ESSAYS ON GLOBAL VALUE CHAINS AND INTERNATIONAL TRADE IN SOUTHEAST ASIAN COUNTRIES

BY

LINH THUY PHAM

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ABSTRACT

This thesis is composed of three essays on global value chains (GVCs) and international trade in developing countries. The first essay studies to what extent global value chains are associated with the country's female employment. Using the firm-level data of the Small and Medium Enterprise Survey in Vietnam in 2011-2015, we analyze the impacts of GVCs on female employment in 2,885 firms across 18 industries, controlling for the intensity of a firm's GVC involvement. The empirical analysis suggests that GVCs are positively associated with total female employment, unskilled female employment (employees with no tertiary education), and production female employment, whereas the association is negative for skilled female employment (employees with tertiary education), and non-production female employment. We also find that the share of female employment declines when GVC-involved firms increase their technology adoption (measured as the number of personal computers), suggesting that female employment in Vietnam remains largely in the low value-added stages of the production process.

The second essay examines the impacts of tariff reductions after the WTO accession on the labour market across 61 provinces in Vietnam. Using individual-level data from the household survey (VHLSS) in 2004-2016, we find evidence of the variation in the impacts on employment, unemployment, labour force inactivity, and wages across provinces and genders. We measure the exposure to tariff reduction as the weighted average of all import tariffs at the province level (the weight of each industry's import tariff at the province level is the share of employment in that industry in each province in 1999). The probability of being employed in the traded sector declined for workers in provinces more exposed to tariff reductions. Displaced workers were likely to move from the traded to the non-traded sector for employment. The probability of unemployment declined for both male and female workers, while the probability of being labour force inactive increased for only female individuals. Male workers' wages in provinces more exposed to the trade shocks increased after the WTO accession. There were no significant changes in wages for female workers.

The third essay investigates the association between institutional similarity and trade via global value chains of the Textiles & apparel sector and the Electrical machinery sector in Southeast Asian countries (ASEAN) in 2000-2015. We calculate the indicators of global value chains from the EORA multi-region input-output database. Focusing on the contract enforcement and rule of law dimension of institutions, our gravity-model estimates suggest that the effects of institutional similarity between each country and its respective trade partners operate through the sector-specific capital intensity and complexity pertaining to the global value chains. In particular,

we find a positive association between institutional similarity and the global value chain participation of the Electrical machinery sector. However, there are no significant effects of institutional similarity on the global value chains of the Textiles & apparel sector. We divide the samples into strong-institution ASEAN countries (whose the rule of law indicator is positive) and weak-institution ASEAN countries (whose the rule of law indicator is negative). We then estimate the importance of institutional similarity for the two subsamples separately. For ASEAN countries with relatively weak institutions, the increase in institutional similarity with weak-institution trade partners is positively associated with the GVC trade of the Electrical machinery sector. However, the increase in institutional similarity with their strong-institution trade partners is negatively associated with the GVC trade of the Electrical machinery sector. We observe no significant association between institutional similarity and GVC trade for strong-institution ASEAN countries.

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Chapter 1. Introduction

Southeast Asia (ASEAN) is a dynamic and an integral part of the world manufacturing production. The growing importance of the region in the global production network is the result of its long-term trade-oriented development strategy. ASEAN is one of the top four exporting regions in the world, along with the European Union, North America, and China/Hong Kong[1]. Focusing on the interplay between globalisation and socioeconomic issues, this thesis comprises trade policy, global value chains, and economic development in five chapters. The current chapter provides an overview. Chapter 2 studies the association between global value chains and female employment in Vietnam. Chapter 3 investigates the impacts of tariff reductions after the WTO accession on the labour market in Vietnam. Chapter 4 examines the association between institutional similarity and global value chains of Southeast Asian countries. Conclusion is given in Chapter 5.

Chapter 2 is titled "**Global Value Chains and Female Employment: The Evidence from Vietnam"** and has been published in The World Economy Journal (Pham & Jinjarak, 2022)**.** Drawn on the task trade theory of Grossman & Rossi-Hansberg (2012) which explains the pattern of specialization of tasks in the production process, we examine the impacts of global value chains on female employment across levels of skills and occupations, taking Vietnam as a case study. The chapter focuses on GVCs of small and medium enterprises (SMEs), using Vietnam's Small and Medium Enterprise Survey in 2011-2015. We rely on OECD-UNIDO (2019) and Veugelers et al. (2013) to measure the involvement of Vietnamese firms in global value chains focusing on their trade and domestic production linkages. Our empirical findings indicate that GVCs are positively associated with the female share of total employment, unskilled employment (employees with no tertiary education), production workforce and negatively associated with the female share of skilled employment (employees with tertiary education), non-production workforce. By explaining the mechanism of the impacts, we discover that GVC-involved firms employ a smaller share of female employment across skill levels and job positions when they increase their adoption of technology. Our findings support the task trade theory: developing countries like Vietnam have a comparative advantage in labor-intensive industries, thereby

[1] https://www.mckinsey.com/~/media/McKinsey/Industries/Public%20Sector/Our%20Insights/Understanding%20ASEAN%20Seven%20things%20you%20need%20to%20know/Understanding%20ASEAN%20Seven%20things%20you%20need%20to%20know.pdf

specializing in the manual tasks that require a large number of female workers with dexterity or "nimble fingers." Consequently, GVC-involved firms prominently feature a higher female share of unskilled, production workers, and a lower female share of skilled, non-production workers.

Chapter 3 is titled "**Trade exposure and labour market: Evidence from Vietnam's household data".** Using the pooled individual-level data from the Vietnam Household Living Standard Survey (VHLSS) in 2004-2016, this chapter contributes to the strand of literature on the impacts of trade exposure across sub-national units. We use a difference in difference (DID) approach to track the impacts of tariff reductions after the WTO accession on the labour market outcomes. Following previous studies (Autor et al., 2013; Dix-carneiro & Kovak, 2019; Erten et al., 2019, Topalova, 2005; Topalova, 2010), we construct a measure of tariff at the province level accounting for the variation of the employment structures across industries and across provinces before the trade shock. The industrial employment share in each province in 1999 is used as the weight of the industry's import tariff and is calculated from the Population and Housing Census in 1999. The local tariff exposure is then the weighted average of all import tariffs. We find the evidence of the variation in the impacts of tariff reductions on employment, unemployment, labour force inactivity, and wages across provinces and genders. Our findings show that the impacts of tariff reductions worked through both employment and earnings. There was a decline in the probability of being employed in the traded sector for workers in more exposed provinces. Displaced workers transited from the traded to the non-traded sector for employment. While our results suggest a drop in the probability of being unemployed for both male and female workers, we find an increase in the probability of being labour force inactive for only female individuals under the impact of tariff reductions. Male workers' wages in provinces more exposed to the trade shocks increased after trade liberalisation, whereas there was no significant change in wages for female workers.

Chapter 4 is titled "**Institutional similarity and global value chains in Southeast Asian countries".** This chapter aims to answer the research question: How does the institutional similarity between ASEAN countries and their trade partners affect their global value chain trade? We focus on the contract enforcement and rule of law dimension of institutions. Institutional quality is proxied with the rule of law indicator obtained from the Worldwide Governance Indicators of the World Bank. We define a country as a strong-institution country if its rule of law indicator is positive and as a weak-institution country if its rule of law indicator is negative. Applying the accounting methodology proposed by Borin & Mancini (2019) for the decomposition of value-added in total exports, we look at two dimensions of GVCs, namely backward linkages which identify the content of imported intermediates embodied in a country's exports and forward

linkages which identify the content of exported intermediates that is later processed and re-exported by the direct importer. We also account for GVC participation, which is the total sum of backward linkages and forward linkages. By examining global value chains in the Textiles & apparel sector, and the Electrical machinery sector in 2000-2015, we shed light on the importance of institutional similarity on bilateral global value chain trade across sectors with different levels of factor intensity. For the labour-intensive sector, namely Textiles & apparel sector, the institutional similarity between ASEAN countries and their trade partners has no significant impact on global value chains. For the capital-intensive and sophisticated sector, namely Electrical machinery sector, the institutional similarity is positively associated with GVC participation. Dividing the samples into strong-institution ASEAN reporter countries and weak-institution ASEAN reporter countries, we estimate the importance of institutional similarity for the two subsamples separately. It turns out that weak-institution ASEAN countries are more involved in the global value chains of the Electrical machinery sector when they are more similar in institutions with their weak-institution trade partners. Yet, the increase in the institutional similarity with strong-institution trade partners is detrimental to their GVC trade of the Electrical machinery sector. We observe no significant association between institutional similarity and GVC trade of strong-institution ASEAN countries.

References

Autor, D. H., Dorn, D., & Hanson, G. H. (2013). The China Syndrome: Local Labour Market Effects of Import ompetitioCn in the United States. *American Economic Review*, *103*(6), 2121–2168. https://doi.org/10.1257/aer.103.6.2121

Borin, A., & Mancini, M. (2019). Measuring What Matters in Global Value Chains and Value-Added Trade. *Measuring What Matters in Global Value Chains and Value-Added Trade, April 2019*. https://doi.org/10.1596/1813-9450-8804

Dix-Carneiro, R., & Kovak, B. K. (2019). Margins of Labour Market Adjustment to Trade. *Journal of International Economics*, *117*, 125–142. https://doi.org/10.1016/j.jinteco.2019.01.005

Erten, B., Leight, J., & Tregenna, F. (2019). Trade Liberalization and Local Labour Market Ajustment in South Africa. *Journal of International Economics*, *118*, 448–467. https://doi.org/10.1016/j.jinteco.2019.02.006

Grossman, G. M., & Rossi-Hansberg, E. (2012). Task Trade Between Similar Countries. *Econometrica*, *80*(2), 593–629. https://doi.org/10.3982/ecta8700

OECD-UNIDO. (2019). *Integrating Southeast Asian SMEs in Global Value Chains: Enabling Linkages with Foreign Investors*.

Topalova, P. (2005). *Trade Liberalization, Poverty and Inequality: Evidence from Indian Districts* (No. 11614).

Topalova, P. (2010). Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India. *American Economic Journal: Applied Economics*, *2*(4), 1–41. https://doi.org/10.1257/app.2.4.1

Veugelers, R., Barbiero, F., & Blanga-Gubbay, M. (2013). Meeting the Manufacturing Firms Involved in GVCs. In *Manufacturing Europe's Future*.

Chapter 2. Global Value Chains and Female Employment: The Evidence from Vietnam

Abstract: What is the relationship between female employment and global value chains (GVCs) in developing countries? Motivated by the rise of offshoring into Vietnam, we study Vietnam's Small and Medium Enterprises (SMEs) from 2011-2015. The empirical findings suggest a positive association between global value chains and the female share of total workforce, unskilled workforce, and production workforce; while GVCs are negatively associated with the female share of skilled workforce and non-production workforce. Intriguingly, technology of GVC-involved firms is negatively associated with the female employment share in the sample, suggesting that female employment remains largely in the low value-added activities of the globally integrated supply chains in Vietnam.

2.1. Introduction

Gender equity in the labour markets is an underexplored area of socioeconomic issues due to activities of the global value chains (GVCs) in developing countries. This chapter's premise is the crossing of development and trade impacts of globalization. Drawn on the task trade theory of Grossman & Rossi-Hansberg (2012), we assess how offshoring from advanced economies is associated with developing countries' increase in female employment, particularly in occupations characterized by manual and routine tasks. Motivated by the remarkable increase in foreign direct investment (FDI) into Vietnam over the past decades, we study to what extent global value chains are associated with the country's female employment across levels of skills and occupations.

Using the firm-level data of the Small and Medium Enterprise Survey in Vietnam in 2011-2015, we analyze the association between GVCs and female employment across industries, controlling for the intensity of a firm's GVC involvement. Specifically, we examine female employment in terms of the female share of total workforce, skilled workforce (employees with tertiary education), unskilled workforce (employees with no tertiary education), production workforce, and non-production workforce. Our empirical analysis suggests that GVCs are positively associated with total female employment, unskilled female employment, and production female employment, whereas the association is negative for skilled female employment and non-production female employment. We also find that GVC-involved firms that are more technology-intensive have a lower share of female employment, indicating that GVC-involved firms in

Vietnam concentrate on low-value-added stages of the production process (technology is measured as the firm's number of personal computers).

This chapter focuses on GVCs of small and medium enterprises (SMEs) against the backdrop of existing studies that focus on large domestic and multinational firms: Upward et al. (2013) and Kee & Tang (2016) study the global value chains of large and medium Chinese firms with a minimum US$600,000 sales; Amendolagine et al. (2019) investigate the local sourcing activities of foreign-invested firms in Vietnam and 19 Sub-Saharan countries. In developing countries, SMEs constitute more than 90% of firms (Wang, 2016), and as shown in Pham & Talavera (2018), the contribution of SMEs is growing in Vietnam. According to the General Statistics Office of Vietnam, 95% of Vietnamese firms are SMEs.

Previous studies have extensively explored the link between globalization in terms of trade or foreign investment and female employment (Chen et al., 2013; Ederington et al., 2009; Juhn et al., 2013; Juhn et al., 2014; Kodama et al., 2018; Villarreal & Yu, 2007). Despite the importance of female participation in GVCs (Bamber & Staritz, 2016), the existing evidence on the impact of international trade and foreign direct investment focusing on GVCs and women empowerment is not much. Our study on gender inequality in Vietnam contributes to a growing body of literature on the socioeconomic impacts of GVCs in developing countries. This strand of the literature includes, for instance, World Bank (2020) on the importance of GVC-involved firms in improving women's livelihoods; Rocha & Winkler (2019), with cross-sectional data from the World Bank's Enterprise Survey in 64 countries, on the positive association between GVCs and female employment. By and large, the existing studies evaluate the share of female employment in GVC-involved firms vis-à-vis non-GVC firms, without accounting for the levels of the firm's GVC involvement and interactions with female employment.

Vietnam is quite a special case as foreign direct investment (FDI) increased from 2.8% of GDP in 1990 to 6.1% of GDP in 2015[2], ranking among the top FDI destinations. Global firms such as Samsung, Toyota, Honda, Canon, etc. have been moving their production facilities to Vietnam. The entry of these firms enables local firms to participate in their GVCs. Production and employment of GVCs inevitably influence the activities of both large and small domestic firms in Vietnam. As pointed out by OECD-UNIDO (2019), SMEs can get involved in GVCs through various channels, including "supplying, sourcing from, or partnering with multinationals, or becoming themselves multinationals." In the sample, we find that 11.5% of Vietnamese SMEs involve in some forms in GVCs.

[2] According to the data collected from the World Bank's database.

Notwithstanding the fast-growing economy and large inflows of FDI, gender inequality remains an unresolved social issue in Vietnam. Half of the Vietnamese population is women, and according to the International Labour Organization, 64% of Vietnamese women either work as own-account workers or for family. Thus, the majority of women do not have stable employment and rights protected by laws and labour regulations. Vietnamese women are drawn into manufacturing sectors for formal-sector employment. Disappointingly, the share of Vietnamese women occupying managerial positions is very low. In 2015, only 25.8% of managerial positions in Vietnam is occupied by women; the figure is much higher in other ASEAN countries (for example, 46.6%, 32.8%, 29.5%, and 28.4% in the Philippines, Thailand, Cambodia, and Myanmar, respectively).

Three distinguishing points that support the contribution of this chapter include: (i) In view of the few existing studies investigating the gender-dimension impacts of global value chains (Rocha & Winkler, 2019; World Bank, 2020), we aim to add to current literature empirical evidence of these impacts from the case of Vietnam, a developing country at the front row of FDI and GVC recipients. While previous literature mainly focused on large and multinational firms, this chapter offers an insightful analysis of global value chains from the perspectives of small and medium-sized enterprises, who play an important part in economic development of developing countries. (ii) The second contribution refers to the two-way feedback between global value chains and female employment. The firm's involvement in GVCs may be an important factor of female employment, and firms with different gender structures in the employment may have engaged with GVCs differently. As such, we use the instrumental approach to take into account the endogeneity of the firm's involvement in GVCs. To the best of our knowledge, there has not been any study addressing this endogeneity problem in the literature. (iii) We study global value chains and gender from the aspect of small and medium enterprises with the Vietnam's data, adding new evidence to the body of this growing literature.

The rest of this chapter proceeds as follows: Section 2.2 explains the theoretical motivation. Section 2.3 presents trends of global value chains and female employment in the context of Vietnam's whole economy. Section 2.4 details the data and descriptive statistics, describing the levels of the firm's GVC involvement, and providing the empirical specification. The estimation results are in Section 2.5. Conclusion is in Section 2.6.

2.2. Theoretical motivation

This chapter is motivated by the task trade theory of Grossman & Rossi-Hansberg (2012). The theory explains the pattern of specialization of tasks in the production process. Unlike standard

trade models that emphasize the role of internal economies of scale, the task trade theory focuses on external economies of scale. A firm is more efficient in performing a task in a location given the growth in the scale of performance of that task by other firms in that same location. Local knowledge and specialized expertise are the sources of the spillover effects on the firm's advantage. External economies of scale provide an incentive for firms to be selective in performing a particular set of tasks and offshoring other tasks.

The model assumes that there are two countries that produce the goods. Two primary factors of production are managers (which incur a fixed cost for the firm) and workers (which incur a variable cost for the firm). The two countries are similar in terms of their relative endowment of the two primary factors. The production process is composed of managerial tasks and a continuum of labour tasks. The managerial tasks are carried out in the country of the firm's headquarters, whereas the labour tasks can be carried out in either country by the subsidiaries of the firm or by outside suppliers. When a firm moves its tasks abroad, it faces the issues of coordinating production or communicating with the managers in the home country. The severity of these issues differs by task, inducing different offshoring costs for different tasks.

A firm makes a decision on the location of each task by comparing the benefit of external economies of scale and the cost of offshoring. When the latter outweighs the former and the two countries have the same number of workers, the labour tasks are retained in the country of the firm's headquarters; in other words, there is no offshoring of tasks. Another scenario is that the number of workers in the two countries is relatively close to each other and offshoring cost is sufficiently high: in this case the country with the higher output and higher wage performs the tasks that have high offshoring costs, leaving the chance for offshoring to take place. If there is a larger endowment of labour overseas firms may decide to perform some labour tasks abroad. In that case, tasks that incur low offshoring cost are implemented in the country with the lower wage and lower output, whereas tasks that incur high offshoring cost are implemented in the country with the higher wage and higher output.

The theory is relevant in explaining the movement of routine and manual tasks of global value chains from developed countries to developing countries. While developed countries perform non-routine and cognitive tasks, the majority of routine and manual tasks are undertaken by developing countries. In the case of Vietnam, those tasks are mostly assembly and require the dexterity or "nimble fingers" of the workers. It is acknowledged that women have an advantage over men in dexterity. In some sectors like textiles, apparels, or electronics, the share of female employment outweighs that of male employment. According to the statistics from the General

Statistics Office in Vietnam, the share of female employment in these sectors constitutes more than 70% of the sector's total workforce.

2.3. Global value chains and female employment in Vietnam

Vietnam's participation in global value chains provides an example for the task trade theory. Multinational firms from developed economies such as Korea, Singapore, Taiwan, and Japan have expanded their production to Vietnam through offshoring to take advantage of the country's abundant supply of labour. As predicted in the task trade theory, tasks with low offshoring cost, specifically the manual tasks, are offshored to Vietnam, while the cognitive tasks are retained in the firm's headquarters' home countries. These trades in tasks between Vietnam and head quarter countries characterize the involvement of Vietnam in global value chains of the past three decades since its trade and investment liberalization in 1990s.

Vietnam's growth strategy is based on the abundant supply of labour to support the main exporting sectors and attract foreign direct investment. Following this strategy, labour-intensive sectors such as textiles, apparel, leather, and electronics were readily integrated into the global value chains. Table 2A.1 in the Appendix illustrates the backward linkages and forward linkages of nine major manufacturing sectors in Vietnam; the former measures the import content of Vietnam's exports as a share of the country's total exports, while the latter measures the use of Vietnam's inputs in foreign partners' exports as a share of Vietnam's total exports, and GVC participation of Vietnam is essentially the sum of these two linkages (Koopman et al., 2012) - a higher linkage implies a higher level of involvement in GVCs. Based on data from the Trade in Value Added database of the OECD, the participation of textiles, apparel & leather, and electronics in GVCs is more significant than other sectors [e.g., basic metals, chemical and pharmaceutical products, and rubber and plastic products]. In 2015, the share of import content of exports and the share of Vietnam's inputs in foreign countries' exports of textiles, apparel and leather is 11.7% and 1.2%, respectively; while the figures for the electronics sector are 7.2% and 2.2%, respectively [the figures in other sectors are much lower: for basic metals, the backward linkages are 1.3%, while the forward linkages are 0.4%].

Figure 2.1 shows the average share of female employment (in percentage of total employment) on the vertical axis, plotted against the GVC participation indicator (in percentage of total exports) of nine manufacturing sectors of Vietnam in 2011-2015, based on the average share of female employment from the General Statistics Office of Vietnam. The figure suggests a positive association between GVC participation and the female labour share. The share of female employment is the highest in electronics at more than 78% in 2011-2015, followed by textiles,

apparel and leather, at more than 77%. In contrast, the share of female employment in other sectors such as basic metals, fabricated metal products, chemical and pharmaceutical products, is relatively low.

[Figure 2.1 is here]

As the backward linkages are always higher than the forward linkages, the data suggest that Vietnamese firms mainly participating in GVCs by importing inputs from abroad to undertake assembly tasks. For instance, Samsung, the Korean electronics giant, entered Vietnam in 1995, gradually allocating a third of its output to the production facilities in Vietnam[3]. Interestingly, Korean firms supply most of Samsung's inputs, limiting Vietnamese firms' participation in the downstream parts of Samsung's global value chains. According to the Foreign Investment Agency in Vietnam, Vietnamese firms' involvement in Samsung's GVCs is mostly packaging, labelling or assembling, the tasks considered unskilled and requiring dexterity of female workers in Vietnam. Similarly, in the textiles and apparel sector, 46.1% of the inputs are imported from foreign suppliers[4], and the finished products can then be exported to large markets such as the United States, EU, and Japan at the competitive prices supported by the low-value-added stage of cutting and sewing in Vietnam, comprising more than 70% of the female labour.

In sum, the task trade theory developed by Grossman & Rossi-Hansberg (2012) sheds light on the link between global value chains and female employment in Vietnam. We next formally examine this relationship by using firm-level data from small and medium-sized enterprises in Vietnam from 2011 to 2015.

2.4. Methodology

2.4.1. Data

Our sample comes from the micro-level data of the Small and Medium Enterprise Survey in Vietnam. The survey was conducted biennially in 2005-2015 under the collaboration of the Central Institute for Economic Management (CIEM), the Institute of Labour Science and Social Affairs (ILSSA), the Development Economics Research Group (DERG) at the University of Copenhagen, and the United Nations University World Institute for Development Economic Research (UNU-WIDER). Nine provinces participating in the survey are Ha Noi[5], Hai Phong, Phu

[3] https://www.economist.com/asia/2018/04/12/why-samsung-of-south-korea-is-the-biggest-firm-in-vietnam.

[4] https://www.wto.org/english/res_e/statis_e/miwi_e/VN_e.pdf.

[5] Ha Tay province also participated in the SME Survey. However, this province was officially merged into Hanoi in 2009. Thus, in this study, we merged the information of Ha Tay to Hanoi. Vietnam currently has 63 administrative provinces.

Tho, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Ho Chi Minh City, and Long An[6] (the population of each province is 7.5 million people, 2.0 million people, 1.4 million people, 3.2 million people, 1.5 million people, 1.2 million people, 1.3 million people, 8.6 million people, and 1.5 million people, respectively). The classification of firms is done according to the World Bank's definition of SMEs. Specifically, micro firms have up to 10 employees; small firms have up to 50 employees; medium-scale firms have up to 300 employees; and large firms have more than 300 employees.

Each round of the survey refers to the previous year. Each survey round covers approximately 2,500 to 2,800 non-state manufacturing SMEs in 18 industries[7]. The survey sample is randomly stratified by the legal status[8] of manufacturing SMEs based on the Establishment Census and the Industrial Census from the General Statistics Office of Vietnam. The on-site identification approach is used to incorporate informal household firms in the sample. In contrast to household firms registered with district authorities, these informal household firms are not registered. Because this study focuses on firms that participate in global value chains, we proceed with the registered firms in the sample (see Table 2A.2 and Table 2A.3 in the Appendix for the distribution of firms by industry and by legal status).

The survey was carried out in 2005, but only the three rounds of the survey in 2011, 2013, and 2015 formed our panel dataset, because the information on the subcontracting details of firms, serving as one measure of participation in the global value chains is sufficiently available since 2011. The final (unbalanced) panel sample has 5,499 observations, covering 2,885 firms, an average of 2 observations per firm.

2.4.2. GVC measurement

There are several approaches to measure GVC involvement. The macro-approach uses input-output tables of bilateral trade (Hummels et al., 2001; Koopman et al., 2012; Antràs et al., 2013). This approach allows for a decomposition of a country's exports into different components such as domestic value added, foreign value added, and other double-counted terms. Yet, the nature of trade statistics and some assumptions of the mathematical frameworks induce the

[6] https://www.wider.unu.edu/database/viet-nam-sme-database.

[7] 18 industries include Food and beverages, Textiles, Apparel, Leather, Wood, Paper, Publishing and printing, Refined petroleum, Chemical products, Rubber, Non-metallic mineral products, Basic metals, Fabricated metal products, Electronic machinery, Motor vehicles, Other transport equipment, Furniture, jewellery, Recycling.

[8] The SME survey covers both firms that registered with official institutions (either at district or provincial level) and unregistered households. Unlike unregistered households, registered firms have their own business registration license and tax code.

measurement of GVCs to underestimate or overestimate the value added. For instance, Koopman et al. (2012) assume that the proportion of an intermediate input imported from a source country for every industry in a destination country is the same to the proportion of that imported intermediate input of the destination country from that source country. Hummels et al. (2001) assume that the proportion of imported intermediates is the same in both production for domestic final demand and production for exports. For a micro-level approach, data are mostly obtained from firm surveys and combined with relevant statistics to account for domestic and foreign value-added contents of firms' exports (Kee & Tang, 2016; Lu et al., 2018; Upward et al., 2013). While the main actors of GVCs are firms, this approach is definitely useful in explaining firm heterogeneity in GVCs. The micro-level approach has its challenges, however, as firm-level data are not always accessible, or in some cases, the data on value-added is insufficient.

We utilize the information in OECD-UNIDO (2019) and the micro-level approach of Veugelers et al. (2013) to measure the involvement of Vietnamese firms in the global value chains focusing on their trade and domestic production linkages. OECD-UNIDO (2019) provides an empirical framework in which small and medium-sized enterprises can get involved in the global value chains according to the extent of their activities in exporting (intermediate or final) products or importing inputs. The GVC involvement can also take place when SMEs supply or source from foreign-owned firms or supply their products to larger domestic firms, which later sell to foreign-owned firms through the domestic linkages. As SMEs become stronger and get larger, they can then play a more important role in GVCs by investing abroad and becoming multinational firms.

We apply the micro-level measure of GVC involvement to the firm-level data from Vietnam's SME survey, aided by the detailed information on the international activities of firms in the survey[9]. We classify firms into two groups: (i) GVC-involved firms and (ii) non-GVC firms. In the GVC-involved group, three modes of involvement are as follows: (i.a) the lowest level of involvement, designated the single mode, is for firms that either export, or import inputs, or act as an international producer (through outsourcing, offshoring, or foreign direct investment); (i.b) the middle level of involvement, the dual mode, describes firms that perform any two of the three

[9] The data do not provide the composition and sources of firms' inputs, nor where the firms are in the supply chains. We follow Veugelers et al. (2013) to measure the involvement of Vietnamese firms in the global value chains focusing on their trade and domestic production linkages with the data available, utilizing the number of international activities that the firms perform (single mode, dual mode, triple mode) rather than a single activity. We note that our approach primarily make inference to the international activities of the firm, as the proxies for the types of GVC involvement, but it does not perfectly measure the details of their involvement in global production networks.

activities mentioned above; (i.c) the highest level of involvement, the triple mode, is for firms that simultaneously perform all the three activities.

The survey on SMEs in Vietnam also provides information on the domestic linkages of the firms, though more limited than the international dimension. The survey asks about the contribution to the firm's revenue from sub-contracting (outsourcing) services for foreign-owned firms. We treat firms answering this question with a positive value as international producers; 1.3% (72 firms) of the observations are international producers according to this classification in the sample.

Table 2.1 reports the sample composition, revealing the skewness in the distribution of GVC involvement. We find that annually more than 87% of Vietnamese SMEs do not get involved in the GVCs (88.7%, 87.9%, and 89.2% in 2011, 2013, and 2015, respectively), less than 9.5%, are single-mode firms (8.9%, 9.4%, and 8.9% in 2011, 2013, and 2015, respectively), and around 2% of firms have the medium-level of involvement (2.3%, 2.6%, and 1.8% in 2011, 2013, and 2015, respectively). In each year, there are three SMEs that are most intensively involved in GVCs, quite a reasonable figure given the dominance of micro, small, and household firms in Vietnam. Among single-mode firms, more than 60% are exporters. The majority of dual-mode firms both export and import (around 80%). As highlighted in OECD-UNIDO (2019), a large number of SMEs may never participate in GVCs because of the nature and the scale of their business, the statistics of Table 2.1 are likely to be persisting and consistent with the stylized facts for the majority of developing countries.

[Table 2.1 is here]

2.4.3. Descriptive statistics

Table 2.2 reports descriptive statistics for all firms in the sample. From 2011-2015, 37% of total employment is female, with skilled-female employment represents 23.2% of the skilled workforce and unskilled-female employment accounts for 35.9% of the unskilled workforce. The average share of female production workforce is 30.5%, while the average share of female non-production workforce is 47%. Additional firm characteristics include that the average firm's age in the sample is about 15 years, 58.7% of them are male-owned firms. The average size of firms is 19 people.

