

Global value chains in the Pacific island countries: Patterns and structure

Upalat KORWATANASAKUL, PhD

Associate Professor, School of Social Sciences, Waseda University

korwatanasakul@aoni.waseda.jp

Abstract

This study investigates the patterns of global value chain (GVC) participation of the Pacific Island countries (PICs) at the country, industry, and firm levels, utilising UNCTAD-Eora GVC data (1999 – 2018) and the World Bank's Enterprise Survey data (2009 and 2015). It also uses the survey data to examine the relationship between firm and country characteristics and firm-level GVC participation. At the country level, the study found a limited role of the PICs in global and regional production networks, hindering foreign technological and knowledge transfer, industrialisation, and economic development, while, at the industry level, the PICs generally engage in low-value-added activities. The firm-level analysis reveals that the PICs' domestic firms, particularly SMEs, face difficulties joining value chains. Although firm characteristics, i.e. labour productivity and quality certification, are essential for firms to engage in GVCs initially, they are insufficient to deepen a GVC participation level. The analysis also emphasises the significance of macro-level business enabling environment factors, including good governance, trade openness, and foreign direct investment.

Keywords: global value chain; islandness; Pacific island; production network; trade in value added

JEL Classification: F13, F14, O24

1. Introduction

The Pacific island countries (PICs) face several issues in their quest for economic and sustainable development due to their characteristic of “islandness”, i.e. economic and geographical smallness, remoteness, and dispersion (e.g. Juswanto and Ali, 2016; Malua, 2003; UNESCAP, 2006; World Bank, 2021). Small domestic markets constrain their economic activities and, in turn, discount the possibilities of realising economies of scale, specialisation, and industrialisation (Kumar and Stauvermann, 2021). Moreover, remoteness and dispersion imply high transportation and, in turn, production costs, whereas smallness indicates a small domestic market size and a hurdle to realise economies of scale. Together, the characteristics of islandness make the region unattractive to foreign direct investment (FDI), posing challenges to the PICs in joining global value chains (GVCs). Without FDI and GVC participation, the PICs’ domestic firms and industries lose several opportunities, including 1) capabilities and competitiveness enhancement; 2) product quality improvement; 3) financial stability; and 4) market expansion (Korwatanasakul and Paweenawat, 2021). Consequently, the manufacturing sector is underdeveloped, and the PICs have become detached from the global market and value chains.

Even though GVC participation is significant for economic development (e.g. Korwatanasakul and Baek, 2021; Korwatanasakul, Baek, and Majoe, 2022), there is very little stand-alone literature regarding GVCs in the PICs. Most discussions are in the context of Asia and the Pacific and, in turn, offer thin analyses and policy implications which may not be specific to the PICs’ context. On the one hand, the literature provides macro-level descriptive analyses of the PICs’ GVCs covering the issues such as the importance of the services sector in GVCs (Anukoonwattaka, Mikic, and Zhang 2017), the benefits and the drivers of GVC participation (Sawada et al., 2020), and connectivity and GVCs (Shepherd 2016; Vickers, Keane, and Palit 2019). On the other hand, Chand (2017) and Angelucci and Conforti (2010) employ case studies at the firm and industry levels to examine the characteristics of garment and food value chains in Fiji and Vanuatu.

Among the limited amount of literature, the existing literature is almost exclusively limited to grey literature, such as reports by international organisations (e.g. Asian Development Bank (ADB) (Juswanto and Ali, 2016), the International Monetary Fund (IMF, 2022), the United Nations Conference on Trade and Development (UNCTAD) (Malua, 2003), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP, 2017), and the World Bank (World Bank, 2021), national governments (e.g. the Commonwealth Secretariat (Shepherd 2016; Vickers, Keane, and Palit 2019)), and research institutes (e.g. International Institute for Environment and Development (IIED) (Bass and Dalal-Clayton, 1995). In addition, GVC data availability is often a technical issue, even in advanced economies, leading to analytical limitations, e.g. restrictive levels of analysis.

To address the gap in the literature, this study investigates the patterns of GVC participation of the PICs at the country, industry, and firm levels. It also examines the relationship between firm and country characteristics and GVC participation of firms in the PICs. The study utilises 1) UNCTAD-Eora industry-level and country-level GVC data of Fiji, Papua New Guinea (PNG), Samoa, and Vanuatu, for 1999 – 2018, and 2) pooled cross-sectional data from the World Bank’s Enterprise Surveys, covering 245 firms from seven PICs (namely Federated States of Micronesia, Fiji, PNG, Samoa, Solomon Islands, Tonga, and Vanuatu) for 2009 and 2015. To the best of the author’s knowledge, this study is the first empirical study to employ firm-level, industry-level, and country-level data to examine GVC participation patterns and structure in the context of the PICs. It provides a novel analysis through the lens of the GVC framework with empirical data of trade in value-added. Matching GVC trends at the firm, industry, and country levels with the economic development path help identify the linkage between firm-level GVC participation patterns and different stages of industry-level and country-level

GVC integration. Hence, the study contributes to more solid findings on the issues related to GVCs and provides relevant policy recommendations that potentially help support the Pacific firms and industries in smoothly integrating into GVCs and improving market access.

At the country level, the study found a limited role of the PICs in global and regional production networks, hindering foreign technological and knowledge transfer, industrialisation, and economic development. Moreover, the PICs generally engage in low-value-added activities at the industry level, despite the different levels of the PICs' industrial development. In addition, the firm-level analysis reveals that the PICs' domestic firms, particularly SMEs, face difficulties joining value chains. Although firm characteristics, i.e. labour productivity and quality certification, are essential for firms to engage in GVCs initially, they are insufficient to deepen their GVC participation level. The analysis also emphasises the significance of macro-level business enabling environment factors, including good governance, trade openness, and foreign direct investment. In conclusion, sub-national and national industrial development and regional cooperation policy measures are critical for the PICs to participate in global and regional production networks, boost GVC and regional value chain participation levels, and overcome the challenges of islandness through the realisation of production networks, economies of scale, specialisation, and industrialisation.

The remainder of the paper is organised as follows. Sections 2 and 3 utilise the UNCTAD-Eora database on GVCs to empirically examine the patterns and structure of the PICs' GVCs at the country and industry levels, respectively. Section 4 provides a firm-level analysis to study the pattern of engagement in value chains at the firm level by employing pooled cross-sectional data from the World Bank's Enterprise Surveys and Global Development Indicators. Each section briefly discusses related literature, methodology, and data used in the analysis. Section 5 concludes the study and provides policy implications based on the analyses.

2. Country-level analysis

This section utilises an UNCTAD-Eora database on GVCs, employing value-added trade data derived from the Eora global multiregional input-output table to empirically examine the patterns and structure of the PICs' GVCs at the country level. The data includes information on foreign value-added content of exports (FVA), domestic value-added content of exports (DVA)¹, value added integrated into other countries' exports (DVX), and gross exports in Fiji, PNG, Samoa, and Vanuatu, covering the period of 1990–2019.²

According to Korwatanasakul, Baek, and Majoe (2022), individual economies can participate in GVCs through either backward or forward participation, reflecting the chain's upstream and downstream links. Backward GVC participation (backward linkage) is measured by FVA share of total exports, indicating the part of a country's gross exports that consists of inputs produced in other countries. Thus, the FVA share does not add to the national gross domestic product (GDP). On the other hand, forward GVC participation (forward linkage) occurs when exporting domestically produced intermediate goods or services to another economy that reexports them through the value chain to third economies as embodied in other goods or services for further processing. The DVX share of total exports captures the forward linkage.

