Analysis of Global Value Chain Participation and the Labour Market in Thailand: Macro- and Micro-level Analyses

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Abstract

This study assesses the links between global value chain (GVC) participation and the labour market. We utilise Labour Force Survey (LFS) data from Thailand for the period 1995–2011 to examine the relationship between GVC participation and worker productivity/wages at the industry and individual levels. At the industry level, we conducted ordinary least squares (OLS) estimations using panel data and found that GVC participation through backward linkages can raise labour productivity in the manufacturing sector. At the individual level, our estimation method is an OLS estimation using pooled cross-sectional data. We also separately examine the effects of forward and backward GVC participation on wages and wage distributions. Our results show that GVC participation induces higher monthly wages for individuals and increases productivity in the labour market through either the forward linkage or backward linkage. We even find that GVC participation can help mitigate inequality. Our findings show that GVC participation promotes inclusive job creation and provides more job opportunities for rural, female, and low-skilled workers. Policies to support leveraging the existing strong industries through upgrading, smoothing labour movements while improving agricultural productivity, and preparing to move towards a services economy can help prepare Thailand, and other developing countries in general, to upgrade to higher value chains. Although GVC participation may be a catalyst for higher wages, greater labour productivity, and more inclusive job creation, its employment effects are complicated. An unbalanced policy framework might contribute to uneven income distributions and exclusive job creation as participating in GVCs through different linkages can benefit different stakeholders in varying ways. Therefore, a policy framework that balances the benefits among stakeholders in terms of wage distributions and job inclusion is ideal.

Keywords

Global value chain participation; wage distributions; job inclusion; labour productivity; labour market; Thailand

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1 Introduction

The spread of global value chains (GVCs) is changing the approach towards trade and development analysis. While traditionally, imports were assumed to reflect a country's domestic demand for foreign goods and services, trade is becoming increasingly characterised by the fragmentation of production across borders, where individual countries along GVCs play specific and separate roles in the production process. This change has called for specialised analysis of GVCs and new measures of trade, one of which is trade in value-added (TiVA).

Through the interactions between countries and the supply of final goods and services, TiVA can provide insights into the industry-specific effects of GVCs and, consequently, the influence on the labour market and labour conditions. These insights are of particular importance for developing countries, who, because of their typical labour abundance, must find the most effective ways of achieving successful and comprehensive GVC participation.

This study assesses the links between GVC participation and the labour market. We utilise Labour Force Survey (LFS) data from Thailand to examine the relationship between GVC participation and worker productivity/wages at the industry and individual levels. The employment-related distribution effects of GVC integration are largely unknown, and evidence is mixed. Participation in value chains may enable firms to grow and stimulate demand for labour, but it may also lead uncompetitive firms to exit the market and be detrimental for employment in some industries. Participation may also affect certain labour demographics in different ways, such as based on skill level, gender, or region, leading to changes in wage levels and wage distribution patterns. Analysis in this area will, thus, aid in greater understanding of the role of labour in the distribution of the benefits from increased GVC participation.

At the industry level, we conducted ordinary least squares (OLS) estimations using panel data and found that GVC participation through backward linkages can raise labour productivity in the manufacturing sector. At the individual level, our estimation method is an OLS estimation using pooled cross-sectional data. We also separately examine the effects of forward and backward GVC participation on wages and wage distributions. Our results show that GVC participation induces higher monthly wages for individuals and increases productivity in the labour market through either the forward linkage or backward linkage. We even find that GVC participation can help mitigate inequality. Our findings show that GVC participation promotes inclusive job creation and provides more job opportunities for rural, female, and low-skilled workers. Policies to support leveraging the existing strong industries through upgrading, smoothing labour movements while improving agricultural productivity, and preparing to move towards a services economy can help prepare Thailand, and other developing countries in

general, to upgrade to higher value chains. Although GVC participation may be a catalyst for higher wages, greater labour productivity, and more inclusive job creation, its employment effects are complicated. An unbalanced policy framework might contribute to uneven income distributions and exclusive job creation as participating in GVCs through different linkages can benefit different stakeholders in varying ways. Therefore, a policy framework that balances the benefits among stakeholders in terms of wage distributions and job inclusion is ideal.

2 Literature Review

GVCs have gained momentum in the emerging international trade and development literature. However, little is known about the link between internationally fragmented production, or GVCs, and productivity due to limited empirical research and the lack of comprehensive GVC data. A large body of research, however, has comprehensively examined the relationship between international trade and productivity gains, especially under models of final goods, and has found that in general, trade can lead to productivity gains through multiple channels.

