Trade liberalization and employments: the case of Vietnam

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Abstract

This study seeks to answer two inter-related questions for Viet Nam: (i) how opening up the domestic market affects the allocation of workers across self-employment, wage work in household businesses and wag work in the formal sector (private, foreign invested and state enterprises);and (ii) income differentials between these kinds of employment. An extension of the two-step model in Goldberg and Pavcnik (2003) and its modification are employed to answer the questions. Data is sourced from five Viet Nam Household Living Standard Surveys from 2002 to 2010 and available measures of opening up the domestic market in Viet Nam. The results indicate that opening up the domestic market does not have significant impacts on labor allocation as well as income differentials between wage workers in different sectors. Meanwhile, the impact on income differentials between self-employers and wage workers in the formal sectors is not clear.

Keywords: Opening up, labor allocation, income differentials, informality, Vietnam.

1. Introduction

The first ten years of this century seems to be a busy decade of Viet Nam in terms of trade liberalization. It was started with the implementation of the Bilateral Trade Agreement with the U.S in 2000. WTO accession in 2007 was another key milestone. A number of trade related agreements were also signed during the period (Phan and Coxhead, 2011). As a result, the economy has become increasingly dependent on foreign trade. The ratio of total export value over GDP increased substantially, from 55 percent in 2000 to 87 percent in 2010[1]. Importantly, the process of trade liberalization is expected to continue in the future as Viet Nam is actively engaged in negotiations of a couple of trade agreements at present[2].

In the meantime, household businesses have been critical non-farm employment providers in Viet Nam. In 2010, 59.5 per cent of the country's non-farm laborers worked in the household business sector (MOLISA, 2012). Given the important role of this employment type and aforementioned trade liberalization, emerging questions are how has trade liberalization affected employment and income in the sector relative to the formal sector, i.e, private and foreign invested enterprises and the state sector including state owned enterprises.

Employing data of five consecutive Vietnam Household Living Standard Surveys (VHLSSs) from 2002 to 2010 as well as available trade liberalization measures, the current paper seeks to answer the two aforementioned questions empirically. Apart from introduction and conclusion, the remaining parts of the paper are organized as follows: Section 2 is devoted to reviewing the literature. Section 3 provides an overview of trade liberalization process in Vietnam during the study period. Section 4 presents empirical models to be used for the analysis while Section 5 discusses data and estimation results. .

2. Literature review

Indeed, these two questions are asked in studies on impacts of trade liberalization on the labor market in a number of countries, especially in the Latin America. In general, empirical evidence is mixed.

In terms of labor allocation, there are different views on changes in employment of household businesses under trade liberalization. Firstly, there is a view that stemmed from the informal characteristic of this kind of employment, which predicts employment expansion in household

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[1] Authors' calculation from GSO's data.
[2] For example, Viet Nam is negotiating on the Trans-Pacific Strategic Economic Partnership Agreement (TPP), and Viet Nam and EU officially started to negotiate their Free Trade Agreement on 26th June 2012.

businesses. When a country liberalizes its international trade, its formal domestic firms face fiercer competition and consequently, they have to find ways to cut labor costs, such as replacing contracted workers by un-contracted workers who do not receive non-wage benefits or sub-contracting to the informal sector, which largely comprises household businesses and self-employed[3]. Following this view, Goldberg and Pavcnik (2003) developed a theoretical model and then tested it against data for Brazil and Colombia. They found no association between trade liberalization and the degree of informality in Brazil, but a positive relationship between cuts in tariffs and the informal employment in a specific period in Colombia when rigidity of the labor market of the country was high. Meanwhile, employing the same empirical model, Aleman-Castilla (2006) found a significant relationship in tradable industries of Mexico, specifically informality decreases when tariffs are cut.

In contrast, a view that originates from "models of trade with heterogeneous firms" (McCaig and Pavcnik, 2014) indicates increases in employment in the formal sector when the trade is liberalized. Under fiercer competition as well as increasingly accessing to other countries markets resulted from trade liberalization, larger and better performing firms have higher probabilities of surviving and growing. Hence, this process results in rising demand for labor by larger and better performing firms and declining labor demand by smaller and less efficient firms. Thus, one would expect declines in employment in household businesses, which are typically small and less productive than firms in the formal sector.

For Viet Nam, in a recent paper by McCaig and Pavcnik (2012), which analyzes data from Viet Nam Household Living Standard Surveys 2002 and 2004, it was found that there was a large labor movement from household businesses to more formal firms after the US-Viet Nam Bilateral Trade Agreement came into effect.

Thus there is no consensus in terms of both theory and empirical evidence with regard to the direction of the labor allocation between household businesses and the formal sector under trade liberalization. Goldberg and Pavcnik (2003) concluded that specific labor market arrangements and regulations play an important role in determining the allocation process.

With regard to income differentials, there is also no consensus. Since workers in household businesses are often found to have lower level of educational attainment than their counterparts in the more formal sectors, investigation of impacts of trade liberalization on

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[3] Precisely, household businesses and self-employed may not be classified as the informal sector if they are registered. VHLSSs do not allow us to differentiate between formal and informal sectors. Thus, we have to choose household businesses versus the more formal sector as an approximation.

returns to education is a good starting point for predicting impacts of trade liberalization on income differentials between different types of employment.

The main theory behind the predicted changes in skill (normally measured by education) premiums under trade liberalization is the Stolper-Samuelson theorem under the Heckscher-Ohlin model of international trade. This theorem suggests that prices of relatively abundant factors would increase when trade is liberalized. In developing countries, like Viet Nam, un-skilled labor is such a factor; therefore, we would expect increases in returns to the un-skilled labor relatively to the skilled one. Given the common situation that un-skilled labor is predominantly employed by household businesses, it is logical to predict that income differentials between workers in household businesses and wage earners in the more formal sectors would decrease when trade is liberalized. However, empirical results do not appear to support this prediction[4]. Consequently, alternative theories have been proposed to explain the increase in the skills premium induced by trade liberalization[5].