¹ Domestic value-added content of exports (DVA) is the part of a country's exports created within the country, i.e. the part of exports that contributes to GDP (Intarakumnerd and Korwatanasakul, 2020). The sum of FVA and DVA equates to gross exports.

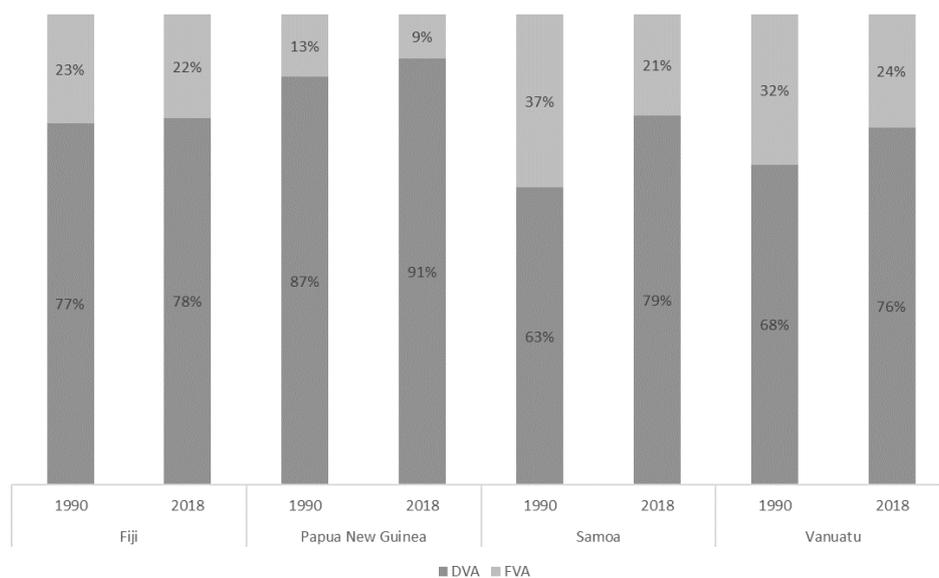
² Trade in value-added data is only available for Fiji, Papua New Guinea, Samoa, and Vanuatu.

The UNCTAD-Eora GVC data manifests that, in general, the PICs' FVA share is smaller than that of DVA and has been declining between 1990 and 2018, implying limited and diminishing participation in backward GVCs (Figure 1.A). Without sufficiently engaging in backward linkage, the PICs lost opportunities to gain from foreign technology and knowledge and, in turn, faced timid economic growth (Intarakumnerd and Korwatanasakul, 2020; Korwatanasakul and Paweenawat, 2021). Figure 1.B shows that the PICs' volume of value-added content of exports (both DVA and FVA), except that of PNG, has grown slightly during the past three decades, reinforcing the argument regarding the adverse effect of underutilisation of backward linkage. Limited backward GVC participation leads to the underdevelopment of local workers, firms, industries, and sectors, particularly the manufacturing sector. Therefore, it explains the slow development of trade in value added among the PICs. Even though PNG, with the lowest FVA share of exports, demonstrates the largest export volume among the PICs, its exports are primarily the exports of natural resources, such as gold, copper, liquefied natural gas, and petroleum, which cannot sustain the economic growth in the long run once these natural resources are used up.

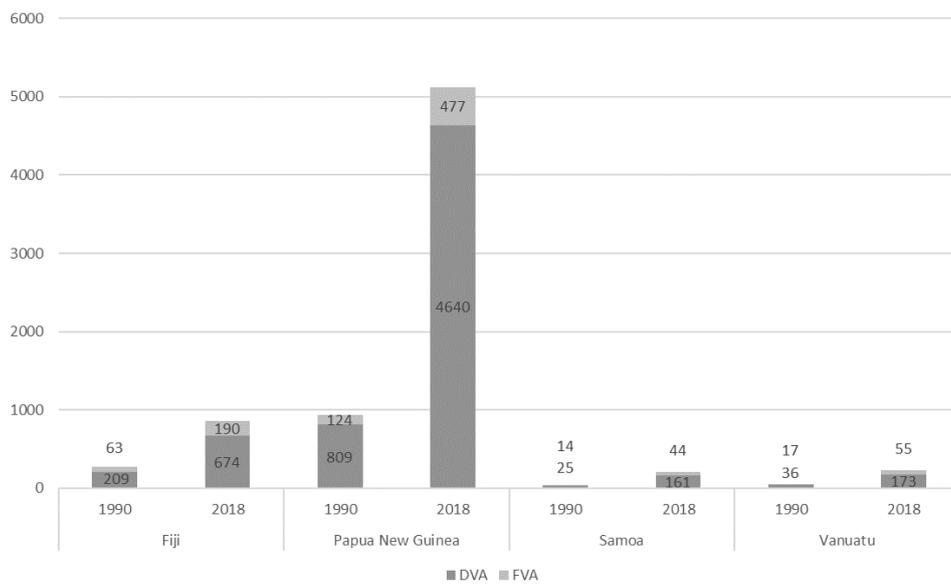
Regarding the PICs' forward GVC participation, except PNG, the DVX share of exports is smaller than that of FVA but has been rising over time (Figure 2.A). Similar to the DVA and FVA volumes, the volume of DVX, however, has not increased much during the same period (Figure 2.B). The relatively low DVX share of exports and volume indicate a restricted role of the PICs in a global production network where other countries do not rely on the PICs' raw and intermediate materials. In other words, the PICs have an insignificant influence on other countries' trade and production. As previously discussed, PNG took advantage of its abundance of local natural resources to boost its trade in value-added, particularly the volume of DVX, which is higher than that of the other PICs. Nevertheless, its DVX volume is still meagre compared to larger economies outside the region.