[Table 2.2 is here]

A comparison of employment by gender across industries shows that the average share of female employment is much higher than that of male employment in textiles and apparel, as shown in Figure 2.2 (detailed t-test provided in Table 2A.4).

[Figure 2.2 is here]

Figure 2.3 compares the average share of female employment of firms according to different levels of GVC involvement, suggesting that GVC-involved firms have a higher average share of female employment than non-GVC firms (with an exception for the triple-mode firms in 2013, only three firms in this group). In 2011-2015, the average share of female employment is 35.6% in non-GVC firms, 45.4% in single-mode firms, 50% in dual-mode firms, and 58.2% in triple-mode firms.

[Figure 2.3 is here]

2.4.4. Econometric approach

2.4.4.1. Model specification and OLS estimation

To examine the relationship between global value chains and female employment, this study follows the literature on the impact of foreign direct investment and trade on female employment (Chen et al., 2013; Kodama et al., 2018; Villarreal & Yu, 2007). Specifically, the model takes the following form:

$$\text{Female employment share}_{it} = \alpha + \beta X_{it} + \gamma GVC_{it} + \varepsilon_{it} \quad (2.1)$$

where Female employment share$_{it}$ is female share of total workforce of firm i at time t. X_{it} is a set of firm i's characteristics at time t, including: age; capital intensity measured as total fixed assets divided by total workforce (in natural logarithm); per capita sales measured as total sales divided by total workforce (in natural logarithm); size measured as total workforce (in natural logarithm); the gender of the firm's owner or manager (a dummy variable is equal to one if the gender of the firm's owner or manager is male, and zero otherwise)[10]; the legal status[11] (an indicator that identifies one of the five legal statuses: household firms, private firms, partnership or cooperative firms, limited liability firms, joint stock firms; the reference category is household firms). In this empirical specification, our variable of interest is GVC_{it}, which represents a set of mutually exclusive dummies identifying the firm's mode of involvement in global value chains, namely the single mode, the dual-mode, and the triple mode. The reference category is the non-GVC mode, which includes firms not involved in global value chains. ε_{it} is the error term[12]. We control for

[10] Becker (1971) states that the gender composition of the firm is affected by the employer's preference for the employee's gender.

[11] Zhu et al. (2008) suggest that the legal status matters for the firm's human resource practices, including employment.

[12] ε_{it} is the composite error term which comprises time-constant unobserved factors (v_i) and time-varying unobserved factors (u_{it}). For panel data, fixed effects model is applied if it is assumed that v_i is correlated with explanatory

province fixed effects to capture time-invariant differences among provinces in terms of culture, history, business environment, and other unobservable characteristics. In addition, industry fixed effects, industry-specific time trend, and year fixed effects are also controlled for.

We are interested in the impact of global value chains on female employment in two dimensions. First, for skilled-female employment, the dependent variable is female share of skilled workforce (employees with tertiary education). For unskilled-female employment, the dependent variable is female share of unskilled workforce (employees with no tertiary education). Second, we estimate the model using as dependent variables the female share of production workforce, and the female share of non-production workforce.

Our sample has 5,499 observations, covering the most recent 3 years of surveys (2011, 2013, 2015). Given the 5-year span, the within-firm variation of the female share is dominated by its cross-sectional variation among the firms. To control for the role of global value chains on female employment within an industry, we use the OLS regression.

Because of the skew distribution of observations by GVC mode (as shown in Table 2.1), we differentiate the involvement of firms in GVCs into two bins, namely the GVC group and the non-GVC group. A binary dummy variable GVC is equal to one for a firm identified as either the single-mode, or dual-mode, or triple-mode, and equal to zero otherwise.

2.4.4.2. 2SLS estimation

One issue is that of the possible simultaneity between global value chains and the firm's female employment. It can be argued that the gender structure of the firm can be associated with the firm's participation in global value chains, especially for industries that have a strong correlation between female employment share and global value chains such as textiles and apparel. If simultaneity exists, the OLS estimates are biased.

Another issue of endogeneity in this study is that the endogenous variable, namely GVC_{it}, is an indicator. We do not use the fitted value of GVC_{it} [from regressing GVC_{it} on instrumental variables and other explanatory variables] with Probit regression as the instruments in the first stage because the 2SLS regression in this case is a type of the forbidden regression. We follow Angrist & Pischke (2009), noting that it is not advisable to use the result of a nonlinear regression as an identifying information source, because only OLS in the first stage ensures that the fitted values and other explanatory variables are not correlated with the residuals. In this study, we follow

variables. But if there is small variation in variables over time, and if v_i and u_{it} are both assumed to be uncorrelated with explanatory variables, pooled OLS is applied.

Wooldridge (2002) and Adams et al. (2009), performing a three-stage procedure: (i) In the first stage, we estimate the probability of a firm's GVC involvement (GVC_{it}) on other variables on the right-hand side of equation (2.1) and instruments for GVC_{it}, using Probit regression. We use the ordered Probit estimation when the endogenous variable is an indicator of GVC-involvement mode (Non-GVC, Single mode, Dual mode, and Triple mode). Probit estimation is used when the endogenous variable is a binary dummy of GVC involvement. (ii) In the second stage, we use OLS to regress GVC_{it} on other variables on the right-hand side of equation (2.1) and the predicted values of GVC_{it} obtained from the first step. (iii) In the third stage, Female employment $share_{it}$ is regressed with OLS on other variables on the right-hand side of equation (2.1) and the predicted values obtained from the second step. This procedure allows us to account for the discrete nature of our endogenous dummy variables and obtain a single coefficient for each GVC involvement mode.

We use the industry-province ratio of GVC-involved firms to total number of firms in the province as the instrument for the involvement of a firm in GVCs. Specifically, the instrument is calculated as follows:

$$\mathrm{GVC}_{\mathrm{spt}} = \frac{\text{Number of GVC}-\text{involved firms}_{\mathrm{spt}}}{\text{Number of firms}_{\mathrm{pt}}} \qquad (2.2)$$

where the two subscripts s and p denote industry and province, respectively. The rationale is driven by the role of regional industrial clusters in economic agglomeration supporting the GVCs. The presence of regional industrial clusters enables the multinational firms, as well as local firms and SMEs, to get better access to shared resources, market opportunities, trade facilities, government institutions (Marshall, 1890; Porter, 2000). Mittelstaedt et al. (2006) find that the industrial concentration of regions is positively associated with firms' propensity to export. With our sample covering 18 industries in nine provinces, each province is characterized by specific environmental, business, and institutional conditions that are likely to be supportive to GVCs and local firms' involvement in certain industries. For instance, the industrial parks in provinces Ha Noi and Lam Dong are known for mechanical and electronic industries, and food and beverage industry, respectively. Thus, a firm's involvement in GVCs is likely to be associated with its provincial industrial cluster. We find that the coefficients of GVC_{spt} by the Probit estimation in the first step are positive and significant (as reported in Table 2A.5 in the Appendix), suggesting that firms are associated with the global value chains when their provincial industrial cluster has a high share of GVC-involved firms.

For the instrument to be valid, it must be uncorrelated with the female employment share at the firm level except through other explanatory variables in the second stage. We consider the

industry-province share of GVC-involved firms can affect the firm's female employment through the industry-province share's effects on firm's international trade and economic agglomeration linkages. In all estimation stages, we control for province fixed effects, industry fixed effects, and industry-specific time trend, to address that our instrument does not capture primarily sector or location unobservable characteristics that can directly affect female employment at the firm level. We acknowledge that it is possible that if there is greater GVC participation in a province, the demand for low-skilled female labour will be under pressure and there should be some adjustments in the labour market, for example, low-skilled female labour will be substituted with low-skilled male ones. There can also be the possibility of low-skill female workers migrating to provinces that have a high demand for their labour. As a robustness check, we incorporate a province by year fixed effects to the right-hand side of the equation to account for these potential issues[13]. The estimates reported in Table 2A.10 stay robust. Having done this due diligence, we note to the readers the limitation on finding the instruments that perfectly satisfy the relevance and the exclusion restriction in the context of this study.

2.5. Findings

2.5.1. Baseline results

2.5.1.1. OLS estimates

The pooled OLS estimates of the impacts of GVC involvement on female employment are reported in Table 2.3. Column (1), column (3), column (5), column (7), and column (9) show the results when the GVC variable is a categorical dummy indicating different levels of the firm's GVC involvement; the reference category is non-GVC firms. The estimates in column (1) suggest that dual-mode firms have the largest share of total female employment compared to firms having other modes of global value chain involvement. The dual mode's positive and significant coefficient implies that all things being equal, the female share of dual-mode firms is, on average, 6.3 percentage-point higher than that of firms not getting involved in GVCs. Single-mode firms also have a higher share of female employment, 4.5 percentage points more than non-GVC firms. The estimates in column (3) and column (5) suggest no significant association between GVC involvement and the female share of skilled workforce, whereas single-mode and dual-mode firms exhibit a higher share of unskilled female employment than non-GVC firms do.

Recall the skewness of firms' distributions by their level of GVC involvement (more than 87% of firms are not involved in a GVC, while less than 1% of firms have triple mode), next, we

[13] We thank Dr. Harold Cuffe for this helpful suggestion.

group the categorical GVC dummies into a binary dummy, equal to one if the firm has either one of the three modes of GVC involvement (GVC-involved firm), and zero otherwise (non-GVC firm). The estimates in column (2), column (4), and column (6) suggest that GVC-involved firms have a higher share of total female employment and unskilled female employment than non-GVC firms and there is no significant difference in the share of skilled female employment between the two groups of firms.

We further analyze the link between global value chains and female job positions by comparing the impact of the firm's involvement in GVCs on the female share of production labour and non-production labour. Column (7) shows that triple-mode firms have a higher share of female production labour than non-GVC firms. The coefficients of single-mode and dual-mode firms are positive as well, indicating a positive association between the level of firms' involvement in GVCs and the female share of production workforce. When GVC involvement is a binary dummy, the results in column (8) suggest a positive correlation between GVC involvement and female production labour. In column (9) we observe that non-GVC firms outweigh dual-mode firms in terms of the female share of non-production workforce. The estimates in columns (10) suggest that there is no significant difference in the female share of non-production workforce between GVC-involved firms and non-GVC firms.

[Table 2.3 is here]

2.5.1.2. 2SLS estimates

The simultaneity of the firm's gender-structure and its involvement in global value chains remains an open question in the literature to the best of our knowledge. The firm's gender-structure may influence its participation in GVCs, rendering thereby the positive correlation between GVCs and female employment share in Vietnam. To address the endogeneity concern, we apply a three-stage procedure using the industry-province ratio of GVC-involved firms to total number of firms in the province as an instrument. The estimated results of the first stage are in Table 2A.5 in the Appendix. The Probit estimates for both the ordinal GVC dummy and the binary GVC dummy are positive and significant at 1 percent level, indicating that firms tend to get involved in GVCs when the industry-province share of GVC-involved firms is high.

Table 2.4 reports the 2SLS estimates. Because there is only one instrument for global value chains, the model is exactly identified - we cannot perform the over-identification tests. The Hausman Chi-square test confirms the endogeneity of the endogenous regressor GVC in all model specifications. The Wald F statistics are greater than 10, thereby rejecting the null hypothesis of

the weak instrument. Additionally, the LM statistics of the under-identification test show that the null hypothesis of under-identification can be rejected.

For the female share of total workforce, the female share of unskilled workforce, and the female share of production workforce, the coefficients of GVC dummies in columns (1), (5), and (7) are only positive and significant for single-mode firms. The coefficients of the dual mode and triple mode are insignificantly different from zero. Furthermore, in column (3) and column (9), we find negative and significant coefficients for dual-mode firms when the dependent variables are the female share of skilled workforce and the female share of non-production workforce. The coefficients of the binary GVC dummy reported are positive and significant in columns (2), (6), and (8) while they are negative and significant in column (4), (10), further indicating that GVC-involved firms have a higher female share of total workforce, female share of unskilled workforce, and female share of production workforce; a lower female share of skilled workforce and female share of non-production workforce than non-GVC firms do. These results are inconsistent with our OLS estimates which show an insignificant association between GVC involvement and the female share of skilled workforce or the female share of non-production workforce. The distinction between the 2SLS estimates and the OLS estimates is second-order important because the local average treatment effect applies to a subset of the sample while the OLS estimation applies to the entire sample.In the later parts of this study, we use the 2SLS as our main regression method and report the 2SLS estimates.

Our findings support the task trade theory: developing countries like Vietnam have a comparative advantage in labour-intensive industries like textiles and apparel, thereby specializing in the manual tasks that require a large number of female workers with dexterity or "nimble fingers." Therefore, firms involved in GVCs prominently feature a higher female share of unskilled, production workers, and a lower female share of skilled, non-production workers.

Table 2.4 also points to the role of other firm characteristics. *Age*: the estimates indicate an association between a firm's age and female employment: older firms tend to have a higher share of total females and unskilled females. *Capital intensity*: there is no significant association between capital-intensive firms and female employment share. *Per capita sales*: Per capita sales is negatively correlated with total female employment, unskilled female, production female employment and positively correlated with skilled female employment. *Firm size*: large firms tend to have a higher female share of total workforce, skilled workforce, and unskilled workforce. *Owner's gender*: male-owned firms tend to have a lower share of total female employment than female-owned firms do. This finding is in line with that of Carrington & Troske (1995): female-owned firms employ a higher female employment share than male-own firms do. *Legal status:*

non-household firms have a higher female share of skilled workforce and non-production workforce than household ones do, whereas the female share of unskilled workforce and production workforce of limited liability firms and joint-stock firms are lower than those of household firms.

[Table 2.4 is here]

Figure 2.4 illustrates the association between the average share of female employment and the average share of firms involved in global value chains across industries in 2011-2015. Sectors with a larger share of firms involved in GVCs are also sectors with a larger share of female employment, notably textiles and apparel.

[Figure 2.4 is here]

2.5.2. Robustness checks

A potential important variable that could be omitted is the share of female employment at the industry level. The argument is that the gender-structure of the firm can be determined by the gender-structure of the industry that the firm operates in. The estimates in Table 2A.6 suggest that GVCs and female employment links remain robust after we control for this variable.

We further control the impact of firm innovation by adding a dummy on firm innovation to equation (2.1). Firm innovation is an indicator of whether the firm implements one of the three forms of innovation: (i) improve existing products, (ii) upgrade technologies (iii) plan to start new projects. The estimates in Table 2A.7 suggest that GVCs and female employment links remain robust.

Another concern is that our findings are primarily driven by textiles and apparel which are the two sectors employing the biggest share of female employment and clearly illustrate a positive correlation between GVCs and female employment as shown in Figure 2.4. Hence, we exclude these two sectors from the sample and re-perform the 2SLS regression. The results are reported in Table 2A.8. We still find a positive association between GVC involvement and the female share of total employment, unskilled employment, production employment, and a negative association between GVC involvement and the female share of skilled employment, non-production employment in this scenario, though the magnitude of the impact gets bigger for the female share of total employment, unskilled employment, skilled employment, production employment and smaller for the female share of non-production employment.

The task trade theory predicts a movement of manual, unskilled tasks from developed countries to developing countries. To provide further evidence supporting this prediction, we replace the dependent variable with the share of unskilled labour in total workforce. The estimates

reported in Table 2A.9 show a positive correlation between GVC involvement and the unskilled labour share. These findings help to align the intuition with the prediction of the task trade theory.

The last robustness check deals with the exclusion restriction validity. As discussed in Subsection 2.4.4.2, we add province by year fixed effects to the right-hand side of the equation to control for the potential effects of labour market adjustments or migration when GVC involvement is more intensive in some provinces relative to other provinces. The estimates reported in Table 2A.10 are consistent with our main findings.

2.5.3. Potential mechanism of the impacts

In the previous sections, we point out a positive association between female employment and GVC involvement, especially unskilled female labour and female production workers. The next question is why the female shares of employment are higher in GVC-involved firms than those in non-GVC firms. In subsection 2.5.2 we exclude textiles and apparel to prove that the links between GVCs and female employment is not driven by female-intensive industries. Consistent with the theoretical motivation, we further clarify our previous argument that Vietnamese firms mainly participate in low-value added and manual stages of the production process. Specifically, we incorporate a variable of technology and its interaction with the binary dummy of GVC involvement into equation (2.1). We denote the log of the number of personal computers as technology. We now have two endogenous variables, including GVC involvement and its interaction with technology. We still apply the three-stage procedure, using the industry-province ratio of GVC-involved firms to total number of firms in the province and its interaction term with technology as instruments. In the first stage, the probability of a firm's GVC involvement (GVC_{it} binary) is regressed on the instrument for $GVC_{it,}$ the interaction term between this instrument and technology, and other variables on the right-hand side of equation (2.1). In the second stage, we use OLS to estimate two equations. One equation has GVC_{it} as the dependent variable, the other equation has the interaction term as the dependent variable. The predicted values of GVC_{it} obtained from the first step and its interaction with GVC_{it} are incorporated to the right-hand side of the two equations. In the final step, Female employment $share_{it}$ is regressed with OLS on other variables on the right-hand side of equation (2.1) and the predicted values obtained from the second step. The estimates in Table 2.5 show a positive association between technology and the female share of total employment, skilled employment, whereas the association is insignificant for unskilled, production, and non-production female labour. However, our special interest is given to the coefficient of the interaction of technology and GVC involvement. In all 5 columns of Table 2.5, the coefficient of the interaction is negative, suggesting that technology of GVC-involved firms is

negatively associated with the female shares of employment. Our findings support the argument that GVC-involved firms in Vietnam concentrate on low-value added stages of the production process which depend more on manual labour than on technology. A similar mechanism in another labour-intensive country has been pointed out in Chen et al. (2013) which examines female employment of exporting firms in China. In most countries, technology-intensive jobs are often skilled-male-intensive. Technology upgrading is expected to be associated with an increase in the share of skilled male workers. In this chapter, the skilled male share and the skilled female share of the skilled workforce sum up to unity. Therefore, our estimates reported in column 2 of Table 2.5 which predict that GVC-involved firms with the lowest level of technology have the highest share of skilled female labour are in line with our expectation.

[Table 2.5 is here]

2.5.4. Trade unions and female employment of GVC-involved firms

In this section, we further examine the impacts of labour market institutions on female employment of GVC-involved firms by comparing GVC-involved firms that have a trade union and GVC-involved firms that have no trade union. We note that 5,301 observations in the sample have available information on trade unions, of which 14% report they have a trade union. To account for firm heterogeneity in terms of trade unions, we add an indicator of whether the firm has a trade union and an interaction term between the binary GVC dummy and trade union indicator into the right-hand side of equation (2.1). We have two endogenous variables, including GVC involvement and its interaction with trade union indicator. The three-stage procedure are applied, using the industry-province ratio of GVC-involved firms to total number of firms in the province and its interaction term with trade union indicator as instruments. The approach is similar to the one we use in Subsection 2.5.3. Our coefficient of interest is the coefficient of the interaction term. A positive coefficient indicates a bigger share of female employment in GVC-involved firms with a trade union, and a negative coefficient indicates the reverse trend. In Table 2.6, all coefficients of the interaction term are negative and significant. Thus, GVC-involved firms with a trade union exhibit a smaller share of female labour than GVC-involved firms without a trade union. Bertola et al. (2007) discuss the environment where higher wage settings under the influence of trade unions induce employment declines for workers, especially female workers whose labour supply is more elastic than that of men[14]. Torm (2018) points out an increase of 9-

[14] Bertola et al. (2007) argue that women are more likely to tradeoff between housework and market works than men are.

21 percentage points in wages for unionized workers in comparison to non-union workers using employee's data from the same SMEs survey in Vietnam. Our study focuses on a setting of female employment in the global value chains, allowing for the role of unions in the comparisons of unskilled and production female workers to the skilled and non-production counterparts. It turns out that while GVC involvement is positively associated with the female share of total workforce, the existence of a trade union induces no positive impacts on female employment, across skill levels and work positions in GVC-involved firms.

[Table 2.6 is here]

2.5.5. Discussion

Several studies consider globalization a driver for improvement in female employment in developing countries. Villarreal & Yu (2007) argue that, in Mexico, foreign-invested firms and exporting firms employ a higher share of women than domestic firms and non-exporting firms at any level of occupation. Related to our findings, the preference for female employees in these firms results from the job requirement rather than other firms' characteristics. Juhn et al. (2013) point out that employers' preference for male employees mostly exists in Mexico's production jobs because of the heavy work nature. For non-production jobs in Mexico, like managerial positions, there is no gender preference. It is plausible that reduced export tariffs encourage new firms' entrance into the market. With new competition, firms upgrade their technology, which, in turn, lowers the demand for labour-intensive skills, and lessens gender discrimination. Supportive evidence is the positive association between a decline in tariff and the female employment in production jobs. Alternatively, Chen et al. (2013) argue that, under the competition pressure from globalization, firms with gender bias are likely to incur higher costs. Their empirical analysis suggests that female employees' share in foreign firms and exporting firms is higher than that in non-exporting domestic firms in China.

Our findings on the positive association between GVCs and female employment are consistent with those of Villarreal & Yu (2007) and Juhn et al. (2013) and highlight the nature of the jobs that induce gender preference. However, unlike Jun et al. (2013) which suggests a complementarity between technology and female employment, we find that female employment in Vietnam is concentrated in GVC-involved firms with low level of technology to perform manual, low-value added tasks. In light of the task trade theory, Vietnamese women perform manual tasks that requires their dexterity ("nimble fingers") in the production process. Hence, GVCs are positively associated with the female share of production workforce.

2.6. Conclusion

As production technologies and automation continue to improve, women performing manual tasks are at risk of being replaced. According to some estimates, about 40 million to 160 million women would have job transition by 2030 (Madgavkar et al. (2019); McKinsey Global Institute). GVCs or not, women gain minimal skills participating in routine and manual tasks and become less versatile and adaptive in the job market. More education and training to upgrade their skills, including the reskilling programs, benefit women in their long-term career outlook in the coming decades.

This paper studies the empirical linkages between the global value chains and the prevalence of manual and routine tasks in developing economies motivated by the task trade theory of Grossman & Rossi-Hansberg (2012). Using Vietnam's data on SMEs from 2011-2015, we find that GVCs are positively associated with the female share of total employment, unskilled employment, production workforce and negatively associated with the female share of skilled employment, non-production workforce. By explaining the mechanism of the impacts, we point out that technology of GVC-involved firms is negatively associated with the share of female employment, across skill levels and job positions. The findings reveal a developing country's reality, which typically fosters economic integration based on its labour-intensive advantages. Global value chains create more jobs for the virtue of women's dexterity but fall short of embracing female employees in the more technology-intensive GVC-involved firms

While the use of Vietnam's SME database has its limitation, it sheds light on the impact of GVCs on female employment. Future studies looking at firms across the spectrum of sizes and activities in the supply chains may provide useful details on the linkages between global value chains and female employment in developing countries, including Vietnam and others.

References

Adams, R., Almeida, H., & Ferreira, D. (2009). Understanding the Relationship between Founder-CEOs and Firm Performance. *Journal of Empirical Finance*, *16*(1), 136–150. https://doi.org/10.1016/j.jempfin.2008.05.002

Amendolagine, V., Presbitero, A. F., Rabellotti, R., & Sanfilippo, M. (2019). Local Sourcing in Developing Countries: The Role of Foreign Direct Investments and Global Value Chains. *World Development*, *113*, 73–88. https://doi.org/10.1016/j.worlddev.2018.08.010

Angrist, J. D., & Pischke, J.-S. (2009). Chapter 4. Instrumental Variables in Action: Sometimes You Get What You Need. In *Mostly Harmless Econometrics* (pp. 113–219). Princeton University Press.

Antràs, P., & Chor, D. (2013). Organizing the Global Value Chain. *Econometrica*, *81*(6), 2127–2204. https://doi.org/10.3982/ecta10813

Bamber, P., & Staritz, C. (2016). *The Gender Dimensions of Global Value Chains Inclusive Economic Transformation* (Issue September).

Becker, G. S. (1971). *The Economics of Discrimination.* University of Chicago Press, Chicago.

Bertola, G., Blau, F. D., & Kahn, L. M. (2007). Labour Market Institutions and Demographic Employment Patterns. *Journal of Population Economics*, *20*(4), 833–867. https://doi.org/10.1007/s00148-007-0137-8

Carrington, W. J., & Troske, K. R. (1995). Gender Segregation in Small Firms. *Journal of Human Resources*, *30*(3), 503–533. https://doi.org/10.2307/146033

Chen, Z., Ge, Y., Lai, H., & Wan, C. (2013). Globalization and Gender Wage Inequality in China. *World Development*, *44*, 256–266. https://doi.org/10.1016/j.worlddev.2012.11.007

Ederington, J., Minier, J., & Troske, K. R. (2010). Where the Girls Are: Trade and Labour Market Segregation in Colombia. *IZA Discussion Paper*, *4131*.

Grossman, G. M., & Rossi-Hansberg, E. (2012). Task Trade Between Similar Countries. *Econometrica*, *80*(2), 593–629. https://doi.org/10.3982/ecta8700

Hummels, D., Ishii, J., & Yi, K. M. (2001). The Nature and Growth of Vertical Specialization in World Trade. *Journal of International Economics*, *54*(1), 75–96. https://doi.org/10.1016/S0022-1996(00)00093-3

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2013). Trade Liberalization and Gender Inequality. *American Economic Review*, *103*(3), 269–273. https://doi.org/10.1257/aer.103.3.269

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2014). Men, Women, and Machines: How Trade Impacts Gender Inequality. *Journal of Development Economics*, *106*, 179–193. https://doi.org/10.1016/j.jdeveco.2013.09.009

Kee, H. L., & Tang, H. (2016). Domestic Value Added in Exports: Theory and Firm Evidence from China. *American Economic Review*, *106*(6), 1402–1436. https://doi.org/10.1257/aer.20131687

Kodama, N., Javorcik, B. S., & Abe, Y. (2018). Transplanting Corporate Culture across International Borders: Foreign Direct Investment and Female Employment in Japan. *World Economy*, *41*(5), 1148–1165. https://doi.org/10.1111/twec.12612

Koopman, R., Wang, Z., & Wei, S. J. (2012). Estimating Domestic Content in Exports When Processing Trade is Pervasive. *Journal of Development Economics*, *99*(1), 178–189. https://doi.org/10.1016/j.jdeveco.2011.12.004

Lu, Y., Shi, H., Luo, W., & Liu, B. (2018). Productivity, Financial Constraints, and Firms' Global

Value Chain Participation: Evidence from China. *Economic Modelling*, *73*(February), 184–194. https://doi.org/10.1016/j.econmod.2018.03.015

Madgavkar, A., Manyika, J., Krishnan, M., Ellingrud, K., Yee, L., Woetzel, J., Chui, M., Hunt, V., & Balakrishnan, S. (2019). The Future of Women at Work. *The Future of Women at Work: Transition in the Age of Automation*, *June*, 1–30. https://www.mckinsey.com/~/media/McKinsey/Featured Insights/Gender Equality/The future of women at work Transitions in the age of automation/MGI-The-future-of-women-at-work-Exec-summary.ashx

Marshall, A.(1890). *Principles of Economics: An Introductory Volume*. London: Macmillan.

Mittelstaedt, J. D., Ward, W. A., & Nowlin, E. (2006). Location, Industrial Concentration and the Propensity of Small US firms to Export: Entrepreneurship in the International Marketplace. *International Marketing Review*, *23*(5), 486–503. https://doi.org/10.1108/02651330610703418

OECD-UNIDO. (2019). *Integrating Southeast Asian SMEs in Global Value Chains: Enabling Linkages with Foreign Investors*.

Pham, T., & Talavera, O. (2018). Discrimination, Social Capital, and Financial Constraints: The Case of Viet Nam. *World Development*, *102*, 228–242. https://doi.org/10.1016/j.worlddev.2017.10.005

Porter, M. E. (2000). Location, Competition, and Economic Development: Local Clusters in a Global Economy. *Economic Development Quarterly*, *14*(1), 15–34. https://doi.org/10.1177/089124240001400105

Rocha, N., & Winkler, D. (2019). Trade And Female Labour Participation: Stylized Facts Using a Global Dataset. *Trade And Female Labour Participation: Stylized Facts Using a Global Dataset*, *December*. https://doi.org/10.1596/1813-9450-9098

Torm, N. (2018). *Does Union Membership Pay Off? Evidence from Vietnamese SMEs* (WIDER Working Paper 2018/71, Issue July).

Upward, R., Wang, Z., & Zheng, J. (2013). Weighing China's Export basket: The Domestic Content and Technology Intensity of Chinese Exports. *Journal of Comparative Economics*, *41*(2), 527–543. https://doi.org/10.1016/j.jce.2012.07.004

Veugelers, R., Barbiero, F., & Blanga-Gubbay, M. (2013). Meeting the Manufacturing Firms Involved in GVCs. In *Manufacturing Europe's Future*.

Villarreal, A., & Yu, W. H. (2007). Economic Globalization and Women's Employment: The Case of Manufacturing in Mexico. *American Sociological Review*, *72*(3), 365–389. https://doi.org/10.1177/000312240707200303

Wang, Y. (2016). What Are the Biggest Obstacles to Growth of SMEs in Developing Countries? – An Empirical Evidence from An Enterprise Survey. *Borsa Istanbul Review*, *16*(3), 167–176. https://doi.org/10.1016/j.bir.2016.06.001

Woolridge, J. M. (2002). *Econometrics Analysis of Cross Section and Panel Data*. MIT Press, Cambridge, MA.

Woolridge, J. M. (2012). Chapter 15. Instrumental Variables and Two Stage Least Squares. In *Introductory Econometrics: A Mordern Approach* (5th ed., pp. 512–553). South-Western Cengage Learning.

World Bank. (2020). *World Development Report 2020: Trading for Development in the Age of Global Value Chain*.