Another prediction on changes in income differentials under trade liberalization comes from the first above mentioned argument on the impact on the labor allocation. Since informal employment increases because formal firms cut their labor costs and the minimum wage regulation tends to be better enforced under trade liberalization, income differentials across types of informality would increase.

Several papers estimated associations between trade liberalization and wage differentials between formal and informal sectors. Aleman-Castilla (2006) reports increases in the wage differentials in Mexico due to cuts in Mexico-US tariffs while Goldberg and Pavcnik (2005) find insignificant relationship between the two. Again, differences in labor market arrangements and regulations may explain these diverse results.

For Viet Nam, there have been a number of studies investigating changes in skill premium since Doi Moi[6]. Phan and Coxhead (2011) finds the skill premium increased for non-state enterprises in traded industries in the period of 2002-2008 but no increase in state enterprises in these industries. Oostendorp and Doan (2011) found decreases in return to education because of trade liberalization, mostly due to changes in employment allocation across industries. Moreover, the authors also report that largest decrease is found among workers with lowest level of educational attainment. Thus, this result may indirectly suggest rising income differentials between workers in the formal sector and those in household businesses due to

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[4] See Goldberg and Pavcnik (2007) for a survey of impacts of trade liberalization on inequality in general and skill premium in particular.
[5] See also See Goldberg and Pavcnik (2007) for a brief review of the alternative theories.
[6] Doi Moi (renovation) policy has been implemented since 1986.

trade liberalization, because of lower education levels of workers in household businesses. Meanwhile, Cling et al. (2009) employs the Computable General Equilibrium (CGE) model to ex ante assess impacts of the Vietnam's WTO accession in January 2007 on income distribution. Their simulations shows that real wage of un-skilled workers would increase relatively to their skilled counterparts and subsequently indicates a decrease in the income differentials.

In brief, the Stolper-Samuelson theorem suggests trade liberalization would narrow the income differentials between laborers in the household business and formal sectors. Meanwhile, the empirical evidence largely suggests increases in income differentials between skilled and un-skilled laborers (Goldberg and Pavcnik, 2007) and indirectly implies increases in the differentials. However, these authors also note about the impacts of trade liberalization on inequality that "the relevant mechanisms through which inequality was affected are case specific". Furthermore, indirect initial empirical evidence for Viet Nam is ambiguous.

In above discussions, self-employers including household business owners and wage earners in household businesses are regarded as one type of employment. But both theoretical and empirical studies studies find that they are different. As noted in Nguyen et al. (2011), self-employment links with an upper-tier of the informal sector where laborers voluntarily select the employment while the wage-work in household businesses represents a lower-tier of the sector which laborers has to join involuntarily. Cling et al. (2010) report a significant proportion of household business owners choose the job for higher income and independence in their employment, as compared with the wage work in the formal sector. Meanwhile, wage earners in household businesses are apparently disadvantaged to their counterparts in the formal sector both in terms of non-monetary benefits and income[7] when personal and work characteristics are controlled for. Directly, a report of Vu and Nguyen (2011) for labor markets in Ha Noi and Ho Chi Minh City indicate that both factors affecting employment attainments and income differentials are different between skilled self-employers and skilled wage earners in household businesses. These pieces of evidence point to the differences between the two types of employment in Vietnam. Therefore, in our empirical analysis we divide them into two different groups.

3. Opening up the domestic market of Vietnam

Trade liberalization includes two sides, opening up the domestic market for imported goods and services and increasingly accessing to foreign markets for exported ones. The current study only focuses on one side- opening up the domestic market as we cannot find feasible measures

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[7] McCaig and Pavcnik (2012) report a lower of 7 per cent in income of wage earners in the household businesses to their counterparts in the formal sectors.

to captures changes in accessing to all foreign markets of Vietnam's exported goods and services.

As a part of transition process as well as following its economic growth strategies, Vietnam has actively engaged in a number of trade related agreements. Before joining the WTO, it was recorded that Vietnam had been involved in bilateral trade agreements with 40 partners but the primary purpose of the agreements had been to reciprocally recognize the MFN status (WTO Secretariat, 2013). However, ASEAN related trade agreement and the US-Vietnam bilateral trade agreement are exceptional. Their contents and mutual commitments were followed and even went beyond the WTO's general principles. Therefore, we shall briefly review these agreements as well as Vietnam's commitments under the WTO accession. Non-tariff barriers, which Viet Nam used in regulating its imports, and selected features of its trade performance in the last decade is subsequently analyzed.

3.1. Trade agreements

ASEAN related trade agreements

The initial form of granting preferences on intra-region trade of the ASEAN was the Common Effective Preferential Tariffs (CEPT). The basic idea of the CEPT was to divide goods into four groups of the Inclusion List (IL), the Temporary Exclusion List (TEL), Sensitive List (SL) or General Exclusion List (GEL) with different treatments on each group. The CEPT was the base for forming the ASEAN Free Trade Area (AFTA) in 2002. In 2009, the CEPT/AFTA and other agreements on trade related matters such as the ASEAN Agreement on Customs, the ASEAN Framework Agreement on the Facilitation of Goods in Transit were integrated into the ASEAN Trade in Goods Agreement (ATIGA). The consolidated agreement came into force on 17 May 2010.

Vietnam started to get engaged in the CEPT in 1995 as a consequence of its jointing ASEAN. Initially, the Temporary Exclusion List covered most goods produced in Vietnam. However, items on this List were to be completely shifted into the Inclusion List in 2003, with tariffs reduced to 0-5 percent by 2006. As per the latest commitment, Vietnam shall eliminate all tariffs for goods imported from other ASEAN countries by 2015, with flexibilities of 7% as the maximum for sensitive products until 2018 (WTO secretariat, 2013).

 Vietnam's General Exclusion List appears not to completely comply with the principle of the CEPT, which specified that such a list should only include products that comply with Article XX of the GATT (the corresponding Article is 9B of the AFTA), where measures are allowed to protect national security, public morals, human, animal or plant life and health, and the

protection of articles of artistic, historic and archaeological value. The CEPT Agreement specifically states that General Exclusion provisions must not be used to provide industry protection or to product revenue. Vietnam's List, however, includes items such as vehicles with less than 16 seats, scraps and used consumer goods. These are all items where Vietnam has strong protection and revenue objectives.