Figure 1. Trade in value-added of the Pacific Island countries

A. Value-added content of exports (%)



B. Value-added content of exports (Value in million USD)

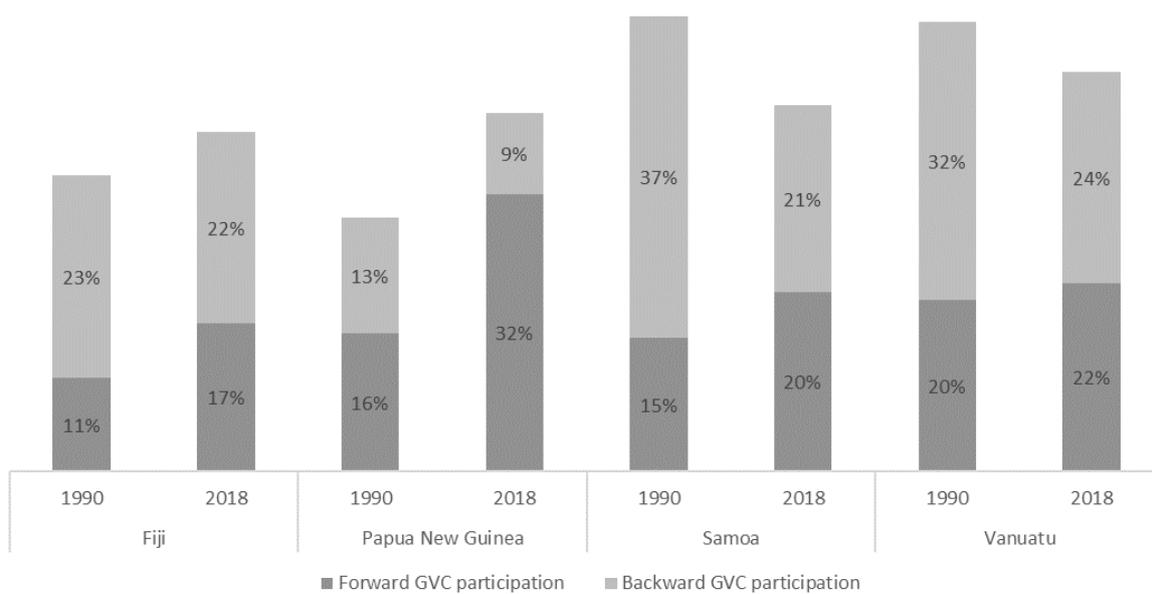


Notes: DVA = domestic value-added content of exports; FVA = foreign value-added content of exports; Total exports = DVA + FVA; USD = United States dollar

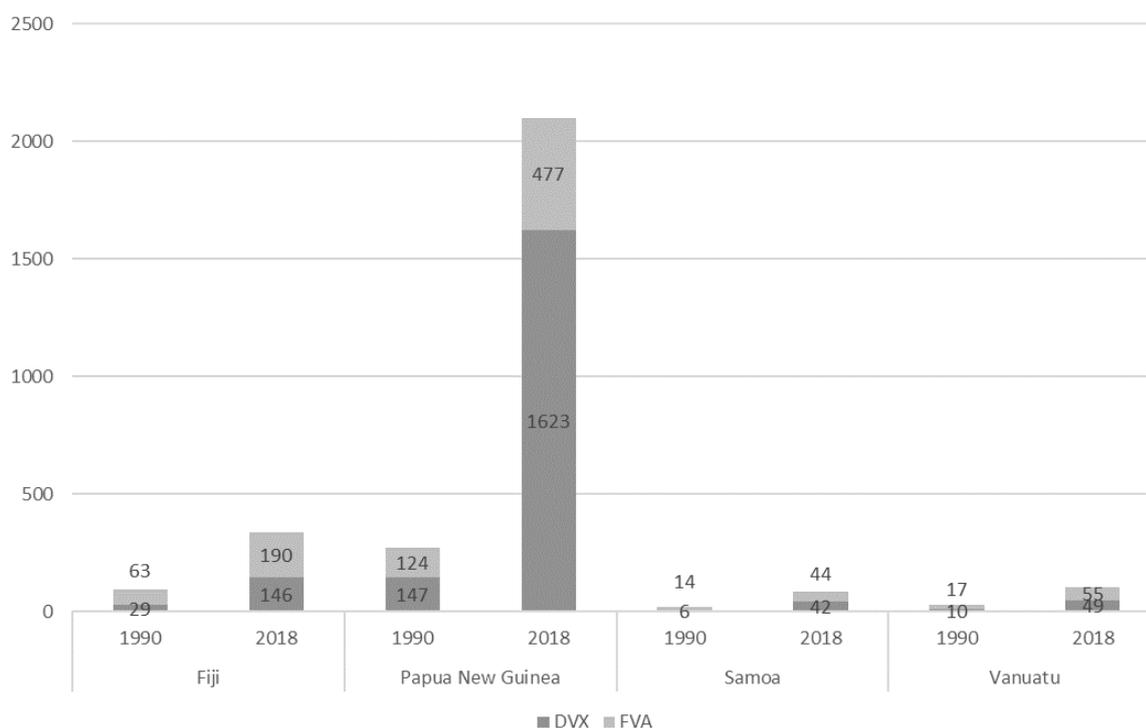
Source: Author, based on the UNCTAD-Eora Global Value Chain Database.

Figure 2. Global value chain participation of the Pacific Island countries

A. Backward and forward GVC participation (%)



B. Backward and forward GVC participation (Value in million USD)



Notes: DVX = domestic value-added content of exports used in other countries' exports; FVA = foreign value-added content of exports; GVC participation = FVA + DVX; USD = United States dollar

Source: Author, based on the UNCTAD-Eora Global Value Chain Database.

The proximity and technological advancement of partner countries possibly explain the pattern of backward linkage in 1990. The PICs' mainly sourced their inputs and technologies to produce their exports from Australia, Japan, New Zealand, and the United States (US). However, comparing the GVC data between 1990 and 2019 gives a somewhat different picture of the backward linkage pattern (Table 1). China and India became critical players in providing production inputs (1-13% increase in FVA share of exports), while the former key players lost their importance (1-17% reduction of FVA share of exports). PNG shows a significant decline in Australia's FVA share of exports (17%) and a sharp rise in China's FVA share of exports (13%). The advantage of competitive inputs and technology costs due to the lower cost of domestic production in China and India may offset the benefits of advanced technology and low international transportation costs due to proximity. Thus, the PICs' recent backward linkage pattern possibly reflects that "lower (domestic production) costs" is another crucial characteristic of partner countries.

The forward linkage shows increasing trading volumes between 1990 and 2019 (Table 2). Nevertheless, the pattern of DVX share of exports is not apparent. Overall, Australia and Germany have been the major markets for inputs from the PICs since 1990. Moreover, Australia's DVX share of exports has increased significantly between 1990 and 2019, as compared to the declining shares of other major markets, e.g. Belgium (for Vanuatu), Germany (for Fiji and PNG), Japan (for PNG), the Netherlands (for Samoa), and Russia (for Fiji). Similarly, the other partner countries' DVX shares of exports have been steadily rising. Increasing DVX volumes by all partner countries, shrinking DVX shares of exports of significant partner countries, and growing DVX shares of exports of the rest imply the PICs' greater market expansion and diversification.

Although the PICs export their production inputs to more advanced economies, such as Australia, Germany, and Japan (with a few exceptions: Belarus, China, Indonesia, and Russia), the country mix varies across the PICs (Table 2). For instance, the main importing partners of Fiji are Australia, Japan, and the United Kingdom (UK), whereas the principal sourcing partners of Samoa include Australia, Germany, and Russia. This observation, together with the fact that the PICs' backward linkage partner countries are those outside the region, points out low intraregional connectivity among the PICs. Table 3 reinforces that trade in value added among the PICs is insignificant, with 0.1% in 1990 and 0.05% in 2019. In contrast, they rely more on GVCs, where their participation was 32% in 1990 and 52% in 2019. In other words, the role of regional value chains (RVCs) among the PICs has declined despite the increase in GVC participation. The low connectivity results from lacking industrial agglomeration and production networks, unlike other economic blocs, e.g. the Association of Southeast Asian Nations (ASEAN) and the Southern Common Market (Mercosur).