Zhu, Z., Collins, N., Webber, M., & Benson, J. (2008). New Forms of Ownership and Human Resource Practices in Vietnam. *Human Resource Management*, *47*(1), 157–175. https://doi.org/10.1002/hrm.20202

Figures and Tables

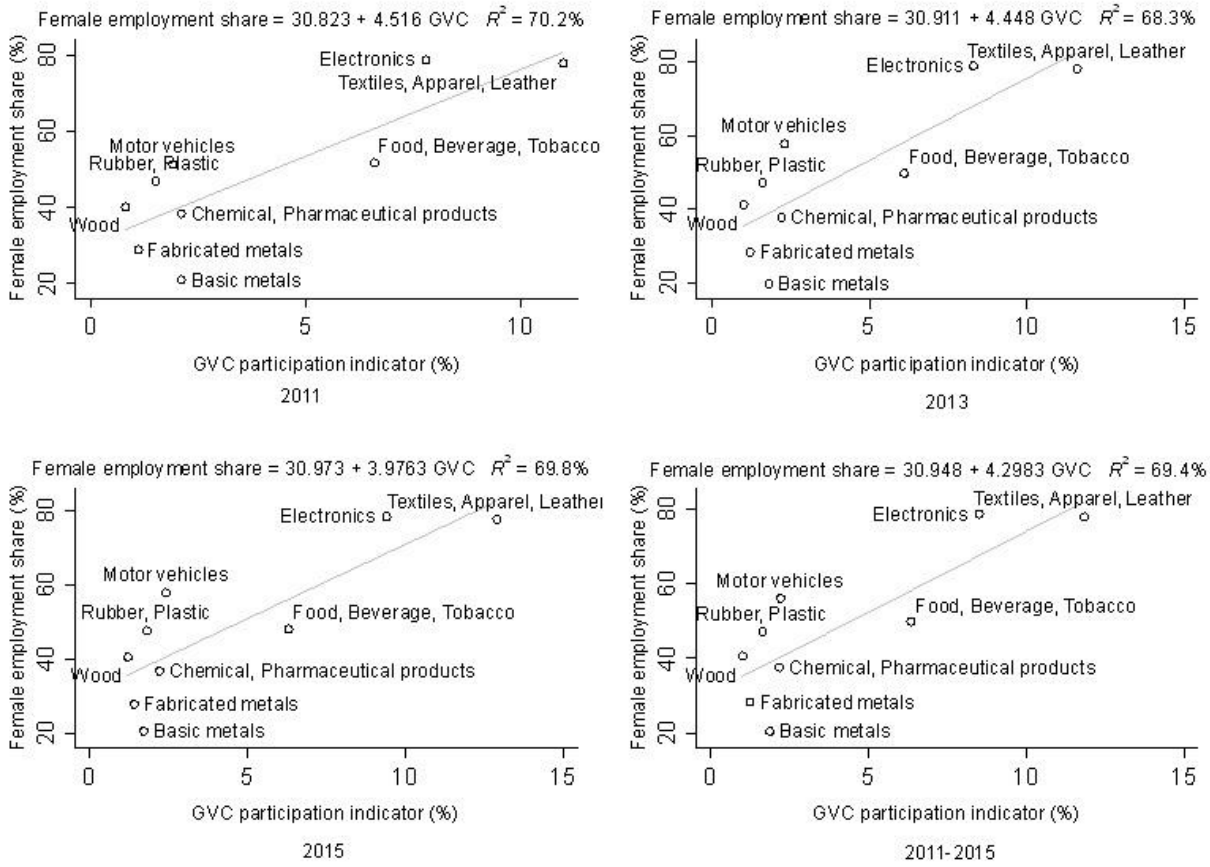

Figure 2.1. Industrial GVC participation indicator (in percentage of total exports) and the female employment share (in percentage of total employment) in 2011, 2013, 2015, and average 2011-2015.

There is a positive and stable association between the GVC participation indicator and the female employment share across industries.

Source: OECD Trade in Value Added database and the General Statistics Office of Vietnam.

Notes: The GVC participation indicator is the sum of the import content of Vietnam's exports as a share of the country's total exports (backward linkages) and the content of Vietnam's inputs in foreign partners' exports as a share of Vietnam's total exports (forward linkages). The data on the GVC participation indicator are from the OECD Trade in Value Added database, and the data on female employment share by industry are from the General Statistics Office of Vietnam.

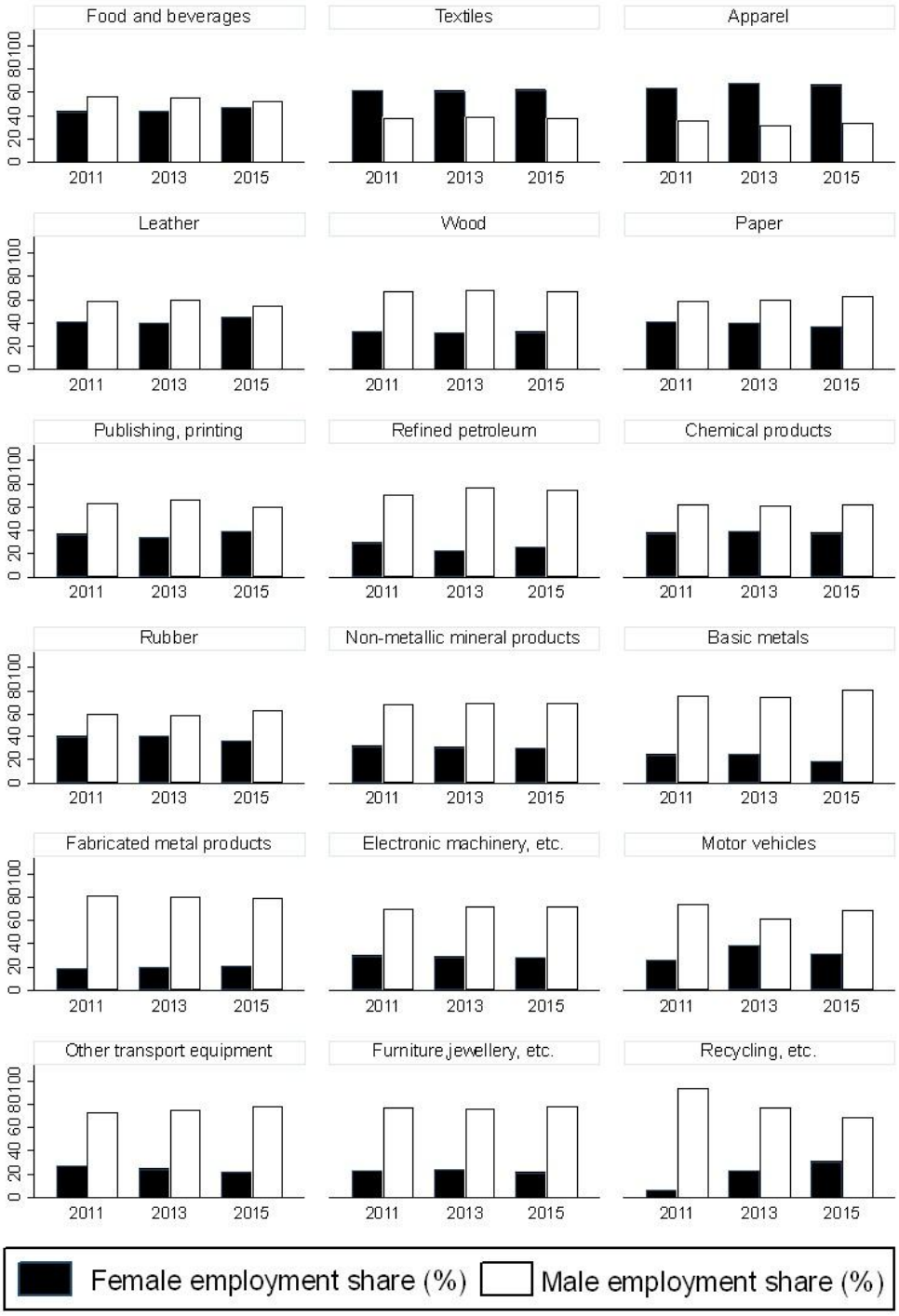

Figure 2.2. The share of employment by gender across industries.

The female employment share is higher than the male employment share in textiles and apparel.

Source: Authors' calculations based on the Small and Medium Enterprise Survey in 2011-2015.

Notes: This figure compares the share of employment between men and women across 18 manufacturing industries in the sample.

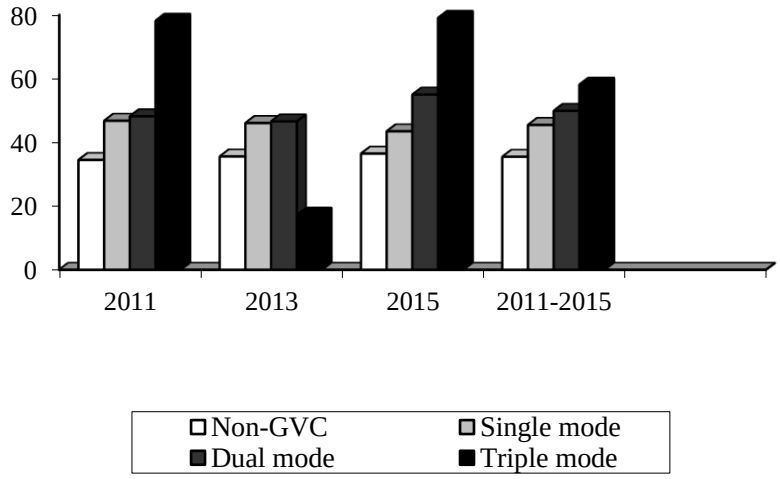

Figure 2.3. The female employment share of total workforce in 2011-2015.

GVC-involved firms have a higher female employment share than non-GVC firms.

Source: Authors' calculations based on the Small and Medium Enterprise Survey in 2011-2015.

Notes: This figure compares the female share of total workforce between GVC-involved and non-GVC firms. Sing-mode firms are firms that either export, or import, or act as an international producer (through outsourcing, offshoring, or foreign direct investment). Dual-mode firms are firms that perform any two of those three activities. Triple-mode firms are firms that simultaneously perform all three activities. Non-GVC firms are firms that neither export, nor import, nor act as an international producer.

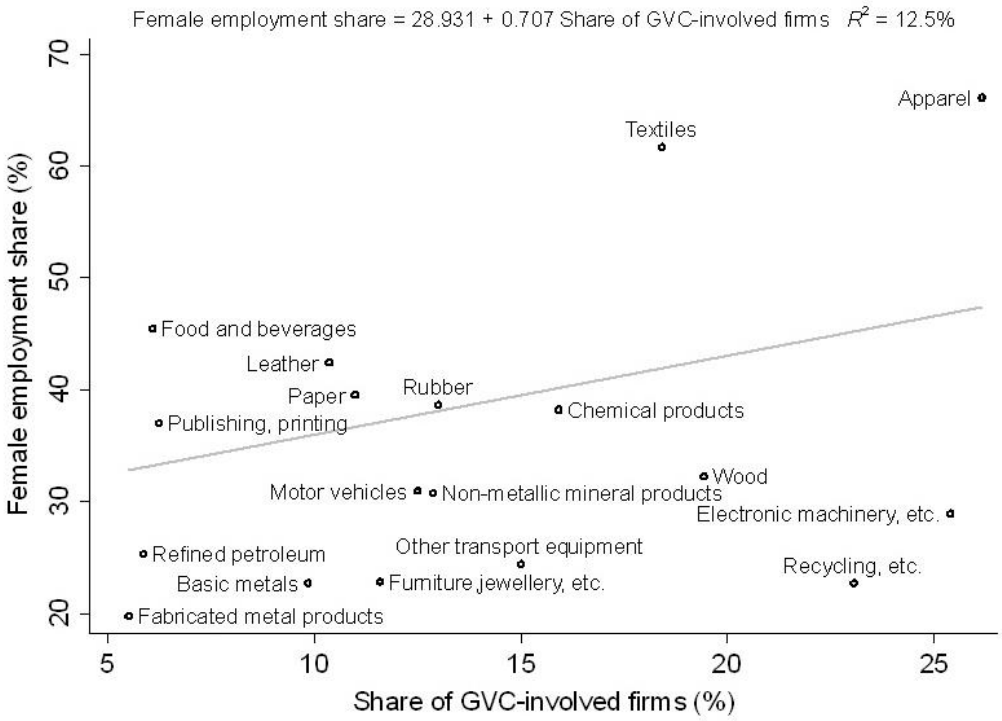

Figure 2.4. The female employment share and the share of GVC-involved firms.

Industries with a large share of firms involved in GVCs have a large female share in the total workforce.

Source: Authors' calculations based on the Small and Medium Enterprise Survey in 2011-2015.

Table 2.1. Distribution of firms by the mode of GVC involvement.

		2011		2013		2015	
Mode	**Specification**	**Firms**	**Percent**	**Firms**	**Percent**	**Firms**	**Percent**
Non-GVC	No international activities	1,451	88.69	1,463	87.87	1,961	89.22
Single	Exporter	94	5.75	95	5.71	135	6.14
	Importer	40	2.44	46	2.76	44	2.00
	International producer	11	0.67	15	0.90	16	0.73
Dual	Exporter and importer	31	1.89	36	2.16	31	1.41
	Exporter and international producer	5	0.31	7	0.42	7	0.32
	Importer and international producer	1	0.06	0	0	1	0.05
Triple	Importer, exporter, and international producer	3	0.18	3	0.18	3	0.14
Total		1,636	100	1,665	100	2,198	100

Source: Authors' calculations based on the Small and Medium Enterprise Survey in 2011-2015.

Table 2.2. Descriptive statistics.

	Mean	SD	Obs	Variable definition
Female share of total workforce	0.370	0.243	5,499	Female share of total workforce
Female share of skilled workforce	0.232	0.384	5,499	Female share of workforce with tertiary education
Female share of unskilled workforce	0.359	0.249	5,499	Female share of workforce with no tertiary education
Female share of production workforce	0.305	0.340	5,499	Female share of workforce who are production workers
Female share of non-production workforce	0.470	0.339	5,499	Female share of workforce who are not production workers
GVC	0.138	0.415	5,499	An indicator for GVC involvement equals zero for non-GVC firms, one for single-mode firms, two for dual-mode firms, three for triple-mode firms
Age	14.518	9.621	5,499	Age of firm
Capital	310.335	602.265	5,499	The ratio of the firm's fixed assets to total workforce
Sales	288,705.06	1,809,991	5,499	The ratio of the firm's sales to total workforce
Size	19	33.423	5,499	Total number of workers
Owner's manager	0.587	0.492	5,499	An indicator equals one if the gender of the firm's owner or manager is male, and zero otherwise
Ownership	1.289	1.479	5,499	An indicator for the ownership of the firm equals zero for household firms, one for private firms, two for partnership or cooperative firms, three for limited liability firms, four for joint stock firms.

Source: Authors' calculations based on the Small and Medium Enterprise Survey in 2011-2015.

Table 2.3. The impacts of GVC involvement on female employment- OLS estimates

	Female share of total workforce		**Female share of skilled workforce**		**Female share of unskilled workforce**		**Female share of production workforce**		**Female share of non-production workforce**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Single	0.045***		0.005		0.046***		0.065***		-0.007	
	(0.011)		(0.019)		(0.012)		(0.015)		(0.014)	
Dual	0.063***		-0.029		0.073***		0.106***		-0.052**	
	(0.022)		(0.035)		(0.023)		(0.028)		(0.023)	
Triple	0.115		0.025		0.112		0.217**		-0.051	
	(0.089)		(0.106)		(0.096)		(0.104)		(0.058)	
Binary GVC		0.049***		0		0.051***		0.074***		-0.015
		(0.011)		(0.018)		(0.011)		(0.014)		(0.013)
Obs	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499
R-squared	0.371	0.371	0.340	0.340	0.375	0.375	0.260	0.259	0.307	0.307

Notes: Robust standard errors clustered at the firm level are in parentheses. In column 1, column 3, column 5, column 7, and column 9, the independent variable GVC_{it} is a set of self-exclusive dummies identifying the firm's mode of involvement in global value chains, including single mode, dual mode, and triple mode. In column 2, column 4, column 6, column 8, and column 10, the independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 2.4. The impacts of GVC involvement on female employment - 2SLS estimates

	Female share of total workforce		**Female share of skilled workforce**		**Female share of unskilled workforce**		**Female share of production workforce**		**Female share of non-production workforce**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Single	0.249***		0.031		0.298***		0.479***		-0.043	
	(0.068)		(0.099)		(0.071)		(0.096)		(0.078)	
Dual	-0.284		-0.724***		-0.259		-0.169		-0.600***	
	(0.173)		(0.250)		(0.181)		(0.210)		(0.179)	
Triple	1.494		-0.035		1.599		1.959		0.508	
	(1.239)		(1.028)		(1.280)		(1.433)		(0.982)	
Binary GVC		0.103***		-0.212***		0.143***		0.286***		-0.190***
		(0.034)		(0.056)		(0.036)		(0.049)		(0.045)
Age	0.001***	0.001***	0	0	0.001***	0.001***	0.001**	0.001**	0.001**	0.001**
	(0)	(0)	(0)	(0)	(0)	(0)	(0.001)	(0.001)	(0.001)	(0.001)
Capital intensity	0.003	0	0.004	0.002	0.003	0	0.006	0.003	0.002	0
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Sales	-0.034***	-0.033***	0.012*	0.014**	-0.037***	-0.035***	-0.049***	-0.046***	-0.003	-0.002
	(0.004)	(0.004)	(0.007)	(0.006)	(0.005)	(0.004)	(0.007)	(0.006)	(0.006)	(0.006)
Size	0.017***	0.020***	0.114***	0.117***	0.015**	0.019***	0.005	0.011	0.046***	0.046***
	(0.006)	(0.006)	(0.008)	(0.008)	(0.006)	(0.006)	(0.009)	(0.009)	(0.008)	(0.008)
Owner's gender	-0.091***	-0.094***	-0.002	-0.004	-0.093***	-0.096***	0.037***	0.033***	-0.299***	-0.301***
	(0.007)	(0.006)	(0.010)	(0.010)	(0.007)	(0.007)	(0.010)	(0.010)	(0.009)	(0.009)
Private	0.017	0.013	0.231***	0.228***	-0.001	-0.005	-0.023	-0.028*	0.073***	0.071***
	(0.013)	(0.012)	(0.022)	(0.022)	(0.013)	(0.012)	(0.017)	(0.016)	(0.017)	(0.016)
Partnership	0.022	0.040*	0.270***	0.304***	0.003	0.021	-0.027	-0.006	0.078***	0.100***
	(0.025)	(0.022)	(0.043)	(0.042)	(0.027)	(0.023)	(0.036)	(0.031)	(0.028)	(0.027)
Limited liability	-0.001	0	0.287***	0.292***	-0.025**	-0.024**	-0.056***	-0.054***	0.090***	0.092***
	(0.011)	(0.010)	(0.018)	(0.018)	(0.011)	(0.010)	(0.015)	(0.014)	(0.013)	(0.013)
Joint stock	-0.022	-0.008	0.226***	0.249***	-0.042**	-0.027*	-0.08***	-0.063***	0.039*	0.056***
	(0.017)	(0.015)	(0.029)	(0.028)	(0.018)	(0.016)	(0.023)	(0.021)	(0.021)	(0.020)
LM statistic	4.466**	183.448***	4.466**	183.448**	4.466**	183.448***	4.466**	183.448***	4.466**	183.448***
Wald F statistic	38.290	626.705	38.290	626.705	38.290	626.705	38.290	626.705	38.290	626.705
Endogeneity	26.251***	2.913*	22.070***	16.307***	32.558***	7.734***	38.003***	22.512***	30.833***	18.617***
Obs	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499
R-squared	0.218	0.367	0.275	0.317	0.200	0.365	0.095	0.230	0.252	0.287

Notes: Robust standard errors clustered at the firm level are in parentheses. In column 1, column 3, column 5, column 7, and column 9, the independent variable GVC_{it} is a set of self-exclusive dummies identifying the firm's mode of involvement in global value chains, including single mode, dual mode, and triple mode. In column 2, column 4, column 6, column 8, and column 10, the independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. The instrument variable is the industry-province ratio of GVC-involved firms to total number of firms in the province. The LM statistic indicates the result of the test for under-identification, of which the null hypothesis is that the structural equation is underidentified. The Wald F statistic indicates the result of the test for weak instruments, of which the null hypothesis is that the correlation between the instrument and the regressor is weak. The null hypothesis of the Hausman test for endogeneity assumes that the regressor is exogenous. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 2.5. Mechanism of the impacts of GVCs on female employment.

	Female share of total workforce	**Female share of skilled workforce**	**Female share of unskilled workforce**	**Female share of production workforce**	**Female share of non-production workforce**
Binary GVC	0.308***	0.221**	0.331***	0.390***	0.101
	(0.072)	(0.109)	(0.074)	(0.088)	(0.082)
Technology	0.016*	0.099***	0.008	-0.011	0.017
	(0.008)	(0.013)	(0.008)	(0.011)	(0.011)
Binary GVC*Technology	-0.102***	-0.224***	-0.093***	-0.059*	-0.125***
	(0.029)	(0.044)	(0.029)	(0.033)	(0.036)
Control variables	Yes	Yes	Yes	Yes	Yes
LM statistic	116.587***	116.587***	116.587***	116.587***	116.587***
Wald F statistic	238.963	238.963	238.963	238.963	238.963
Endogeneity	17.236***	51.770***	18.197***	22.287***	29.229***
Obs	5,499	5,499	5,499	5,499	5,499
R-squared	0.347	0.324	0.343	0.223	0.300

Notes: Robust standard errors clustered at the firm level are in parentheses. The independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: technology (the log of the number of personal computers); an interaction between the GVC_{it} dummy variable and technology; age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. The instrument variable is the industry-province ratio of GVC-involved firms to total number of firms in the province. The LM statistic indicates the result of the test for under-identification, of which the null hypothesis is that the structural equation is underidentified. The Wald F statistic indicates the result of the test for weak instruments, of which the null hypothesis is that the correlation between the instrument and the regressor is weak. The null hypothesis of the Hausman test for endogeneity assumes that the regressor is exogenous. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 2.6. Trade unions and female employment of GVC-involved firms.

	Female share of total workforce	**Female share of skilled workforce**	**Female share of unskilled workforce**	**Female share of production workforce**	**Female share of non-production workforce**
Binary GVC	0.198***	-0.085	0.238***	0.360***	-0.058
	(0.058)	(0.097)	(0.061)	(0.082)	(0.068)
Trade union	0.063***	0.070**	0.062***	0.085***	-0.001
	(0.019)	(0.033)	(0.020)	(0.024)	(0.022)
Binary GVC*Trade union	-0.185***	-0.210**	-0.186***	-0.213***	-0.137**
	(0.055)	(0.097)	(0.058)	(0.072)	(0.063)
Control variables	Yes	Yes	Yes	Yes	Yes
LM statistic	80.846***	80.846***	80.846***	80.846***	80.846***
Wald F statistic	169.798	169.798	169.798	169.798	169.798
Endogeneity	11.868***	21.514***	12.614***	16.960***	15.868***
Obs	5,301	5,301	5,301	5,301	5,301
R-squared	0.356	0.317	0.351	0.230	0.303

Notes: Robust standard errors clustered at the firm level are in parentheses. The independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: an indicator of trade union; an interaction between the GVC_{it} dummy variable and trade union; age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. The instrument variable is the industry-province ratio of GVC-involved firms to total number of firms in the province. The LM statistic indicates the result of the test for under-identification, of which the null hypothesis is that the structural equation is underidentified. The Wald F statistic indicates the result of the test for weak instruments, of which the null hypothesis is that the correlation between the instrument and the regressor is weak. The null hypothesis of the Hausman test for endogeneity assumes that the regressor is exogenous. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Appendix

Table 2A.1. GVC participation indicators of manufacturing industries in Vietnam, 2015.

Sector	Backward linkages (%)	Forward linkages (%)	GVC participation (%)
Textile, Apparel, Leather	11.7	1.2	12.9
Rubber, Plastic	1.5	0.3	1.8
Basic metals	1.3	0.4	1.7
Chemical, Pharmaceutical products	1.5	0.7	2.2
Motor vehicles	1.4	1	2.4
Electronics	7.2	2.2	9.4
Food, Beverage, Tobacco	5.6	0.7	6.3
Paper, Printing	0.2	0.1	0.3
Fabricated metals	1.2	0.2	1.4

Source: OECD Trade in Value Added database.

Notes: The backward linkages measure the import content of Vietnam's exports as a share of the country's total exports. The forward linkages measure the use of Vietnam's inputs in its foreign partners' exports as a share of Vietnam's total exports. The GVC participation is the sum of these two linkages.

Table 2A.2. Distribution of firms by industry.

	2011		2013		2015	
Sector	**Firms**	**Percent**	**Firms**	**Percent**	**Firms**	**Percent**
Food and beverages	424	25.92	407	24.44	643	29.25
Textiles	65	3.97	78	4.68	74	3.37
Apparel	102	6.23	97	5.83	122	5.55
Leather	40	2.44	43	2.58	52	2.37
Wood	102	6.23	129	7.75	242	11.01
Paper	64	3.91	71	4.26	56	2.55
Publishing, printing	52	3.18	56	3.36	84	3.82
Refined petroleum	3	0.18	6	0.36	8	0.36
Chemical products	37	2.26	49	2.94	52	2.37
Rubber	112	6.85	135	8.11	153	6.96
Non-metallic mineral products	92	5.62	82	4.92	90	4.09
Basic metals	29	1.77	19	1.14	23	1.05
Fabricated metal products	306	18.7	293	17.60	378	17.20
Electronic machinery, etc.	67	4.1	61	3.66	57	2.59
Motor vehicles	17	1.04	11	0.66	12	0.55
Other transport equipments	6	0.37	7	0.42	7	0.32
Furniture, jewellery, etc.	115	7.03	117	7.03	139	6.32
Recycling, etc.	3	0.18	4	0.24	6	0.27
Total	1,636	100	1,665	100	2,198	100

Source: Authors' calculations based on the Small and Medium Enterprise Survey in 2011-2015.

Table 2A.3. Distribution of firms by legal status.

	2011		2013		2015	
Legal status	**Firms**	**Percent**	**Firms**	**Percent**	**Firms**	**Percent**
Household firm	788	48.17	784	47.09	1,258	57.23
Private firm	190	11.61	188	11.29	160	7.28
Partnership/Cooperative firm	66	4.03	53	3.18	53	2.41
Limited liability firm	497	30.38	529	31.77	605	27.53
Joint-stock firm	95	5.81	111	6.67	122	5.55
Total	1,636	100	1,665	100	2,198	100

Source: Authors' calculations based on the Small and Medium Enterprise Survey in 2011-2015.

Table 2A.4. The difference in employment share by gender across industries.

Sector	Firms	Female	Male	Difference	t-value
Food and beverages	1,474	0.454	0.546	-0.091	-12.301***
Textiles	217	0.617	0.383	0.233	9.820***
Apparel	321	0.661	0.339	0.322	16.663***
Leather	135	0.424	0.576	-0.152	-5.129***
Wood	473	0.322	0.678	-0.355	-22.483***
Paper	191	0.395	0.605	-0.210	-10.846***
Publishing, printing	192	0.370	0.630	-0.260	-12.940***
Refined petroleum	17	0.253	0.747	-0.494	-11.182***
Chemical products	138	0.382	0.618	-0.236	-10.294***
Rubber	400	0.386	0.614	-0.227	-16.076***
Non-metallic mineral products	264	0.308	0.693	-0.385	-21.220***
Basic metals	71	0.227	0.773	-0.546	-20.992***
Fabricated metal products	977	0.198	0.802	-0.605	-74.989***
Electronic machinery, etc.	185	0.289	0.711	-0.422	-20.778***
Motor vehicles	40	0.309	0.691	-0.381	-8.029***
Other transport equipments	20	0.244	0.756	-0.512	-10.881***
Furniture, jewellery, etc.	371	0.228	0.772	-0.544	-36.716***
Recycling, etc.	13	0.227	0.773	-0.546	-6.565***

Notes: The table reports the t-test result. The null hypothesis of the t-test assumes that there is no difference in the means of female employment and male employment. *, **, and *** denote significance at 10%, 5% and 1% level, respectively.

Table 2A.5. Results of the first-stage regression *(Dependent variable: GVC_{it}).*

	(1)	(2)
GVC_{spt}	22.273***	26.731***
	(3.495)	(3.890)
Control variables	Yes	Yes
Obs	5,499	5,499
R-squared	0.304	0.348

Notes: Robust standard errors clustered at the firm level are in parentheses. In column 1, the dependent variable GVC_{it} is a set of self-exclusive dummies identifying the firm's mode of involvement in global value chains, including single-mode, dual-mode, and triple-mode. In column 2, the dependent variable GVC_{it} is a binary dummy variable. The independent variable of interest is the industry-province ratio of GVC-involved firms to total number of firms in the province (GVC_{spt}). Other firm-level control variables include: age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 2A.6. Robustness checks- Industrial female employment is added.

	Female share of total workforce		**Female share of skilled workforce**		**Female share of unskilled workforce**		**Female share of production workforce**		**Female share of non-production workforce**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Single	0.246***		0.030		0.293***		0.476***		-0.047	
	(0.068)		(0.098)		(0.071)		(0.096)		(0.077)	
Dual	-0.285		-0.720***		-0.260		-0.176		-0.593***	
	(0.175)		(0.250)		(0.183)		(0.213)		(0.178)	
Triple	1.547		-0.021		1.653		2.047		0.488	
	(1.286)		(1.060)		(1.326)		(1.502)		(0.983)	
Binary GVC		0.103***		-0.209***		0.143***		0.286***		-0.190***
		(0.034)		(0.056)		(0.036)		(0.049)		(0.045)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LM statistic	3.719*	183.944***	3.719*	183.944***	3.719*	183.944***	3.719*	183.944***	3.719*	183.944***
Wald F statistic	37.268	630.007	37.268	630.007	37.268	630.007	37.268	630.007	37.268	630.007
Endogeneity	26.311***	2.989*	21.825***	15.867***	32.367***	7.855***	38.161***	22.748***	30.647***	18.603***
Obs	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499
R-squared	0.217	0.368	0.277	0.318	0.199	0.365	0.092	0.230	0.255	0.287

Notes: Robust standard errors clustered at the firm level are in parentheses. The independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: the share of female employment at the industry level, age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. The instrument variable is the industry-province ratio of GVC-involved firms to total number of firms in the province. The LM statistic indicates the result of the test for under-identification, of which the null hypothesis is that the structural equation is underidentified. The Wald F statistic indicates the result of the test for weak instruments, of which the null hypothesis is that the correlation between the instrument and the regressor is weak. The null hypothesis of the Hausman test for endogeneity assumes that the regressor is exogenous. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 2A.7. Robustness checks- An indicator of innovation is added.