Apart from the ATIGA and other agreements in effect of ASEAN, Vietnam has also been involved in trade related agreements between ASEAN and its partners include:

1. ASEAN-China Free Trade Area

2. ASEAN-Korea Comprehensive Economic Cooperation Agreement

3. ASEAN-Japan Comprehensive Economic Partnership

4. ASEAN-India Regional Trade and Investment Area

5. ASEAN-Australia and New Zealand Free Trade Agreement

Effectiveness of these agreements has resulted in concessions of Vietnam on products from the partners. Analysis of tariffs of Viet Nam imposed on imports from selected countries to be done subsequently shall partly assess the effects of these agreements.

The VN-US Bilateral Trade Agreement

The VN-US Bilateral Trade Agreement came into force in December 2001 after a long period of negotiation. The agreement has similar contents as main WTO agreements, which cover numerous areas including economic participation, tariff and non-tariff measures affecting trade of goods between entities of the two countries, technical barrier to trade (TBT) including sanitary and phytosanirtary (SPS) measures, trading in services, investment relation and dispute settlement mechanisms. In some fields, the agreement goes beyond provisions in WTO agreements at that time such as economic participation and investment relation. But in some fields, the provisions in the agreement are not as strict as their counterparts in WTO agreements such as tariff reduction or SPS measures.

Under the agreement, Vietnam is required to grant trading rights to US firms within three to six years and remove quantitative restrictions on imports for almost all products within three to seven years since the agreement came into force. Another important commitment is that Vietnam has to reduce restrictions on foreign entry into numerous service sectors such as banking, tourism, telecommunications and others.

Based on this agreement as well as upon the accession of Vietnam to the WTO in early 2007, the two economies signed the Vietnam-US Trade and Investment Framework Agreement (TIFA)

on June 22, 2007. No further commitments were added but a joint agency (United States- Viet Nam Council on Trade and Investment) for the monitoring of implementation of Vietnam's commitments under the WTO accession and in the BTA were established.

The WTO commitments

Vietnam's commitments to WTO are relatively strict given the country's level of economic development; they not only include tariff reduction but also include openness of its market and following WTO agreements on standards and rules such as customs valuation or non-discrimination between domestic and foreign businesses upon accession without a transition period.

In terms of tariff reduction, applied MFN rates have been significantly cut since 2007 in accordance with the accession's commitment. The simple average MFN applied tariff of non-agricultural products was cut from 17.4 per cent to as low as 9.3 percent in 2013. And the corresponding figures for agriculture related products were 29.4 percent and 17.4 percent respectively (WTO Secretariat, 2013).

Vietnam also commits to substantially open its services market[8]. After three years of accession, foreign juridical persons can provide services in a majority of sub-sectors including construction and distributional services. Indeed, common measures of trade liberalization do not capture liberalization in the services sector. Although a large number of laborers work in the services sector, they may not be impacted significantly, because their petty services are very different from high end services that have been opened up to foreign competition. Furthermore, the current study, as will be noted later, only investigates the manufacturing sector.

In brief, Vietnam's commitments of opening up its domestic market in the last decade are tremendous. The commitments include both reductions in tariffs and removals of non-tariff barriers. The MFN tariff was stable up to 2007. Since then, the rates have been significantly cut down. However, Vietnam granted tariff preferences to products from selected countries through ASEAN trade related agreements and the bilateral trade agreement with the U.S before 2007 as depicted in Figure 1. This causes difficulties in capturing the true picture of trade liberalization in the respective period.

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[8] Indeed, liberalization in the service sector is more relevant to investment, instead of trade, activities.

Figure 1. Simple average tariffs imposed on products from selected countries (%)
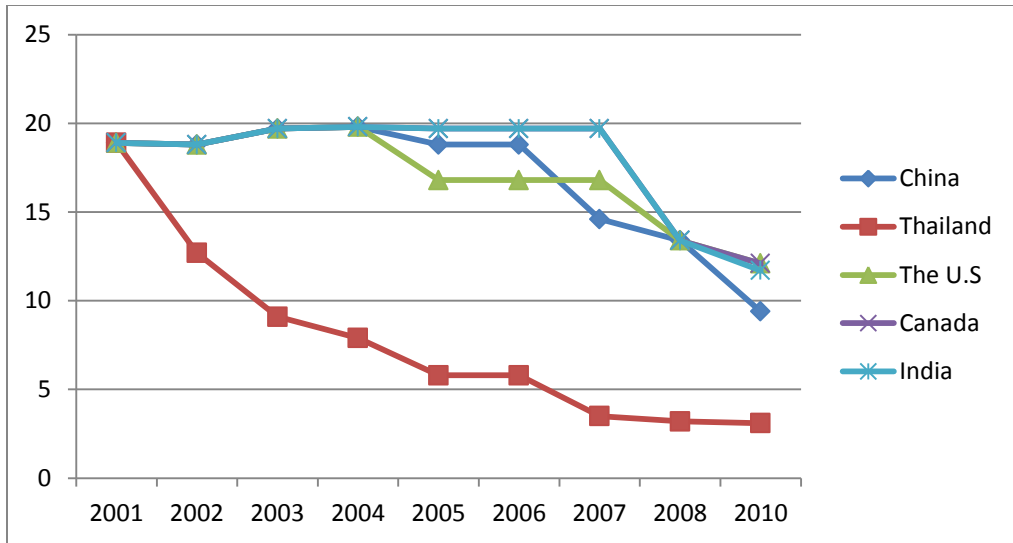
Source: Authors' calculation with data from the UNCTAD-TRAINS

3.2. Non-tariff barriers

As a commitment in the trade agreements previously discussed, Viet Nam has gradually adopted international practices in regulating its international trade. Since the beginning of the last decade, the country has used tariffs as the major instruments in managing its imports (Athukorala, 2006). However, non-tariff barriers have been used in certain extents.

In this section, we shall discuss a number of non-tariff barriers used by Vietnam's authorities in the last decade. We focus on changes of these barriers over time and highlight their potential effects across manufacturing industries.