Before the era of GVCs, studies of internationally fragmented production focused mainly on the role of offshoring and productivity (Feenstra and Hanson, 1996; Egger and Egger, 2006; Amiti and Wei, 2009; Winkler, 2010). Offshoring can increase productivity in offshoring countries, which are mainly developed countries, through the specialisation of production with comparative advantage (compositional change) and the gaining of access to new input varieties (structural change) (Mitra and Ranjan, 2007; Grossman and Rossi-Hansberg, 2007; Criscuolo, Timmis, and Jonestone, 2016). New production base countries, mainly developing countries, enjoy productivity gains from greater input varieties, knowledge and technology spillovers, and the pro-competitive effects of foreign competition (Li and Liu, 2012; Baldwin and Robert-Nicoud, 2014; Criscuolo, Timmis, and Jonestone, 2016; Constantinescu, Mattoo, and Ruta, 2017). However, offshoring looks mostly at the benefits for the (mainly developed) countries that move their production bases to developing countries. In other words, the benefits of becoming part of a global production network that are accrued in developing countries are less obvious. Moreover, the definition of offshoring is relatively limited and partial compared to the definition of GVCs, which relates to the whole production network (Criscuolo, Timmis, and Jonestone, 2016). Consequently, the recent literature emphasises the impact of vertical specialisation and GVCs on productivity (Winkler and Farole, 2015; Formai and Caffarelli, 2016; Kummritz, 2016; Taglioni and Winkler, 2016; Constantinescu, Mattoo, and Ruta, 2017) and argues that GVC participation (both backward and forward participation) leads to higher productivity, especially in terms of labour. More recent studies have moved towards micro-level

analysis in which they examine the wealth distribution at the task level within production chains (World Bank, 2017). This wealth distribution is represented by the well-known smiley curve.

As discussed, the large-scale economic phenomena and microeconomic effects in terms of producer theory have been well studied; firms organise production based on efficiency and profitability criteria. As such, the relationship between GVC participation and the broad labour market outcomes is quite clear. However, evidence of the impact of GVC participation in terms of the labour market and income distribution at the individual level, especially in developing countries, remains obscure. Farole (2016) categorises the impacts of GVC participation into four aspects, namely job creation, skills development and working conditions, wage and wage distributions, and inclusion.

2.1 Job creation

While only few studies have addressed job creation, we can observe two main trends.[1] First, in general, the jobs embodied in exports are moving away from low-skilled labour content towards high-skilled and medium-skilled labour content (Timmer et al., 2014; Farole, 2016; OECD, 2016a; World Bank, 2017; Jiang and Carabello, 2017). This result conforms with the standard Heckscher-Ohlin model and Feenstra and Hanson's empirical findings (1995, 1996), where outsourcing leads to an increase in the relative demand for skilled labour. Second, there is a shift towards the service sector within GVCs (OECD, 2016a; World Bank, 2017). However, Jiang and Carabello (2017) find that in developing countries, the jobs embodied in exports remain concentrated in low-skilled jobs, and participating in GVCs leads to higher domestic employment than foreign employment through foreign trade. Moreover, it is still debatable whether the effect of GVC participation on employment in developing countries is positive (Kabeer and Mahmud, 2004; Humphrey et al., 2004; Nadvi and Thoburn, 2004) or negative (Roberts and Thoburn, 2004; Nadvi and Thoburn, 2004).

2.2 Skills development and working conditions

Whether GVC participation leads to better skills development and working conditions remains an unsolved question. Farole (2016) argues that existing studies may suffer from two technical

[1] As our study focuses only on the aspects of wage, wage distribution, and inclusion, for a more comprehensive review of the literature on job creation, skills development, and working conditions, see Shingal (2015) and Criscuolo, Timmis, and Johnstone (2016).

estimation problems, reverse causality and selection bias. However, there is a general impression that GVC participation leads to better working conditions in developed countries and worse conditions in developing countries.

2.3 Wages and wage distributions

From the macro perspective, it is argued that GVC-oriented investment due to differences in relative wages across countries leads to large employment effects, both in developed countries (outsourcing countries) and developing countries (host countries) (Kabeer and Mahmud, 2004; Humphrey et al., 2004; Nadvi and Thoburn, 2004). Most studies find that GVC-oriented investment results in within-country wage inequality, especially in developed countries (IMF, 2013). This can be explained by the shift towards high-skilled labour content (Katz and Autor, 1999; IMF, 2007) or as an effect of offshoring (Pavcnik, 2011; Amiti and Davis, 2012; Hummels et.al., 2012; Lopez-Gonzalez, et al., 2015; Meng, Ye, and Wei, 2017). In other words, greater demand for high-skilled labour and/or lower demand for domestic low-skilled labour results in wage inequality between low- and high-skilled workers.

However, from the previous discussion, the employment effects are unclear in developing countries, where GVC participation may lead to higher employment either of high-skilled and medium-skilled labour or low-skilled labour. Hence, it is also inconclusive whether GVC participation leads to wage inequality in developing countries.

There are three main groups of findings regarding GVC participation and wages and wage distributions. First, findings in favour of GVC participation argue that it is not a major factor in the increase in wage inequality or that it can even help mitigate inequality in some cases (Lopez-Gonzalez, et al., 2015). Second, findings against GVC participation posit that the benefits from GVC participation, especially in terms of wages, largely accrue to a small number of high-skilled workers and to the owners of capital, including foreign investors (Goldberg and Pavcnik, 2007; Pavcnik, 2017; Das et al., 2017; Meng, Ye, and Wei, 2017; Medeiros and Trebat, 2017). Meng, Ye, and Wei (2017) find for the case of China that factory wages are significantly larger than rural wages. Furthermore, Medeiros and Trebat (2017) argue that participation in GVCs can even result in a race to the bottom for wages and profits for labour-intensive workers and contract manufacturers. The last group of literature argues that the effect of GVC participation on wage inequality is inconclusive, highly case specific, and dependent on the nature of GVC participation, such as the type of activity or the position of workers within GVCs (McCulloch and Ota, 2002; Kabeer and Anh, 2003; Kabeer and Mahmud, 2004; Nadvi and Thoburn, 2004; Shepherd, 2013; Lopez-Gonzalez et al., 2015).