Table 1. Foreign value-added content of exports (FVA) by destination countries and its growth between 1990 and 2019

	Fiji				Papua New Guinea				Samoa				Vanuatu		
	1990	2019	Growth		1990	2019	Growth		1990	2019	Growth		1990	2019	Growth
Australia	26.4%	20.8%	2.6%	Australia	35.8%	18.9%	5.9%	New Zealand	5.9%	8.6%	10.6%	India	1.0%	8.5%	-0.4%
New Zealand	16.1%	15.3%	3.2%	China	2.0%	14.7%	3.4%	USA	11.1%	8.0%	1.9%	Australia	9.4%	7.0%	9.0%
China	1.7%	9.4%	9.8%	Indonesia	2.8%	7.2%	9.2%	China	1.7%	6.3%	7.9%	China	1.7%	6.7%	5.2%
India	1.4%	8.6%	10.0%	Singapore	6.3%	6.8%	4.0%	Australia	6.3%	5.4%	2.0%	Japan	8.7%	6.7%	2.1%
USA	7.3%	4.1%	1.3%	Japan	7.0%	5.9%	2.8%	Japan	7.0%	4.3%	4.0%	New Zealand	4.1%	5.5%	1.2%
Japan	6.2%	4.0%	1.9%	Malaysia	2.2%	4.9%	4.0%	UK	3.9%	3.4%	6.3%	South Korea	1.0%	2.5%	4.5%
Indonesia	2.0%	3.4%	5.3%	USA	6.5%	4.9%	4.6%	Germany	2.2%	2.2%	1.5%	UK	3.6%	2.4%	0.7%
Singapore	2.2%	2.6%	4.1%	New Zealand	4.6%	3.3%	5.1%	Thailand	1.5%	1.8%	-1.2%	USA	7.8%	2.4%	0.7%
Thailand	1.9%	2.2%	3.9%	Thailand	2.0%	3.3%	6.8%	India	0.9%	1.8%	2.8%	Germany	2.2%	2.2%	3.6%
South Korea	1.0%	2.1%	6.0%	Germany	2.0%	2.6%	6.0%	South Korea	1.0%	1.5%	3.8%	Thailand	1.6%	2.0%	2.6%
Other	33.7%	27.4%		Other	28.9%	27.4%		Other	58.6%	56.8%		Other	59.0%	54.0%	

Source: Author, based on the UNCTAD-Eora Global Value Chain Database.

Table 2. Domestic value-added content of exports used in other countries' exports (DVX) by destination countries and its growth between 1990 and 2019

	Fiji				Papua New Guinea				Samoa				Vanuatu		
	1990	2019	Growth		1990	2019	Growth		1990	2019	Growth		1990	2019	Growth
Australia	12.0%	16.9%	6.6%	Australia	16.4%	22.5%	10.8%	Australia	7.2%	15.7%	9.5%	Germany	23.4%	7.5%	1.7%
Japan	18.2%	12.9%	4.1%	Germany	20.2%	14.1%	8.3%	Russia	4.4%	7.2%	8.4%	Russia	2.8%	6.9%	9.1%
UK	12.2%	11.3%	5.0%	South Korea	7.5%	8.9%	10.3%	Germany	4.2%	5.6%	7.6%	Belgium	17.7%	5.9%	1.8%
New Zealand	5.3%	7.6%	6.7%	Belgium	5.9%	8.7%	11.1%	Belarus	2.7%	4.8%	8.7%	Indonesia	1.3%	5.4%	11.0%
Germany	5.4%	6.4%	5.9%	Japan	16.1%	7.8%	6.9%	China	0.7%	3.5%	12.8%	Belarus	1.8%	4.7%	9.2%
USA	3.7%	4.5%	6.1%	China	1.4%	6.1%	15.3%	Japan	2.4%	3.0%	7.3%	Japan	3.2%	4.6%	7.1%
Netherlands	2.7%	3.5%	6.2%	Netherlands	4.3%	4.1%	9.5%	Belgium	8.0%	2.9%	3.0%	Singapore	1.4%	3.5%	9.2%
China	0.4%	2.7%	12.6%	Italy	2.1%	3.5%	11.6%	UK	4.2%	2.6%	4.8%	Netherlands	3.3%	3.1%	5.5%
Singapore	1.5%	2.0%	6.3%	UK	4.2%	2.9%	8.2%	New Zealand	2.2%	2.6%	7.2%	China	0.0%	3.0%	22.7%
South Korea	1.6%	1.9%	5.8%	Singapore	1.4%	1.9%	10.7%	Singapore	2.2%	2.3%	6.8%	UK	2.9%	2.5%	5.2%
Other	37.0%	30.4%		Other	20.5%	19.4%		Other	61.7%	49.8%		Other	42.2%	52.9%	

Source: Author, based on the UNCTAD-Eora Global Value Chain Database.

Table 3. The PICs' GVC and RVC participation

Year	FVA			DVX			GVC participation	RVC participation
	Non-PICs	PICs	Total	Non-PICs	PICs	Total		
Volume (Million USD)								
1990	219.41	0.63	220.04	194.01	0.63	194.65	414.69	1.27
2019	459.87	1.45	461.31	2,343.39	1.45	2,344.83	2,806.15	2.89
Share (%)								
1990	17%	0.05%	17%	15%	0.05%	15%	32%	0.10%
2019	9%	0.03%	9%	44%	0.03%	44%	52%	0.05%

Notes: DVX = domestic value-added content of exports used in other countries' exports; FVA = foreign value-added content of exports; GVC = global value chain, GVC participation = Total FVA volume/share + Total DVX volume/share; PICs = Pacific island countries (Fiji, Papua New Guinea, Samoa, and Vanuatu); RVC = regional value chain; RVC participation = FVA volume/share by the PICs + DVX volume/share in the PICs; USD = United States dollar.

Source: Author, based on the UNCTAD-Eora Global Value Chain Database

3. Industry-level analysis

Similar to the country-level analysis, this section employs the UNCTAD-Eora database on GVCs, covering 27 industries, to empirically examine the PICs' GVC participation pattern and structure at the industry level between 1990 and 2017. This study focuses on the PICs' manufacturing sector and strategic industries as they are the most relevant to the PICs' GVC participation. Overall, the PICs' strategic industries, i.e. food and beverage (Fiji, Samoa, and Vanuatu), metal and non-metallic mineral products (PNG), textiles and clothing (Fiji and PNG), transport equipment (Samoa), and wood and paper (Fiji and Vanuatu), (Commonwealth Network, 2020; Investment Fiji, 2021; Vanuatu Foreign Investment Promotion Agency, 2022), are primarily concentrated in the middle of global value chains. The countries engage in low-value-added activities, including supplying raw materials (upstream industry) and sourcing parts and components (e.g. Samoa's automotive wiring harness).