There have been three Decrees of the government directly and generally regulating import and export activities in the last decade. They include Decree No. 57/1998/NĐ-CP dated 31st July 1998; Decree No. 12/2006/NĐ-CP dated 23rd January 2006; and Decree No. 187/2013/ND-CP dated 20th November 2013. These Decrees have listed in general products banned from imports, products imported under quotas or tariff quotas and products imported under line managements.

Import prohibitions

In line with international treaties and practices, goods which are considered as potentially harmful to human health and safety have been prohibited from imports to Viet Nam. With only minor amendments over time, such as cigarettes are removed from the list since 2006, products and materials containing asbestos of the amphibole group were banned since 2006 or incompatibility radio equipment and radio-wave appliances was added in 2013, products banned from imports consistently includes weapons, fireworks, publications banned from dissemination and circulation; toxic chemicals including pesticides banned from use in Vietnam, used consumer goods, used vehicles; right-hand drive means of transport.

Import quota

In 1998, products imported under quotas accounted for about 40% of total import of the country (CIEM, 1999). However, since the beginning of the last decade, import quotas have been removed significantly. In 2002, there were only four commodities including petroleum, sugar, cement and motorcycles being subject to the quotas. Two of them, cement and motorcycles were excluded from the list in 2003 (Athukorala, 2006) and sugar were also removed in 2006[9]. Since then, only petroleum has been subject to this kind of barrier.

Tariff rate quotas

Since 2003, Viet Nam has introduced tariff rate quotas on import of some commodities. Initially, the list included seven agricultural products: raw milk, condensed milk, poultry eggs, maize, raw tobacco, salt, and cotton[10]. In 2006, raw milk, condensed milk, maize, and cotton were removed from this list[11]. Imports of refined sugar, crude sugar were changed from an import quota to this kind of barrier. Consequently, only four products were subject to this kind of instruments in 2006 and this list was kept in the latest Decree (No. 187/2013/ND-CP).

As we can see, non-tariff barriers imposed on a number of imported products have been relatively stable in the last decade, especially manufacturing products. Certain changes include removals of import quotas and introduction of tariff rate quotas. The first change happened in early years of the last decade and the latter changes only affected agricultural products. Hence, non-tariff barriers imposed on imports of manufacturing products has been only slightly changed in the 2004-2010 period.

Other regulatory instruments

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[9] Decree 12/2006/NĐ-CP.
[10] Decision No.91/2003/QD dated 9th May 2003 of the Prime Minister.

[11] Decree 12/2006/NĐ-CP.

For several purposes, Viet Nam's authorities have promulgated some specific regulations on imports of selected commodities. Indeed, it is impossible to review all policies that potentially affect imports of selected goods. Therefore, we highlight two policies which directly administer the import of selected goods.

For purposes of controlling inflation and stabilizing macroeconomy, in April 2010, the Ministry of Industry and Trade issued decision No. 1899/QD-BCT containing a long list of "non-essential" commodities and consumer goods which are discouraged for import. Products in the list were from more than 50% chapter of manufacturing products in the HS Nomenclature. This decision was subsequently replaced by the decision 1380/QĐ-BCT dated 25th March 2011 which is still in effectiveness. The underling policy instrument makes this measure effective is to restrict foreign currency purchasing of importers as the request in Official Dispatch No. 3215/NHNN-CSTT dated 29th April 2010 of the State Bank of Viet Nam to commercial banks. However, efficacy and impact of this measure is quite ambiguous as it is not clear on how commercial banks have behaved and responded to the request.

Another regulation for the purposes of protecting against counterfeits, deterring trade fraud and protecting consumers was restrictions of seaports that wines, spirits, cosmetics and mobile phones were allow importing through. The Notice No.197/TB-BCT dated 6th May 2011 issued by the Ministry of Industry and Trade stipulated that these goods were only allowed to import through three seaports (Hai Phong, Da Nang, and Ho Chi Minh City). However, this regulation is abrogated by 1 January 2013 through effectiveness of Notice No. 301/TB-BCT dated 28 December 2012.

It is safe to argue that this policy have not had strong impacts in domestic production of the products for two reasons. Firstly, supplies of these products are mainly from imports. Therefore, this restriction in import locations should not have strong impacts in domestic production of the products. In addition, the short-term in effectiveness also restrict adjustment of the domestic production.

In short, standard non-tariff barriers of Viet Nam have been stable in the last decade and impacts of other regulatory Impediments affecting imports are ambiguous across products. Consequently, impacts of non-tariff barriers on imports of different manufacturing products should not be significant in the last decade.

3.3. Selected features of the foreign trade performance

In the last decade, the growth of trade has been significantly higher than economic growth, resulting in an increasing dependence of the economy on foreign trade. On average, Vietnam's

economy grew at 7.2 percent per year in the period of 2000-2010 while the corresponding figure for the foreign trade is 19.6 percent. Export accounted for 55 percent and 87 percent of the GDP in 2000 and 2010 respectively[12]. The increasing dependence of economy on international trade implies the growing importance of the latter, but also rising vulnerability of the former.

Regarding the trend, foreign trade of Vietnam has been concentrated in a few main markets, in both export and import. ASEAN countries, the European Community, Japan, China, the U.S, Taiwan Province of China, and the Republic of Korea, are major trading partners of Vietnam, as shown in Table 1. These partners have made up over 80 percent of the country's import and the first five partners have been destinations of more than 70 percent of Vietnam's export since 2002. Among these trading partners, China has emerged as the biggest provider of Vietnam's imports at the expense of ASEAN's countries and, to a lesser extent, the EU in recent years. The concentration in trading partners result in a risk of vulnerability of trade performances, with unfavorable impacts on the economy, as discussed in previous paragraph.

