capita)	3.784	9.509	
	Logistics_performance	Logistics performance index Quality of trade and transport-related infrastructure (1=low to 5=high)	2	4	
	Governance	1st principal component of 6 political risks (Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption)	-1.955	1.641	Political Risk Services International Country Risk Guide (PRS)

Sources: World Bank, Enterprise Surveys, WTO, UNCTAD, World Development Indicators, Political Risk Services International Country Risk Guide (PRS).



**Appendix Table 4A: Correlation Coefficients for Firm-level Variables**

	<b>Labor _productivity</b>	<b>Firm_size</b>	<b>Firm_age</b>	<b>Foreign _ownership</b>
Labor_productivity	1			
Firm_size	0.131	1		
Firm_age	0.129	0.286	1	
Foreign_ownership	0.167	0.210	0.052	1
Government_ownership	-0.006	0.134	0.086	-0.012
Quality_certification	0.193	0.431	0.168	0.121
Skilled_labor	-0.077	-0.038	-0.039	0.003
Financial_access	0.013	0.045	0.073	-0.060
	<b>Government _ownership</b>	<b>Quality _certification</b>	<b>Skilled_labor</b>	<b>Financial _access</b>
Labor_productivity				
Firm_size				
Firm_age				
Foreign_ownership				
Government_ownership	1			
Quality_certification	0.066	1		
Skilled_labor	0.045	-0.019	1	
Financial_access	0.007	-0.015	-0.049	1

Source: Computed by the authors.

**Appendix Table 4B: Correlation Coefficients for Country-level Variables**

	<b>Tariffs</b>	<b>FDI_share</b>	<b>Education</b>	<b>Electricity _consumption</b>	<b>Logistics _performance</b>	<b>Governance</b>
Tariffs	1					
FDI_share	-0.231	1				
Education	-0.508	-0.015	1			
Electricity_consumption	-0.559	0.158	0.845	1		
Logistics_performance	-0.305	-0.054	0.475	0.425	1	
Governance	-0.454	0.018	0.564	0.533	0.489	1

Source: Computed by the authors.

**Appendix Table 5A: Results of Heckman Sample Selection Model for All Firms**

World	(1)		(2)		(3)		(4)	
	Heckman Sample Selection Model							
Variables	GVC Index	Selectio n	GVC Index	Selectio n	GVC Index	Selectio n	GVC Index	Selectio n
Application_importpermi t		0.620*** (0.030)		0.478*** (0.040)		0.667*** (0.028)		0.651*** (0.028)
Labor_productivity	-0.005** (0.002)	0.050*** (0.006)	-0.003 (0.003)	0.053*** (0.009)	-0.005*** (0.002)	0.049*** (0.005)	-0.003* (0.002)	0.060*** (0.005)
Firm_size	0.021*** (0.004)	0.336*** (0.009)	0.020*** (0.005)	0.322*** (0.013)	0.020*** (0.004)	0.279*** (0.008)	0.017*** (0.004)	0.264*** (0.008)
Firm_age	-0.001*** (0.000)	0.001 (0.001)	-0.001*** (0.000)	0.002* (0.001)	-0.001*** (0.000)	0.004*** (0.001)	-0.001*** (0.000)	0.004*** (0.001)
Foreign_ownership	0.001*** (0.000)	0.008*** (0.000)	0.001*** (0.000)	0.008*** (0.001)	0.002*** (0.000)	0.009*** (0.000)	0.002*** (0.000)	0.009*** (0.000)
Government_ownership	-0.001*** (0.000)	-0.003** (0.001)	-0.001*** (0.000)	-0.001 (0.002)	-0.001* (0.000)	-0.001 (0.001)	-0.001 (0.000)	0.000 (0.001)
Quality_certification	0.005 (0.008)	0.386*** (0.025)	0.002 (0.011)	0.412*** (0.037)	-0.025*** (0.008)	0.310*** (0.023)	-0.019** (0.009)	0.356*** (0.023)
Skilled_labor	0.000* (0.000)	-0.000 (0.000)	0.000 (0.000)	0.001 (0.001)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Financial_access			-0.000 (0.000)	0.001** (0.000)				
Tariffs					-0.008*** (0.001)	-0.061*** (0.003)		
FDI_share							0.001*** (0.000)	0.003*** (0.000)
Education								
Electricity_consumption								
Logistics_performance								
Governance								
inverse Mills ratio	0.026 (0.016)		0.019 (0.024)		0.019 (0.017)		0.016 (0.017)	
Constant	-0.036 (0.146)	-4.068*** (0.334)	0.010 (0.177)	-4.018*** (0.460)	0.188*** (0.049)	-2.398*** (0.085)	0.078 (0.057)	-3.194*** (0.079)
Country Dummy	Yes	Yes	Yes	Yes	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi2	3,038.84		1,939.6		1,855.73		1,860.17	
Prob > chi2	0.000		0.000		0.000		0.000	
Observations	28,559	28,559	11,232	11,232	28,315	28,315	28,434	28,434
Selected obs.	5,942		3,453		5,877		5,923	
Nonselected obs.	22,617		7,779		22,438		22,511	