	Female share of total workforce		**Female share of skilled workforce**		**Female share of unskilled workforce**		**Female share of production workforce**		**Female share of non-production workforce**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Single	0.260***		0.035		0.308***		0.487***		-0.036	
	(0.067)		(0.098)		(0.070)		(0.094)		(0.078)	
Dual	-0.291*		-0.743***		-0.264		-0.166		-0.620***	
	(0.174)		(0.254)		(0.180)		(0.208)		(0.182)	
Triple	1.371		0.087		1.442		1.776		0.495	
	(1.127)		(1.016)		(1.144)		(1.282)		(0.932)	
Binary GVC		0.106***		-0.211***		0.146***		0.290***		-0.191***
		(0.034)		(0.056)		(0.036)		(0.049)		(0.045)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LM statistic	5.888***	185.412***	5.888***	185.412***	5.888***	185.412***	5.888***	185.412***	5.888***	185.412***
Wald F statistic	40.015	628.482	40.015	628.482	40.015	628.482	40.015	628.482	40.015	628.482
Endogeneity	27.627***	3.283*	22.477***	16.294***	33.796***	8.184***	39.412***	23.332***	31.126***	18.694***
Obs	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499
R-squared	0.219	0.367	0.271	0.317	0.204	0.364	0.100	0.229	0.249	0.286

Notes: Robust standard errors clustered at the firm level are in parentheses. The independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: an indicator of firm innovation indicating whether the firm implement one of the three forms of innovation: (i) improve existing products, (ii) upgrade technologies (iii) plan to start new projects; age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. The instrument variable is the industry-province ratio of GVC-involved firms to total number of firms in the province. The LM statistic indicates the result of the test for under-identification, of which the null hypothesis is that the structural equation is underidentified. The Wald F statistic indicates the result of the test for weak instruments, of which the null hypothesis is that the correlation between the instrument and the regressor is weak. The null hypothesis of the Hausman test for endogeneity assumes that the regressor is exogenous. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 2A.8. Robustness checks- Textiles and apparel are excluded.

	Female share of total workforce		**Female share of skilled workforce**		**Female share of unskilled workforce**		**Female share of production workforce**		**Female share of non-production workforce**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Single	0.455***		0.110		0.504***		0.674***		0.092	
	(0.124)		(0.140)		(0.127)		(0.152)		(0.121)	
Dual	-0.061		-0.974*		-0.038		0.153		-0.396	
	(0.378)		(0.515)		(0.380)		(0.410)		(0.369)	
Triple	-5.037		-1.660		-4.907		-4.963		-4.798	
	(3.699)		(4.848)		(3.711)		(4.06)		(3.705)	
Binary GVC		0.160***		-0.240***		0.201***		0.354***		-0.147***
		(0.037)		(0.062)		(0.039)		(0.053)		(0.048)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LM statistic	2.847*	140.036***	2.847*	140.036***	2.847*	140.036***	2.847*	140.036***	2.847*	140.036***
Wald F statistic	1.989	576.236	1.989	576.236	1.989	576.236	1.989	576.236	1.989	576.236
Endogeneity	43.510***	9.848***	22.066***	17.162***	52.470***	16.579***	51.275***	31.709***	20.482***	8.370***
Obs	4,961	4,961	4,961	4,961	4,961	4,961	4,961	4,961	4,961	4,961
R-squared		0.269	0.200	0.301		0.261		0.122	0.009	0.294

Notes: Robust standard errors clustered at the firm level are in parentheses. The independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. The instrument variable is the industry-province ratio of GVC-involved firms to total number of firms in the province. The LM statistic indicates the result of the test for under-identification, of which the null hypothesis is that the structural equation is underidentified. The Wald F statistic indicates the result of the test for weak instruments, of which the null hypothesis is that the correlation between the instruments and the regressor is weak. The null hypothesis of the Hausman test for endogeneity assumes that the regressor is exogenous. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively. R^2 of the 2SLS regression in column (1), column (5), and column (7) are negative and not reported: Woolridge (2012) notes that R^2 from IV estimation can be negative, and it "has no natural interpretation"

Table 2A.9. The impacts of GVC involvement on unskilled employment.

	The share of unskilled labour in total workforce	
	(1)	(2)
Single	-0.020	
	(0.019)	
Dual	0.131***	
	(0.050)	
Triple	-0.098	
	(0.288)	
Binary GVC		0.026**
		(0.011)
Control variables	Yes	Yes
LM statistic	4.466**	183.448***
Wald F statistic	38.290	626.705
Endogeneity	12.088***	8.529***
Obs	5,499	5,499
R-squared	0.229	0.286

Notes: Robust standard errors clustered at the firm level are in parentheses. In column 1, the independent variable GVC_{it} is a set of self-exclusive dummies identifying the firm's mode of involvement in global value chains, including single mode, dual mode, and triple mode. In column 2, the independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, and industry-specific time trends are included. The instrument variable is the industry-province ratio of GVC-involved firms to total number of firms in the province. The LM statistic indicates the result of the test for under-identification, of which the null hypothesis is that the structural equation is underidentified. The Wald F statistic indicates the result of the test for weak instruments, of which the null hypothesis is that the correlation between the instruments and the regressor is weak. The null hypothesis of the Hausman test for endogeneity assumes that the regressor is exogenous. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively. R^2 of the 2SLS regression in column (1), column (5), and column (7) are negative and not reported: Woolridge (2012) notes that R^2 from IV estimation can be negative, and it "has no natural interpretation".

Table 2A.10. Robustness checks- Province-year fixed effects are included

	Female share of total workforce		**Female share of skilled workforce**		**Female share of unskilled workforce**		**Female share of production workforce**		**Female share of non-production workforce**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Single	0.248***		0.039		0.294***		0.481***		-0.061	
	(0.070)		(0.102)		(0.074)		(0.010)		(0.079)	
Dual	-0.292		-0.676***		-0.270		-0.189		-0.560***	
	(0.187)		(0.254)		(0.196)		(0.230)		(0.177)	
Triple	1.451		-0.308		1.574		2.004		0.244	
	(1.207)		(0.831)		(1.261)		(1.472)		(0.800)	
Binary GVC		0.106***		-0.198***		0.139***		0.289***		-0.196***
		(0.034)		(0.056)		(0.036)		(0.049)		(0.045)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LM statistic	4.438**	179.132***	4.438**	179.132***	4.438**	179.132***	4.438**	179.132***	4.438**	179.132***
Wald F statistic	33.617	617.234	33.617	617.234	33.617	617.234	33.617	617.234	33.617	617.234
Endogeneity	22.957***	2.761*	19.643***	14.140***	28.668***	7.161***	36.571***	22.862***	29.173***	19.547***
Obs	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499	5,499
R-squared	0.224	0.370	0.287	0.325	0.204	0.368	0.097	0.236	0.268	0.290

Notes: Robust standard errors clustered at the firm level are in parentheses. In column 1, column 3, column 5, column 7, and column 9, the independent variable GVC_{it} is a set of self-exclusive dummies identifying the firm's mode of involvement in global value chains, including single mode, dual mode, and triple mode. In column 2, column 4, column 6, column 8, and column 10, the independent variable GVC_{it} is a binary dummy variable. Other firm-level control variables include: age; capital intensity (the log of total fixed assets divided by total workforce); per capita sales (the log of total sales divided by total workforce); size (the log of total workforce); a dummy on the gender of the owner; an indicator identifying the legal status of the firm (household, private, partnership, limited liability, joint stock). A constant term, province fixed effects, industry fixed effects, year fixed effects, province-year fixed effects, and industry-specific time trends are included. The instrument variable is the industry-province ratio of GVC-involved firms to total number of firms in the province. The LM statistic indicates the result of the test for under-identification, of which the null hypothesis is that the structural equation is underidentified. The Wald F statistic indicates the result of the test for weak instruments, of which the null hypothesis is that the correlation between the instrument and the regressor is weak. The null hypothesis of the Hausman test for endogeneity assumes that the regressor is exogenous. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Chapter 3. Trade exposure and labour market: The evidence from Vietnam's household data

Abstract: We employ microdata from the Vietnam Household Living Standard Survey in 2004-2016 to examine the impacts of tariff reductions after the WTO accession on the labour market across 61 provinces in Vietnam. There is evidence that workers were less likely to be employed in the traded sectors in provinces more exposed to trade shocks, as measured by the probability of an individual being employed. These displaced workers were more likely to change employment from the traded sector to the non-traded sector. The probability of being unemployed declined for both genders in more exposed provinces. We also find that female workers were more likely to drop out of the labour force. While the wages of male workers increased, the wages of female workers did not register any significant adjustment under the impact of trade shocks.

3.1. Introduction

How vulnerable are workers to the distributive impacts of international trade? Vietnam's WTO accession in 2007 may provide some lessons. To be approved as a WTO member, Vietnam agreed to implement a comprehensive reduction in import tariffs across the traded industries, at an average rate of 23 percent[15]. Tariff reductions became effective in 2008, gradually declining until the committed tariff level has been reached. Generally, import tariff reductions both increase the imported substitutes from overseas and lower the cost of intermediate inputs for domestic production. Thus, the distributive impacts of import tariff reductions on the labour market are ambiguous and context-dependent (Erten et al., 2019). For instance, tariff reductions were found to reduce to employment in Brazil (Moreira & Najberg, 2000), increase informality in Argentina (Acosta & Montes-Rojas, 2014), while their positive effects on work participation and wages were pointed out in Indonesia (Kis-Katos & Sparrow, 2015). Like many developing countries before Vietnam, entry to the WTO is a major step to enter the international market, and there is a need to understand better the impacts of the WTO accession on the country's labour market. This is the focus of our study.

Using individual-level data from the Vietnam Household Living Standard Survey (VHLSS), we assess the pressure from imported substitutes on Vietnam's labour market indicators after the WTO accession. We find that workers in provinces more exposed to tariff reductions

[15]https://trungtamwto.vn/file/16050/Cam%20ket%20chung%20ve%20Thue%20quan.pdf

were subsequently less likely to be employed in the traded sector. Additional findings point to the probability of being unemployed for workers in more exposed provinces having declined after the WTO accession, and a transition of displaced workers from the traded to the non-traded sector. For female workers, the probability of being labour force inactive increased significantly. In terms of wages, we find an increase of 9.8 percentage points for the male workers in provinces that experienced an average tariff reduction of 6.9 percentage points after the WTO accession, whereas there was no significant change in wages for female workers. The findings suggest a negative impact of trade liberalization on women in the formal sector (women who worked for registered enterprises) in terms of both employment and wages. Trade shocks only improved employment and wages for high-skilled, older-age cohort, and urban male workers.

Vietnam presents a relevant context for us to examine the labour market impact of trade liberalization. After the launch of 'Doi moi' ('Renovation') in 1986, the country implemented intensive measures to foster trade liberalization (e.g. reducing tariffs, abolishing State monopoly in foreign trade, joining the Association of South East Asian Nation (ASEAN)). The share of trade in gross domestic product increased 7 times from 23% in 1986 to 155% in 2007 according to the World Bank's data. The figure in 2007 was much higher for Vietnam than that for low- and middle-income countries (at 59%) and high-income countries (at 61%). Export-oriented strategy as well as an increasing amount of inward foreign direct investment have turned the country into one of the world manufacturing factories. The entry to the WTO marks an important turn for a developing country like Vietnam to get better access to the world economy.

This chapter contributes to the strand of literature on the impacts of trade exposure across sub-national units. By and large, the previous studies have provided insights yet a mixed picture in several developing economies. Topalova (2005) uses industrial employment share as the local weight in calculating trade exposure at the district level. The study finds poverty and poverty gap worsening in rural areas more exposed to trade liberalisation in India. Kovak (2013) points out a wage reduction in the regions more exposed to trade reform in Brazil. Erten et al. (2019) find in South Africa a significant drop in employment of both the informal and the formal sectors in districts harder hit by trade liberalisation; some workers stopped searching for a job or exited the labour force. Dix-carneiro & Kovak (2019) find negative effects of trade liberalisation on employment and earnings of the formal sector in Brazil; with the displaced workers in the traded industries moving to the non-traded industries, and the displaced workers in the formal sector finding jobs in the informal sector. McCaig (2011) studies Vietnam from 2002 to 2004, noting that low-skilled workers in provinces that were more exposed to export tariff reductions after the Vietnam-US bilateral trade agreement (BTA) gained a higher wage growth, and the level of

poverty declined significantly in these provinces. Furthermore, McCaig & Pavcnik (2018) suggest a transition of Vietnamese workers from households to registered enterprises under the impact of the BTA.

We also investigate the gender dimension of trade-induced inequality, motivated by the works on gender discrimination. Tariff reduction would help producers cut costs of imported input, enabling them to upgrade the production technology. Technology upgrading, in turn, helps lower the demand for physical requirements of labour-intensive tasks, thereby lessening gender discrimination (Juhn et al., 2014). Competitive and governance pressure due to globalization could also discourage producers from gender discrimination, as studied in Chen et al. (2013). Based on the strong complementarity between capital and female labour, Sauré & Zoabi (2014) argue that international trade could initially induce the expansion of female labour-intensive sectors. Theoretically, given the costless movement of labour across sectors, male workers, in response, move to these expanding sectors, which lowers the marginal productivity of female labour more than that of male labour. Female labour force participation then drops consequently. In contrast, given the imperfect substitutability between men and women, Do et al. (2016) suggest better labour market outcomes for women under the impacts of trade liberalisation if a country has the comparative advantage in female-intensive sectors. The premise of the above-mentioned studies is primarily done at the sector level. We take a step further by utilizing the sectoral variation of trade exposure at the sub-national level to describe the trade impacts across gender. While Gaddis & Pieters (2017) and (Kis-Katos et al., 2018) provide evidence from Brazil and Indonesia, respectively, on the association between local tariff reductions and the gender gap in employment, our sample of microdata at the individual level from the VHLSS allows for controlling the individual characteristics underlying the job-market decisions. Moreover, we assess the trade impacts across the labour-market indicators, including employment, unemployment, labour force inactivity, and wages.

Section 3.2 of this chapter describes data and trends in Vietnam's labour market. The tariff reductions after the WTO accession are discussed in Section 3.3. Methodology is given in Section 3.4. Section 3.5 shows empirical findings. Conclusion is given in Section 3.6.

3.2. Data and trends in Vietnam's labour market

3.2.1. Data

This chapter uses the pooled individual-level data from the Vietnam Household Living Standard Survey. The survey is conducted by the General Statistics Office (GSO) in Vietnam. We employ the survey data in 2004-2016 to investigate the causal effects of tariff reductions since the

WTO accession on labour market outcomes. The household sample sizes are 9,189 households in VHLSS 2004-VHLSS 2008 and 9,399 households in VHLSS 2010-VHLSS 2016. These samples are representative at the national level.

We restrict the sample to individuals who age 15 to 55, since according to the Labour Code in Vietnam, the youngest working age is 15 and the retirement age is 55 for women and 60 for men. Our analysis focuses on the most time-consuming job, and we define it as the main job. We examine the impacts of tariff reductions on the labour market outcomes in terms of employment; unemployment; labour force inactivity; wages (i.e., the average hourly wage of a worker). Our definition of indicators of the labour market outcomes is not perfectly consistent with that of the International Labour Organization (ILO) as the information we collect from the household survey is not sufficient to satisfy all the characteristics of the indicators defined by the ILO[16]. With available information from the household survey, we define unemployment as the status of a person in the working age being unable to find a job; labour force inactivity as the status of a person in the working age either being at school, or doing housework, or being sick, or being too old, or being disabled. It is noted that the data on unemployment and labour force inactivity are only available in 2004, 2006, 2008, 2014, and 2016, as there is no question concerning the reasons for not working in 2010 and 2012. We do not account for self-employment, as the information about self-employment is only available in VHLSS before 2010[17].

Table 3.1 provides descriptive statistics of the sample in terms of the labour market outcomes, and individual demographic characteristics. Our sample includes 160,884 individuals of whom 50.3% are female, 27.6% live in the urban area, 18.2% belong to ethnic minority groups. The average level of education is grade 8. Of the individuals in the sample, 82.3% are employed. Of the sample with information on unemployment and labour force inactivity (the sample that covers all years except 2010 and 2012), 0.6% are unemployed, 17.1% are labour force inactive. Average hourly wages are calculated as the sum of wages/salaries and all other benefits (e.g.,

[16] The ILO defines unemployment as the status of "all those of working age who were not in employment, carried out activities to seek employment during a specified recent period and were currently available to take up employment given a job opportunity"; labour force inactivity as the status of persons of working age "who, during the specified reference period, were not in the labour force (that is, were not employed or unemployed") (see *https://www.ilo.org/ilostat-files/Documents/Statistical%20Glossary.pdf* for more details).

[17] Some studies examine self-employment ((Erten et al., 2019; McCaig & Pavcnik, 2015), as it is an important indicator of the labour market outcomes. Self-employed workers tend to have unstable employment and their rights are not protected by laws and labour regulations. McCaig & Pavcnik (2015) also use the VHLSS survey's data, but they only use the data before 2010, and the data on self-employment is available for that period.

holiday, maternity, accident compensation, allowance, etc.) divided by the total working hours for the main job. Average hourly wages are converted to 2006 real prices using consumer price index collected from the GSO. Average hourly wages in the non-traded sector (the sector that is not imposed with tariffs) are higher than those in the traded sector (at 9,042 VNDs and 6,965 VNDs, respectively).

[Table 3.1 is here]

For the calculation of weight for the measurement of provincial tariff that is discussed in Section 3.4, we use the Population and Housing Census 1999 obtained from IPUMS-International. As there have been several changes in subnational administrative boundaries in 1999-2016[18], we recode provinces in VHLSS to be consistent with the Population and Housing Census 1999. Thus, our sample covers 61 provinces in Vietnam.

We collect the data on import tariffs from the WTO database. Because the tariff data are available at the 6-digit HS level, whereas industries are classified at the 2-digit ISIC level (Revision 3) in VHLSS, we use the correspondence tables provided by the World Integrated Trade Solution (WITS) to convert the data at the 6-digit HS level to the 2-digit ISIC level. We then merge the data on tariff rates with the data collected from the VHLSS survey rounds.

3.2.2. Trends in Vietnam's labour market

Figure 3.1 illustrates the trends of total employment and employment by gender in Vietnam in 2004-2016. The share of total employment and employment for both men and women increased slightly after the WTO entry in 2007. Total employment as a share of the working population increased from 81.4% to 83% in 2004-2016. The contribution of both female employment and of male employment in total employment increased over the period (from 40.4% to 40.9% and from 41.3% to 42.4% in 2004-2016 for women and men, respectively).

[Figure 3.1 is here]

A decomposition of employment by sector in 2004-2016 is presented in Table 3.2. On average, 45.6% of the employees were employed in agriculture, 37.7% in services (including, electricity, construction, and other services), 16.1% in manufacturing, and 0.6% in mining. While the share of female employees outweighed that of male employees in both manufacturing and agriculture, the reverse pattern is observed in services where the share of male employees was much higher than that of female employees.

[18] Three provinces, Dien Bien, Dak Nong, and Hau Giang were created from Lai Chau, Dak Lak, and Can Tho, respectively in 2003. Ha Tay was merged into Ha Noi in 2008.

[Table 3.2 is here]

Figure 3.2 illustrates the changes in hourly wages in 2004-2016. Average hourly wages are calculated as the sum of wages/salaries and all other benefits (e.g., holiday, maternity, accident compensation, allowance, etc.) divided by the total working hours for the main job. In the whole economy, average hourly wages tripled over the period, from 2,100 VNDs in 2004 to 6,400 VNDs in 2016. Although there was an increase in wages for both male and female workers over the period, women's wages remained lower than men's wages. We observe no convergence in the two genders' wages over the period.

[Figure 3.2 is here]

3.3. The WTO accession and the exogeneity of tariff reductions in Vietnam

Vietnam became a member of the WTO in 2007. As commitments with other WTO members, the country reduced most of its import tariffs from 2008. Import tariffs were then reduced annually until reaching the committed level.

Our identification strategy is based on the exogeneity of tariff reductions after Vietnam's accession to the WTO. If tariff reductions are endogenous, it is irrational to identify the causal relationship between the WTO accession and the labour market outcomes. There is evidence supporting the exogeneity of tariff reforms. First, Vietnam applied for joining WTO since 1995. It took the country several years to negotiate its import tariffs with other WTO members. According to Baccini et al. (2019), the country had a weak bargaining power in the negotiation. Import tariffs therefore were reduced solely with an aim to meet the WTO's requirement for accession. Figure 3A.1 in the Appendix shows that before the WTO accession, tariff rates were stable, then dropped from 2008 in all sectors.

Second, we find a positive correlation between import tariffs in the year before the WTO accession and import tariff reductions after the WTO accession. As can be seen in Figure 3.3, industries that had high tariff rates in 2007 were industries that experienced great decreases in tariffs in the period 2007-2016[19]. The country's two main industries, namely textiles and apparel had the highest tariff rates in 2007 (32.6% and 47.6% respectively), and the reductions in tariff rates of these industries were also the highest in 2007-2016 (22.6% and 28% respectively). Presumably the size of the existing tariffs was proportional to certain interests of the industry, in which case tariff reductions

[19] Tobacco was the only exception and was not presented in Figure 3.3. Before the WTO accession, imports of cigar, cheroots, cigarillos and cigarettes (HS code 2402) were prohibited in Vietnam. After 2007, imports of these products were allowed and a high import tariff was imposed in replacement for import prohibition. MFN tariff of tobacco industry increased from 65% to 77% in 2006-2016.

would be endogenous. But this scenario is very unlikely to happen given the fact that Vietnam negotiated tariff reductions with all the WTO member countries. It is also probable that even when specific industries played no role in tariff negotiation, tariff reductions could be correlated with the pre-WTO efficiencies of industries. To check this correlation, we regress tariff reductions in the period 2007-2016 on each of the following industrial indicators: the change in industrial share of low-skilled workers[20], the change in industrial share of state-owned companies' (SOEs) workers, the change in industrial share of informal workers[21], the change in industrial average wages. These indicators are calculated from VHLSS 2004-2006. As reported in Table 3A.1, the estimates in all specifications are insignificantly different from zero, suggesting no significant relationship between the initial trends of the industries and tariff reductions. We acknowledge that tariff reductions in some industries could be implicitly determined by the government's protection orientation, but the protection should be within the framework of trade liberalization required by the WTO. Thus, our findings support the argument that the magnitude of tariff reductions in Vietnam after the WTO accession was primarily determined with an aim to lower the country's trade barriers.

[Figure 3.3 is here]

Third, if tariff reductions after the WTO accession are endogenous, they might relate to the previous trends of imports. Table 3A.2 in the Appendix reports the estimates of the regression of the import tariff reductions in the period 2007-2016 and Vietnam's changes in import values from the world and its main trading partners including the USA, the EU, China, Japan[22] in 2000-2007. The coefficients are insignificant in all cases, indicating there is no correlation between the previous trends of imports and tariff reductions after the WTO accession. In addition, we add evidence of the exogeneity of tariff at the province level. Our measure of province tariff is discussed in the next section. We regress provincial tariff reductions in 2007-2016 on each of the following indicators: the change in provincial share of low-skilled workers, the change in provincial share of state-owned companies' workers, the change in provincial share of informal workers, the change in provincial average wages. These indicators are calculated from VHLSS 2004-2006. The estimates reported in Table 3A.3 in the Appendix are insignificantly different from zero, indicating that there is no significant relationship between the pre-trends of the local labour market and tariff reductions.

[20] The formal sector is defined as all registered firms while the informal sector is defined as the household business.

[21] Low skilled workers are those having less than 12 years of education, and high skilled workers are those having at least 12 years of education.

[22] The data on the import value (in thousand US dollars) are collected from the World Integrated Trade Solution.

3.4. Methodology

3.4.1. Measurement of provincial tariffs

Following previous studies (Autor et al., 2013; Dix-carneiro & Kovak, 2019; Erten et al., 2019, Topalova, 2005; Topalova, 2010), we construct a measure of tariff at the province level accounting for the variation of the employment structures across industries and across provinces before the trade shock. Specifically, we use the share of employment in each industry in each province in 1999 as the weight of the industry's import tariff. The industrial employment share in each province in 1999 is calculated from the Population and Housing Census in 1999. The local tariff exposure is then the weighted average of all import tariffs. Following Kovak (2013), our calculation only covers the traded industries with the assumption that the non-traded prices change with the traded prices[23]. Two industries, namely uranium (ISIC code 12) and metal ores (ISIC code 13) have zero tariffs over the year. Employment share in these two sectors is relatively small (less than 1%). Thus, we also exclude these two sectors from our calculation of tariff exposure[24].

$$\text{Tariff}_{pt}=\Sigma_j \text{ Employment share}_{jp,1999} * \text{Tariff}_{jt} \qquad (3.1)$$

where Tariff_{pt} denotes the industrial employment weighted tariff of province p at time t; j denotes the traded industry j; Tariff_{jt} denotes import tariff of industry j at time t; $\text{Employment}_{jp,1999}$ is the employment share of industry j in total employment of province p in 1999, calculated as:

$$\text{Employment share}_{jp,1999}=\frac{\text{Employment}_{jp,1999}}{\sum_j \text{Employment}_{jp,1999}} \qquad (3.2)$$

In 2004-2016, the province which experience the highest tariff reduction was Ho Chi Minh (in the South, at 11.9%), and the lowest tariff reduction was observed in Thai Nguyen (in the North, at 6.1%). The average local tariff reduction across provinces after the WTO accession is 6.9%.

[23] As argued by Kovak (2013), if we set tariffs of the non-traded sector as zero and include employment of this sector in our calculation of $\text{Employment}_{jp,2006}$, it means that we assume no price change for the non-traded goods. In this case, wages are not equalized between the traded and the non-traded sector. We can avoid this disequilibrium by removing the non-traded sector from the calculation of $\text{Employment}_{jp,2006}$, allowing for the non-traded price to grow by the same proportion to the traded price. Erten et al. (2019) applied the same approach in the calculation of district-level tariffs.

[24] Topalova (2010) treats cereals and oilseeds as non-traded industries in the calculation of district tariff exposure because tariffs in these industries were remained at zero in India.

3.4.2. Model specification

We exploit the variation of tariff exposure across provinces to compare the impacts of tariff reductions on the labour market outcomes among provinces with different levels of tariff exposure. Two individuals with similar characteristics can be affected differently because they come from two provinces with different levels of trade shock exposure. Two dimensions of the differences emerge include the across-province differences in tariff exposure and the within-province differences in tariff exposure before and after the WTO accession. Hence, we use a difference in difference (DID) approach to track the impacts of tariff reductions across provinces. Following Lu & Yu (2015) we construct the model specification as follows:

$$Outcome_{ipt}=\alpha+\beta Tariff_{p2006} *WTO_t+\delta X_{ipt}+\lambda_p+\gamma_t+\theta_p t + \varepsilon_{ipt} \quad (3.3)$$

where $Outcome_{ipt}$ is the labour market outcomes of individual i in province p in year t in terms of employment (i.e., the indicator of an individual being employed); unemployment (i.e., the indicator of a worker being unable to find a job); labour force inactivity (i.e., the indicator of an individual either being at school, or doing housework, or being sick, or being too old, or being disabled); wages (i.e., the average hourly wages of workers). Our variable of interest is the interaction term between the provincial tariff in 2006 ($Tariff_{p2006}$) and the WTO indicator (WTO) which is equal to 1 if year is from 2008 (the years that tariff reductions were in effect) onward. All the 61 provinces in our sample had different pre-WTO tariffs and they also experienced different tariff reductions after the WTO entry. The variation in initial tariffs and tariff reductions across provinces allow us to compare the impacts of trade shocks on the labour market among provinces. According to Liu & Trefler (2011) and Lu & Yu (2015), this approach accounts for both real and expected impacts of tariff reductions. We also check the robustness of the estimators by using yearly provincial tariffs ($Tariff_{pt}$) instead of the interaction term between the provincial tariff in 2006 and the WTO indicator. This approach produces similar results (see Table 3A.5 in the Appendix).

X_{ipt} denotes individual characteristics, namely gender, age, age squared, education, an indicator of urban area, and an ethnic minority indicator. A detailed explanation of variables is given in Table 3A.4 in the Appendix. Province fixed effects (λ_p) account for time-invariant disparity across provinces. Year fixed effects (γ_t) account for year-specific common shocks in the economy that coincide with the trade shocks. We also include unobserved province-specific trends ($\theta_p t$) to account for changes in province-specific unobserved factors that correlate with the trade shocks across years. Standard errors are clustered at the provincial level.

Our identification strategy assumes that labour market outcomes of provinces with different tariff exposures would exhibit parallel trends in the absence of tariff reductions, meaning

that without tariff reductions, the labour market of high-tariff exposed provinces would need to follow similar trends with that of low-tariff exposed provinces in both the pre-WTO and post-WTO period. However, the counterfactual trend in the post-WTO period is not observable. Although we are not able to test this assumption, we can visualize the labour market trends of these two groups of provinces before and after the WTO entry. Figure 3.4 plots trends in the labour market by gender in low-tariff exposed provinces (provinces with provincial tariffs below the first quartile of the sample in 2006) and high-tariff exposed provinces (provinces with provincial tariffs above the third quartile of the sample in 2006). It can be seen from the graph that before tariff reductions came into effect in 2008, employment and wages in the two groups of provinces followed similar trends. After 2008, there was divergence of post-trends in the two groups, which supports the parallel trends assumption.