Table 1. Shares of selected markets (%)

	Shares in the total export			Shares in the total import		
Years	2004	2008	2010	2004	2008	2010
United States	**19.1**	**19.1**	**19.8**	3.6	3.3	4.5
EU	18.9	17.5	15.9	8.5	6.9	7.5
ASEAN	15.3	16.5	14.4	**24.4**	**24.3**	**19.4**
Japan	13.4	13.6	10.8	11.2	10.3	10.7
China	10.6	7.4	10.3	**14.0**	**19.5**	**23.7**
Australia	7.1	7.0	3.8			
Republic of Korea	2.3	2.9	4.3	10.6	9.0	11.5
Taiwan, China				11.6	10.4	8.2
Total	**86.8**	**84.0**	**79.2**	**83.8**	**83.7**	**85.5**

Source: Authors' calculation with data from the UN Comtrade

Similar to other developing countries, a good number of Vietnam's exports have low value added, being done at the lowest end of the global value chain. To illustrate this point, Table 2 presents performance of Vietnam's two major exports. While textile and garment represent

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[12] Authors' calculation with data from GSO.

traditional exports, electrical machinery and equipment has emerged as a rising star in recent years. These products accounted for almost 30 percent of total export in 2010. Export values are not significantly higher than import values of inputs into production of these products. As assembly dominates these export items, labor skill requirements are not high, resulting in easy movements of workers into these sectors. Value addition of production of these exports has been increasing as evidenced by declining ratios of import over export values in recent years.

Table 2. Performance of selected products in foreign trade of Vietnam

Textile and garments				
Year	Export value (million USD)	Share in total export (%)	Import value (million USD)	Share in the total import (%)
2004	4 785.1	18.1	3713.5	11.7
2008	10150.7	16.3	6673	8.3
2010	13303.7	18.5	8469.1	10.0
Electrical machinery and equipment and parts thereof				
2004	1307.3	5.0	2616.9	8.2
2008	3655.6	5.9	7416.4	9.2
2010	7080	9.9	9868.5	11.7

Source: Authors' calculation with data from the UN Comtrade

Looking at ownership of exports, the FDI sector has played an important role, with the peak share of 57.9 percent in total export in 2006. Although the share of the sector has been declining since then, it was still as high as 54.2 percent in 2010. The important role of the FDI sector may mitigate direct impacts of trade liberalization on employment as productivity of FDI firms has been considerably higher than that of domestic counterparts, implying lesser employment effects caused by lowered trade barriers.

Foreign trade of Vietnam has significantly expanded in the last decade. While this has made an important contribution to economic growth, it could result in rising vulnerability, especially when certain goods are traded with few trading partners. The dominance of exports with low value added in foreign trade implies that labor skill requirement is limited. In another aspect, the presence of substantial FDI sector in export activities may mitigate direct impacts of trade liberalization on employment.

4. Empirical models

To answer the research questions empirically, we employ an extension of the two-step model proposed by Goldberg and Pavcnik (2003) to estimate impacts of opening up the domestic market on the employment allocation and then modify it for estimating the income differentials.

4.1. Estimating of impact of opening up the domestic market on employment allocation

Let P_{ijtS} denote for employment type S of laborer i in industry j at year t; X_{ijtS} is a vector of the laborer's characteristics such as age, gender, education, ethnicity group, location…; I_{ijtS} a vector of dummy variables expressing characteristics of the working industry of the laborer. The probability of laborer i being involved in his/her employment is expressed as:

$$P_{ijtS} = X_{ijtS} B_{XtS} + I_{ijtS} \phi_{jtS} + \varepsilon_{ijtS} \qquad (1)$$

Where S=1, 2, 3 denotes three types of employment as the wage work in the formal sector, the self-employment, and the wage work in the household business respectively.

When we have three outcomes, (1) are formed into a standard multinomial logit model. (1) will be estimated for each year separately.

The key in the equation is ϕ_{jtS}, if we select S=1 as the base, ϕ_{jtS} could be called as industry employment differentials to the base, as we follow the term given by of Goldberg and Pavcnik. ϕ_{jtS} can be alternatively the marginal effects to have free base effects.

In the second step, the industry employment differentials are employed as the dependent variable in the following equation:

$$\phi_{jtS} = T_{jt}\varphi_S + D_j\gamma_S + Y\rho_S + \zeta_{jtS} \qquad (2)$$

T_{jt} is a vector of measures of opening up the domestic market such as tariffs, and quotas imposed at the industry level. D_j and Y are vectors of industry and time dummies.

As data for equation (2) is panel-data at the industry level, fixed effect and first difference techniques can be applied. Furthermore, the weighted least square method may be employed in estimation of equation (2) as its dependent variable are estimated. The weight is the inverse of the variance of the industry employment differentials.

VHLSSs are a series of surveys with a rotating panel component. Therefore we can construct two three-wave-panels of 2002-2004-2006 or 2004—2006-2008 and (1) and (2) could be consolidated into a one-equation-model as below:

$$P_{ijtS} = X_{ijtS} B_{XtS} + T_{jt}\varphi_S + D_{jt}\gamma_S + Y\rho_S + v_{ijtS} \qquad (3)$$

Again, three equations of (3) form a standard multinomial logit model and it could be estimated with fixed effect techniques.

However, the panel suffers from significant decreases in number of observations if we expand time dimension. 3,931 panel households between 2002 and 2004, 4,193 panel households between 2004 and 2006, and 1,844 panel households between 2002 and 2006 could be constructed (Le and Pham, 2009). Attrition is another issue; with Baulch and Vu (2011) reporting an estimation of 14.0% of attrition between 2002 and 2004, and this figure is 9.5% between 2004 and 2006 for the panel. Additionally, when we fix our sample to a specific panel group, we may miss different patterns of new entry or exiting laborers. Thus, we prefer the two-step model.

Commonly, individual industries are included in estimation as dummies and one industry dummy has to be excluded to secure the rank condition. Consequently, estimation results are interpreted with regard to the omitted industry as the reference one. However, the industry employment differentials are interpreted in a different way in the current study. The industry employment differentials are defined as deviations from the mean of all individual industry effects. These are free-base industry individual effects on employment attainment. The deviations are attained by the normalization technique in DeNew and Schmidt (1997).

4.2. Estimating impact of opening up the domestic market on income differentials

For studying income differentials, we apply the same approach. First, industry pair-employment income differentials, Ω_{jtW}, are estimated, and then equation (2) are estimated to investigate impacts of trade liberalization on the income differentials.