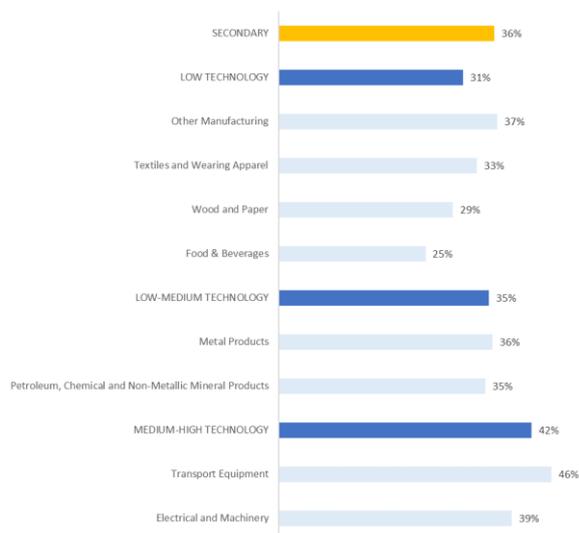
On average, the PICs' FVA share of the manufacturing sector is 32%. In general, the medium-high technology industrial group, covering transport equipment and electrical and machinery, demonstrates the highest FVA share, approximately 35% (Figure 3). The top industries that rely on foreign materials and technology are textiles, wearing apparel, metal products, and transport equipment. However, the degree of industrial FVA shares varies across the PICs, implying different degrees of industrial development. Countries engage in backward GVC participation to improve domestic industries, particularly their strategic industries, through the benefits of imported production inputs, technology, and knowledge (Korwatanasakul and Paweenawat, 2021). On the one hand, more advanced economies, i.e. Fiji and PNG, show the highest FVA shares in industries utilising medium-high technology, such as transport equipment and electrical and machinery. On the other hand, smaller economies, i.e. Samoa and Vanuatu, demonstrate the largest FVA shares in the low-technology industrial groups, such as textiles and wearing apparel and other manufacturing.

The industries such as food and beverage, wood and paper, and metal and non-metallic mineral products require simple technologies; therefore, they rely relatively less on foreign inputs and technologies and involve in simpler value chains. Figure 3 shows that the FVA shares of those industries are among the lowest: on average, 17.5%, 26%, and 28%, respectively. In contrast, products from industries, such as textiles and clothing and transport equipment, engage in more complex value

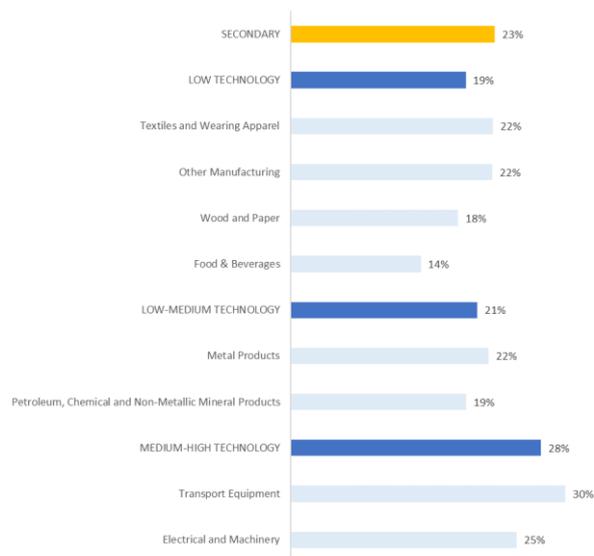
chains requiring different technology levels (Korwatanasakul and Intarakumnerd, 2020; Saito, 2020). Thus, the higher FVA shares are observable in these industries: on average, 39% for both industries.

Figure 3. Share of foreign value added in exports by sector, industrial group, and industries, 2017

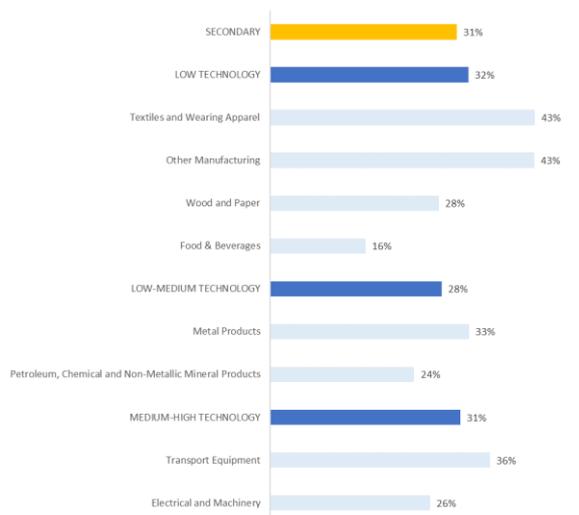
A. Fiji



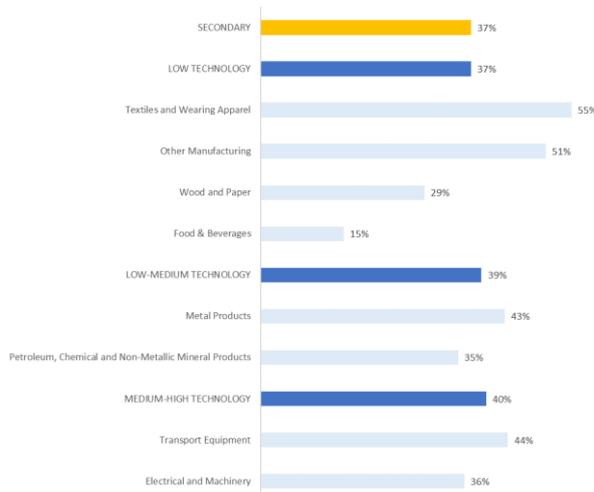
B. Papua New Guinea



C. Samoa



D. Vanuatu



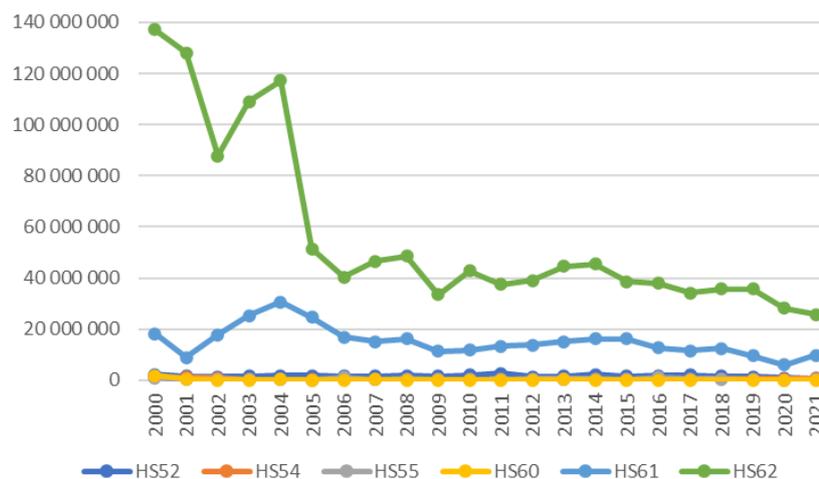
Source: Author, based on the UNCTAD-Eora Global Value Chain Database.

The textiles and clothing industry is relatively less capital-intensive (low-technology). It allows labour-intensive economies to participate in GVCs and industrialise. Higher backward GVC participation in less developed PICs, e.g. Samoa and Vanuatu, is observable (Figure 4), even though the industry is not prioritised. For more advanced economies, e.g. Fiji and PNG, the industry depends relatively less on foreign inputs as it has been developed to the extent that it can utilise more domestic inputs to produce exports. According to Investment Fiji (2021), Fashionating World (2017), and Fibre2Fashion

News Desk (2017), the industry is one of the strategic industries of Fiji and PNG. However, this study focuses on Fiji due to PNG’s data limitation.³

The textiles industry and clothing industry are substantially different in terms of technology and capital intensity (Korwatanasakul, 2023). The clothing industry’s main activities are cut, make, and trim (CMT) operations, indicating a highly labour-intensive nature. In contrast, the textiles industry involves a broader range of operations, e.g. spinning, yarn producing, weaving, knitting, dyeing, and finishing, implying more capital and technological-oriented nature. Although Fiji’s industrialisation is more advanced than other PICs, the country’s textiles and clothing industry operations are still behind countries outside the region, such as China, Germany, Italy, Japan, Korea (Republic of), and the US. Since 2000, Fiji’s competitiveness has lain mainly in the clothing industry (HS61 and HS62) or labour-intensive and low-value-added activities, while the textiles industry (HS52, HS54, HS55, and HS60) has not developed, as its exports remained significantly low (Figure 4). Figure 4 also reveals that the textiles and clothing industry’s exports are generally constant over time. The typical issue of the textile and clothing industry is its heavy reliance on foreign inputs (e.g. imported fabrics), particularly for a country specialising in low-value-added activities (e.g. CMT operations) and cannot achieve functional upgrading or move up value chains (Korwatanasakul, 2023).