2.4 Inclusion

GVC participation may result in wider disparities in developed countries and more advanced developing countries where there is a demand for high-skilled and medium-skilled labour. High- and medium-skilled labour tends to be biased towards urban residents and male workers. In developing countries, GVC participation may provide more job opportunities for youth, rural, female, and low-skilled workers as the demand for low-skilled labour rises (Dolan and Sutherland, 2003; Nguyen et al., 2003; Barrientos and Kritzinger, 2004a; Farole, 2016). Although "inclusive" job creation (Farole, 2016) has been observed, inequalities in wages and employment conditions still persist, especially in terms of gender (Dolan and Sutherland, 2003; Nguyen et al., 2003; Barrientos and Kritzinger, 2004a; Tejani and Milberg, 2010).

To summarise, what we know so far is the following. (i) Microeconomic findings in terms of producer theory and the relationship between GVC participation and broad labour market outcomes seem to be well studied, whereas evidence of the impact of GVC participation in terms of the labour market and income distribution, especially in developing countries, remains unclear. (ii) Recent studies are moving towards micro-level analysis, e.g. the smiley curve. However, such studies carry out their analysis at the industry or sector level. To the best of our knowledge, there have not been any studies that use data at the individual level. (iii) In developed countries, GVC-oriented investment results in within-country wage inequality due to a shift towards high-skilled labour content or as an effect of offshoring. (iv) In developing countries, the results are highly case/industry specific and mixed among a very limited number of literature. The past four decades have seen dramatic GVC proliferation, while within-country income inequality in many developed and developing countries has also risen. This highlights the need for analysis of the long-term effects of GVC participation on income inequality and the labour market in order to fill the gaps in the current literature. The gaps and limitations contributing to the mixed findings in developing countries are largely due to the lack of availability of GVC data, ambiguous and non-traditional definitions of GVC participation, restrictive levels of analysis, and heterogeneity in the nature of recent findings.

Data availability is often lacking in developing countries. Most of the studies have no choice but to use the available aggregate data sources to examine the relationship between GVC participation and broad labour market outcomes. Combining multiple data sources, both at the aggregate and individual levels, such by using LFS data, can provide a much richer, micro-level view to understand better the impact of GVC participation on labour market outcomes, e.g., on wages, the wage distribution, and inclusion. The lack of availability of GVC data has led to analytical limitations, including ambiguous and non-traditional definitions of GVC participation and restrictive levels of analysis in the early literature. Given that the data limitations vary

across different studies, GVC participation has also been quantified in multiple ways. Hence, it is difficult to compare and contrast the impacts of GVC participation across different studies without uniformity in its definition. Recent literature has adopted a more common definition of GVC participation in which participation is defined as the share of foreign value-added (FVA) in gross exports, the share of domestic value-added incorporated in other countries' exports (DVX) in gross exports, or the sum of the share of FVA and DVX in gross exports. While the early literature tended to analyse the impact of GVC participation at the macro level due to data limitation issues, more recent studies have moved towards micro-level analysis, but evidence of the impact of GVC participation in terms of the labour market and income distribution at the individual level, especially in developing countries, remains unclear. Finally, recent findings are heterogeneous in nature. The impacts of GVC participation vary by sector, firm type, and country. As Farole (2016) puts it: "Results to date suggest that heterogeneity – of sectors, firm types, countries – rules the day. While that has been the argument of this contribution, it would be highly unsatisfactory as an ultimate conclusion of this research question."

To address the aforementioned gaps and limitations, our study focuses on the relationship between GVC participation and worker productivity/wages at the industry/individual levels in Thailand, a developing country. Our study also conforms to the modern definition of GVCs by following the recent literature in using the share of FVA in gross exports, the share of DVX in gross exports, and the sum of the share of FVA and DVX in gross exports. Finally, this study contributes to the more solid findings on the impact of GVC participation on the labour market and income distribution at the individual level. In terms of Thailand and developing countries in general, this study is an initial stepping stone for reviewing the skills needed for GVC firms and for providing policy recommendations that can help economies benefit from GVC integration in the short run and distribute income more equally in the long run.

3 Data and Methodology

This study exploits FVA and DVX as proxies for GVC participation to examine the relationship between GVC participation and labour productivity at the industry level in Thailand. The main estimation method is panel data analysis using TiVA data for 34 industries for 17 years from 1995 to 2011. We also use Thailand's LFS data at the industry level to calculate our indicators, such as for labour productivity at the industry level.

To investigate the link between GVC participation and wages, wages distribution, and inclusion at the industry level, this study uses the Mincer wage model and adjusts it by including the GVC participation index by industry in the main model. The main estimation method is a simple OLS estimation using pooled cross-sectional LFS data for 1995–2011 (for which GVC data is

available) together with the OECD TiVA data for all independent variables related to GVC participation. We estimate various model specifications using different definitions of GVC participation, including forward and backward linkages, to check the robustness of the main specification. We also separately examine the effects of forward and backward linkages on wages and wage distributions. Finally, control variables, e.g., for gender and area of residence, are included in the estimation to examine the wage distribution and inclusion in the labour market.