There are several ways to estimate Ω_{jtW}. Aleman-Castilla (2006) estimate a modified Mincerian unique wage equation for both formal and informal wage earners with interactions between industries and the informality status to capture, industry informality income differentials. Moreover, interactions between productive characteristics and the informality status are included in his estimation to capture potential differences in returns to productive characteristics between formal and informal wage earners. In this study, we apply another approach, industry pair-employment income differentials are calculated by differentiating deviations from the mean of industry premiums of each employment. The deviations are also attained by the normalization technique in DeNew and Schmidt (1997). We briefly present the approach in following.

$$INCOME_{ijtS} = X_{ijtS} B_{XtS} + I_{ijtS} \eta_{jtS} + \varepsilon_{ijtS} \qquad\qquad (4)$$

$INCOME_{ijtS}$ is the income of labor i in employment S in industry j at time t. X_{ijtS}, I_{ijtS} are defined as (1). η_{jtS} is a vector of coefficients capturing industry effects on income.

(4) is also a modified Mincerian income equation, and it is estimated for each type of employment in each year. It is well documented in labor economics literature that (4) suffer from selection bias because we only have observation of income of labor i in his/her employments and there are unobservable factors that affect his/her employments.

The deviations obtained from the normalization technique for each industry (η_{jtS}) can be regarded as individual industry premiums within each type of employment. Therefore, differences between the deviations across types of employments plus differences between means of industry employment income effects are income differences across employments within industry or industry pair-employment income differentials. It should be noted that differences between means of industry employment income effects are constant across industries for each year and they can be captured by year fixed effects.

5. Data and estimation results

5.1. Data and sample

The main data source of the current study is sourced from five consecutive surveys of Viet Nam Household Living Standard Survey (VHLSSs) series in 2002-2010. With the sample size of approximately 30,000 households in 2002 and 9,189 households for 2004, 2006, 2008, and 9399 household for 2010, the VHLSSs are representative for the whole country and 8 regions with a further breakdown into urban/rural areas.

The surveys follow the standardized content of the Living Standards Measurement Study (LSMS) of the World Bank and provide rich information of demographics of households, education of individuals, and employments including income. In addition, information of industries of employment is also available in the surveys. Therefore, data of the surveys are suitable for empirically answering the questions of the study.

The key variables in the empirical model in the current study are measures of opening up the domestic market. Unfortunately, there are too many alternatives and a number of them do not well correlate with each other (McCulloch et al., 2002). In the current paper, we employ three measures including simple average tariffs, effective rate of protection and import penetration. The first and the last measures belong to two different approaches to measures trade liberalization, openness in policy and openness in practices, meanwhile the second can be considered as a hybrid measure. All these are measured at the 2-digit level. Recalling Section 3.2, standard non-tariff restrictions on imports have only slightly changed in the study period.

Hence, absence of measures of non-tariff restrictions should not significantly affect the results. Meanwhile, effects of other regulatory instruments are not clear.

Data of simple and weighted average tariffs is obtained from the UNCTAD-TRAINS and UN COMTRADE which provide data of applied MFN tariffs and trade values at 6-digit-level of the economy. Import penetration and the effective rate of protection (ERP) are sourced from Pham Dinh Long (2013). Nevertheless, import penetration and EPR is only obtained for 2003 to 2008. Consequently, data of 2008 is used for the year 2010.

Definitions of a majority of variables included in the empirical models such as gender, ethnicity, education or living areas follows their popular definitions in studies for Vietnam and they are easily calculated from primary indicators of the surveys. However, income of non-farm activities is only available at the household level. Commonly, one can allocate the household's income to individuals involved in the households' activities based on their working time for the activities. However, productivity is apparently different across ages or experiences. To estimate hourly income of self-employers and unpaid family workers, we use average hourly income of the wage workers by ages as a proxy from productivity and used for adjust hourly income from self-employments. This approach is described in Mason et al. (2009). With this approach, we assume the same association between age and productivity across type of employments but as long as age compositions are random across industry, industry premiums are still unbias.

We restrict our sample to manufacturing sector as the measures of trade liberalization are only applicable to commodity trade which includes manufactured and agricultural products. However, impacts of opening up the domestic market on the two product groups are possibly different and we only investigate the former to obtain more precise results as a consequence.

5.2. Descriptive analysis

Labor allocation and income

Allocation of labor across type of employments over years is given in Table 3. In general, proportions of the self-employment and the wage work in HHBs have decreased with an increase in the wage work in the formal sectors as the complement. The tendencies of the self-employment and the wage work in the formal sector have been quite strong over time. Accumulatively, ratio of the former has decreased by 8.3 percentage points and that of the latter has increased 14.3 percentage points. However, it should be noted proportion of the self-employment have rebound in 2010. Between 2010 and 2002, the proportion of the wage work in HHBs also decrease by 6 percentage points but the trend have not clear, it fluctuated between 2002 and 2008 before a considerable drop in 2010.

Table 3. Compositions of employment

Years	2002	2004	2006	2008	2010
Self-employment	39.83	35.88	33.62	29.75	31.46
Wage work in HHBs	27.22	24.47	23.63	26.81	21.23
Wage work in formal sectors	32.95	39.65	42.75	43.43	47.31

Source: Author's calculations with data from VHLSSs

Hourly income reported in Table 4 is nominal values, thus we cannot comments about the trend. However, our interest is the relative income across types of employments. Wage workers in HHBs have had a disadvantage in income to their counterparts in the formal sectors is not new and this disadvantage have been quite stable overtime. The ratio has been identical in three out of four years in the sample. However, this situation is not observed for the relative income between the self-employers and the wage workers in the formal sectors. The relative income steadily increased in 2004-2008 but it enormously dropped in 2010. Difficulties in Vietnam's economy in the period of 2008-2010 as well as behaviors of the labor market[13] are good candidates of reasons for the fall in the relative income of the self-employers.