Figure 4. Textiles and Clothing Exports of Fiji, 2000 - 2021 (US\$)



Notes: HS52 = Cotton; HS54 = Man-made filaments; strip and the like of man-made textile materials; HS55 = Man-made staple fibres; HS60 = Fabrics; knitted or crocheted; HS61 = Apparel and clothing accessories; knitted or crocheted; HS62 = Apparel and clothing accessories; not knitted or crocheted

Clothing = HS61 + HS62; Textiles = HS52 + HS54 + HS55 + HS60

Source: Author, based on the United Nations Statistics Division.

Similar to the textiles and clothing industry, even though the transport equipment industry is regarded as a medium-high industry, the PICs’ transport equipment industry is located in a lower tier or value

³ The data limitation is possibly explained by the recent development of the industry in PNG. In 2017, the domestic textiles and clothing industry began to develop through the support of the government as the government saw the necessity to reduce its dependence on imported products, including manufactured garments (Fashionating World, 2017).

chain. For example, Samoa participated in the automotive value chain in 1991 through the establishment of Yazaki EDS, a Japanese-owned automotive wiring harness company. Samoa suppliers are in either Tier 2 or Tier 3 of the value chain, signifying low-value-added activities and products. In 2017, Yazaki EDS stopped its operation due to the withdrawal of the original equipment manufacturer in the automotive manufacturing sector within Australia. The incident points out the vulnerability of the domestic suppliers that relied heavily on their labour rather than improving domestic technologies. Consequently, domestic suppliers cannot upgrade their operations and fall into the vicious cycle where the small domestic automobile market has led to underdeveloped automobile and supporting industries.

4. Firm-level analysis

This section examines the pattern of engagement in value chains at the firm level by utilising pooled cross-sectional data from the World Bank's Enterprise Surveys and Global Development Indicators. The data covers 245 manufacturing firms from seven PICs, namely Federated States of Micronesia, Fiji, PNG, Samoa, Solomon Islands, Tonga, and Vanuatu, for 2009 and 2015. Following Urata and Baek (2021) and Korwatanasakul and Paweenawat (2021), this study constructs two indicators of GVC participation, a GVC participation dummy and a GVC participation index. The GVC participation dummy indicates whether firms join GVCs. In contrast, the GVC participation index, calculated by multiplying the ratio of exports to total sales and the ratio of foreign input to total input, represents the level of GVC participation.

4.1. Patterns and structure of GVC participation

Table 4 categorises firms into six types based on domestic and international sales and input procurement. The first column (Column 1) represents firms engaging entirely in domestic sales and procurement, accounting for 7% of the sample firms, whereas the largest share of firms, 51%, rely on foreign inputs for domestic sales (Column 2). This is consistent with the characteristic of islandness discussed in the introduction: a high degree of import dependence (Bass and Dalal-Clayton, 1995; World Bank, 2021), while showing a sharp contrast to the world average GVC participation pattern presented by Urata and Baek (2021)⁴: 45.5% do not engage in foreign trade, and 24.4% engage in imports but not exports. The contrast of the results emphasises the unique characteristics of the PICs' foreign trade and GVC participation, which is worth further examination. The rest of the firm types (Columns 3-6) illustrate similar results to those of Urata and Baek (2021): Firms engaging in exports but not imports (sum of Columns 3 and 4) occupy 4%; GVC firms (sum of Columns 5 and 6) represent a quarter of the sample (25%). Columns 5 and 6 indicate the number of firms engaging in backward GVC participation (hereafter, "GVC firms"). GVC firms utilise imported inputs to produce their products and then export their products to the international market directly or indirectly.

Considering a firm size, the largest portion of small business (less than 20 employees) and medium business (20-99 employees)⁵, 53.6% and 53.1%, respectively, depends on imported inputs but only feeds their products to the domestic market. The second largest category of small and medium-sized enterprises is GVC firms, accounting for 22.7% of small enterprises and 21.9% of medium enterprises. In contrast, three-quarters of the enterprises are considered GVC firms, signalling that large enterprises (more than 99 employees) tend to engage in GVCs. The findings reveal that small and

⁴ Urata and Baek (2021) employed the same dataset, World Bank's Enterprise Surveys, to study the pattern of engagement in foreign trade at the firm level, covering 111 countries.

⁵ The study follows the firm size criteria of the World Bank Enterprise Survey.

medium-sized enterprises (SMEs) may face greater barriers to participating in GVCs. The previous studies, e.g. Korwatanasakul (2019), Korwatanasakul and Intarakumnerd (2020), Korwatanasakul and Paweenawat (2021), suggest that requirements, such as international standards, greater managerial and financial resources, and intellectual property, hinder SMEs' GVC participation as they face constraints in terms of economies of scale, access to finance and information, and technological capacity.

Table 4. Patterns of Engagement in Foreign Trade for the Sample Firms in the Pacific Island countries, 2009 & 2015

		1	2	3	4	5	6	Missing	GVC firms (5+6)	Total
Sales	Domestic	O	O	X	O	X	O	.	X/O	
	Exports	X	X	O	O	O	O	.	O	
Inputs	Domestic	O	O	O	O	O	O	.	O	
	Imports	X	O	X	X	O	O	.	O	
Firm size	Small (<= 19)	13	97	1	6	3	38	23	41	181
	Medium (>= 20 & <= 99)	1	17	1	1	3	4	5	7	32
	Large (>= 100)	0	0	0	1	3	3	1	6	8
	Missing	3	12	0	0	3	5	1	8	24
	Total	17	126	2	8	12	50	30	62	245
Firm size	Small (<= 19)	76.5	77.0	50.0	75.0	25.0	76.0	76.7	66.1	73.9
	Medium (>= 20 & <= 99)	5.9	13.5	50.0	12.5	25.0	8.0	16.7	11.3	13.1
	Large (>= 100)	0.0	0.0	0.0	12.5	25.0	6.0	3.3	9.7	3.3
	Missing	17.6	9.5	0.0	0.0	25.0	10.0	3.3	12.9	9.8
	Total	100	100	100	100	100	100	100	100	100
Firm size	Small (<= 19)	7.2	53.6	0.6	3.3	1.7	21.0	12.7	22.7	100
	Medium (>= 20 & <= 99)	3.1	53.1	3.1	3.1	9.4	12.5	15.6	21.9	100
	Large (>= 100)	0.0	0.0	0.0	12.5	37.5	37.5	12.5	75.0	100
	Missing	12.5	50.0	0.0	0.0	12.5	20.8	4.2	33.3	100
	Total	6.9	51.4	0.8	3.3	4.9	20.4	12.2	25.3	100

Notes: GVC = global value chain; PICs = Pacific Island countries; O = Having exports of products/imports of foreign inputs; X = Not exports of products/imports of foreign inputs; . = not applicable (missing).