3.5. Findings

3.5.1. Baseline findings

The estimates are reported for men and women separately to compare the impacts on the two genders. Table 3.3 reports the estimates of the employment effects for the whole economy and for each sector. The coefficient of the interaction term between the provincial tariff in 2006 and the WTO indicator reported in column (1) of Panel A is negative but insignificant, indicating a negligible impact on economy-wide employment for men. Meanwhile, in column (6), we find a drop in the probability of being employed for women. The average tariff cut at regional level over the period 2004-2016 was 6.9 percentage points. Hence, a woman in a province facing an average tariff cut of 6.9 percentage points experienced approximately a 4.4 percentage-point decrease in the probability of being employed after the WTO accession [i.e., 6.9 * 0.632=4.4]. The results in Panel A also suggest that the probability of being employed in manufacturing declined for both genders in more exposed provinces, which determined the drop in their probability of being employed in the traded sector. It is likely that tariff reductions encouraged more imported products, which imposed a burden on import-competing producers in manufacturing. The data obtained from UN Comtrade show that the value of manufacturing imports to Vietnam increased 3.8 times in 2006-2016. Employment suffered the loss consequently. In addition, we find a transition of both male and female workers from the traded to the non-traded sector as the estimates reported in column (4) and column (9) for the traded sector are significantly negative while the estimates in column (5) and column (10) for the non-traded sector are significantly positive.

Panel B of Table 3.3 reports the estimates of the impacts on unemployment and labour force inactivity. In terms of unemployment, the estimates reported in column (1) and column (3)

are negative and significant, suggesting a decrease in the probability of being unemployed for both men and women in more exposed provinces. While we find no evidence of a change in the probability of being inactive for men in provinces more exposed to tariff reductions, we observe an increase in the probability of being inactive for women in these provinces. In sum, under the impacts of trade liberalisation, displaced female workers in the traded sector might either transfer to the non-traded sector or become inactive, and there was a loss in economy-wide female employment, which implies a worse employment outcome for women than for men.

We further investigate the link between tariff reductions and earning inequality across provinces. 31.3% of the observations report they work for wages for their main job. The estimates reported in Panel C of Table 3.3 suggest that tariff reductions favoured men more than women. There was an increase in wages for male workers in more exposed provinces. Specifically, a male worker in a province exposed to an average tariff reduction of 6.9 percentage points gained a rise in wages of 9.8 percentage points in comparison to a male worker in a province facing no tariff reduction [6.9 * 1.427=9.8].

Our findings suggest that the impacts of trade liberalisation in the case of Vietnam worked through both employment and earnings, and men gained more benefits than women. Men and women differed in their ability to move across sectors under the impact of trade shocks. While displaced male workers moved from the traded to the non-traded sector, displaced female workers in the traded sector could either transfer to the non-traded sector or became labour force inactive in more exposed provinces.

[Table 3.3 near here]

3.5.2. Heterogeneity

In this section, we further control for heterogeneity to identify the underlying mechanism of the impacts of the WTO accession on the labour market in Vietnam. We account for the heterogeneity at sector level, and individual level.

3.5.2.1. Formal and Informal Sectors

The formal sector is defined as all registered firms while the informal sector is defined as the household business[25]. In Vietnam, the informal sector constitutes a large share of employment. As calculated from our sample, 70% of total workers work in the informal sector. Table 3.4 and Table 3.5 report the impact of tariff reductions for the formal sector and the informal sector separately. Panel A shows the estimates for employment outcomes and Panel B shows the

[25] Our definition of formal employment follows that of McCaig & Pavcnik (2015).

estimates for wages. In terms employment, the estimates in Panel A of Table 3.4 show that while there was no significant effect of tariff reductions on the probability of being employed in the formal sector for male workers, female workers' probability of being employed in the formal sector declined in more exposed provinces. For the informal sector, the estimates in Panel A of Table 3.5 implies a reallocation of both male and female workers from the traded sector to the non-traded sector under the impact of trade liberalization.

In terms of wages, estimates reported in Panel B of Table 3.4 and Table 3.5 suggest an increase in wages of male workers in both the formal and informal sectors. For female workers, wages grew in the informal sector but declined in the formal sector in more exposed provinces.

3.5.2.2. Age

In terms of age, we divide the sample into 2 groups: below 30 years-old and above 30 years-old. 42% of observations in the sample age equal or less than 30 years-old and 58% of them age more than 30 years-old. The estimates of the impact of the WTO accession on the labour market by age cohort are reported in Table 3.6 and Table 3.7. In each table, Panel A reports the estimates for employment, Panel B reports the estimates for unemployment and labour force inactivity, and Panel C reports the estimates for wages.

For male employment, we find a transition from the traded to the non-traded sector for the younger-age cohort, while the probability of being employed increased for the older-age one in more exposed provinces. While the probability of being unemployed and being labour force inactive remained unchanged for the male younger-age cohort, we find a decrease in the probability of being unemployed and an increase in the probability of being labour force inactive for male workers of the older-age cohort. For female employment, there is a fall in the probability of being employed for both age cohorts in more exposed provinces. There was a reallocation of the older-age female workers from the traded to the non-traded sector. We also observe a decline in the probability of being unemployed and an increase in the probability of being labour force inactive for female individuals of both age cohorts in these provinces. In terms of wages, the estimates in Panel B of the two tables suggest an increase in wages for male workers whereas there was no significant change in wages for female workers of both age cohorts.

3.5.2.3. Skill levels

Table 3.8 and Table 3.9 reports the estimates of the impacts on employment outcomes by skill levels. Low skilled workers are those having less than 12 years of education, and high skilled workers are those having at least 12 years of education. 72.7% of observations in the sample are

low-skilled whereas 27.3% of them are high-skilled. Table 3.8 presents the estimates for low-skilled workers, and Table 3.9 shows the estimates for high-skilled workers. In terms of employment, we find a fall in the probability of being employed for low-skilled workers of both genders in more exposed provinces. Moreover, there was a movement of displaced low-skilled workers from the traded to the non-traded sector.

For male individuals, the probability of being unemployed decreased and the probability of being labour force inactive grew solely for low-skilled workers while they remained unchanged for high-skilled workers in more exposed provinces. Yet, we observe a drop in the probability of being unemployed for female workers of both skill levels and an increase in the probability of being labour force inactive for the low-skilled female ones. In terms of wages, it can be observed that in the economy-wide setting, both low-skilled and high-skilled male workers gained an increase in wages, while there was no significant change in wages of both low-skilled and high-skilled female workers in more exposed provinces.

3.5.2.4. Urban location

The estimates of the impacts on labour market outcomes by urban location are reported in Table 3.10 and Table 3.11. Table 3.10 shows the estimates for rural area and Table 3.11 presents the estimates for urban area. In terms of male employment in more exposed provinces, we observe a decrease in the probability of being employed for rural men, whereas urban men's probability of being employed remained unchanged. On the contrary, the probability of being employed declined for both rural and urban women. We also find a decline in the probability of being unemployed for women in both areas. In terms of wages, the estimates in Panel C of the two tables suggest an increase in wages for urban male workers in more exposed provinces. For female workers, we find no evidence of the significant impact of tariff reductions on wages in both rural and urban areas.

By capturing heterogeneous effects, our analysis highlights the negative impacts of trade liberalization on formal sector's women in terms of both employment and wages. While a trade shock benefitted high-skilled, older-age cohort, urban male workers, we find no positive impacts of trade shocks on women of both age cohorts, skill levels, and areas. Low-skilled workers of both genders were also vulnerable to being labour force inactive.

3.5.3. Robustness checks

We perform several checks for the robustness of our empirical findings on the causal effects of tariff reductions on the labour market outcomes.

First, following Erten et al. (2019), we replace the interaction term between the provincial tariff in 2006 ($Tariff_{p2006}$) and the WTO indicator (WTO) in equation (3.3) with yearly provincial tariff ($Tariff_{pt}$). The negative sign of the coefficient of $Tariff_{pt}$ indicates a positive effect of tariff reductions and the positive sign of the coefficient of $Tariff_{pt}$ indicates a negative effects of tariff reductions in more exposed provinces. As can be seen in Table 3A.5, our estimates confirm no significant impact of trade liberalization on male employment and a drop in the probability of being employed for female workers. While there was a decline in the probability of being unemployed for both genders, we observe an increase in the probability of being labour force inactive for female individuals. Wages of male workers also increased in more exposed provinces. Hence, our baseline findings are robust.

Vietnam is making great efforts in international economic integration. The bilateral trade agreement with the USA became effective in 2002, paving the way for the growth of exports to the country's major market. Before joining WTO, the country concluded two free trade agreements with members of the Association of Southeast Asian Nations (ASEAN) and China. After the WTO entry, the number of free trade agreements signed gets larger than before. Up to 2015, six more free trade agreements had become effective. Trade partners in these agreements spread across continents, including Korea, Japan, India, Australia, New Zealand, Chile. Besides, as a developing country, Vietnam's exports enjoy Generalised Scheme of Preferences (GSP) status given by EU countries, according to which export products are imposed reduced or zero tariffs. The intensive efforts of Vietnam in preferential trade agreements raise our concerns about the concurrence of the impacts of export tariff reductions on the labour market. To address this concern, we calculate the average effectively applied export tariffs imposed by trade partners in the above trade agreements[26]. These trade partners accounts for approximately 90 percent of Vietnam's total exports. We then use equation (3.1) to calculate provincial export exposure and add this variable to equation (3.3). It can also be concerned that foreign direct investment (FDI) is another concurrent factor that can affect the labour market. We therefore include FDI inflows at the province level[27] (in natural logarithm) as another control variable in equation (3). The results reported in Table 3A.6 show that the estimates of the impact of local tariff exposure on the labour market outcomes after controlling for export tariffs and FDI remain robust.

We also control for other individual characteristics, including marital status (married or single), and the household size (the number of members in the household). The results reported in Table 3A.7 show that the estimates slightly drop but they still show similar pattern of the impacts.

[26] The data of effectively applied export tariffs are collected from the World Integrated Trade Solution (WITS).
[27] The data of FDI inflows at the province level are obtained from the Mistry of Planning and Investment in Vietnam.

Another robustness check is that we exclude other mining and quarrying (ISIC code 14), tobacco (ISIC code 16), refined petroleum (ISIC code 23), basic metal (ISIC code 27), electricity and gas (ISIC code 40), other services (ISIC code 93) from the traded sector, because of different tariff trends in these industries. Tobacco is the only industry that experiences an increase in the tariff rate after the WTO accession, whereas there is no change in the tariff rates of other mining and quarrying, electricity and gas, and other services. Tariff cuts of refined petroleum, and basic metal are relatively small (less than 1%). We exclude these industries from the traded sector and re-calculate the provincial tariff exposure. We again find consistent results as reported in Table 3A.8.

Another the concern is that our baseline results might be driven by some provinces that are initially more labour-intensive in industries experiencing high or low tariff variations. To address it, in Table 3A.9, we exclude the province that have the highest employment share in 2006 in the industry that had the largest tariff reduction (apparel) and in Table 3A.10, we exclude the province that had the highest employment share in 2006 in the industry that have the smallest tariff reduction (basic metal). As shown in these two tables, our results are robust to the exclusion of these provinces.

3.5.4. Labour mobility across provinces

Following the literature on the local trade exposure (i.e., Erten et al., 2019; Mccaig, 2011; Topalova, 2005), we examine the mobility of labour across provinces under the impact of trade liberalization. When tariff reductions after the WTO accession had no impact on inter-province movement, workers were not motivated to move across regions. Consequently, wages were not equalized among provinces and our main findings in the previous sections are not violated. In line with Mccaig (2011), we find that the share of individuals moving to another province to find work was relatively slow. Using the data from the subsection of migration in two consecutive rounds of VHLSS, we estimate that the shares of inter-province migrants for work reason in total working-age population was around 3.3% in 2004-2006, 2.9 % in 2006-2008, 2.4 % in 2010-2012, 2.7 % in 2012-2014, and 2 % in 2014-2016[28].

We further regress the probability of individuals moving across province to find a job on the local tariff exposure. The estimation results are reported in Table 3A.11 for men and women separately. The coefficients of the interaction term between provincial tariff in 2006 and the WTO indicator are insignificantly different from zero in both columns, indicating that individuals in

[28] There is no data on migration in 2008-2010.

provinces with high tariffs in 2006 experienced negligible changes in the probability of migrating to other provinces to find job after the WTO accession. Hence, tariff reductions had no significant impact on migration. Our findings are in line with those of previous literature (Erten et al., 2019; Mccaig, 2011; Topalova, 2005) on the insignificant impact of local trade exposure on labour movement across region.

3.6. Conclusion

This chapter examines the impacts of trade shocks on the labour market, taking Vietnam as a case study. Using individual-level data from the household survey, we add to the literature the empirical evidence of local tariff exposure. We further focus on the gender dimension of the impacts.

We find evidence of the variation in the impacts of tariff reductions after Vietnam's accession to the WTO on economy-wide employment, unemployment, labour force inactivity, and wages across provinces and genders. Workers in provinces more exposed to tariff reductions had a smaller probability of being employed in the traded sector. Displaced workers moved from the traded to the non-traded sector for employment. While our results suggest a decrease in the probability of being unemployed for both male and female workers, we find an increase in the probability of being labour force inactive for female individuals under the impact of trade liberalisation. Male workers' wages in provinces more exposed to trade shocks increased after trade liberalisation. Yet, we observe no significant changes in wages for female workers.

By capturing heterogeneous effects, we find that import tariff reductions hurt employment and wages of women in the formal sector. While high-skilled, older-age cohort, urban male workers gained benefits from trade shocks, we find no positive impacts of tariff reductions on women of both skill levels, age cohorts, and areas. Low-skilled workers of both genders were also vulnerable to being labour force inactive. Trade liberalisation is essential for the country to integrate in the global market, but more measures should be taken to narrow down the gap between the winners and the losers in the labour market.

In this chapter, we have scrutinized the impacts of trade liberalisation on various aspects of the labour market. Nevertheless, we are not able to explain the channel generating the impacts in detail due to the limitation of the household survey. Future studies incorporating data from different stakeholders such as enterprises, and local authorities are expected to offer a more thorough view on the mechanism of labour demand and labour supply that channels the impact.

References

Autor, D. H., Dorn, D., & Hanson, G. H. (2013). The China syndrome: Local labour market effects of import competition in the United States. *American Economic Review*, *103*(6), 2121–2168. https://doi.org/10.1257/aer.103.6.2121

Baccini, L., Impullitti, G., & Malesky, E. J. (2019). Globalization and state capitalism: Assessing Vietnam's accession to the WTO. *Journal of International Economics*, *119*, 75–92. https://doi.org/10.1016/j.jinteco.2019.02.004

Chen, Z., Ge, Y., Lai, H., & Wan, C. (2013). Globalization and Gender Wage Inequality in China. *World Development*, *44*, 256–266. https://doi.org/10.1016/j.worlddev.2012.11.007

Dix-Carneiro, R., & Kovak, B. K. (2019). Margins of labour market adjustment to trade. *Journal of International Economics*, *117*, 125–142. https://doi.org/10.1016/j.jinteco.2019.01.005

Do, Q. T., Levchenko, A. A., & Raddatz, C. (2016). Comparative advantage, international trade, and fertility. *Journal of Development Economics*, *119*, 48–66. https://doi.org/10.1016/j.jdeveco.2015.10.006

Erten, B., Leight, J., & Tregenna, F. (2019). Trade liberalization and local labour market adjustment in South Africa. *Journal of International Economics*, *118*, 448–467. https://doi.org/10.1016/j.jinteco.2019.02.006

Gaddis, I., & Pieters, J. (2017). The Gendered Labour Market Impacts of Trade Liberalization Evidence from Brazil. *Journal of Human Resources*, *52*(2), 457–490. https://doi.org/10.3368/jhr.52.2.1014-6690R1

ILO. (2014). *Vietnam wage policy in the context of market economy and economic integration* (Issue November 2014).

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2014). Men, women, and machines: How trade impacts gender inequality. *Journal of Development Economics*, *106*, 179–193. https://doi.org/10.1016/j.jdeveco.2013.09.009

Kis-Katos, K., Pieters, J., & Sparrow, R. (2018). Globalization and Social Change: Gender-Specific Effects of Trade Liberalization in Indonesia. *IMF Economic Review*, *66*(4), 763–793. https://doi.org/10.1057/s41308-018-0065-5

Kis-Katos, K., & Sparrow, R. (2015). Poverty, labour markets and trade liberalization in Indonesia. *Journal of Development Economics*, *117*, 94–106. https://doi.org/10.1016/j.jdeveco.2015.07.005

Kovak, B. K. (2013). Regional effects of trade reform: What is the correct measure of liberalization? *American Economic Review*, *103*(5), 1960–1976. https://doi.org/10.1257/aer.103.5.1960

Liu, R. L., & Trefler, D. (2011). *A Sorted Tale of Globalization: White Collar Jobs and the Rise of Service Offshoring*.

Lu, Y., & Yu, L. (2015). Trade liberalization and markup dispersion: Evidence from China's WTO accession. *American Economic Journal: Applied Economics*, *7*(4), 221–253. https://doi.org/10.1257/app.20140350

McCaig, B. (2011). Exporting out of poverty: Provincial poverty in Vietnam and U.S. market access. *Journal of International Economics*, *85*(1), 102–113. https://doi.org/10.1016/j.jinteco.2011.05.007

McCaig, B., & Pavcnik, N. (2015). Informal employment in a growing and globalizing low income country. *American Economic Review*, *105*(5), 545–550. https://doi.org/10.1257/aer.p20151051

McCaig, B., & Pavcnik, N. (2018). Export markets and labour allocation in a low-income country. *American Economic Review*, *108*(7), 1899–1941. https://doi.org/10.1257/aer.20141096

Sauré, P., & Zoabi, H. (2014). International trade, the gender wage gap and female labour force participation. *Journal of Development Economics*, *111*, 17–33. https://doi.org/10.1016/j.jdeveco.2014.07.003

Topalova, P. (2005). *Trade Liberalization, Poverty and Inequality: Evidence from Indian Districts* (No. 11614).

Topalova, P. (2010). Factor immobility and regional impacts of trade liberalization: Evidence on poverty from India. *American Economic Journal: Applied Economics*, *2*(4), 1–41. https://doi.org/10.1257/app.2.4.1

Figures and Tables

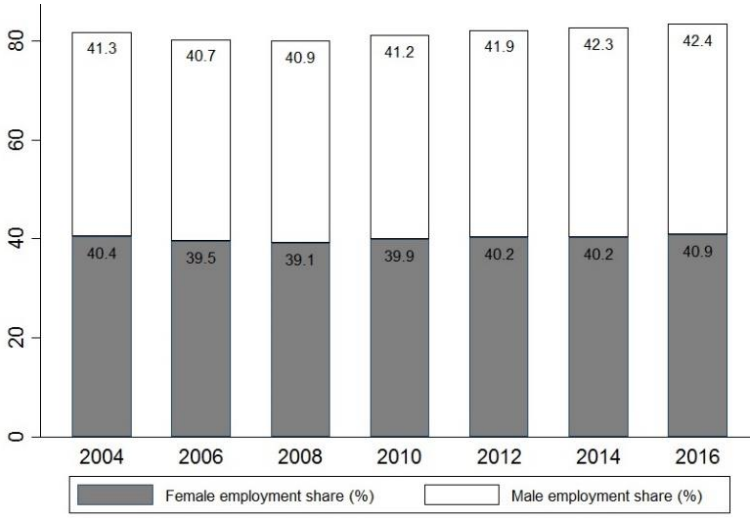

Figure 3.1. Composition of total employment share of working population by gender (%).

There was an upward trend in the share of employment after the WTO accession.

Source: Authors' calculation from the VHLSS in 2004-2016.

Notes: We restrict working population to individuals who age from 15 to 55. The grey bar represents the female employment share of working population and the white bar represents the male share of working population. Total employment share of working population is the sum of the female employment share of working population and the male employment share of working population.

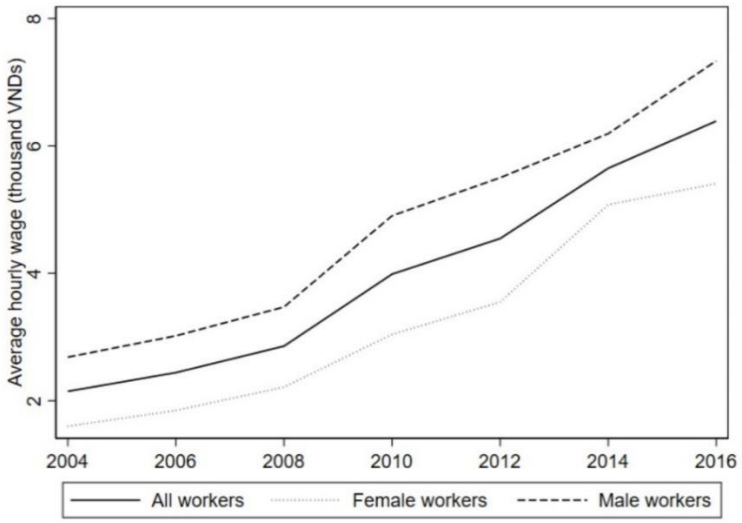

Figure 3.2. Average hourly wages in 2004-2016.

Average hourly wages tripled over the period.

Source: Authors' calculation from the VHLSS in 2004-2016.

Notes: Average hourly wages are calculated as the sum of wages/salaries and all other benefits (e.g., holiday, maternity, accident compensation, allowance, etc.) divided by the total working hours for the main job. Average hourly wages are converted to 2006 real prices using consumer price index collected from the General Statistics Office.

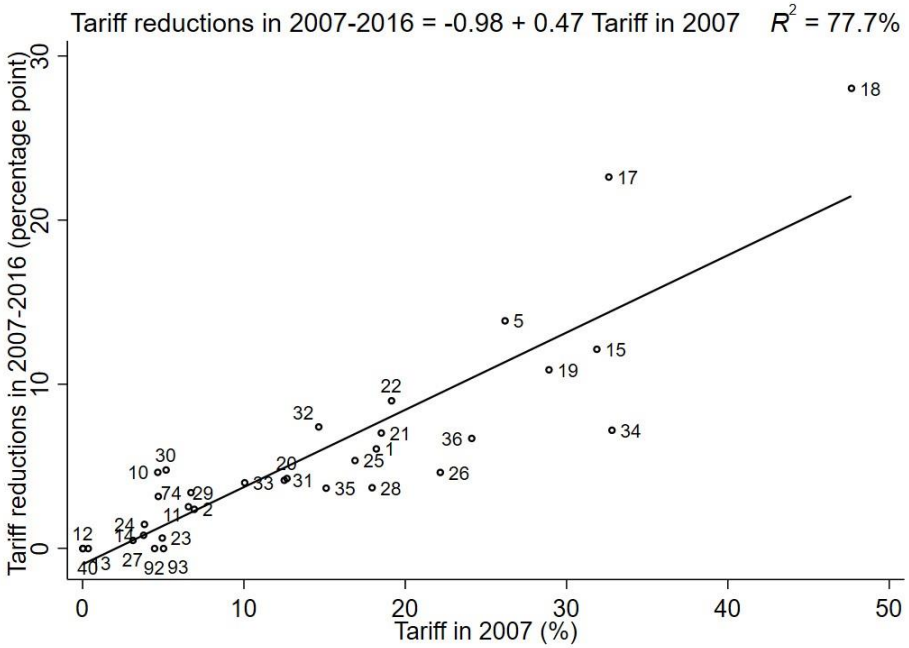

Figure 3.3. The correlation between tariff rates in 2007 and tariff reductions in 2007-2016.

Textiles and apparel had the highest tariff reductions after the WTO accession.

Notes: Tariff reductions are calculated as the difference between tariff rates in 2007 and tariff rates in 2016. ISIC industries included: Agriculture (1), Forestry (2), Fishing (5), Mining (10), Crude Petroleum (11), Uranium and thorium ores (12), Metal ores (13), Other mining and quarrying (14), Food and beverages (15), Textiles (17), Apparel (18), Leather (19), Wood (20), Paper (21), Publishing and Printing (22), Refined Petroleum (23), Chemicals (24), Rubber (25), Other non-metallic mineral products (26), Basic metals (27), Fabricated metals (28), Machinery and equipment (29), Office and computing machinery (30), Electrical machinery (31), Communication equipment (32), Medical instrument (33), Motor (34), Other transports (35), Furniture (36), Electricity (40), Other business activities (74), Recreation (92), Other services (93).

Source: Author's calculations from the WTO database.

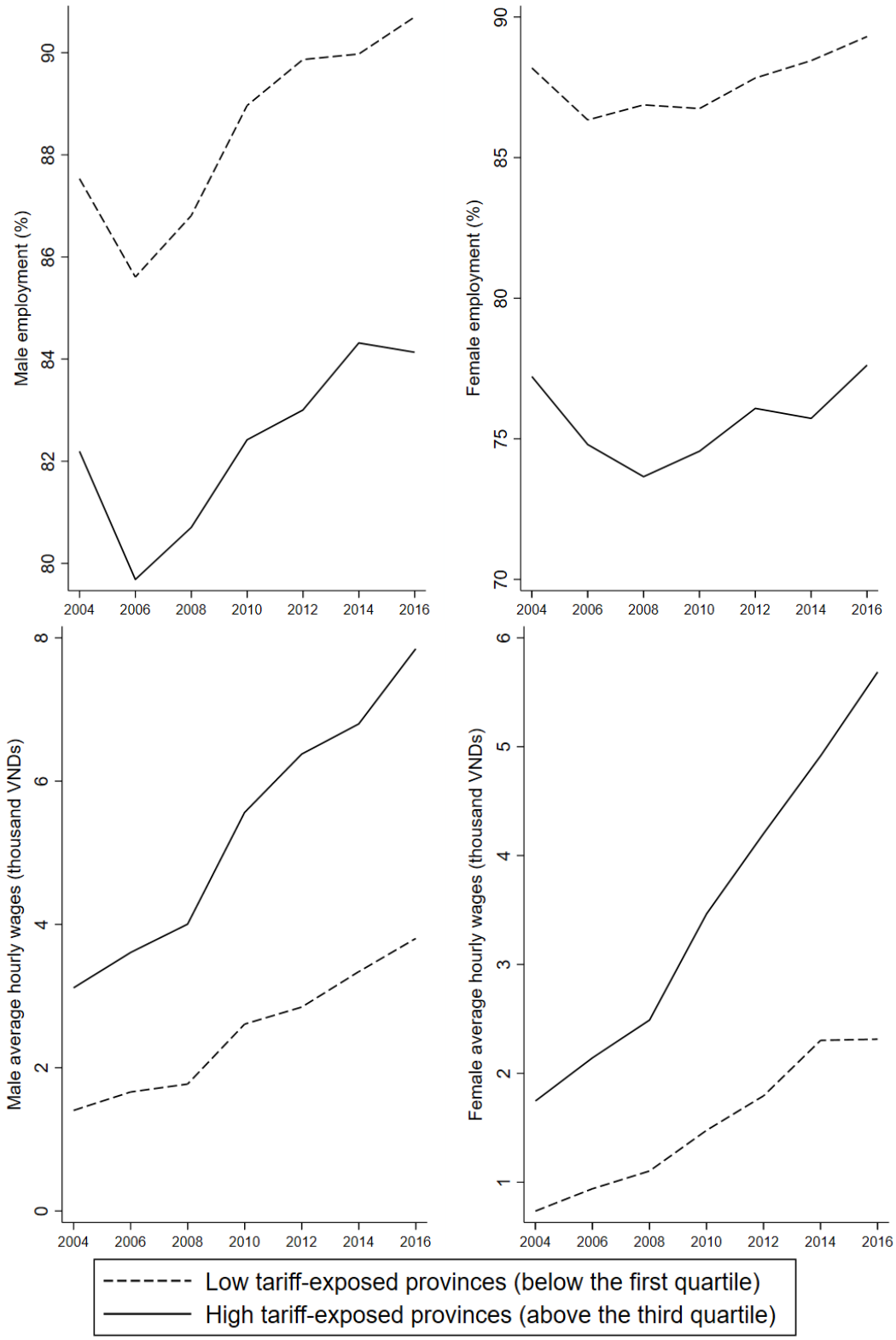

Figure 3.4. Trends of labour markets in low versus high tariff-exposed provinces.

Source: Authors' calculation from the VHLSS in 2004-2016.

Notes: Average hourly wages are calculated as the sum of wages/salaries and all other benefits (e.g., holiday, maternity, accident compensation, allowance, etc.) divided by the total working hours for the main job. Average hourly wages are converted to 2006 real prices using consumer price index collected from the General Statistics Office.

Table 3.1. Descriptive statistics.

	Mean	SD	Obs
Demographic characteristics			
Female	0.503	0.500	160,884
Urban	0.276	0.447	160,884
Minority	0.182	0.386	160,884
Education	8.195	3.505	160,884
Employment			
Employment	0.823	0.381	160,884
Employment in manufacturing	0.120	0.325	160,884
Employment in agriculture	0.400	0.490	160,884
Employment in the traded sector	0.542	0.498	160,884
Employment in the non-traded sector	0.282	0.450	160,884
Unemployment	0.006	0.080	115,333
Labour force inactivity	0.171	0.377	115,333
Wages (in thousand VNDs)			
Average hourly wages	8.108	13.405	50,330
Average hourly wages in manufacturing	7.271	21.447	13,426
Average hourly wages in agriculture	5.587	4.162	7,016
Average hourly wages in the traded sector	6.965	16.977	22,635
Average hourly wages in the non-traded sector	9.042	9.438	27,695

Source: Authors' calculation from the VHLSS in 2004-2016.

Notes: Employment is an indicator of being employed. Unemployment is an indicator of being unable to find a job. Labour force inactivity is an indicator of being either at school, or doing housework, or being sick, or being too old, or being disabled. Average hourly wages are calculated as the sum of wages/salaries and all other benefits (e.g., holiday, maternity, accident compensation, allowance, etc.) divided by the total working hours within 12 months for the main job.