Table 4. Hourly income of different types of employment (1 000 VND)

Year	2004	2006	2008	2010
Self-employment (1)	4.94	6.72	11.31	12.13
Wage work in HHBs (2)	3.57	4.57	6.58	9.72
Wage work in formal sectors (3)	5.68	6.97	10.40	15.51
Ratios across types of employment				
(1)/(3)	0.87	0.96	1.09	0.78
(2)/(3)	0.63	0.66	0.63	0.63

Source: Author's calculations with data from VHLSSs

Opening up domestic market measures

It is useful to evaluate capacity of the opening up domestic measures employed in the current state of the paper in capturing the context discussed in Section 3 as well as their variances. The

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[13] In the period, unemployment rates of the economy have been stable at low rates (Oudin et al, 2013) and difficulties of formal sectors are reported. Thus, it is reasonable to expect self-employments increased with a decrease in income of self-employers as a result. The increase of the self-employment is indeed observed in the manufacturing industries as depicted in Table 3.

latter characteristic is an important indicator for validating results of empirical models as the empirical models is based on the variances of the opening up the domestic market across industries.

Figure 2 presents the simple averages of MFN and ASEAN preferential tariffs of selected manufacturing industries. The average MFN tariffs of all three industries under study were stable before dropping since 2007. However, Vietnam gradually cut its tariffs imposed on products from ASEAN countries before this milestone as shown in the figure. Therefore, we have to capture these two separate lines of the tariffs in empirical estimation later on.

Indeed, the simple average tariffs are not perfect ones in capturing levels of opening up the domestic market at the industrial level as the aggregation does not take into account economic meanings of individual goods corresponding to each tariff line (Kee et al., 2009). Consequently, they overstate the true level of restrictiveness. An alternative aggregation procedure is to use import volumes as economic weights of individual commodities. However, this aggregation is subject to endogeneity problem and underestimates the true level of restrictiveness.

Figure 2. Simple average tariff of selected manufacturing industries
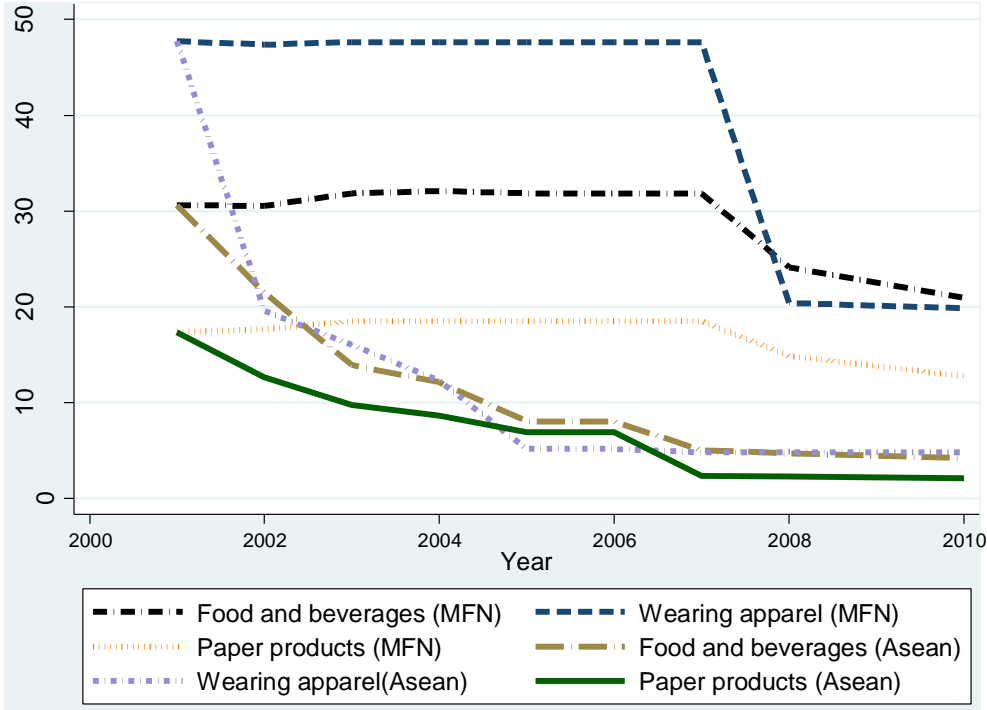
Source: Authors' calculation with data from the UNCTAD-TRAINS

Figure 3. Import penetration of selected manufacturing industries
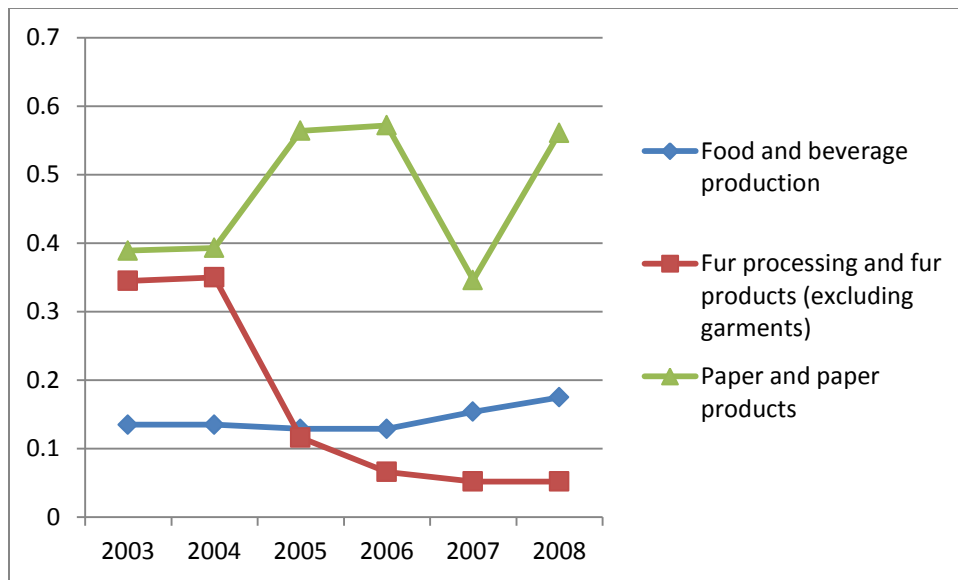
The import penetration measured at the 2-digit level of industries has been quite fluctuating as depicted in Figure 3. There have been clear trends for industries of fur processing and fur products as well as food and beverage production but the paper industry has exhibited fluctuation without a trend. As noted, the import penetration is a practical measure of trade liberalization; it is affected by both trade liberalization in policy as well as responses of stakeholders. However, this measure may be bias because of intra-industry trade.