PICs include Fiji, Micronesia, Papua New Guinea, Samoa, Solomon Islands, Tonga, and Vanuatu.

Source: Author, based on the World Bank's Enterprise Surveys data.

4.2. GVC-firm characteristics

Given the PICs' data limitation, this section investigates firm-level and country-level characteristics possibly *correlated* with the probability of participating in GVCs and the level of such participation. Therefore, no causal relations are established behind those relationships. The section follows the studies of Urata and Baek (2021) and Korwatanasakul and Paweenawat (2021) to select firm-level and country-level characteristics (variables) correlated with the possibility of GVC participation (GVC participation dummy) and the level of GVC participation (GVC participation index). Thus, two kinds of regression analyses are performed for two dependent variables, GVC participation dummy and GVC participation index. Table 5 provides summary statistics.

Table 5. Summary Statistics

Level	Variable	Description	Observation	Mean	Standard deviation	Min	Max
Firm	GVC participation	GVC participation dummy - whether firms join GVCs	215	0.2884	0.4541	0	1
	GVC participation index	A GVC index is computed as (exports/total sales)×(procurements from foreign countries/total procurements). It indicates the level of GVC participation	215	0.0821	0.2078	0	1
	Labour productivity	Logarithm of labour productivity based on value-added	191	12.3015	2.1801	7.87	19.8
	Firm size	Logarithm of total employees	221	2.1944	1.1078	0	8.01
	Firm age	Number of years in operation	235	20.9830	17.1776	0	116
	Foreign ownership	The share of equity owned by foreign firm (%)	240	0.2364	0.3732	0	1
	Quality certification	Ownership of internationally recognised quality certification	225	0.2444	0.4307	0	1
	Financial access	Proportion of external funds to purchase fixed assets	235	0.2370	0.3303	0	1
Country	Tariffs	Tariff rate, most favoured nation, simple mean, manufactured products (%)	245	10.3689	2.8944	2.46	13.9
	Foreign direct investment	Foreign direct investment, net inflows (% of GDP)	245	3.6091	4.0826	0.08	10.7
	Education	School enrollment, secondary (% gross)	245	78.4405	22.5372	42.8	103
	Logistics performance	Logistics performance index: Quality of trade and transport-related infrastructure (1=low to 5=high)	245	2.1455	0.1544	1.98	2.46
	Governance	CPIA property rights and rule-based governance rating (1=low to 6=high)	245	3.2102	0.5017	2	4

Note: CPIA = Country Policy and Institutional Assessment; GDP = gross domestic product; GVC = global value chain

Source: Author, based on the World Bank's Enterprise Surveys data and World Bank Open Data (World Bank, 2022).

A probit estimation (1) is performed for the GVC participation dummy, while a tobit estimation (2) is employed for the GVC participation index:

$$\begin{aligned}
 \Pr(GVC_{ict} = 1|Z_{ict}) &= \Phi(\alpha + \beta_1 Labour\ Productivity_{ict} + \beta_2 Firm\ Size_{ict} + \beta_3 Firm\ Age_{ict} \\
 &+ \beta_4 Foreign\ Ownership_{ict} + \beta_5 Quality\ Certification_{ict} \\
 &+ \beta_6 Financial\ Access_{ict} + \gamma_1 Tariffs_{ct} + \gamma_2 FDI_{ct} \\
 &+ \gamma_3 Education_{ct} + \gamma_4 Logistics\ Performance_{ct} + \gamma_5 Governance_{ct} + \eta_c + \delta_k \\
 &+ \mu_t + \varepsilon_{ict}) \quad (1)
 \end{aligned}$$

$$\begin{aligned}
 GVCindex_{ict} &= \alpha + \beta_1 Labour\ Productivity_{ict} + \beta_2 Firm\ Size_{ict} + \beta_3 Firm\ Age_{ict} \\
 &+ \beta_4 Foreign\ Ownership_{ict} + \beta_5 Quality\ Certification_{ict} \\
 &+ \beta_6 Financial\ Access_{ict} + \gamma_1 Tariffs_{ct} + \gamma_2 FDI_{ct} \\
 &+ \gamma_3 Education_{ct} + \gamma_4 Logistics\ Performance_{ct} + \gamma_5 Governance_{ct} + \eta_c + \delta_k \\
 &+ \mu_t + \varepsilon_{ict} \quad (2)
 \end{aligned}$$

where GVC_{ict} indicates whether firm i of country c in year t participates in GVCs, whereas $GVCindex_{ict}$ represents the degree of GVC participation of firm i . Firm-characteristic variables include 1) *Labour Productivity* computed by dividing annual sales by the number of employees; 2) *Firm Size* proxied by the number of total employees; 3) *Firm Age* represented by the number of years in operation; 4) the share of foreign ownership (*Foreign Ownership*); 5) ownership of internationally recognised quality certification (*Quality Certification*); and 6) proportion of external funds to purchase fixed assets (*Financial Access*). On the other hand, country-characteristic variables cover 1) most favoured nation,

simple mean, manufactured products (*Tariffs*); 2) net inflows of foreign direct investment (% of GDP) (*FDI*); 3) secondary school enrollment (% gross) (*Education*); 4) *Logistics Performance*; and 5) *Governance*. *Logistics Performance* is proxied by the logistics performance index measuring the quality of trade and transport-related infrastructure (1=low to 5=high), while *Governance* is measured by Country Policy and Institutional Assessment (CPIA) property rights and rule-based governance rating (1=low to 6=high). ε_{ijt} is the disturbance term. Industry, country, and year fixed effects (η_c , δ_k , and μ_t) are imposed in the estimation to control for unobserved heterogeneity across industrial groups, countries, and times. According to the previous literature (e.g. Harvie, Narjoko, and Oum, 2010; Ignatenko, Raei, and Mircheva, 2019; Kowalski et al., 2015; Lu et al., 2018; Wignaraja, 2013), the expected signs of the coefficients for all variables, except *Tariffs* and *Firm Age*, are positive.⁶

Table 6 shows the regression results of both estimation models. The estimated coefficients for labour productivity, firm size, foreign ownership, and quality certification are positive and statistically significant for the probit estimation model, consistent with the existing literature. Nevertheless, labour productivity and quality certificate lose statistical significance in the tobit estimation model. Moreover, in both models, firm age, financial access, and logistics performance are not statistically significant, giving somewhat contrasting results to the previous studies.

The estimated results of labour productivity illustrate that firms with labour productivity have a higher chance of participating in GVCs, consistent with Harvie, Narjoko, and Oum (2010) and Lu et al. (2018). However, only labour productivity may not help firms increase the level of GVC participation as involvement in value chains requires greater technology, managerial skills, and financial resources (Korwatanasakul and Paweenawat, 2021). Similarly, the same argument applies to firms with quality certification. The firms are more likely to join value chains because they may pass minimum international standards. Still, the quality certification may not significantly improve the GVC participation level.