Table 3.2. Composition of employment by sector and gender in 2004-2016(%).

The majority of workers were employed in agriculture.

Sector	Male	Female	Total
Agriculture	22.2	23.4	45.6
Manufacturing	7.4	8.7	16.1
Mining	0.5	0.1	0.6
Services	20.9	16.8	37.7
All sectors	51.0	49.0	100

Source: Authors' calculation from the VHLSS in 2004-2016.

Notes: We restrict working population to individuals who age from 15 to 55. The employment share by gender in a sector is calculated as the number of workers by gender in that sector divided by the total number of workers in all sectors.

Table 3.3. The impacts of the WTO accession on the labour market outcomes.

	Male					**Female**				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.108	-0.700***	0.014	-0.620***	0.512***	-0.632***	-1.302***	-0.067	-1.095***	0.463***
	(0.123)	(0.208)	(0.222)	(0.178)	(0.140)	(0.104)	(0.214)	(0.232)	(0.131)	(0.110)
Obs	79,993	79,993	79,993	79,993	79,993	80,891	80,891	80,891	80,891	80,891
R-squared	0.320	0.055	0.307	0.177	0.160	0.280	0.074	0.347	0.225	0.168
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.202***		0.183			-0.243***		0.489**		
	(0.070)		(0.161)			(0.018)		(0.214)		
Obs	57,392		57,392			57,941		57,941		
R-squared	0.017		0.317			0.011		0.275		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.427***	1.838***	1.824	1.307**	1.635***	0.292	0.539	1.182	0.169	0.357
	(0.253)	(0.594)	(2.825)	(0.554)	(0.386)	(0.427)	(0.696)	(3.064)	(0.659)	(0.444)
Obs	29,945	6,244	4,346	12,266	17,679	20,385	7,182	2,670	10,701	9,684
R-squared	0.300	0.339	0.238	0.323	0.290	0.336	0.336	0.290	0.314	0.357

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3.4. Labour market outcomes – Formal sector.

	Male					**Female**				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.057	-0.303***	0.017	-0.123	0.066	-0.373**	-0.307***	-0.018	-0.210*	-0.163
	(0.110)	(0.070)	(0.033)	(0.112)	(0.131)	(0.145)	(0.081)	(0.022)	(0.105)	(0.160)
Obs	79,993	79,993	79,993	79,993	79,993	80,891	80,891	80,891	80,891	80,891
R-squared	0.191	0.055	0.014	0.061	0.144	0.192	0.087	0.013	0.089	0.161
Panel B: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	0.958***	1.614**	13.527	0.841	1.022*	-0.892*	-0.920	0.204	-1.136*	-0.281
	(0.307)	(0.610)	(8.373)	(0.718)	(0.520)	(0.447)	(0.702)	(9.104)	(0.582)	(0.525)
Obs	14,710	3,969	617	5,821	8,889	13,359	5,0319	343	6,215	7,144
R-squared	0.294	0.365	0.510	0.353	0.280	0.328	0.340	0.657	0.340	0.302

Notes: The formal sector is defined as all registered firms. Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3.5. Labour market outcomes – Informal sector.

	Male					Female				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.098	-0.387*	-0.037	-0.517***	0.419**	-0.237	-0.976***	-0.048	-0.862***	0.626***
	(0.178)	(0.196)	(0.222)	(0.192)	(0.169)	(0.176)	(0.203)	(0.234)	(0.146)	(0.160)
Obs	79,993	79,993	79,993	79,993	79,993	80,891	80,891	80,891	80,891	80,891
R-squared	0.273	0.031	0.307	0.259	0.075	0.316	0.035	0.351	0.316	0.079
Panel B: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.158*	4.444***	1.637	2.905***	0.638	3.158***	3.763***	3.837	2.414*	3.967***
	(0.608)	(1.294)	(2.574)	(0.899)	(0.778)	(0.865)	(1.199)	(3.502)	(1.312)	(0.989)
Obs	15,235	2,275	3,729	6,445	8,790	7,026	1,863	2,327	4,486	2,540
R-squared	0.217	0.297	0.238	0.221	0.234	0.191	0.333	0.248	0.221	0.233

Notes: The informal sector is defined as the household business. Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3.6. Labour market outcomes – Below 30 years-old.

	Male					Female				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.403	-1.429***	-0.496	-1.563***	1.160***	-1.167***	-0.852***	-0.162	-0.998***	-0.169
	(0.277)	(0.249)	(0.307)	(0.297)	(0.273)	(0.249)	(0.302)	(0.252)	(0.275)	(0.244)
Obs	34,999	34,999	34,999	34,999	34,999	32,795	32,795	32,795	32,795	32,795
R-squared	0.341	0.084	0.315	0.218	0.151	0.293	0.104	0.354	0.248	0.150
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.085		0.010			-0.480***		1.045***		
	(0.155)		(0.409)			(0.038)		(0.341)		
Obs	25,174		25,174			23,340		23,340		
R-squared	0.023		0.339			0.016		0.300		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.444***	1.112	-0.007	-0.053	2.674***	-0.678	-1.257	14.645	-0.218	-1.405**
	(0.392)	(0.859)	(5.647)	(0.591)	(0.518)	(0.632)	(1.244)	(11.152)	(1.032)	(0.603)
Obs	11,587	3,188	1,823	5,644	5,943	8,603	3,886	854	5,144	3,459
R-squared	0.282	0.336	0.291	0.312	0.277	0.311	0.327	0.327	0.317	0.345

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3.7. Labour market outcomes – Above 30 years-old.

	Male					**Female**				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	0.151*	-0.238	0.515*	0.161	-0.010	-0.402***	-1.685***	0.033	-1.207***	0.805***
	(0.078)	(0.212)	(0.260)	(0.204)	(0.179)	(0.093)	(0.227)	(0.285)	(0.155)	(0.152)
Obs	44,994	44,994	44,994	44,994	44,994	48,096	48,096	48,096	48,096	48,096
R-squared	0.031	0.050	0.307	0.154	0.146	0.090	0.073	0.336	0.213	0.162
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.296***		0.281***			-0.079***		0.267**		
	(0.029)		(0.068)			(0.009)		(0.105)		
Obs	32,218		32,218			34,601		34,601		
R-squared	0.014		0.030			0.006		0.091		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.367***	1.823***	1.742	2.014***	1.016**	0.583	1.653	-0.114	0.106	0.993**
	(0.272)	(0.569)	(6.442)	(0.664)	(0.464)	(0.452)	(1.016)	(2.277)	(0.721)	(0.464)
Obs	18,358	3,056	2,523	6,622	11,736	11,782	3,296	1,816	5,557	6,225
R-squared	0.299	0.324	0.243	0.328	0.292	0.356	0.387	0.327	0.340	0.347

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3.8. Labour market outcomes – Low-skilled level.

	Male					**Female**				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.235*	-0.803**	-0.003	-0.889***	0.655***	-0.489***	-1.860***	0.023	-1.422***	0.933***
	(0.122)	(0.338)	(0.306)	(0.233)	(0.183)	(0.145)	(0.274)	(0.355)	(0.247)	(0.277)
Obs	57,206	57,206	57,206	57,206	57,206	59,674	59,674	59,674	59,674	59,674
R-squared	0.314	0.061	0.272	0.171	0.141	0.272	0.091	0.312	0.206	0.118
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.293***		0.506***			-0.152***		0.623***		
	(0.043)		(0.154)			(0.026)		(0.213)		
Obs	41,344		41,344			43,110		43,110		
R-squared	0.019		0.313			0.010		0.272		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.369***	1.326*	3.308	1.097	1.702***	0.266	0.545	4.793	-0.433	1.714
	(0.474)	(0.685)	(3.309)	(0.657)	(0.534)	(0.635)	(0.900)	(4.151)	(0.945)	(1.117)
Obs	18,683	3,951	3,971	8,684	9,999	10,777	4,933	2,528	7,805	2,972
R-squared	0.217	0.296	0.243	0.240	0.215	0.227	0.302	0.286	0.257	0.260

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3.9. Labour market outcomes – High-skilled level.

	Male					**Female**				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	0.340	-0.544***	0.176	-0.059	0.399	-0.639***	-0.534*	0.309	-0.209	-0.430
	(0.256)	(0.156)	(0.204)	(0.247)	(0.274)	(0.212)	(0.287)	(0.204)	(0.424)	(0.418)
Obs	22,787	22,787	22,787	22,787	22,787	21,217	21,217	21,217	21,217	21,217
R-squared	0.403	0.055	0.176	0.078	0.201	0.350	0.058	0.193	0.093	0.219
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.032		-0.492			-0.356***		0.103		
	(0.133)		(0.376)			(0.038)		(0.353)		
Obs	16,048		16,048			14,831		14,831		
R-squared	0.021		0.391			0.019		0.341		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.444***	3.495***	-9.845	1.824*	1.322	0.210	1.054	-2.729	1.572***	-0.158
	(0.381)	(0.945)	(12.080)	(1.015)	(0.793)	(0.467)	(0.865)	(22.518)	(0.570)	(0.650)
Obs	11,262	2,293	375	3,582	7,680	9,608	2,249	142	2,896	6,712
R-squared	0.294	0.366	0.523	0.369	0.273	0.297	0.354	0.663	0.345	0.289

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3.10. Labour market outcomes – Rural area.

	Male					Female				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.426*	-0.566	-0.091	-0.709	0.283	-0.653*	-1.417**	0.215	-1.154***	0.502**
	(0.230)	(0.769)	(0.463)	(0.612)	(0.607)	(0.334)	(0.634)	(0.515)	(0.329)	(0.236)
Obs	58,402	58,402	58,402	58,402	58,402	58,149	58,149	58,149	58,149	58,149
R-squared	0.295	0.068	0.233	0.142	0.120	0.278	0.090	0.257	0.167	0.101
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	0.061		0.218			-0.166***		0.695		
	(0.073)		(0.378)			(0.062)		(0.523)		
Obs	42,107		42,107			41,851		41,851		
R-squared	0.010		0.295			0.011		0.276		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.508	-1.721	5.763	-0.961	0.508	0.471	3.272***	2.409	2.508*	-2.278**
	(0.620)	(1.040)	(0)	(0.966)	(1.001)	(0.891)	(1.066)	(3.450)	(1.279)	(1.092)
Obs	19,183	4,009	3783	8,616	10,567	11,803	4,739	2,376	7,414	4,389
R-squared	0.182	0.248	0.248	0.219	0.168	0.242	0.282	0.307	0.240	0.311

Notes: Other independent variables include age, age squared, education, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3.11. Labour market outcomes – Urban area.

	Male					Female				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.010	-0.460***	-0.040	-0.486*	0.476*	-0.415*	-1.064***	-0.206	-0.969***	0.554**
	(0.169)	(0.157)	(0.208)	(0.259)	(0.272)	(0.212)	(0.170)	(0.183)	(0.227)	(0.237)
Obs	21,591	21,591	21,591	21,591	21,591	22,742	22,742	22,742	22,742	22,742
R-squared	0.397	0.044	0.193	0.071	0.145	0.285	0.068	0.183	0.082	0.144
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.106		0.090			-0.285***		0.168		
	(0.113)		(0.231)			(0.033)		(0.227)		
Obs	15,285		15,285			16,090		16,090		
R-squared	0.022		0.390			0.015		0.280		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.682***	3.030***	-10.144	1.557**	1.818**	-0.194	-1.151	0.212	-0.907	0.919*
	(0.461)	(0.932)	(8.365)	(0.715)	(0.714)	(0.456)	(1.040)	(14.376)	(0.628)	(0.539)
Obs	10,762	2,235	563	3,650	7,112	8,582	2,443	294	3,287	5,295
R-squared	0.346	0.409	0.388	0.398	0.332	0.351	0.383	0.569	0.364	0.372

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Appendix

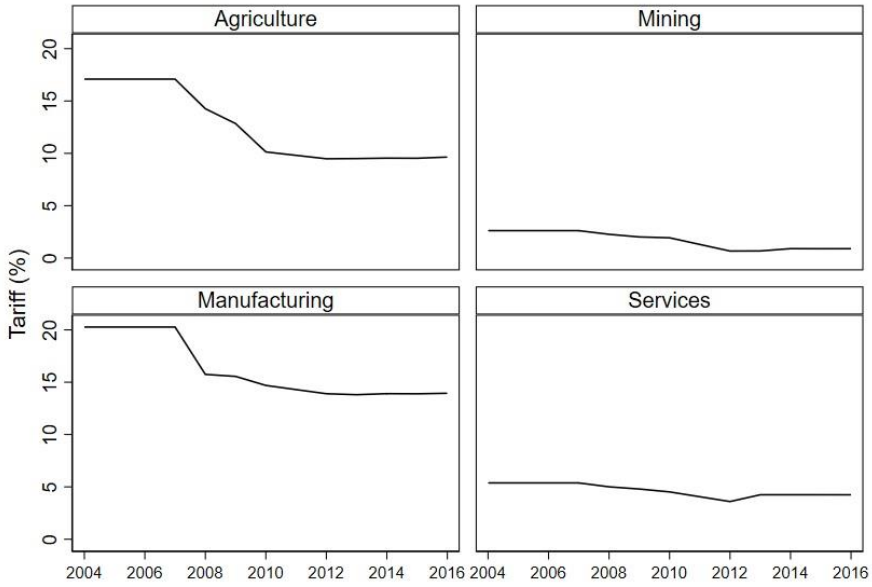

Figure 3A.1. Tariff trends by main sectors in 2004-2016**.**

Tariffs dropped in all sectors after the WTO accession.

Source: Authors' calculations from the WTO database.

Table 3A.1. The correlation between initial industrial characteristics and tariff reductions.

The tariff reductions were independent of the initial industrial trends.

	(1) Low-skilled employment	**(2) SOE's employment**	**(3) Informal employment**	**(4) Average wages**
Tariff reductions in 2007-2016	-0.069	-0.080	0.057	0.017
	(0.049)	(0.066)	(0.09)	(0.014)
Obs	33	33	33	33
R-squared	0.053	0.072	0.017	0.019

Notes: The table reports the correlation between initial industrial characteristics and tariff reductions. The dependent variable is industrial tariff reduction in 2006-2016. The independent variables are the change in industrial share of low-skilled employment, the change in industrial share of state-owned companies' employment, the change in industrial share of informal employment, the change in industrial average wages in 2004-2006. Robust standard errors are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.2. The correlation between the previous trends of imports and the tariff reductions. *The tariff reductions after the WTO entry were independent of the previous trends of imports.*

	(1) World	(2) China	(3) EU	(4) Japan	(5) USA
Imports in 2000-2007	-0.282	0.171	0.221	-2.744	-1.765
	(4.099)	(0.952)	(1.396)	(1.881)	(1.239)
Obs	28	25	28	25	26
R-squared	0.001	0.001	0.002	0.141	0.116

Notes: The table reports the estimates of the correlation between the tariff reductions in 2007-2016 and Vietnam's change in import value in 2000-2007. The dependent variable is tariff reductions in 2006-2016. The independent variable is Vietnam's change in import value in 2000-2007 from the world and its main trading partners including the USA, the EU, China, Japan. Robust standard errors are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.3. The correlation between initial provincial characteristics and the tariff reductions. *The tariff reductions were independent of the initial provincial trends.*

	(1) Low-skilled employment	(2) SOE's employment	(3) Informal employment	(4) Average wages
Tariff reductions in 2007-2016	-0.017	-0.038	0.003	0.004
	(0.028)	(0.039)	(0.026)	(0.002)
Obs	61	61	61	61
R-squared	0.004	0.013	0.001	0.019

Notes: The table reports the correlation between initial provincial characteristics and the tariff reductions. The dependent variable is provincial tariff reduction in 2006-2016. The independent variables are the change in provincial share of low-skilled employment, the change in provincial share of state-owned companies' employment, the change in provincial share of informal employment, the change in provincial average wages in 2004-2006. Robust standard errors are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.4. Description of variables.

Variable	Description
Provincial tariff	The industrial employment weighted tariff of province p. The weight is the share of employment in each industry in 2006.
Employment	A dummy variable which is equal to 1 if an individual is employed within the last 12 months, and zero otherwise.
Unemployment	A dummy variable which is equal to 1 if an individual in the working age is unable to find a job within the last 12 months, and zero otherwise.
Labour force inactivity	A dummy variable which is equal to 1 if an individual in the working age is not working because of either being at school, or doing housework, or being sick, or being too old, or being disabled within the last 12 months, and zero otherwise.
Wages	Natural logarithm of the real average hourly wage of the most time-consuming job of an individual within the last 12 months.
Female	A dummy variable which is equal to 1 for female, and zero otherwise.
Age	Age.
Age squared	Squared age.
Education	Number of years of education.
Minority	A dummy variable which is equal to 1 if an individual belongs to the ethnic minority group, and zero otherwise.
Urban	A dummy variable which is equal to 1 if an individual lives in the urban area, and zero otherwise.

Table 3A.5. Using yearly provincial tariff instead of the interaction term between the provincial tariff in 2006 and the WTO indicator.

	Male					**Female**				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
$Tariff_{pt}$	0.129	0.838***	-0.009	0.856***	-0.727***	0.631***	1.710***	0.027	1.358***	-0.727***
	(0.185)	(0.230)	(0.261)	(0.207)	(0.217)	(0.139)	(0.274)	(0.345)	(0.179)	(0.206)
Obs	79,993	79,993	79,993	79,993	79,993	80,891	80,891	80,891	80,891	80,891
R-squared	0.320	0.055	0.307	0.177	0.160	0.280	0.073	0.347	0.225	0.168
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
$Tariff_{pt}$	0.320***		-0.366			0.292***		-0.563**		
	(0.091)		(0.237)			(0.027)		(0.263)		
Obs	57,392		57,392			57,941		57,941		
R-squared	0.017		0.317			0.011		0.275		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
$Tariff_{pt}$	-1.634***	-2.673***	2.608	-1.299	-2.018***	-0.397	-0.078	-0.317	0.036	-0.463
	(0.538)	(0.730)	(6.100)	(0.986)	(0.488)	(0.484)	(0.753)	(6.296)	(0.785)	(0.576)
Obs	29,945	6,244	4,346	12,266	17,679	20,385	7,182	2,670	10,701	9,684
R-squared	0.300	0.339	0.238	0.323	0.290	0.336	0.336	0.290	0.314	0.357

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.6. Including average effectively applied export tariffs and FDI inflows.

	Male					Female				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.101	-0.680***	0.023	-0.619***	0.519***	-0.633***	-1.359***	-0.065	-1.146***	0.513***
	(0.124)	(0.227)	(0.214)	(0.162)	(0.119)	(0.105)	(0.222)	(0.238)	(0.131)	(0.113)
Obs	79,993	79,993	79,993	79,993	79,993	80,891	80,891	80,891	80,891	80,891
R-squared	0.320	0.055	0.307	0.177	0.160	0.280	0.074	0.347	0.225	0.168
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.348***		0.249			-0.244***		0.367*		
	(0.053)		(0.153)			(0.023)		(0.216)		
Obs	57,392		57,392			57,941		57,941		
R-squared	0.019		0.317			0.011		0.275		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.542***	1.910***	2.241	1.474***	1.700***	0.320	0.452	2.014	0.148	0.417
	(0.230)	(0.581)	(2.888)	(0.535)	(0.372)	(0.453)	(0.718)	(3.262)	(0.708)	(0.461)
Obs	29,945	6,244	4,346	12,266	17,679	20,385	7,182	2,670	10,701	9,684
R-squared	0.301	0.339	0.241	0.323	0.290	0.336	0.336	0.296	0.314	0.357

Notes: Other independent variables include effectively applied export tariffs, FDI inflows, age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.7. Including more individual characteristics.

	Male					Female				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.155	-0.690***	-0.019	-0.640***	0.485***	-0.610***	-1.283***	-0.065	-1.072***	0.463***
	(0.126)	(0.211)	(0.222)	(0.184)	(0.141)	(0.109)	(0.220)	(0.235)	(0.141)	(0.109)
Obs	79,993	79,993	79,993	79,993	79,993	80,891	80,891	80,891	80,891	80,891
R-squared	0.332	0.055	0.309	0.180	0.161	0.288	0.074	0.352	0.229	0.168
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.194**		0.240			-0.243***		0.491**		
	(0.073)		(0.154)			(0.018)		(0.213)		
Obs	57,392		57,392			57,941		57,941		
R-squared	0.019		0.325			0.012		0.281		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.297***	1.835***	2.113	1.281**	1.417***	0.281	0.631	1.187	0.188	0.281
	(0.256)	(0.576)	(2.826)	(0.546)	(0.409)	(0.432)	(0.685)	(3.002)	(0.663)	(0.437)
Obs	29,945	6,244	4,346	12,266	17,679	20,385	7,182	2,670	10,701	9,684
R-squared	0.302	0.339	0.241	0.324	0.293	0.339	0.337	0.291	0.315	0.360

Notes: Other independent variables include number of household members, marital status, age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.8. Excluding some sectors.

	Male					Female				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.245	-0.820***	-0.245	-0.885***	0.639***	-0.562***	-1.090***	-0.092	-1.032***	0.470***
	(0.161)	(0.258)	(0.289)	(0.247)	(0.208)	(0.197)	(0.384)	(0.346)	(0.22)	(0.148)
Obs	79,993	79,993	79,993	79,993	79,993	80,891	80,891	80,891	80,891	80,891
R-squared	0.320	0.054	0.307	0.179	0.161	0.281	0.073	0.347	0.227	0.169
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.211***		0.355*			-0.218***		0.523***		
	(0.055)		(0.212)			(0.042)		(0.196)		
Obs	57,392		57,392			57,941		57,941		
R-squared	0.017		0.317			0.011		0.276		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.463***	2.053*	2.350	1.478*	1.573***	0.633	1.125	3.480	0.377	0.837
	(0.449)	(1.104)	(2.598)	(0.863)	(0.503)	(0.603)	(0.877)	(2.970)	(0.958)	(0.702)
Obs	29,945	6,244	4,346	12,198	17,747	20,385	7,182	2,670	10,692	9,693
R-squared	0.294	0.330	0.240	0.317	0.283	0.327	0.325	0.299	0.307	0.348

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.9. Excluding the most apparel-intensive province in 2006.

	Male					**Female**				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.066	-0.708***	0.022	-0.602***	0.536***	-0.657***	-1.321***	-0.076	-1.108***	0.451***
	(0.101)	(0.215)	(0.226)	(0.174)	(0.136)	(0.108)	(0.219)	(0.229)	(0.137)	(0.107)
Obs	78,900	78,900	78,900	78,900	78,900	79,764	79,764	79,764	79,764	79,764
R-squared	0.319	0.055	0.304	0.176	0.158	0.279	0.074	0.344	0.224	0.167
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.190***		0.154			-0.240***		0.503**		
	(0.061)		(0.149)			(0.016)		(0.228)		
Obs	56,612		56,612			57,136		57,136		
R-squared	0.017		0.315			0.010		0.275		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.418***	1.855***	1.950	1.336**	1.613***	0.278	0.526	1.182	0.207	0.330
	(0.252)	(0.582)	(2.872)	(0.547)	(0.379)	(0.417)	(0.683)	(3.064)	(0.676)	(0.432)
Obs	29,289	6,102	4,332	12,063	17,226	19,917	7,023	2,667	10,503	9,414
R-squared	0.301	0.340	0.238	0.324	0.289	0.338	0.338	0.290	0.316	0.358

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.10. Excluding the most basic metal-intensive province in 2006.

	Male					Female				
Panel A: Employment										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	-0.106	-0.684***	0.007	-0.601***	0.494***	-0.629***	-1.308***	-0.058	-1.091***	0.462***
	(0.123)	(0.206)	(0.224)	(0.178)	(0.141)	(0.105)	(0.217)	(0.235)	(0.131)	(0.111)
Obs	78,902	78,902	78,902	78,902	78,902	79,714	79,714	79,714	79,714	79,714
R-squared	0.320	0.054	0.308	0.179	0.160	0.279	0.073	0.349	0.226	0.168
Panel B: Unemployment and Labour force inactivity										
	(1) Unemployment		(2) Labour force inactivity			(3) Unemployment		(4) Labour force inactivity		
Tariff 2006*WTO	-0.200***		0.177			-0.242***		0.480**		
	(0.070)		(0.161)			(0.018)		(0.214)		
Obs	56,615		56,615			57,127		57,127		
R-squared	0.017		0.316			0.011		0.274		
Panel C: Wages										
	(1) All	(2) Manufacturing	(3) Agriculture	(4) Traded	(5) Non-traded	(6) All	(7) Manufacturing	(8) Agriculture	(9) Traded	(10) Non-traded
Tariff 2006*WTO	1.414***	2.000***	1.823	1.397**	1.567***	0.313	0.669	1.176	0.224	0.346
	(0.257)	(0.572)	(2.825)	(0.547)	(0.382)	(0.434)	(0.719)	(3.068)	(0.674)	(0.447)
Obs	29,522	6,068	4,344	12,076	17,446	20,076	7,001	2,667	10,509	9,567
R-squared	0.302	0.340	0.238	0.324	0.291	0.339	0.341	0.291	0.317	0.359

Notes: Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3A.11. Tariff reductions and inter-province migration.

Tariff reductions had no significant effect on migration.

	Male	**Female**
Tariff 2006*WTO	0.100	0.084
	(0.178)	(0.161)
Obs	23,945	23,708
R-squared	0.043	0.042

Notes: The dependent variable is the probability of moving across provinces to find a job. Other independent variables include age, age squared, education, an indicator of the urban area, and an indicator of ethnic minority. We also control for province fixed effects, year fixed effects, and province-specific trends. Robust standard errors clustered at the province level are in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Chapter 4. Institutional similarity and global value chains in Southeast Asian countries

Abstract: This chapter studies the association between institutional similarity and global value chains in the Southeast Asian region (ASEAN). Using the gravity model for global value chain trade between 10 ASEAN countries and their international trade partners in 2000-2015, we highlight the positive impact of institutional similarity on ASEAN countries' global value chain participation of the capital-intensive and sophisticated sector, namely Electrical machinery. There is no significant relationship between institutional similarity and global value chains of the labour-intensive sector, namely Textiles & apparel. We further examine the differential impacts of institutional similarity by trade partners' and ASEAN countries' institutional levels. We classify that a strong-institution country has a positive rule of law indicator, and a weak-institution country has a negative rule of law indicator (the rule of law indicator is obtained from the World Governance Indicators of the World Bank). Our findings suggest that for the Electrical machinery sector, while institutional similarity is positively associated with global value chain trade between weak-institution ASEAN countries and their weak-institution partners, it is detrimental to weak-institution ASEAN countries' global value chain trade with their strong-institution partners.

4.1. Introduction

Over recent decades, the Southeast Asian region (ASEAN) has risen as a major manufacturing hub of the world. According to a McKinsey report, ASEAN ranks the fourth among top exporting regions in the world, behind the European Union, North America, and China/Hong Kong[29]. In comparison to those players, ASEAN participates in the global production network a little bit later. However, given enormous changes in the global economy recently, it is expected that ASEAN will accelerate its contribution to product fragmentation worldwide. Global value chains (GVCs) are of crucial importance to this region. Recent studies show that as GVC trade involves intense interactions among stakeholders along the chain, it depends greatly on contract enforcement, rule and regulations binding trade partners in the transaction (Fernandes et al., 2021; Kowalski et al., 2015). Thus, similarity in institutions with trade partners can be a determinant of

[29] https://www.mckinsey.com/~/media/McKinsey/Industries/Public%20Sector/Our%20Insights/Understanding%20ASEAN%20Seven%20things%20you%20need%20to%20know/Understanding%20ASEAN%20Seven%20things%20you%20need%20to%20know.pdf

the region's participation in the global production network. Yet, the importance of this factor has been inadequately quantified. Our question is: How does the institutional similarity between ASEAN countries and their trade partners affect their global value chain trade?

This chapter provides an empirical analysis of the association between institutional similarity and global value chains in the context of ASEAN's manufacturing sector. We focus on the contract enforcement and rule of law dimension of institutions. By examining global value chains in the Textiles & apparel sector, and the Electrical machinery sector, we shed light on the importance of institutional similarity on bilateral global value chain trade. As can be seen in Figure 4A.1 in the Appendix, the Textiles & apparel sector, and the Electrical machinery sector constitute the biggest average GVC trade volume of the labour-intensive sectors and the capital-intensive sectors in ASEAN over the period 2000-2015, respectively. Focusing on these two sectors allows us to obtain an insightful analysis of institutional similarity on the global value chains of sectors with different levels of factor intensity. Levchenko (2007) also notes that institutions have differential impacts on goods with different levels of skill intensity. Demir & Hu (2021) conclude that institutional similarity fosters exports of sophisticated products.

We apply the accounting methodology proposed by Borin & Mancini (2019) who build on Koopman et al. (2014) for the decomposition of value-added in total exports. Specifically, we examine two dimensions of GVCs, namely backward linkages which identify the content of imported intermediates embodied in a country's exports and forward linkages which identify the content of exported intermediates that is later processed and re-exported by the direct importer. We also account for GVC participation, which is the total sum of backward linkages and forward linkages.

We use the rule of law indicator obtained from the Worldwide Governance Indicators (WGI) of the World Bank to measure institutional quality. The rule of law indicator captures the perceptions of agents' confidence in and obedience to the rules of society and contract enforcement. The unnormalized indicator ranges from -2.5 to 2.5, with a higher value of the indicator indicates stronger rule of law. In this study, a country is classified as a strong-institution one if it has a positive value of unnormalized rule of law indicator and a country is classified as a weak-institution one if it has a negative value of unnormalized rule of law indicator.

Our empirical findings suggest that the impacts of institutional similarity vary by sector. For the Textiles & apparel sector, the similarity in institutional quality between ASEAN countries and their trade partners does not matter for global value chains. However, for the Electrical machinery sector, institutional similarity improves ASEAN countries' GVC participation. We divide the samples into strong-institution ASEAN countries (the unnormalized rule of law

indicator of the ASEAN country is positive) and weak-institution ASEAN countries (the unnormalized rule of law indicator of the ASEAN country is negative). We then estimate the importance of institutional similarity for the two subsamples separately. The empirical results suggest that weak-institution ASEAN countries are more involved in global value chains of the Electrical machinery sector when they are more similar in institutions with weak-institution trade partners. In contrast, improvement in institutional similarity with strong-institution trade partners discourages their GVC trade of the Electrical machinery sector. There is no significant association between institutional similarity and GVC trade of strong-institution ASEAN countries.