3.1 Data

Industry-level data: OECD TiVA

This study utilises the latest OECD TiVA data (2016 edition) to investigate the link between GVC participation and labour productivity at the industry level in Thailand. In general, the main indicators in the database measure the value-added content of international trade flows and final demand. The TiVA database covers 63 economies, including the OECD, EU28 and G20 economies; most East Asian and Southeast Asian economies and some South American countries; and 34 industries, 16 manufacturing sectors, and 14 services sectors. The data are available for 17 years, from 1995 to 2011. Table 1 shows the OECD TiVA industry coverage. We also link the TiVA data to Thailand's LFS data to examine the relationship between GVC participation and wages, the wages distribution, and inclusion at the individual level.

Table 1: OECD TiVA Industry Coverage

Agriculture – primary products
Agriculture, hunting, forestry and fishing
Low-tech industries
Wood, paper, paper products, printing and publishing
Food products, beverages and tobacco
Textiles, textile products, leather and footwear
Manufacturing n.e.c.; recycling
Medium-low tech industries
Mining and quarrying
Basic metals and fabricated metal products
High and medium-high tech industries
Transport equipment
Chemicals and non-metallic mineral products
Machinery and equipment, n.e.c.
Electrical and optical equipment
Electricity, gas, and water supply
Construction
Services
Wholesale and retail trade; hotels and restaurants
Transport and storage, post and telecommunications
Financial intermediation
Business services
Other services

Source: Authors' compilation based on OECD TiVA database.

Individual-level data: Thailand Labour Force Survey

The dataset used in the micro-level analysis is drawn from Thailand's LFS conducted by the National Statistical Office (NSO) for the period 1995–2011 (due to limitations on the available GVC data). The LFS is collected quarterly on approximately 80,000 random households for a total of around 200,000 observations per quarter, representing 0.1%–0.5% of the total Thai population. The LFS is the only national dataset for Thailand that comprehensively includes information both on demographic characteristics and labour-related characteristics.

The sample used for the estimation in this study is obtained by pooling the 17 consecutive annual LFSs. Only the data from the third quarter of the LFS is used in this study to control for the seasonal migration of agricultural labour. In general, agricultural workers move back and forth between the urban manufacturing sector and the rural agricultural sector. However, they tend to migrate back to the rural agricultural sector during the rainy season (Sussangkarn and Chalamwong, 1996), i.e., the third quarter of the year. This study limits the sample to wage workers aged 15 or above in the year of interview. The age restriction is imposed because the minimum legal age that individuals can start working is 15 years.

The dependent variable in the estimation of the returns to schooling is "log monthly wage". The monthly wages are calculated from the different types of wages reported by each individual observation. As this study pools multiple years of data together, the data in nominal values, such as for monthly wages, requires adjustment for inflation. We deflate the nominal wage by the regional headline Consumer Price Index (CPI) using 2011 as the reference base year. Finally, the monthly wage adjusted for inflation is transformed into log form. For the "years of schooling" variable, in the LFS, the measure of school attainment is not the actual number of years spent at school but the highest degree attained by an individual. Hence, the school attainment variable is recoded into years of schooling ranging from zero (no education) to 21 years for those with a PhD degree. "Age" refers to the individual's age at the time of the survey. The estimation model also includes other variables, namely year fixed effects, region fixed effects, industry fixed effects, gender, area of residence, and labour skills, as control variables. In this study, we match the industrial control variables with the 34 industrial sectors categorised in the OECD TiVA data.

3.2 Methodology

Labour productivity (industry-level analysis)

We empirically examine the link between GVC participation and labour productivity at the industry level. Following the method used by Constantinescu et al. (2017), the estimation model in this study is as follows:

$$Y_{it} = A_{it}(\theta_1, \theta_2, \cdots, \theta_n) \times F(K_{it}, L_{it}) \quad (1)$$

Equation 1 shows a simple production function, where Y_{it} indicates the output of industry *i* in year *t*. K_{it} and L_{it} are the capital and labour of industry *i* in year *t*, A is the technology spillover of industry *i* in year *t*, and θ refers to the channels of the technology spillover, such as traditional trade and FDI.

Dividing Equation 1 by L_{it}, taking the log of both sides of the equation, and adding fixed effects yields Equation 2. LP_{it} represents the labour productivity of industry *i* in year *t*, while δ and μ are dummy variables for industry and time. The two dummy variables serve as fixed effects variables to control for unobservable factors, such as labour market reforms and global technology shocks.

$$\ln LP_{it} = \alpha + \beta \ln\left(\frac{K_{it}}{L_{it}}\right) + \sum_{j=1}^{n} \gamma_j \ln(\theta_{jit-1}) + \delta + \mu + \varepsilon_{it} \quad (2)$$

As there is no sectoral capital data available for Thailand, we use the reduced-form model shown in Equation 3 to investigate the role of θ on labour productivity. Furthermore, we adopt value-added-based labour productivity as this is preferable to an output based measure.

$$\ln LP_{it} = \alpha + + \sum_{j=1}^{n} \gamma_j \ln(\theta_{jit-1}) + \delta + \mu + \varepsilon_{it} \quad (3)$$

Labour productivity, LP_{it}, is calculated by dividing the value added of an industry i by the estimated total labour force in the industry. The estimated labour data is from Thailand's LFS of Thailand. The variable θ takes a lag of one period since it takes time for a country to adopt new technology or acquire new knowledge through the import of foreign intermediate goods. Therefore, we can expect that the productivity of the importing country will only increase only at least one period after it actually imports the intermediate goods. Using lagged independent variables can also help cope with endogeneity issues arising from reverse causal relationships.