Regarding firm age, the result is consistent with that of Harvie, Narjoko, and Oum (2013), revealing no relationship between firm age and GVC participation and the participation level while contrasting with that of Lu et al. (2018) and Wignaraja (2013) finding a statistically significant negative relationship. On the one hand, older firms are possibly more competitive as they have accumulated experience, market information, and networks, which can help them participate in GVCs. On the other hand, younger firms may have better opportunities to join value chains since they are more agile and quick to adopt new technology and knowledge (Lu et al., 2018; Urata and Baek, 2021; Wignaraja, 2013). Hence, the positive and negative effects of firm age may cancel each other out due to the opposite directions.

The coefficients of financial access and logistics performance are not statistically significant, possibly due to the characteristics of islandness, i.e. remoteness and dispersion. As discussed in the introduction, remoteness and dispersion pose high transportation costs to the PICs' firms, reflecting the low logistics performance of firms across the PICs. On average, the logistics performance index of the PICs is approximately 2.1, with a minimum value of 1.9 and a maximum value of 2.2 (World Bank Open Data), showing a similar level of logistics performance among the PICs. Furthermore, regardless of GVC status, PIC firms face difficulties acquiring external funds, particularly from abroad, to purchase fixed assets and operate their businesses. Therefore, the unique characteristics of the PICs give a sharp contrast to the previous literature on non-PICs (e.g. Harvie, Narjoko, and Oum, 2013; Kowalski et al.,

⁶ For theoretical discussion of the relationship between GVC participation dummy and index and each firm-characteristics and country-characteristic variables, See Urata and Baek (2021) and Korwatanasakul and Paweenawat (2021). Some variables are omitted due to data unavailability of the PICs.

2015; Lu et al., 2018; Urata and Baek, 2021) that illustrates the positive relationship between GVC participation and financial access and logistics performance.

Lastly, country characteristics, namely openness to trade and FDI and governance, manifest positive relationships with a tendency and a level of engagement in value chains. Openness to trade encourages GVC participation since firms have better incentives to source foreign inputs and export their products abroad (Ignatenko, Raei, and Mircheva, 2019; Kowalski et al., 2015). Furthermore, openness to FDI and good governance attract foreign firms to invest in a country due to a reliable, fair, and transparent business environment (Ignatenko, Raei, and Mircheva, 2019; Kowalski et al., 2015). The findings are also consistent with the firm-level characteristics, i.e. foreign ownership and firm size, as firms with relatively higher levels of both characteristics tend to enjoy the benefits of FDI.

Table 6. Regression results - GVC participation (probit estimation) and GVC participation index (tobit estimation)

Independent variables	Dependent variables			
	GVC participation (probit) 1	GVC participation index (tobit) 2	GVC participation (probit) 3	GVC participation index (tobit) 4
Firm characteristics				
Labour productivity	0.0529*** (0.00585)	0.00618 (0.00920)	0.0321** (0.0126)	0.00194 (0.00898)
Firm size	0.116*** (0.0289)	0.0681*** (0.0129)	0.178*** (0.0456)	0.0657*** (0.0141)
Firm age	0.00361 (0.0123)	-0.000220 (0.000191)	0.00983 (0.0143)	-0.000145 (9.80e-05)
Foreign ownership	0.0924 (0.0790)	0.0719*** (0.00539)	0.149*** (0.0150)	0.0691*** (0.00725)
Quality certificate	1.116* (0.628)	-0.000965 (0.00331)	1.083* (0.651)	0.00428 (0.00273)
Finance access	-1.677 (1.429)	-0.0419 (0.0445)	-1.374 (1.157)	-0.0412 (0.0471)
Country characteristics				
Tariffs			-0.245*** (0.0142)	-0.0178*** (0.00227)
Foreign direct investment			0.173*** (0.0550)	0.00974*** (0.000334)
Governance			2.713*** (0.488)	0.172*** (0.00995)
Logistics performance			2.121 (2.069)	-0.000174 (0.0609)
Constant	-2.090*** (0.310)	-0.207** (0.0857)	-13.87** (6.786)	-0.576*** (0.0346)
Observations	88	134	96	134

Note: GVC = global value chain; Robust standard errors are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. All models control for industry and year fixed effects.

Source: Author, based on the World Bank's Enterprise Surveys data and World Bank Open Data.

5. Conclusion

This study examines the patterns of GVC participation of the PICs at the country, industry, and firm levels and the relationship between firm and country characteristics and GVC participation of firms in the PICs. The study employs 1) UNCTAD-Eora industry-level and country-level GVC data of Fiji, Papua New Guinea (PNG), Samoa, and Vanuatu, for 1999 – 2018, and 2) pooled cross-sectional data from the World Bank's Enterprise Surveys, covering 245 firms from seven PICs (namely Federated States of Micronesia, Fiji, PNG, Samoa, Solomon Islands, Tonga, and Vanuatu) for 2009 and 2015.

First, the country-level analysis reveals that the role of the PICs in global and regional production networks is limited, hampering foreign technological and knowledge transfer, industrialisation, and economic development. Thus, there is a need to boost the level of GVC and RVC participation among the PICs. Building economic and political coordination among the PICs, together with foreign investment promotion measures, may help overcome the challenges of islandness through the realisation of production networks, economies of scale, specialisation, and industrialisation.

Second, the industry-level analysis shows that the PICs' strategic industries engage in low-value-added activities. Therefore, policy measures, e.g. capacity building programmes, research and development for domestic technology, potentially help the PICs gradually achieve different stages of upgrading, including process upgrading, product upgrading, functional upgrading, and, ultimately, chain upgrading. Moreover, the analysis indicates different degrees of industrial development among the PICs from the degree of industrial FVA shares. This information is necessary when considering regional coordination since it informs policymakers regarding the specialisation and division of labour among the PICs. Better industrial coordination among the PICs may contribute to greater GVC and RVC participation levels, reinforcing the first policy suggestion regarding integration and regional cooperation.

Lastly, the firm-level analysis emphasises the unique characteristics of the PICs' foreign trade and GVC participation. For instance, the analysis shows that the largest share of PIC firms relies on foreign inputs for domestic markets (a high degree of import dependence), implying vulnerabilities to external shocks. Furthermore, the analysis reveals different firm and country characteristics correlated with the possibility of participating in GVCs and the GVC participation level. First, the PICs' domestic firms, particularly SMEs, face difficulties joining value chains. SMEs may find it challenging to enter GVCs for several reasons, such as a lack of ability to meet international standards, managerial and human capital resources, limited access to credit and loans, and limited access to information and innovation. Therefore, it is worth further examination of PIC SMEs' challenges to engage in GVCs and, in turn, formulate policies that can practically address the challenges to help local SMEs to enter GVCs smoothly. The study also points out that improvements in labour productivity and the acquisition of quality certification are essential for firms to engage in GVCs initially but insufficient to deepen their GVC participation level. Thus, a mix of policy tools to promote greater technology, managerial skills, and financial resources for domestic firms, especially SMEs, is necessary to ensure smooth value chain participation and upgrade domestic firms within and among value chains. In addition to firm-level characteristics, the analysis stresses the significance of macro-level business enabling environment factors, including good governance and openness to trade and FDI. A business-enabling environment does not only facilitate local firms to participate in GVCs but also encourages foreign investors to invest in the PICs. In conclusion, the country, industry, and firm-level analyses suggest that sub-national and national industrial development and regional cooperation policy measures are critical for the PICs to participate in global and regional production networks, boost GVC and regional value chain participation levels, and overcome the challenges of islandness.

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