Our paper belongs to the strand of literature on the relationship between institutional similarity and trade. Most of this literature employs gravity model for empirical analysis and suggests that similarity in institutions can facilitate smooth cooperation among international trade partners (Barbero et al., 2021; Dixon & Moon, 1993; Martínez-Zarzoso & Márquez-Ramos, 2019; Morrow et al., 1998). Focusing on two dimensions of institutional similarity, namely domestic governing practices and foreign policy, Dixon & Moon (1993) find that the US exports more to similar sociopolitical trade partners. Institutional similarity helps to enhance trust between trade partners. Firms are more confident in their future benefits when they are familiar with the sociopolitical practices of the trade partner's market. Similar findings can be found in Morrow et al. (1998) which suggests a stronger trade relation between countries with similar political and economic systems. It is argued that firms are demotivated to trade with partners in a country that has different practices of solving disputes as firms' ability to forecast their future in this market declines. Martínez-Zarzoso & Márquez-Ramos (2019) show that Middle East and North Africa countries trade more with countries that are more similar to them in terms of regulation and rule of law. However, like most papers on the impact of institutions on traditional trade (Acemoglu et al., 2003; Berden et al., 2014; Márquez-Ramos, 2016; Méon & Sekkat, 2008), they focus more on institutional quality than on institutional similarity between countries. Recently, Barbero et al. (2021) have used sub-national level data to show bigger trade volumes for regions with a similar level of institutions within the EU. Moreover, inter-country trade is more sensitive to institutions than intra-country trade. Examining the effects of institutional similarity from the perspectives of firms, Demir & Hu (2021) suggest that Chinese firms export more sophisticated goods to countries with high level of institutional similarity, as familiarity with trade partner's institutions helps to reduce trade costs for firms and increases their sale of sophisticated goods.

While literature on how institutional similarity affects traditional trade seems to have flourished so far, studies examining the impacts of institutional similarity on global value chains have been far more limited. The few empirical studies mainly focus on how institutional quality

matters for global value chain participation. We complement current literature in two dimensions: First, instead of traditional trade, we examine the impact of institutional similarity on global value chains of one of the most dynamic regions of the world. Second, unlike previous papers that mainly examine institutional quality, we pay careful attention to institutional similarity between ASEAN countries and their trade partners by accounting for the heterogeneity by institutional level.

The remaining sections are organized as follows: Section 4.2 presents the data. Section 4.3 describes our model specification. Section 4.4 discusses empirical findings and provides robustness checks. Conclusion is given in Section 4.5.

4.2. Data

4.2.1. Global value chains

We calculate the indicators of global value chains from the EORA multi-region input-output database which covers 186 countries (Lenzen et al., 2013) and 25 sectors classified according to ISIC Revision 3. The number of countries in the EORA database is the biggest in comparison to other databases (namely the World input-output database-WIOD, the OECD's inter-country input-output tables, the Asian Development Bank's multi-regional input-output tables, etc.). In this chapter, we focus on bilateral GVC trade between 10 ASEAN countries, namely Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Vietnam and their trade partners in the Textiles & apparel sector (ISIC codes 17, 18, 19) and the Electrical machinery sector (ISIC codes 29, 30, 31, 32, 33).

We apply the accounting methodology proposed by Borin & Mancini (2019) which extends Koopman et al. (2014) decomposition of value-added from a country level perspective to any level of disaggregation including the sector, bilateral, and bilateral-sectoral level. The methodology improves the accuracy of other existing methodologies in decomposing gross exports into value-added components and double counted ones (value-added that crosses border multiple times) (Borin & Mancini, 2019). Based on the vertical specialization concept in Hummels et al. (2001), the analytical framework focuses on global value chains of goods that are produced in at least two sequential stages and cross at least two international borders (See Figure 4A.2 in the Appendix for additional details).

To investigate the impacts of institutional similarity on global value chains in ASEAN countries, we look at the following components of gross exports:

(1) the foreign value added (FVA): It measures the content of imported intermediates embodied in gross exports. This indicator captures GVC backward linkages which tend to be stronger when the nation is more involved in downstream production.

(2) the indirectly absorbed value-added exports (InDAVAX) and the reflection (REF): These two components measure the content of exported intermediates that is later processed and re-exported by the direct importer to a third country (lnDAVAX) or to the home country (REF). Thus, they indicate GVC forward linkages. Forward linkages tend to be stronger when the nation is more involved in upstream production. For developed nations, the upstream activities are related to know-how and innovation, whereas for the developing world, upstream nations supply raw materials or primary inputs (Balié et al., 2019; Del Prete et al., 2018).

(3) GVC participation (GVCs): It is the sum of backward GVCs and forward GVCs.

Figure 4.1 illustrates ASEAN countries' GVC trade with their trade partners of the Textile & apparel sector (the left-hand side figure) and the Electrical machinery sector (the right-hand side figure) in 2000-2015 using the measures of GVC trade mentioned above. Over the period, GVC trade is 10 times bigger for the Electrical machinery sector than for the Textile & apparel sector. However, we can observe a similar trend in the two sectors. There is an increase in GVC participation of the two sectors, with backward GVCs outweighing forward GVCs and making the dominant contribution to GVC participation (more than 70%). The figure suggests that ASEAN countries mainly get involved in the global production network by importing inputs. They then process them and re-export final products.

[Figure 4.1 is here]

4.2.2. Institutional similarity

Our variable of interest is the institutional similarity SIM_{ijt} which is proxied with the similarity in the rule of law (RUL) indicator. The indicator is obtained from the Worldwide Governance Indicators (WGI) constructed by Kaufmann et al. (2007). The rule of law indicator captures the perceptions of agents' confidence in and obedience to the rules of society and contract enforcement. The indicator ranges from -2.5 to 2.5, with a higher value of the indicator indicating a stronger rule of law. Following artínez-Zarzoso & Márquez-Ramos (2019), we normalize the indicator to range from 0-1, then construct the institutional similarity indicator (SIM_{ijt}) as follows:

$$SIM_{ijt} = \frac{\min(Standardized\ RUL_{\ it},\ \ Standardized\ RUL_{jt})+1}{\max(Standardized\ RUL_{\ it},\ \ Standardized\ RUL_{jt})+1} \qquad (4.1)$$

The institutional similarity indicator ranges from 0 to 1 and is larger when the two countries are more similar in rule of law.

Figure 4.2 reports the institutional similarity indicator of ASEAN countries with their trade partners (simple average) in the sample in 2000-2015 using the measures described above. In general, the institutional similarity indicator between ASEAN countries and their partners stands

at more than 0.6. We divide trade partners according to their unnormalized rule of law indicator. A trade partner who has a positive unnormalized rule of law indicator is considered as having strong institutions. In contrast, a trade partner who has a negative unnormalized rule of law indicator is considered as having weak institutions. A decomposition of institutional similarity by trade partners' level of institutions shows that ASEAN countries are more similar in rule of law to their weak-institution partners than with their strong-institution partners.

[Figure 4.2 is here]

4.2.3. Other variables

Data on GDP is obtained from the World Bank Development Indicators. Data on other standard variables of the gravity model, namely distance between the two trade partners' capitals ($DIST_{ij}$), dummy variables for trade partners having a common border (BOR_{ij}), a common language ($LANG_{ij}$), colonial ties (COL_{ij}), preferential trade agreements (RTA_{ijt}), and WTO_{ijt} are obtained from the CEPII website[30].

Based on the availability of data from different sources, we obtain a panel dataset of 10 ASEAN countries and 156 other countries over the period 2000-2015. A list of countries in the sample is provided in Table 4A.1 in the Appendix. The data on the rule of law indicator is not available in 2001, so the year 2001 is not covered in our panel data. A descriptive summary of the variables is given in Table 4A.2 in the Appendix.

4.3. Model specification

Following previous studies on the impact of institutions on trade (Berden et al., 2014; Martínez-Zarzoso & Márquez-Ramos, 2019), we employ an augmented gravity model to examine the relationship between institutional similarity and global value chains. In this section, we go through different model specifications (from equation (4.2) to equation (4.5)), which helps to justify our choice of equation (4.4) and equation (4.5) as our main model specifications.

The model specification with standard variables of the gravity model (GDP, distance between the two trade partners' capitals, dummy variables for trade partners having a common border, a common language, colonial ties, dummy variables for trade partners both being members of a trade agreement, or WTO) has the following form:

$$\ln GVC_{ijt} = \alpha_0+\alpha_1 SIM_{ijt}+\alpha_2 \ln GDP_{it}+\alpha_3 \ln GDP_{jt}+\alpha_4 \ln DIST_{ij}+\alpha_5 BOR_{ij}+\alpha_6 LANG_{ij}+\alpha_7 COL_{ij}+ \alpha_8 RTA_{ijt}+\alpha_9 WTO_{ijt}+\delta_t+\varepsilon_{ijt} \quad (4.2)$$

[30] http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=8

where i identifies ASEAN reporter country; j identifies the trade partner country; t identifies the year; $\ln GVC_{ijt}$ stands for the natural logarithm of GVC trade volumes of country i with country j in year t (can be either GVC participation, or backward GVCs, or forward GVCs); SIM_{ijt} is the institutional similarity between country i and country j in year t; $\ln GDP_{it}$ and $\ln GDP_{jt}$ are the natural logarithm of GDP of country i and country j in year t, respectively; $\ln DIS_{ij}$ is the natural logarithm of the geographical distance between the capitals of country i and country j; BOR_{ij} is the dummy variable which equals 1 if the two trade partners share a common border (0 otherwise); $LANG_{ij}$ is the dummy variable which equals 1 if the two trade partners share a common language (0 otherwise); COL_{ij} is the dummy variable which equals 1 if the two trade partners had a colonial relationship (0 otherwise); RTA_{ijt} is the dummy variable which equals 1 if the two trade partners are members of the same regional trade agreement in year t (0 otherwise); WTO_{ijt} is the dummy variable which equals 1 if the two trade partners are members of the WTO in year t (0 otherwise). To avoid the reverse effects of GVCs on RTA and WTO entry and to allow for the delay in the effects of these entries, we use one lag of RTA and one lag of WTO. We also control for year fixed effects (δ_t). ε_{ijt} is the error term.

To account for the multilateral resistance terms (MRTs) that have been argued to affect trade between the two trade partners (Anderson & Van Wincoop, 2003; Baier & Bergstrand, 2007), we incorporate country-pair fixed effects into Equation (4.2). Consequently, the time-invariant control variables, including the distance between the two trade partners' capitals, dummy variables for trade partners having a common border, a common language, colonial ties are absorbed by the country-pair fixed effects. The model specification becomes:

$$\ln GVC_{ijt} = \beta_0+\beta_1 SIM_{ijt}+\beta_2 \ln GDP_{it}+\beta_3 \ln GDP_{jt}+\beta_4 RTA_{ijt}+\beta_5 WTO_{ijt}+\gamma_{ij}+\delta_t+\varepsilon_{ijt} \quad (4.3)$$

where γ_{ij} identifies country-pair fixed effects.

As the multilateral resistance terms can also be time-varying and country-specific (Anderson & Van Wincoop, 2003; Baier & Bergstrand, 2007), our estimates of the gravity variables can be biased if we fail to control for these terms. Thus, we further incorporate reporter-time fixed effects and partner-fixed effects into Equation (4.3) to account for these time-varying resistance terms. Country-specific and time-varying variables, namely $\ln GDP_{it}$ and $\ln GDP_{jt}$ are absorbed by these fixed effects. The model specification becomes:

$$\ln GVC_{ijt} = \theta_0 + \theta_1 SIM_{ijt} + \theta_2 RTA_{ijt} + \theta_3 WTO_{ijt} + \gamma_{ij} +\lambda_{it} +\mu_{jt} + \varepsilon_{ijt} \quad (4.4)$$

where λ_{it} and μ_{jt} identify reporter-year fixed effects and partner-fixed effects, respectively.

We acknowledge that by controlling the multilateral resistance terms, we are not able to separately estimate the effects of the standard variables of the gravity model. However, using fixed-effects allows us to solve the issue of omitted variable biases, which causes the endogeneity

of institutional similarity[31]. We expect to find a positive coefficient of institutional similarity, as familiarity with the trade partner's rule of law motivates countries to participate in the global production network. The impact is expected to be stronger for the sophisticated and capital-intensive sector, namely Electrical machinery than for the labour-intensive sector, namely Textiles & apparel. In section 4.4 we discuss the estimation results of equation (4.4) as our main findings. Estimation results of equation (4.2) and (4.3) are given in Table 4A.3 and Table 4A.4 in the Appendix.

We are further concerned that among ASEAN's trade partners, there are some countries which have strong institutional quality while other countries' institutional quality is weak. What will be the differential effects of institutional similarity on global value chains when ASEAN countries trade with partners with different levels of institutions? In addition, ASEAN countries are heterogeneous by institutional quality. While some countries such as Singapore, Malaysia, and Brunei Darussalam have strong institutions, others' institutions are weak. We therefore address these forementioned issues by incorporating an interaction term of institutional similarity and a dummy variable of the partner's institutions which is equal to unity if the unnormalized rule of law indicator of the trade partner is positive (strong institutions), and equal to zero if the unnormalized rule of law indicator of the trade partner is negative (weak institutions), to the right-hand side of equation (4.4). The model specification becomes:

$$\ln GVC_{ijt} = \theta_0 + \theta_1 SIM_{ijt} + \theta_2 SIM_{ijt}*STR_{jt} + \theta_3 RTA_{ijt} + \theta_4 WTO_{ijt} + \gamma_{ij} + \lambda_{it} + \mu_{jt} + \varepsilon_{ijt} \quad (4.5)$$

where λ_{it} and μ_{jt} identify reporter-year fixed effects and partner-fixed effects, respectively.

STR_{jt} denotes the strong institution indicator of the trade partner. It equals unity if the unnormalized rule of law indicator of the trade partner is positive (strong institutions) and equals zero if the unnormalized rule of law indicator of the trading partner is negative (weak institutions).

We divide the samples into strong-institution ASEAN reporter countries (the unnormalized rule of law indicator of an ASEAN country is positive) and weak-institution ASEAN reporter countries (the unnormalized rule of law indicator of an ASEAN country is negative) and estimate equation (4.5) for the two sub-samples separately. There are three strong-institution ASEAN countries, namely Singapore, Brunei Darussalam, and Malaysia. The other seven ASEAN countries are classified as weak-institution ones.

[31] Martínez-Zarzoso & Márquez-Ramos (2019) point out that institutional quality can be endogenous when it is correlated with the error term in the gravity model. Similarly, in this study, institutional similarity between the two trade partners can also be biased due to its correlation with the error terms. Thus, fixed effects help to account for this endogeneity bias.

4.4. Findings

4.4.1. Empirical findings

In this section, we discuss our main findings based on the estimates of parameters in equation (4.4) and equation (4.5). Estimation results for equation (4.2) and (4.3) are given in Table 4A.3 and Table 4A.4 in the Appendix. We note that the estimates reported in Table 4A.3 and Table 4A.4 are biased because multilateral resistance terms have not been controlled. We account for the impacts of country-pair fixed effects and all multilateral resistance terms by estimating equation (4.4). Standard variables of the gravity model, namely GDP, distance between the two trade partners' capitals, dummy variables for trade partners having a common border, a common language, colonial ties have been absorbed by country time-varying fixed effects and country pair fixed effects.

Table 4.1 reports the estimates of equation (4.4). For the Textiles & Apparel sector, unlike our expectation, we observe no significant relationship between institutional similarity and all the measures of GVCs. For the Electrical machinery sector, we observe a higher volume of GVC trade between ASEAN countries and trade partners who are more similar to ASEAN countries in institutions. Specifically, the estimates in column (4) suggest that a 1-percentage-point increase in the level of institutional similarity between an ASEAN country with its trade partners is associated with a 0.08-percentage-point increase in its GVC participation. These findings are in line with our expectation of the impact of institutional similarity on global value chains of the capital-intensive and sophisticated sector, because the global production networks of sophisticated sectors as represented with the Electrical machinery sector are more sensitive to the distance of the two trade partners' legal systems and contract enforcement. Meanwhile, for labour-intensive sectors, such as Textiles & apparel, institutional similarity is not a significant determinant of their global value chains. Our findings are in line with previous literature on the positive impact of similarity in rule of law on trade (Martínez-Zarzoso & Márquez-Ramos, 2019) and on the differential impacts of institutional similarity on trade across sectors with different levels of factor intensity (Demir & Hu, 2021; Levchenko, 2007).

A noteworthy point in Table 4.1 is that R-squared is very high, ranging from 0.946 to 0.968. We try to scrutinize the factor that determines this high R-squared by excluding country-pair fixed effects, country-year fixed effects and including standard gravity model's variables (namely GDP, distance between the two trade partners' capitals, dummy variables for trade partners having a common border, a common language, colonial ties). R-squared remains at a high level (more than 0.70), which suggests that fixed effects are not the reason for high R-squared. When there are no fixed effects, we try dropping one by one the time-invariant control variables, namely the distance

between the two trade partners' capitals, dummy variables for trade partners having a common border, a common language, colonial ties or country-pair time-varying variables (SIM_{ijt}, RTA_{ijt}, WTO_{ijt}), but R-squared stays at a similarly high level. We then exclude $lnGDP_{it}$ and $lnGDP_{jt}$ and keep all other the standard variables of the gravity model, R-squared drops to less than 0.22. Therefore, the economic size of the reporter and the trade partner drives high R-squared. When we account for the impacts of all multilateral resistance terms by estimating equation (4.4), these two variables are absorbed by country time-varying fixed effects, which increases R-squared[32].

[Table 4.1 is here]

To account for the heterogeneity by institutional quality across ASEAN countries and their trade partners, we regress equation (4.5) for weak-institution ASEAN countries and strong-institution ASEAN countries separately. Table 4.2 reports the estimates for the weak-institution sub-sample and Table 4.3 reports the estimates for the strong-institution sub-sample. For the Textiles and apparel sector, we find no significant correlation between institutional similarity and GVCs across ASEAN countries' institutional quality level.

For the Electrical machinery sector, the similarity in rule of law indicator affects GVCs and their components in different ways, depending on the partner's level of rule of law. Specifically, the estimates in the last three columns of Table 4.2 suggest that institutional similarity encourages weak-institution ASEAN countries' GVC participation with trade partners whose rule of law is weak. However, the sum of the coefficient of institutional similarity and the coefficient of the interaction term turns negative, indicating that institutional similarity with partners that have strong institutions hinders weak ASEAN countries' global value chain participation. Let us consider the impact of a one-standard deviation increase in the institutional similarity indicator to clarify the findings. The standard deviation of the institutional similarity indicator between weak-institution ASEAN countries and their trade partners is 0.2. A one-standard-deviation increase in the institutional similarity indicator between weak-institution ASEAN countries and their weak-institution trade partners, which presents an improvement of the institutional similarity indicator from 0.7 (the level exhibited by the country pair Lao PDR-Panama) to 0.9 (the level exhibited by the country pair Philippines-Georgia), is associated with a 0.02-percentage-point increase in the average value of global value chains. On the contrary, a one-standard-deviation increase in the institutional similarity indicator between weak-institution ASEAN countries and their strong-institution trade partners, which presents an improvement of the institutional similarity indicator

[32] The estimation results for these checks are available from the authors upon request.

from 0.4 (the level exhibited by the country pair Cambodia-Cyprus) to 0.6 (the level exhibited by the country pair Philippines-Korea), is associated with a 0.02-percentage-point decrease in the average value of global value chains.

For the backward and forward components, the coefficients of institutional similarity are insignificant, whereas the coefficients of the interaction terms are significantly negative, suggesting a negative impact of institutional similarity on backward and forward GVCs when weak-institution ASEAN countries trade with strong-institution partners. It is plausible that for weak-institution ASEAN countries, high standards of legal system and contract enforcement for sophisticated and capital-intensive sectors in strong-institution partners' market impose a big burden on firms in ASEAN countries and only competent firms can overcome these barriers. All coefficients in Table 4.3 are insignificantly different from zero, indicating no impacts of institutional similarity on GVCs of strong-institution ASEAN countries when they trade with either strong-institution or weak-institution partners.

[Table 4.2 is here]

[Table 4.3 is here]

4.4.2. Robustness checks

We perform several robustness checks to confirm the consistency of our estimates of parameters in equation (4.4) and equation (4.5) reported in Table 4.1, Table 4.2, and Table 4.3.

First, it is possible that the similarity in economic size of the two countries can be an important determinant of global value chains, and its effect is captured by institutional similarity. Therefore, we include an indicator of GDP similarity in the right-hand side of equation (4.4) and equation (4.5) to control the effect of both GDP similarity and institutional similarity. The GDP similarity indicator is constructed by using equation (4.1), with GDP being used instead of the rule of law indicator. The estimates reported in Table 4A.5 are similar to our findings in the previous sub-section, suggesting that our findings are robust.

We then test the consistency of results by changing the measurement of institutional similarity. The institutional similarity indicator (SIM_{ijt}) is measured as $SIM_{ijt}=-|RUL_{it} - RUL_{jt}|$. The rule of law indicator is unnormalized and ranges from -2.5 to 2.5. SIM_{ij} ranges from -5 to 0. The institutional similarity indicator is maximized when the two countries have the same rule of law indicators. Although the magnitude of the estimates changes when we use a different measure of institutional similarity, from Table 4A.6 we can see an increase in global value chain participation of the Electrical machinery sector when ASEAN countries are more similar with their partners in rule of law. Similar signs of the coefficients are also observed when we estimate

equation (4.5) for weak-institution and strong-institution ASEAN countries separately. Hence, our findings are robust.

This chapter investigates the impact of institutional similarity on global value chain trade. It is also possible that the similarity in institutional quality between the two trade partners is a determinant of their global value chain trade. Acemoglu et al. (2005) point out significant changes in institutions under the impact of international trade. We acknowledge that failing to address the endogeneity of institutional similarity may induce biased estimates. In this chapter, we partially deal with that potential issue by using one lag of institutional similarity instead of the current institutional similarity as a robustness check. The estimates reported in Table 4A.7 are consistent with our baseline findings, indicating that our findings are robust. Future research that further accounts for the endogeneity of institutional similarity would be of crucial importance to the literature on global value chain trade.

4.5. Conclusion

In this chapter, we study how the similarity in rule of law affects ASEAN countries' global value chain trade. The chapter provides empirical evidence of a dynamic region which is making impressive progress in global value chain involvement. The analysis considers differential effects of institutional similarity across sectors by focusing on the Textiles & Apparel sector which is labour-intensive and the Electrical machinery sector which is capital-intensive and sophisticated.

Our estimates of the gravity model suggest that institutional similarity enhances the capital-intensive and sophisticated sector's global value chains. In particular, we find a positive association between institutional similarity and global value chain participation of the Electrical machinery sector. Our findings are consistent with previous works that institutional similarity matters more for the capital-intensive and sophisticated sector.

The empirical analysis calls for more efforts of weak-institution ASEAN countries to improve their legal system and contract enforcement to better facilitate their global value chain involvement. By accounting for the heterogeneity in terms of institutional quality, we point out that for weak-institution ASEAN countries, the increase in institutional similarity with weak-institution partners encourages their global value chains of the Electrical machinery sector. In contrast, improvement in institutional similarity with strong- institution partners is negatively associated with the sector's global value chains. High standards of legal system and contract enforcement for sophisticated and capital-intensive sectors in strong-institution partner countries may act as a big burden on firms in weak-institution ASEAN countries.

The chapter provides empirical analysis of the importance of institutional similarity in terms of rule of law on bilateral global value chain trade. As a venue for future studies, there is still little evidence on the relationship between other dimensions of institutions, for example, political stability, governance, control of corruption and global value chains. It is recommended that further research should cover these dimensions to offer more empirical findings on the impact of institutional similarity on GVCs.

References

Acemoglu, D., Johnson, S., Robinson, J., & Thaicharoen, Y. (2003). Institutional Causes, Macroeconomic Symptoms: Volatility, Crises and Growth. *Journal of Monetary Economics*, *50*(1), 49–123. https://doi.org/10.1016/S0304-3932(02)00208-8

Anderson, J. E., & Van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, *93*(1), 170–192. https://doi.org/10.1257/000282803321455214

Araujo, L., Mion, G., & Ornelas, E. (2016). Institutions and Export Dynamics. *Journal of International Economics*, *98*, 2–20. https://doi.org/10.1016/j.jinteco.2015.08.004

Baier, S. L., & Bergstrand, J. H. (2007). Do Free Trade Agreements Actually Increase Members' International Trade? *Journal of International Economics*, *71*(1), 72–95. https://doi.org/10.1016/j.jinteco.2006.02.005

Balié, J., Del Prete, D., Magrini, E., Montalbano, P., & Nenci, S. (2019). Does Trade Policy Impact Food and Agriculture Global Value Chain Participation of Sub-Saharan African Countries? *American Journal of Agricultural Economics*, *101*(3), 773–789. https://doi.org/10.1093/ajae/aay091

Barbero, J., Mandras, G., Rodríguez-Crespo, E., & Rodríguez-Pose, A. (2021). Quality of Government and Regional Trade: Evidence from European Union Regions. *Regional Studies*, *55*(7), 1240–1251. https://doi.org/10.1080/00343404.2021.1873934

Berden, K., Bergstrand, J. H., & van Etten, E. (2014). Governance and Globalisation. *World Economy*, *37*(3), 353–386. https://doi.org/10.1111/twec.12135

Borin, A., & Mancini, M. (2019). Measuring What Matters in Global Value Chains and Value-Added Trade. *Measuring What Matters in Global Value Chains and Value-Added Trade, April 2019*. https://doi.org/10.1596/1813-9450-8804

Del Prete, D., Giovannetti, G., & Marvasi, E. (2018). Global Value Chains: New Evidence for North Africa. *International Economics*, *153*(March 2017), 42–54. https://doi.org/10.1016/j.inteco.2017.03.002

Demir, F., & Hu, C. (2021). Institutional Similarity, Firm Heterogeneity and Export Sophistication. *World Economy*, *August 2019*, 1–29. https://doi.org/10.1111/twec.13201

Dixon, W. J., & Moon, B. E. (1993). Political Similarity and American Foreign Trade Patterns. *Political Research Quarterly*, *46*(1), 5. https://doi.org/10.2307/449053

Fernandes, A. M., Kee, H. L., & Winkler, D. (2021). Determinants of Global Value Chain Participation: Cross-Country Evidence. In *World Bank Policy Research Working Paper* (No. 9197; Issue March). https://doi.org/10.2139/ssrn.3598755

Hummels, D., Ishii, J., & Yi, K. M. (2001). The Nature and Growth of Vertical Specialization in World Trade. *Journal of International Economics*, *54*(1), 75–96. https://doi.org/10.1016/S0022-1996(00)00093-3

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2007). Governance Matters VI: Aggregate and Individual Governance Indicators 1996-2006. In *World Bank Economic Review* (Vol. 4280, Issue July 2007).

Koopman, R., Wang, Z., & Wei, S.-J. (2014). Tracing Value-Added and Double Counting. *American Economic Review*, *104*(2), 459–494.

Kowalski, P., Lopez, J., Ragoussis, A., & Ugarte, C. (2015). Participation of Developing Countries in Global Value Chains. In *OECD Trade Policy Papers* (No. 179; Vol. 179).

Lenzen, M., Moran, D., Kanemoto, K., & Geschke, A. (2013). Building Eora: a Global Multi-Region Input-Output Database At High Country and Sector Resolution. *Economic Systems Research*, *25*(1), 20–49. https://doi.org/10.1080/09535314.2013.769938

Levchenko, A. A. (2007). Institutional Quality and International Trade. *Review of Economic Studies*, *74*(3), 791–819. https://doi.org/10.1111/j.1467-937X.2007.00435.x

Márquez-Ramos, L. (2016). The Role of Institutional Environment in International Trade: The Case of Spanish Regions. *REGION – Journal of The European Regional Science Association*, *3*(2), 125–140. https://doi.org/10.18335/region.v3i2.147

Figures & Tables

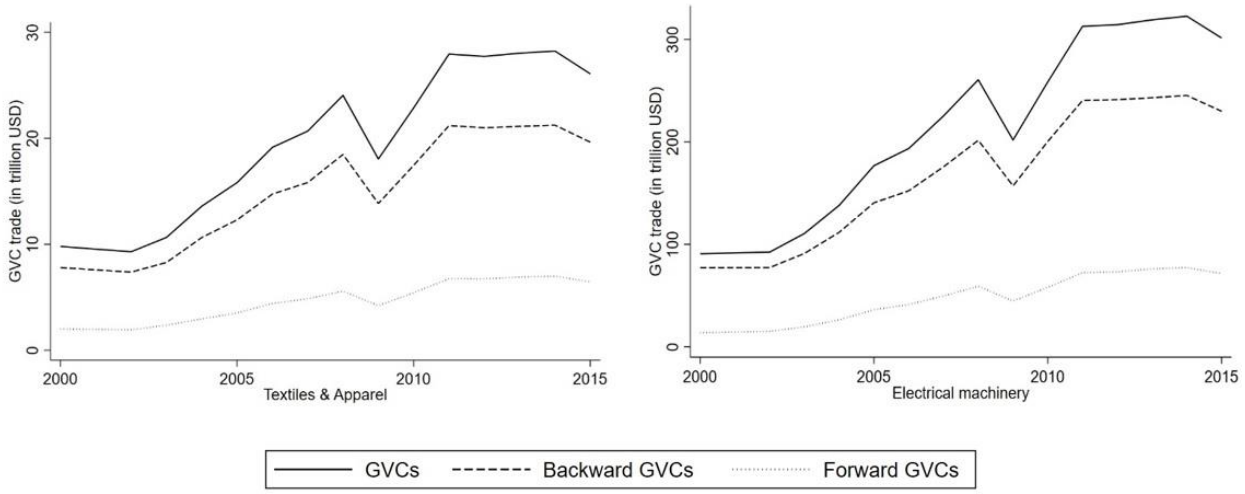

Figure 4.1. ASEAN's GVC trade of Textiles & apparel, and Electrical machinery (in trillion USD) in 2000-2015.