Following Constantinescu et al. (2017), a proxy variable for the participation of GVCs in industry *i* serves as one of the channels for the technology spillover, θ. Backward participation, or FVA, indicates the value of imported intermediate goods and services that are embodied in domestic gross exports (OECD, 2016b). In our model specification, FVA is represented by *lnFVA*. Other variables that can be considered as a medium of technology transfer are also included in the estimation and summarised in Table 2.

Table 2: Estimation Model Specifications

Dependent Variable: Labour Productivity (lnLP)			
Independent Variables	**(1)**	**(2)**	**(3)**
Total imports (lnTTL_IMP)	O		
Total exports (lnTTL_EXP)	O		
Imported final goods (lnFIN_IMP)		O	
Imported intermediate goods (lnINT_IMP)		O	
Foreign value added (lnFVA)			O
Industry fixed effects (δ)	O	O	O
Time fixed effects (μ)	O	O	O

Source: Authors' compilation.

Wages, wage distributions, and inclusion (individual-level analysis)

To estimate the impacts of GVC participation on wages, we exploit the Mincer wage model and adjust the model by including the GVC participation index by industry. The GVC participation index is calculated as

$$\text{GVC}_{\text{Participation}} = \frac{\text{DVX+FVA}}{\text{GE}} \quad (4)$$

where *DVX* is the domestic value-added incorporated in other countries' exports, and *FVA* is the foreign value-added embodied in exports as a percentage of the total gross exports of the exporting country (OECD, 2016b).

The main estimation method is a simple OLS estimation using the pooled cross-sectional LFS data from 1995–2011 (for which GVC data are available).

The Mincer wage equation (OLS regression) is

$$\log y_i = \beta_0 + \beta_1 S_i + \beta_2 A_i + \beta_3 A_i^2 + \beta_4 G_i + \beta_5 C_i + e_i \quad (5)$$

where $\log y_i$ is the log of monthly wages of an individual, *I*; S_i refers to the number of years of education of individual *I*; A_i is the age of individual *i* as a proxy for working experience; and G_i indicates the GVC participation ratio of the industry to which individual *i* belongs. C_i represents control variables included for year fixed effects, region fixed effects, industry fixed effects, gender, area of residence, and labour skills. e_i is the disturbance term.

We estimate several model specifications using different definitions of GVC participation to check the robustness of the main specification. All independent variables related to GVC participation are derived from the TiVA database, while the individual-level variables are mainly from the LFS.

4 Results

Labour productivity (industry-level analysis)

We conducted OLS estimations using panel data for Thailand for the period 1995–2011. The estimation results are presented in Table 3. The specifications in columns 1–3 are for all industries, while those in columns 4–6 are for manufacturing industries, and those in columns 7–9 are for non-manufacturing industries.

The coefficients for total exports (TTL_EXP) are positive and statistically significant for all specifications, while those for total imports (TTL_IMP) are not statistically significant in columns 1 or 7. The coefficient for total imports in column 4 is negative statistically significant, contrary to our hypothesis.

The coefficients for imported final goods (FIN_IMP) are positive and statistically significant, but the coefficients for imported intermediate goods (INT_IMP) are negative and statistically significant in all columns. These results differ from those of many of the previous studies but suggest that in Thailand, the pro-competitive effects of importing final goods contribute to increasing labour productivity rather than the knowledge spillover effects from importing intermediate goods.

Meanwhile, contrary to INT_IMP, the coefficient for foreign value added in Thailand's gross exports, FVA, is positive and statistically significant for the manufacturing sector. From these results, we can conclude that intermediate goods have a negative impact on labour productivity, while FVA included in gross exports related to GVC backward linkages can raise labour productivity in Thailand.

Table 3: Labour Productivity Estimation Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All industries			Manufacturing industries			Non-manufacturing industries		
Variables	lnLP	lnLP	lnLP	lnLP	lnLP	lnLP	lnLP	lnLP	lnLP
L.lnTTL_IMP	-0.0202			-0.191**			0.131		
	(0.0561)			(0.0809)			(0.0796)		
L.lnTTL_EXP	0.109***			0.177***			0.0557		
	(0.0339)			(0.0543)			(0.0454)		
L.lnFIN_IMP		0.0947**			0.156**			0.0980**	
		(0.0382)			(0.0698)			(0.0486)	
L.lnINT_IMP		-0.280***			-0.373***			-0.250***	
		(0.0484)			(0.0980)			(0.0580)	
L.lnFVA			0.0822**			0.112*			0.0631
			(0.0339)			(0.0572)			(0.0438)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	512	528	512	240	240	240	272	288	272
R-squared	0.927	0.931	0.927	0.786	0.784	0.773	0.953	0.956	0.953

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

Source: Authors.

Wages, wage distributions, and inclusion (individual-level analysis)

Table 4 shows the estimation results for the effects of GVC participation on monthly wages.