*continued on next page*

Appendix Table 5A *continued*

World	(5)		(6)		(7)		(8)	
	Heckman Sample Selection Model							
Variables	GVC Index	Selection	GVC Index	Selection	GVC Index	Selection	GVC Index	Selection
Application_importpermi t		0.705*** (0.029)		0.647*** (0.030)		0.641*** (0.030)		0.669*** (0.029)
Labor_productivity	-0.001 (0.002)	0.074*** (0.006)	-0.001 (0.002)	0.039*** (0.005)	-0.001 (0.002)	0.057*** (0.005)	-0.002 (0.002)	0.056*** (0.005)
Firm_size	0.014*** (0.004)	0.256*** (0.008)	0.015*** (0.004)	0.279*** (0.008)	0.013*** (0.004)	0.270*** (0.008)	0.013*** (0.004)	0.266*** (0.008)
Firm_age	-0.001*** (0.000)	0.004*** (0.001)	-0.001*** (0.000)	0.003*** (0.001)	-0.001*** (0.000)	0.004*** (0.001)	-0.001*** (0.000)	0.004*** (0.001)
Foreign_ownership	0.002*** (0.000)	0.009*** (0.000)	0.002*** (0.000)	0.009*** (0.000)	0.002*** (0.000)	0.009*** (0.000)	0.002*** (0.000)	0.009*** (0.000)
Government_ownership	-0.001 (0.000)	-0.001 (0.001)	-0.001 (0.000)	-0.001 (0.001)	-0.001 (0.000)	-0.001 (0.001)	-0.001 (0.000)	0.001 (0.001)
Quality_certification	-0.026*** (0.009)	0.298*** (0.024)	-0.014 (0.009)	0.322*** (0.024)	-0.014 (0.009)	0.311*** (0.024)	-0.015* (0.009)	0.338*** (0.024)
Skilled_labor	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Financial_access								
Tariffs								
FDI_share								
Education	0.000 (0.000)	0.007*** (0.001)						
Electricity_consumption			-0.002 (0.004)	0.225*** (0.012)				
Logistics_performance					-0.034*** (0.007)	0.086*** (0.021)		
Governance							-0.006 (0.007)	0.120*** (0.020)
inverse Mills ratio	0.014 (0.016)		0.018 (0.018)		0.006 (0.018)		0.007 (0.017)	
Constant	0.002 (0.064)	-3.960*** (0.100)	0.096 (0.077)	-4.583*** (0.113)	0.211*** (0.064)	-3.294*** (0.098)	0.118** (0.056)	-3.059*** (0.084)
Country Dummy	No	No	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi2	1,643.23		1,841.27		1,729.41		1,602.02	
Prob > chi2	0.000		0.000		0.000		0.000	
Observations	27,035	27,035	26,382	26,382	25,751	25,751	26,750	26,750
Selected obs.	5,568		5,555		5,301		5,543	
Nonselected obs.	21,467		20,827		20,450		21,207	

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Appendix Table 5B: Results of Heckman Sample Selection Model  
for All Firms in Asia**