Source: The authors' calculation from the EORA data.

Notes: Backward GVCs measure the content of imported intermediates embodied in gross exports. Forward GVCs measure the content of exported intermediates that is later processed and re-exported by the direct importer. GVC participation (GVCs) is the sum of backward GVCs and forward GVCs

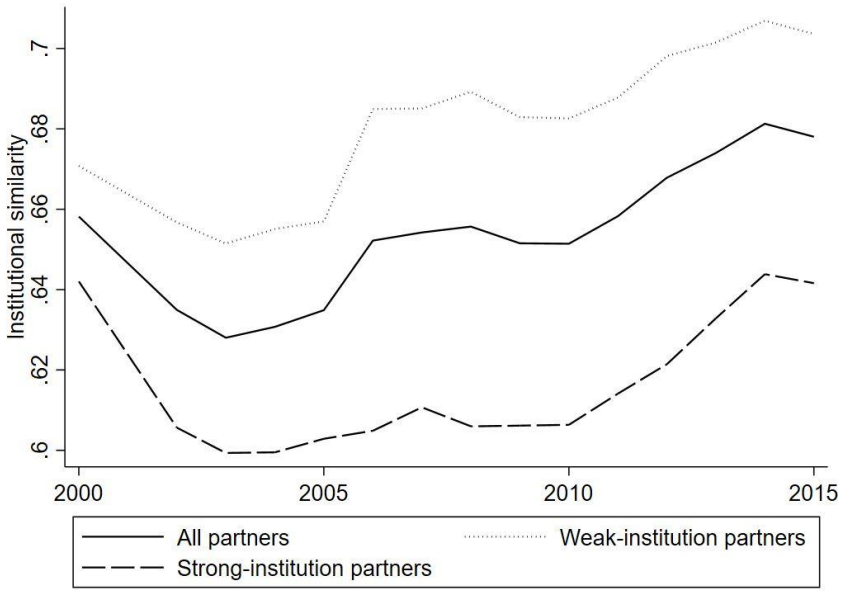

Figure 4.2. Institutional similarity indicator of ASEAN countries with their trade partners in 2000-2015.

Source: The authors' calculation from the rule of law indicator of WGI obtained from the World Bank.

Notes: The institutional similarity indicator ranges from 0 to 1 and is larger when the two countries are more similar in rule of law. A trade partner whose unnormalized rule of law indicator is positive is considered as a strong-institution partner. A trade partner whose unnormalized rule of law indicator is negative is considered as a weak-institution partner.

Table 4.1. The impacts of institutional similarity on ASEAN countries' GVCs.

	Textiles & apparel			Electrical machinery		
	(1)	(2)	(3)	(4)	(5)	(6)
	GVCs	**GVCB**	**GVCF**	**GVCs**	**GVCB**	**GVCF**
Institutional similarity	-0.020	-0.056	0.001	0.076**	0.044	0.036
	(0.040)	(0.039)	(0.034)	(0.035)	(0.033)	(0.028)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,750	24,750	24,750	24,750	24,750	24,750
R-squared	0.946	0.949	0.951	0.948	0.950	0.968

Notes: Other control variables include dummy variables for the two trade partners both being members of an RTA, or the WTO. Robust standard errors clustered at the country pair level are in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 4.2. The impacts of institutional similarity on weak-institution ASEAN countries by partner's institutions.

	Textiles & apparel			Electrical machinery		
	(1)	(2)	(3)	(4)	(5)	(6)
	GVCs	**GVCB**	**GVCF**	**GVCs**	**GVCB**	**GVCF**
Institutional similarity	-0.010	-0.055	-0.020	0.093**	0.051	0.024
	(0.049)	(0.049)	(0.040)	(0.043)	(0.041)	(0.034)
Institutional similarity*STR_{jt}	0.008	-0.010	0.019	-0.172**	-0.226***	-0.172**
	(0.081)	(0.075)	(0.068)	(0.076)	(0.080)	(0.068)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,360	17,360	17,360	17,360	17,360	17,360
R-squared	0.952	0.952	0.958	0.950	0.950	0.966

Notes: Other control variables include dummy variables for the two trade partners both being members of an RTA, or the WTO. STR_{jt} denotes the strong institution indicator of the trade partner. It equals unity if the unnormalized rule of law indicator of the trade partner is positive (strong institutions), and equal to zero if the unnormalized rule of law indicator of the trading partner is negative (weak institutions). There are three strong-institution ASEAN countries, namely Singapore, Brunei, and Malaysia. The other seven ASEAN countries are classified as weak-institution ones. Robust standard errors clustered at the country pair level are in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 4.3. The impacts of institutional similarity on strong-institution ASEAN countries by partner's institutions.

	Textiles & apparel			**Electrical machinery**		
	(1)	(2)	(3)	(4)	(5)	(6)
	GVCs	**GVCB**	**GVCF**	**GVCs**	**GVCB**	**GVCF**
Institutional similarity	-0.064	-0.047	0.010	-0.055	-0.002	0.025
	(0.144)	(0.145)	(0.143)	(0.160)	(0.157)	(0.134)
Institutional similarity*STR_{jt}	0.220	0.138	0.133	0.189	0.110	0
	(0.155)	(0.157)	(0.152)	(0.178)	(0.175)	(0.149)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,440	7,440	7,440	7,440	7,440	7,440
R-squared	0.949	0.958	0.947	0.960	0.965	0.981

Notes: Other control variables include dummy variables for the two trade partners both being members of an RTA, or the WTO. STR_{jt} denotes the strong institution indicator of the trade partner. It equals unity if the unnormalized rule of law indicator of the trade partner is positive (strong institutions), and equal to zero if the unnormalized rule of law indicator of the trading partner is negative (weak institutions). There are three strong-institution ASEAN countries, namely Singapore, Brunei, and Malaysia. The other seven ASEAN countries are classified as weak-institution ones. Robust standard errors clustered at the country pair level are in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Appendix.

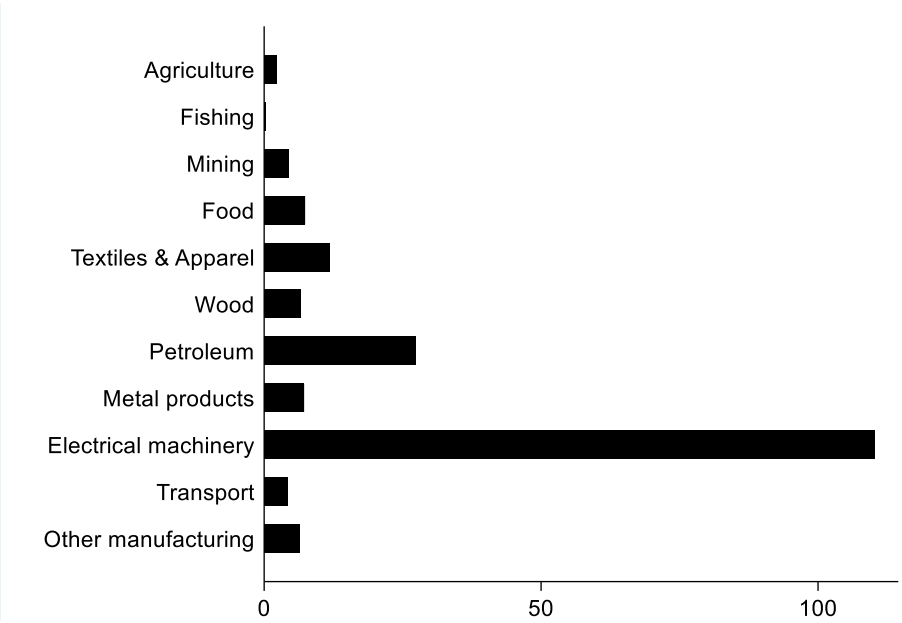

Figure 4A.1.

ASEAN's average GVC trade volume of traded sectors (in trillion USD) in 2000-2015.

Source: The authors' calculation from the EORA database.

Notes: We apply the accounting methodology proposed by Borin & Mancini (2019) which extends Koopman et al. (2014) decomposition of value-added to calculate GVC trade. Our analytical framework focuses on global value chains of goods that are produced in at least two sequential stages and cross at least two international borders (See Figure 4A.2 for additional details). GVC trade volume is calculated at bilateral level for each traded sector in each ASEAN country. ASEAN's average GVC trade volume for each sector is the simple average of 10 ASEAN countries' GVC trade volumes of that sector in the sample.

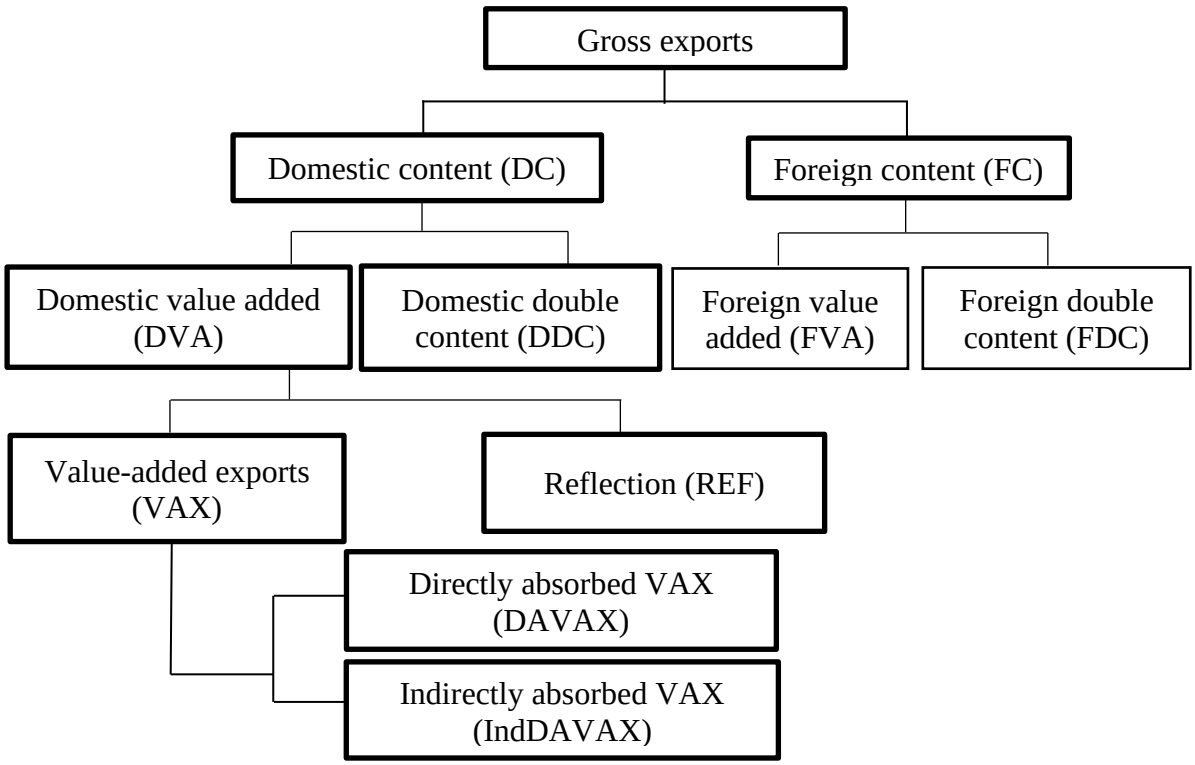

Figure 4A.2. A decomposition of value-added in exports extended by Borin & Mancini (2019).

Figure 4A.2 presents a decomposition of value-added in exports by Borin & Mancini (2019). The analytical framework focuses on global value chains of goods that are produced in at least two sequential stages and cross at least two international borders. Gross exports of a country are composed of domestic content (DC) and foreign content (FC). One component of domestic value added (DVA) in domestic content, namely the domestic value-added exports which are either final products or intermediates can be either absorbed directly in the direct importer's country (DAVAX (Directly absorbed VAX)) or re-exported to a third country for its consumption or exports (IndDAVAX). Another component of DVA, the reflection (REF) is domestic value-added that is re-imported to the home country from the direct importer or from a third country. In terms of foreign content, foreign value added (FVA) measures the content of imported intermediates embodied in gross exports. Both domestic content and foreign content have a double-counted component which is domestic value-added and foreign value-added, respectively that crosses a border multiple time (DDC (Domestic Double Content) and FDC (Foreign Double Content), respectively).

Table 4A.1. List of countries in the sample.

No	Country	No	Country	No	Country
1	Afghanistan	57	France	113	New Zealand
2	Albania	58	Gabon	114	Nicaragua
3	Algeria	59	The Gambia	115	Niger
4	Andorra	60	Georgia	116	Nigeria
5	Angola	61	Germany	117	Norway
6	Antigua and Barbuda	62	Ghana	118	Oman
7	Argentina	63	Greece	119	Pakistan
8	Armenia	64	Guatemala	120	Panama
9	Australia	65	Guinea	121	Papua New Guinea
10	Austria	66	Guyana	122	Paraguay
11	Azerbaijan	67	Haiti	123	Peru
12	The Bahamas	68	Honduras	124	Philippines
13	Bahrain	69	Hong Kong, China	125	Poland
14	Bangladesh	70	Hungary	126	Portugal
15	Barbados	71	Iceland	127	Qatar
16	Belarus	72	India	128	Romania
17	Belgium	73	Indonesia	129	Russian Federation
18	Belize	74	Iran, Islamic Rep.	130	Rwanda
19	Benin	75	Iraq	131	Samoa
20	Bhutan	76	Ireland	132	Sao Tome and Principe
21	Bolivia	77	Israel	133	Saudi Arabia
22	Bosnia and Herzegovina	78	Italy	134	Senegal
23	Botswana	79	Jamaica	135	Serbia
24	Brazil	80	Japan	136	Seychelles
25	Brunei Darussalam	81	Jordan	137	Sierra Leone
26	Bulgaria	82	Kazakhstan	138	Singapore
27	Burkina Faso	83	Kenya	139	Slovak Republic
28	Burundi	84	Korea, Rep.	140	Slovenia
29	Cambodia	85	Kuwait	141	Somalia
30	Cameroon	86	Kyrgyz Republic	142	South Africa
31	Canada	87	Lao PDR	143	Spain
32	Cayman Islands	88	Latvia	144	Sri Lanka
33	Central African Republic	89	Lebanon	145	Suriname
34	Chad	90	Lesotho	146	Sweden
35	Chile	91	Liberia	147	Switzerland
36	China	92	Libya	148	Syrian Arab Republic
37	Colombia	93	Lithuania	149	Tajikistan
38	Congo, Dem. Rep.	94	Luxembourg	150	Tanzania
39	Congo, Rep.	95	Macao	151	Thailand
40	Costa Rica	96	Madagascar	152	Togo
41	Cote d'Ivoire	97	Malawi	153	Trinidad and Tobago
42	Croatia	98	Malaysia	154	Tunisia
43	Cuba	99	Maldives	155	Turkey
44	Cyprus	100	Mali	156	Uganda
45	Czech Republic	101	Malta	157	United Arab Emirates
46	Denmark	102	Mauritania	158	United Kingdom
47	Djibouti	103	Mauritius	159	United States
48	Dominican Republic	104	Mexico	160	Uruguay
49	Ecuador	105	Moldova	161	Uzbekistan
50	Egypt, Arab Rep.	106	Mongolia	162	Vanuatu
51	El Salvador	107	Morocco	163	Venezuela
52	Eritrea	108	Mozambique	164	Vietnam
53	Estonia	109	Myanmar	165	Yemen, Rep.
54	Ethiopia (excludes Eritrea)	110	Namibia	166	Zambia
55	Fiji	111	Nepal		
56	Finland	112	Netherlands		

Table 4A.2. Descriptive statistics.

	Min	Max	Mean	SD	Obs
GVCs of Textiles & Apparel					
GVC participation (million USD)	0	1695.95	12.20	72.33	24,750
Backward GVCs (million USD)	0	1664.26	9.33	63.09	24,750
Forward GVCs (million USD)	0	627.64	2.87	18.16	24,750
GVCs of Electrical machinery					
GVC participation (million USD)	0	26491.80	134.10	972.63	24,750
Backward GVCs (million USD)	0	24426.73	104.43	776.25	24,750
Forward GVCs (million USD)	0	10967.28	29.66	276.71	24,750
Independent variables					
Institutional similarity	0.01	1	0.66	0.20	24,750
RTA (1 lag)	0	1	0.09	0.28	24,750
WTO (1 lag)	0	1	0.69	0.46	24,750
ASEAN's GDP (million USD)	1,731.20	917,869.91	157,975.58	192930.98	24,750
Partner's GDP (million USD)	85.17	18,238,301	353,802.67	1,355,180.6	24,430
Geographical distance (km)	315.54	19,812.04	9,542.62	4,544.40	24,750
Common language	0	1	0.06	0.24	24,750
Common colonizer	0	1	0.15	0.35	24,750
Common border	0	1	0.02	0.13	24,750

Source: The authors' calculation from the EORA database, the World Bank, and the CEPII website.

Table 4A.3. Gravity model with year fixed effects.

	Textiles & apparel			Electrical machinery		
	(1)	(2)	(3)	(4)	(5)	(6)
	GVCs	**GVCB**	**GVCF**	**GVCs**	**GVCB**	**GVCF**
Institutional similarity	0.218	1.480***	0.192	1.188***	3.122***	1.020***
	(0.197)	(0.272)	(0.198)	(0.234)	(0.355)	(0.205)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,430	24,430	24,430	24,430	24,430	24,430
R-squared	0.714	0.635	0.652	0.734	0.632	0.698

Notes: Other control variables include reporter's GDP, partner's GDP, distance between the two trade partners' capitals, dummy variables for trade partners having a common border, a common language, colonial ties, dummy variables for the two trade partners both being members of an RTA, or the WTO. Robust standard errors clustered at the country pair level are in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 4A.3 reports the estimates for equation (4.2) over the period 2000-2015 for different components of value added in exports. In equation (4.2) we control standard variables of the gravity model and year fixed effects. The first three columns (from 1 to 3) report the coefficients for the Textiles & Apparel sector and the last three columns (from 4 to 6) report the coefficients for the Electrical machinery sector. For the Textiles & Apparel sector, we only observe a significantly positive correlation between backward GVCs and institutional similarity. Meanwhile, for the Electrical machinery sector, institutional similarity is positively associated with global value chain participation (GVCs) and all components of global value chains (backward GVCs and forward GVCs). We note that the estimates reported in Table 4A.3 are biased because the multilateral resistance terms have not been controlled yet.

Table 4A.4. Gravity model with year fixed effects and country pair fixed effects.

	Textiles & apparel			Electrical machinery		
	(1)	(2)	(3)	(4)	(5)	(6)
	GVCs	**GVCB**	**GVCF**	**GVCs**	**GVCB**	**GVCF**
Institutional similarity	0.225***	0.118*	0.357***	0.291***	0.167**	0.139**
	(0.061)	(0.070)	(0.066)	(0.056)	(0.070)	(0.061)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,430	24,430	24,430	24,430	24,430	24,430
R-squared	0.827	0.776	0.742	0.823	0.721	0.786

Notes: Other control variables include reporter's GDP, partner's GDP, dummy variables for the two trade partners both being members of an RTA, or the WTO. Robust standard errors clustered at the country pair level are in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

The estimates of equation (4.3) controlling for the impacts of time-invariant bilateral resistance terms are reported in Table 4A.4. The coefficients reported in the first three columns of this table for the Textiles & Apparel sector suggest a positive correlation between institutional similarity and global value chain participation (GVCs), both backward GVCs and forward GVCs. Positive effects of institutional similarity on GVCs are also found for the Electrical machinery sector. Nevertheless, the estimates reported in Table 4A.4 are also biased because time-variant multilateral resistance terms have not been controlled.

Table 4A.5. Robustness check: GDP similarity is included.

	Textiles & apparel			Electrical machinery		
	(1) GVCs	(2) GVCB	(3) GVCF	(4) GVCs	(5) GVCB	(6) GVCF
Panel A: Whole samples						
Institutional similarity	-0.020	-0.056	0.001	0.076**	0.044	0.036
	(0.040)	(0.039)	(0.034)	(0.035)	(0.033)	(0.028)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,750	24,750	24,750	24,750	24,750	24,750
R-squared	0.946	0.949	0.951	0.948	0.950	0.968
Panel B: Weak-institution ASEAN countries						
Institutional similarity	-0.009	-0.053	-0.018	0.091**	0.050	0.023
	(0.049)	(0.049)	(0.040)	(0.043)	(0.041)	(0.034)
Institutional similarity*Strong	0.006	-0.012	0.016	-0.170**	-0.224***	-0.171**
	(0.081)	(0.075)	(0.068)	(0.077)	(0.080)	(0.068)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,325	17,325	17,325	17,325	17,325	17,325
R-squared	0.952	0.953	0.958	0.950	0.950	0.966
Panel C: Strong-institution ASEAN countries						
Institutional similarity	-0.064	-0.048	0.014	-0.050	0.002	0.032
	(0.143)	(0.145)	(0.143)	(0.159)	(0.157)	(0.134)
Institutional similarity*STR_{jt}	0.220	0.139	0.124	0.177	0.099	-0.017
	(0.154)	(0.157)	(0.151)	(0.179)	(0.175)	(0.149)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,425	7,425	7,425	7,425	7,425	7,425
R-squared	0.949	0.958	0.947	0.960	0.965	0.981

Notes: Other control variables include GDP similarity, dummy variables for trade partners both being members of an RTA, or WTO. STR_{jt} denotes the strong institution indicator of the trade partner. It equals unity if the unnormalized rule of law indicator of the trade partner is positive (strong institutions), and equal to zero if the unnormalized rule of law indicator of the trading partner is negative (weak institutions). There are three strong-institution ASEAN countries, namely Singapore, Brunei, and Malaysia. The other seven ASEAN countries are classified as weak-institution ones. Robust standard errors clustered at the country pair level are in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 4A.6. Robustness check: SIM_{ijt}=-|RUL_{it} – RUL_{jt}|.

	Textiles & apparel			Electrical machinery		
	(1) GVCs	(2) GVCB	(3) GVCF	(4) GVCs	(5) GVCB	(6) GVCF
Panel A: Whole samples						
Institutional similarity	-0.007	-0.021	0.002	0.023*	0.009	0.008
	(0.014)	(0.014)	(0.013)	(0.013)	(0.012)	(0.010)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,750	24,750	24,750	24,750	24,750	24,750
R-squared	0.946	0.949	0.951	0.948	0.950	0.968
Panel B: Weak-institution ASEAN countries						
Institutional similarity	-0.014	-0.038*	-0.013	0.039*	0.016	0.005
	(0.023)	(0.023)	(0.019)	(0.020)	(0.020)	(0.016)
Institutional similarity*Strong	0.013	0.009	0.010	-0.074***	-0.094***	-0.070***
	(0.029)	(0.026)	(0.024)	(0.028)	(0.030)	(0.025)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,325	17,325	17,325	17,325	17,325	17,325
R-squared	0.952	0.952	0.958	0.950	0.950	0.966
Panel C: Strong-institution ASEAN countries						
Institutional similarity	0.006	0.011	0.027	0.014	0.024	0.022
	(0.029)	(0.029)	(0.031)	(0.028)	(0.028)	(0.024)
Institutional similarity*STR_{jt}	0.032	0.013	0.010	0.027	0.012	-0.008
	(0.032)	(0.032)	(0.032)	(0.036)	(0.035)	(0.029)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,425	7,425	7,425	7,425	7,425	7,425
R-squared	0.949	0.958	0.947	0.960	0.965	0.981

Notes: Other control variables include GDP similarity, dummy variables for trade partners both being members of an RTA, or the WTO. The institutional similarity indicator (SIM_{ijt}) is measured as SIM_{ijt}=-|RUL_{it} – RUL_{jt}|. The rule of law indicator (RUL) is unnormalized and ranges from -2.5 to 2.5. STR_{jt} denotes the strong institution indicator of the trade partner. It equals unity if the unnormalized rule of law indicator of the trade partner is positive (strong institutions), and equal to zero if the unnormalized rule of law indicator of the trading partner is negative (weak institutions). There are three strong-institution ASEAN countries, namely Singapore, Brunei, and Malaysia. The other seven ASEAN countries are classified as weak-institution ones. Robust standard errors clustered at the country pair level are in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 4A.7. Robustness check: One lag of institutional similarity is used as the main variable

	Textiles & apparel			Electrical machinery		
	(1) GVCs	(2) GVCB	(3) GVCF	(4) GVCs	(5) GVCB	(6) GVCF
Panel A: Whole samples						
Institutional similarity	-0.010	-0.046	-0.004	0.061*	0.029	0.025
	(.035)	(0.034)	(0.029)	(0.031)	(0.029)	(0.025)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,100	23,100	23,100	23,100	23,100	23,100
R-squared	0.951	0.953	0.955	0.957	0.958	0.971
Panel B: Weak-institution ASEAN countries						
Institutional similarity	-0.007	-0.049	-0.029	0.016	0.062	0.020
	(0.043)	(0.042)	(0.034)	(0.037)	(0.038)	(0.036)
Institutional similarity*Strong	0.004	-0.017	0.005	-0.205***	-0.122*	-0.181***
	(0.071)	(0.065)	(0.060)	(0.069)	(0.065)	(0.066)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,170	16,170	16,170	16,170	16,170	16,170
R-squared	0.958	0.957	0.963	0.957	0.956	0.972
Panel C: Strong-institution ASEAN countries						
Institutional similarity	0.013	0.023	0.047	-0.090	-0.024	-0.006
	(0.120)	(0.120)	(0.119)	(0.123)	(0.119)	(0.101)
Institutional similarity*STR_{jt}	0.134	0.059	0.074	0.174	0.097	0.010
	(0.138)	(0.139)	(0.136)	(0.137)	(0.133)	(0.111)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant MRTs	Yes	Yes	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,930	6,930	6,930	6,930	6,930	6,930
R-squared	0.952	0.960	0.948	0.967	0.972	0.981

Notes: Other control variables include GDP similarity, dummy variables for trade partners both being members of an RTA, or the WTO. The institutional similarity indicator (SIMijt) is measured as one lag of similarity in rule of law. The rule of law indicator (RUL) is unnormalized and ranges from -2.5 to 2.5. STRjt denotes the strong institution indicator of the trade partner. It equals unity if the unnormalized rule of law indicator of the trade partner is positive (strong institutions), and equal to zero if the unnormalized rule of law indicator of the trading partner is negative (weak institutions). There are three strong-institution ASEAN countries, namely Singapore, Brunei, and Malaysia. The other seven ASEAN countries are classified as weak-institution ones. Robust standard errors clustered at the country pair level are in parenthesis. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Chapter 5. Conclusion

Motivated by the remarkable rise of Southeast Asian countries over the past decades, the three essays in this thesis provide new empirical evidence on the impacts of global value chains and international trade policy on the labour market, and the role of institutional similarity in the global value chains for countries in this region.

Chapter 2 sheds light on the relationship between global value chains and female employment in Vietnam. Our findings indicate that global value chains create more jobs for the virtue of women's dexterity but fall short of embracing female employees in more technology-intensive GVC-involved firms. We add to the current literature three distinguishing points. First, we account for the gender-dimension impacts of global value chains in the case of Vietnam, a trade-oriented developing country in ASEAN. Second, we address the issue of the two-way feedback between global value chains and female employment. Using the instrumental approach, we take into account the endogeneity of the firm's involvement in GVCs. Furthermore, we provide empirical evidence of global value chains from the aspect of small and medium enterprises. We acknowledge that our measurement of global value chain involvement primarily refers to the international activities of the firm, which also represent the main types of GVC involvement, but it does not entirely capture global production networks. Better data on firms across the spectrum of sizes and activities in the supply chains in future studies can provide useful details on the linkages between global value chains and female employment in developing countries, including Vietnam and others.

Chapter 3 focuses on the impacts of import tariff reductions on the labour market, using household survey data in Vietnam. Our identification strategy is based on the exogeneity of tariff reductions after Vietnam's accession to the WTO. We use a difference in difference approach to study the variation in the impacts of trade shocks across 61 provinces. We also add to the literature on the trade liberalization at the sub-national level by accounting for different impacts by gender and employing individual-level data. We find that trade liberalisation created winners and losers in the society. There was a movement of displaced workers from the traded to the non-traded sector in more exposed provinces. The probability of being unemployed declined for both men and women but there was also an increase in the probability of being inactive for women in these provinces. While there was an increase in wages for male workers, there was no significant change in wages for female workers under the impacts of tariff reductions. Additional data on other stakeholders should be incorporated in future studies to explain the mechanism of the impacts in more details.

Different from Chapter 2 and Chapter 3 which use survey data in a country, Chapter 4 employs data from the EORA database to calculate GVC indicators between 10 Southeast Asian countries and their worldwide trade partners. We examine the association between institutional similarity and global value chains of the Textiles & apparel sector and the Electrical machinery sector. Unlike previous studies which mainly look at the impacts of institutional quality, we focus on the impacts of institutional similarity, considering different levels of institutions across ASEAN countries and across their trade partners. While we observe no significant effect of institutional similarity on global value chains of the Textiles & apparel sector, we find that it is positively associated with global value chains of the Electrical machinery sector. Moreover, for this capital-intensive sector, improvement in institutional similarity enhances global value chain trade between weak-institution ASEAN countries and their weak-institution partners, but it discourages global value chain trade between weak-institution ASEAN countries and their strong-institution partners. While we use the rule of law indicator obtained from the World Governance Indicators to measure institutions, we acknowledge that institutions can also be captured by other indicators, for instance, political stability, control of corruption, government effectiveness. It can be useful for future studies to account for these indicators to offer a more comprehensive understanding of the association between various aspects of institutional similarity and global value chains.