Table 4: Effects of GVC Participation on Monthly Wages

	(1)	(2)	(3)	(4)
Schooling	0.105***	0.0933***	0.0945***	0.105***
	(0.000175)	(0.000210)	(0.000209)	(0.000190)
Age	0.0689***	0.0638***	0.0644***	0.0692***
	(0.000361)	(0.000377)	(0.000377)	(0.000380)
Age^2	-0.000603***	-0.000591***	-0.000596***	-0.000629***
	(0.00000460)	(0.00000480)	(0.00000480)	(0.00000486)
GVC participation index		0.173***		
		(0.00147)		
Forward linkage			0.153***	
			(0.00140)	
Backward linkage				0.121***
				(0.00808)
Constant	6.146***	6.302***	6.318***	6.162***
	(0.00782)	(0.00821)	(0.00826)	(0.00842)
N	513,564	443,990	443,990	443,990
R-squared	0.579	0.586	0.584	0.573

Note: Standard errors are in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. All models control for year, region, and industry fixed effects. The GVC participation index is calculated as (DVX+FVA)/gross exports, where DVX and FVA are the quantities of domestic value-added incorporated in other countries' exports and foreign value-added embodied in exports, respectively. Forward linkage represents the share of FVA in gross exports, while backward linkage refers to the share of DVX in gross exports.

From the table, we can see that all GVC participation variables, on average, have a statistically significant positive impact on individuals' monthly wages. The forward linkage effect shows a positive impact on wages because as sectors and countries upgrade and shift towards high-skilled labour content, wages increase, especially for skilled workers (Katz and Autor, 1999; IMF, 2007; Shepherd, 2013; Farole, 2016). At the same time, we can observe a positive effect of the backward linkage since, on average, workers benefit from higher wages due to higher job opportunities from abroad (higher demand). However, the effect of the forward linkage is larger than that of the backward linkage as workers working in industries with high forward linkages tend to have higher skills than those working in industries with high backward linkages.

Table 5 illustrates the effects on monthly wages disaggregated by gender, area of residence and skill level.

Table 5: Disaggregation of the Effects of GVC Participation on Monthly Wages by Gender, Area of Residence, and Skill Level

	(1)	(2)	(3)	(4)
Schooling	0.0933***	0.0949***	0.0927***	0.0857***
	(0.000210)	(0.000208)	(0.000211)	(0.000249)
Age	0.0638***	0.0642***	0.0637***	0.0625***
	(0.000377)	(0.000371)	(0.000376)	(0.000409)
Age^2	-0.000591***	-0.000599***	-0.000591***	-0.000557***
	(0.00000480)	(0.00000473)	(0.00000479)	(0.00000527)
GVC participation index	0.173***	0.167***	0.173***	0.157***
	(0.00147)	(0.00145)	(0.00147)	(0.00148)
Male		0.174***		
		(0.00156)		
Urban			0.0522***	
			(0.00182)	
High-skilled labour				0.164***
				(0.00250)
Constant	6.302***	6.195***	6.272***	6.352***
	(0.00821)	(0.00815)	(0.00827)	(0.00869)
N	443,990	443,990	443,990	391,768
R-squared	0.586	0.597	0.587	0.603

Note: Standard errors are in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. All models control for year, region, and industry fixed effects. The GVC participation index is calculated as (DVX+FVA)/gross exports where DVX and FVA are the quantities of domestic value-added incorporated in other countries' exports and foreign value-added embodied in exports, respectively. Forward linkage represents the share of FVA in gross exports, while backward linkage refers to the share of DVX in gross exports.

From Table 5, it seems that on average, the GVC participation benefits males (more than females), people living in urban areas (rather than those in rural areas), and high-skilled labour (rather than low-skilled labour). In other words, participating in GVC leads to inequality in wage distributions.

Next, we deepen our analysis by examining the differences between GVC participation through industries engaging with forward linkage activities and those engaging with backward linkage activities. The results are shown in Table 6.

Institutively, we would expect to that in terms of GVC participation through industries engaging with forward-linkage activities, high-skilled labour would benefit more than low-skilled labour. Conversely, in terms of the backward linkage effect, low-skilled labour would benefit more from GVC participation than high-skilled labour. However, our analysis gives somewhat contradictory results. The reason is that the nature of GVC participation matters; a greater degree of low-skill task offshoring is associated with lower levels of wage inequality (Lopez-Gonzalez, et al., 2015). That is to say, the gap between the wages of low- and high-skilled workers decreases as the wages of low skilled workers rise faster than those of high skilled workers. The intuition is that the positive productivity and labour demand effects of offshoring dominate the negative labour supply effects.

First, offshoring boosts the productivity of the remaining low-skilled workers as they can focus on the tasks they are most efficient at. Second, it increases the productivity of firms relying more on low-skilled labour, thereby further boosting the demand for—and, thus, wages of—this type of labour. These two effects outweigh the more traditional labour supply effect, which exerts downward pressure on the wages of workers. On the other hand, in terms of the backward linkage effect, similar logic applies, as engaging in high-skilled tasks from offshoring countries, e.g., Japan, can widen the gap between the wages of low- and high-skilled workers. In other words, the wages of high-skilled workers rise faster than those of low-skilled workers.

As Thailand is placed in the middle of GVCs, it is more likely that even industries engaging with the backward linkage engage with medium- or high-skilled tasks. As a result, the backward linkage effect boosts the demand for high-skilled workers, and the wages of high-skilled workers increase faster than those of lower skilled workers. This leads to an increase in the wage gap between low- and high-skilled workers in industries engaging with the backward linkage.