Asia	(1)		(2)		(3)		(4)	
	Heckman Sample Selection Model							
Variables	GVC Index	Selectio n	GVC Index	Selectio n	GVC Index	Selectio n	GVC Index	Selectio n
Application_importpermi t		0.868*** (0.046)		0.751*** (0.068)		0.876*** (0.045)		0.883*** (0.044)
Labor_productivity	-0.004 (0.003)	0.048*** (0.009)	-0.005 (0.005)	0.058*** (0.015)	-0.001 (0.003)	0.049*** (0.009)	-0.002 (0.003)	0.060*** (0.008)
Firm_size	0.011 (0.006)	0.326*** (0.013)	0.005 (0.009)	0.315*** (0.021)	0.010 (0.007)	0.318*** (0.013)	0.015** (0.006)	0.304*** (0.012)
Firm_age	-0.002*** (0.000)	0.002* (0.001)	-0.002*** (0.001)	0.004** (0.002)	-0.002*** (0.000)	0.002** (0.001)	-0.002*** (0.000)	0.002** (0.001)
Foreign_ownership	0.002*** (0.000)	0.011*** (0.001)	0.002*** (0.000)	0.011*** (0.001)	0.002*** (0.000)	0.011*** (0.001)	0.002*** (0.000)	0.011*** (0.001)
Government_ownership	-0.000 (0.001)	-0.004* (0.002)	-0.000 (0.001)	-0.002 (0.004)	-0.001 (0.001)	-0.005** (0.002)	-0.001 (0.001)	-0.006** (0.002)
Quality_certification	-0.018 (0.015)	0.336*** (0.038)	-0.036 (0.022)	0.363*** (0.062)	-0.052*** (0.015)	0.326*** (0.037)	-0.058*** (0.016)	0.358*** (0.037)
Skilled_labor	0.000 (0.000)	-0.000 (0.001)	-0.000 (0.000)	0.000 (0.001)	-0.000* (0.000)	-0.000 (0.001)	-0.000 (0.000)	-0.000 (0.001)
Financial_access			0.000 (0.000)	0.001* (0.001)				
Tariffs					0.009*** (0.003)	-0.061*** (0.007)		
FDI_share							0.000 (0.000)	0.006*** (0.001)
Education								
Electricity_consumption								
Logistics_performance								
Governance								
inverse Mills ratio	-0.003 (0.022)		-0.048 (0.035)		-0.007 (0.023)		0.000 (0.022)	
Constant	0.106 (0.168)	-4.050*** (0.349)	0.310 (0.221)	-4.055*** (0.482)	0.206*** (0.075)	-2.380*** (0.143)	0.260*** (0.085)	-3.287*** (0.132)
Country Dummy	Yes	Yes	Yes	Yes	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi2	1,029.88		559.37		666.21		636.12	
Prob > chi2	0.000		0.000		0.000		0.000	
Observations	15,773	15,773	4,970	4,970	15,655	15,655	15,773	15,773
Selected obs.	2,112		1,027		2,075		2,112	
Nonselected obs.	13,661		3,943		13,580		13,661	

*continued on next page*

Appendix Table 5B *continued*

Asia	(5)		(6)		(7)		(8)	
Variables	Heckman Sample Selection Model							
	GVC Index	Selectio n	GVC Index	Selectio n	GVC Index	Selectio n	GVC Index	Selectio n
Application_importpermi t		0.951*** (0.046)		0.853*** (0.047)		0.864*** (0.048)		0.915*** (0.046)
Labor_productivity	0.002 (0.003)	0.066*** (0.009)	0.006* (0.003)	0.050*** (0.009)	0.005 (0.004)	0.048*** (0.009)	-0.006* (0.003)	0.062*** (0.009)
Firm_size	0.007 (0.006)	0.296*** (0.013)	0.010 (0.007)	0.318*** (0.013)	0.006 (0.007)	0.318*** (0.013)	0.011* (0.006)	0.316*** (0.013)
Firm_age	-0.002*** (0.000)	0.002** (0.001)	-0.002*** (0.000)	0.002** (0.001)	-0.002*** (0.000)	0.002 (0.001)	-0.002*** (0.000)	0.002 (0.001)
Foreign_ownership	0.003*** (0.000)	0.011*** (0.001)	0.002*** (0.000)	0.010*** (0.001)	0.002*** (0.000)	0.010*** (0.001)	0.002*** (0.000)	0.011*** (0.001)
Government_ownership	-0.001 (0.001)	-0.009*** (0.003)	-0.001 (0.001)	-0.006*** (0.002)	-0.001 (0.001)	-0.005** (0.002)	-0.001 (0.001)	-0.004 (0.002)
Quality_certification	-0.056*** (0.016)	0.338*** (0.038)	-0.032** (0.016)	0.326*** (0.039)	-0.035** (0.016)	0.307*** (0.039)	-0.045*** (0.016)	0.335*** (0.039)
Skilled_labor	-0.001* (0.000)	-0.001 (0.001)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.000)	-0.001 (0.001)
Financial_access								
Tariffs								
FDI_share								
Education	-0.003*** (0.000)	0.000 (0.001)						
Electricity_consumption			-0.083*** (0.009)	0.190*** (0.023)				
Logistics_performance					-0.100*** (0.014)	0.218*** (0.038)		
Governance							0.011 (0.020)	0.472*** (0.056)
inverse Mills ratio	-0.017 (0.022)		-0.006 (0.024)		-0.021 (0.024)		-0.004 (0.022)	
Constant	0.371*** (0.117)	-3.379*** (0.226)	0.801*** (0.115)	-4.220*** (0.201)	0.554*** (0.102)	-3.496*** (0.166)	0.323*** (0.076)	-2.442*** (0.148)
Country Dummy	No	No	No	No	No	No	No	No
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi2	598.02		768.31		672.13		564.36	
Prob > chi2	0.000		0.000		0.000		0.000	
Observations	15,094	15,094	14,542	14,542	14,272	14,272	14,913	14,913
Selected obs.	1,896		1,963		1,896		1,980	
Nonselected obs.	13,198		12,579		12,376		12,933	

Standard errors in parentheses, \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1.