Table 5: High-skilled Labour Estimation Results

	Forward Linkage			Backward Linkage		
	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	0.0945***	0.0869***	0.0873***	0.105***	0.0960***	0.0961***
	(0.000209)	(0.000248)	(0.000249)	(0.000190)	(0.000232)	(0.000233)
Age	0.0644***	0.0631***	0.0632***	0.0692***	0.0674***	0.0674***
	(0.000377)	(0.000410)	(0.000410)	(0.000380)	(0.000412)	(0.000412)
Age^2	-0.000596***	-0.000562***	-0.000562***	-0.000629***	-0.000590***	-0.000590***
	(0.00000480)	(0.00000528)	(0.00000528)	(0.00000486)	(0.00000533)	(0.00000533)
Forward linkage	0.153***	0.138***	0.184***			
	(0.00140)	(0.00141)	(0.00317)			
Backward linkage				0.121***	0.166***	0.155***
				(0.00808)	(0.00827)	(0.00952)
High-skilled labour		0.163***	0.180***		0.170***	0.162***
		(0.00250)	(0.00270)		(0.00253)	(0.00427)
Forward linkage x High-skilled labour			-0.0561***			
			(0.00343)			
Backward linkage x High-skilled labour						0.0318*
						(0.0126)
Constant	6.318***	6.364***	6.343***	6.162***	6.208***	6.210***
	(0.00826)	(0.00874)	(0.00883)	(0.00842)	(0.00889)	(0.00891)
N	443,990	391,768	391,768	443,990	391,768	391,768
R-squared	0.584	0.601	0.601	0.573	0.592	0.592

Note: Standard errors are in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. All models control for year, region, and industry fixed effects. The GVC participation index is calculated as (DVX+FVA)/gross exports where DVX and FVA are the quantities of domestic value-added incorporated in other countries' exports and foreign value-added embodied in exports, respectively. Forward linkage represents the share of FVA in gross exports, while backward linkage refers to the share of DVX in gross exports.

Table 6 shows that GVC participation, either through industries engaging more in forward linkage activities or backward linkage activities, benefits workers in manufacturing sectors more than those in non-manufacturing sectors. However, GVC participation through industries engaging more in backward linkage activities has a negative impact on wages of workers in non-manufacturing sectors. A possible explanation for these results could be that technology in non-manufacturing sectors, such as the agriculture and service sectors, tends to replace workers when productivity increases. Therefore, we observe lower demand for workers in non-manufacturing sectors leading to lower wages.

Next, Table 7 shows the estimation results by area of residence. GVC participation through industries engaging more in forward linkage activities benefits workers in urban areas more than those in rural areas. The reason is that most higher skilled tasks are concentrated in urban areas. However, GVC participation through industries engaging in more backward linkage activities narrows the wage gaps between urban and rural areas as there are more opportunities for rural employment. As most lower skilled tasks are concentrated in rural areas, demand for rural workers increases and, as such, their wages rise faster than those of workers in urban areas.

Finally, the results in Table 8 shows that GVC participation through industries engaging in more forward linkage activities benefit both male and female workers equally. In other words, there is no effect on the wage gap between male and female workers as the interaction term between “forward linkage” and “male” is not statistically significant. In contrast, GVC participation through industries engaging in more backward linkage activities narrows the wage gap between male and female workers as there are more opportunities for female employment.

Table 6: Manufacturing Estimation Results

	Forward Linkage			Backward Linkage		
	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	0.104***	0.105***	0.105***	0.115***	0.116***	0.115***
	(0.000200)	(0.000200)	(0.000201)	(0.000177)	(0.000178)	(0.000180)
Age	0.0655***	0.0653***	0.0655***	0.0701***	0.0703***	0.0704***
	(0.000388)	(0.000386)	(0.000386)	(0.000388)	(0.000388)	(0.000388)
Age^2	-0.000618***	-0.000612***	-0.000613***	-0.000646***	-0.000646***	-0.000648***
	(0.00000494)	(0.00000491)	(0.00000491)	(0.00000497)	(0.00000497)	(0.00000497)
Forward linkage	0.138***	0.159***	0.147***			
	(0.00140)	(0.00143)	(0.00157)			
Backward linkage				0.209***	0.0907***	-0.225***
				(0.00560)	(0.00827)	(0.0143)
Manufacturing		0.116***	0.101***		0.0514***	-0.0706***
		(0.00180)	(0.00197)		(0.00263)	(0.00522)
Forward linkage x Manufacturing			0.0616***			
			(0.00329)			
Backward linkage x Manufacturing						0.476***
						(0.0176)
Constant	6.617***	6.544***	6.545***	6.391***	6.394***	6.455***
	(0.00825)	(0.00829)	(0.00829)	(0.00846)	(0.00845)	(0.00874)
N	443,990	443,990	443,990	443,990	443,990	443,990
R-squared	0.561	0.565	0.565	0.552	0.553	0.554

Note: Standard errors are in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. All models control for year, region, and industry fixed effects. The GVC participation index is calculated as (DVX+FVA)/gross exports where DVX and FVA are the quantities of domestic value-added incorporated in other countries' exports and foreign value-added embodied in exports, respectively. Forward linkage represents the share of FVA in gross exports, while backward linkage refers to the share of DVX in gross exports.

Table 7: Area of Residence Estimation Results

	Forward Linkage			Backward Linkage		
	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	0.0945***	0.0939***	0.0939***	0.105***	0.104***	0.104***
	(0.000209)	(0.000210)	(0.000210)	(0.000190)	(0.000191)	(0.000191)
Age	0.0644***	0.0644***	0.0644***	0.0692***	0.0691***	0.0691***
	(0.000377)	(0.000377)	(0.000377)	(0.000380)	(0.000379)	(0.000379)
Age^2	-0.000596***	-0.000596***	-0.000596***	-0.000629***	-0.000629***	-0.000629***
	(0.00000480)	(0.00000480)	(0.00000480)	(0.00000486)	(0.00000485)	(0.00000485)
Forward linkage	0.153***	0.154***	0.140***			
	(0.00140)	(0.00140)	(0.00280)			
Backward linkage				0.121***	0.118***	0.204***
				(0.00808)	(0.00808)	(0.0113)
Urban		0.0526***	0.0460***		0.0506***	0.0854***
		(0.00182)	(0.00213)		(0.00185)	(0.00368)
Forward linkage x Urban			0.0173***			
			(0.00294)			
Backward linkage x Urban						-0.125***
						(0.0114)
Constant	6.318***	6.287***	6.293***	6.162***	6.132***	6.114***
	(0.00826)	(0.00832)	(0.00837)	(0.00842)	(0.00848)	(0.00863)
N	443,990	443,990	443,990	443,990	443,990	443,990
R-squared	0.584	0.585	0.585	0.573	0.574	0.574

Note: Standard errors are in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. All models control for year, region, and industry fixed effects.

Table 8: Gender Estimation Results

	Forward Linkage			Backward Linkage		
	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	0.0945***	0.0959***	0.0959***	0.105***	0.106***	0.106***
	(0.000209)	(0.000206)	(0.000206)	(0.000190)	(0.000188)	(0.000188)
Age	0.0644***	0.0648***	0.0648***	0.0692***	0.0695***	0.0695***
	(0.000377)	(0.000372)	(0.000372)	(0.000380)	(0.000374)	(0.000374)
Age^2	-0.000596***	-0.000604***	-0.000604***	-0.000629***	-0.000636***	-0.000637***
	(0.00000480)	(0.00000474)	(0.00000474)	(0.00000486)	(0.00000479)	(0.00000479)
Forward linkage	0.153***	0.151***	0.150***			
	(0.00140)	(0.00138)	(0.00180)			
Backward linkage				0.121***	0.0454***	0.0571***
				(0.00808)	(0.00800)	(0.00995)
Male		0.177***	0.176***		0.179***	0.185***
		(0.00156)	(0.00186)		(0.00158)	(0.00315)
Forward linkage x Male			0.00136			
			(0.00224)			
Backward linkage x Male						-0.0208*
						(0.0106)
Constant	6.318***	6.210***	6.210***	6.162***	6.069***	6.066***
	(0.00826)	(0.00820)	(0.00821)	(0.00842)	(0.00834)	(0.00853)
N	443,990	443,990	443,990	443,990	443,990	443,990
R-squared	0.584	0.596	0.596	0.573	0.585	0.585

Note: Standard errors are in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. All models control for year, region, and industry fixed effects.

5 Conclusion

This study assesses the links between GVC participation and the labour market. We utilise LFS data from Thailand for the period 1995–2011 to examine the relationship between GVC participation and worker productivity/wages at the industry and individual levels. At the industry level, we conducted OLS estimations using panel data and found that GVC participation through backward linkages can raise labour productivity in the manufacturing sector.

Moreover, this study addresses the gaps in the literature through empirical analysis of the distribution effects of GVC integration for the case of a developing country, Thailand. It investigates the presence of disparities in the accrual of the benefits from GVC participation that may appear in the labour market in the form of productivity or wage differentials or through differences in other socioeconomic characteristics, including, among others, the skill level, gender, or area of residence of workers. Based on the Mincer wage model, we examined the relationship between GVC participation and worker productivity and wages at the individual level using pooled cross-sectional data from the Thai LFS. We also separately examined the effects of forward and backward GVC participation on wages and wage distributions. Our results show that GVC participation induces higher monthly wages for individuals and increases productivity in the labour market through either the forward linkage or the backward linkage. We also found that GVC participation can help mitigate inequality. The findings show that GVC participation promotes inclusive job creation and provides more job opportunities for rural, female, and low-skilled workers. Policies to support the existing strong industries can help Thailand and other developing countries to upgrade to higher value chains. However, the employment effects of GVC participation are complicated. An unbalanced policy framework could increase disparities in income distributions and cause exclusive job creation as the different linkages benefit stakeholders in different ways. As such, policy framework must be designed to balance the benefits among stakeholders.

One of our caveats in our analysis is that our econometric model may face the problem of endogeneity, which is common to cross-sectional regression and analysis of the Mincer model. However, this study is an initial stepping stone for contributing to more solid findings on the impact of GVC participation on the labour market and income distribution at the individual level. Future research may improve on the methodology to deal with the endogeneity issue. Moreover, with the current econometric specification, it would be possible to study how wages in industries with different levels of GVC participation are evolving over time by interacting the GVC variables with year variables. This might provide interesting findings and patterns. As

recent studies are moving towards micro-level analysis, firm-level data may be integrated to further deepen the analysis of the link between GVC participation and wages. This would possibly allow us to examine different implications for GVC participation on wages between local and multinational companies or among different socio-economic characteristics at the firm and individual levels.

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