Among these measures, the bias caused by the intra-industry trade of import penetration is unpredictable, especially when intra-industry trade has increased significantly for the studying period in Viet Nam. For example, the Grubel-Lloyd Index of intra-industry trade between Viet Nam and Thai land has increased from 0.094 in 2000-2004 to 0.221 in 2010-2011; figures of the index between Viet Nam and Singapore for the corresponding periods are 0.063 and 0.225 respectively (UNCTAD, 2013). Therefore, the import penetration captures not only the open of domestic market but also the increase in intra-industry trade. Meanwhile, the effective rate of protection is based on weighted average tariffs and it also suffers from endogenous problem as the weighted average tariffs. Consequently, our analyses focus on results with the simple average tariffs, results with two measures of import penetration and effective rate of protection are used as references.

Although we have tried alternative measures of opening up the domestic market but all measures more or less suffer from shortcomings, however, in different ways. Therefore, the

principal for conclusion is consensus across results and consistent results across specifications as well as measures are reliable.

5.3.   Estimation results

The employed econometric strategy includes two steps and our main interests are results of the second step. However, it is worth to briefly discuss the results of the first step as an evaluation of validity of the estimation strategy.

5.3.1. Employment attainments and income equations

Employment attainments

In the model of employment attainments, a wide range personal, household and community characteristics are included in the model of job attainments. As noted in Section 4, attainments of three types of employments are estimated with the multinomial logit model. Wage work in the formal sectors is selected as the base. Estimation results of selected years are presented in Appendix 1.

In general, included variables are relevant and their directions in determining employments are also as expected. As depicted in Appendix 1, almost all variables are significant in at least one year. This result is evident for the relevance of the variables. In terms of directions, male laborers have lower probability to work as self-employers but higher probability to work as wage workers in household business, compared with their female counterparts. The higher education the laborers attained the lower probability to works as the self-employer or wage workers in household businesses.

In another aspect, ethnicity and living areas which are normally found to be strong determinants of employment attainments in Vietnam are only marginally significant in a couple of equations over years. As the sample is restricted to manufacturing industries, workers are indeed filtered one time. The differences in employment attainments between laborers across locations or ethnic groups found in other studies are presumably caused by differences in industry attainments of which employment compositions are different.

Estimated coefficients of industry dummies are not presented in Appendix 1 to save space. The results demonstrate relevance of the industry individual effects as a number of coefficients is significant at any conventional level of significance. Furthermore, the test for joint insignificance of industry dummies is rejected at 1% level.

Income equations

Moving to results of income estimations given in Appendix 2, beside conventional variables of education, gender and age (as proxy for experiences), location and ethnicity of laborers which are often found to be significant determinants of income in studies for Vietnam are included in regressions. As noted, the equation is estimated by OLS may suffer from the problem of selection bias. However, we cannot find proper instrumental variables for employment selection those does not affect the income. Consequently, OLS is used to estimate. It should be noted that information of employment in VHLSS 2002 is not sufficient to precisely estimate income of self-employers and that year is consequently excluded.

The estimation results indicate that gender and age are strong determinants of income as all coefficients except ones of age in formal wage work in 2006 are statistically significant at 1% level. Meanwhile, education is less relevant in the self-employment and wage work in HHBs. This result reveals that the production technology in HHBs in the manufacturing industries in Vietnam is simple and it requires simple skills only. In addition, few laborers attaining vocational training or college/university education can be also a reason for insignificance of these levels of education in HHBs.

Laborers living urban areas or belonging to Kinh-Hoa group are normally found to have higher income compared with their counterparts in rural areas or from Ethnic Minorities. However, these common results are only found for the living areas in the estimation results in Appendix 2 that laborers in the urban areas have higher income in all types of employments over years. Meanwhile, the coefficient of Kinh-Hoa group is not statistically significant for year 2008 and 2010 in both kinds of wage works. This unexpected result needs further investigation to be appropriately explained but it goes beyond scope of the current study.

5.3.2. Labor allocation, income differentials and opening up the domestic market

We now turn to our main interests, associations between labor allocations, income differentials and the opening of the domestic market. Alternative measures of opening of the domestic markets as well as their combinations are included in regressions. It should be noted that lagged values of the measures are used as an efforts to capture the lagged effects of the opening up the domestic market.

Labor allocation

Estimation results of relative allocations between the self-employment, the wage work in HHBs and the wage work in the formal sectors are presented in Table 5 and Table 6 respectively. R-squares of all alternative estimations are relatively high, especially for the self-employment. In

addition, the problem small number of observations is not serious as R-squares do not change much with exclusion of the year 2002. These results indicate that the specifications are effective in capturing changes in labor allocation across different types of employments in Vietnam. However, a majority of variables presented in Tables 5 and 6 is statistically insignificant and the main variances are captured by industry fixed effects.

Table 5. Labor allocation: self-employment versus wage work in the formal sectors

Variables	(1)	(2)	(3)	(4)	(5)
Year 2002	-0.921				
	(0.675)				
Year 2004	-0.447	-0.280	-0.327	-1.066*	-0.367
	(0.346)	(0.307)	(0.195)	(0.565)	(0.272)
Year 2006	-0.176	-0.024	0.050	-0.194	0.042
	(0.263)	(0.214)	(0.250)	(0.286)	(0.249)
Year 2008	0.030	-0.040	0.003	0.021	-0.001
	(0.210)	(0.176)	(0.184)	(0.251)	(0.186)
Year 2010			Base		
Simple average tariff (lag) (MFN)	-0.007			-0.010	
	(0.013)			(0.014)	
Simple average tariff (lag) (Asean)	0.038			0.109	
	(0.033)			(0.068)	
Effective rate of protection (lag)		0.240			0.119
		(0.337)			(0.353)
Import penetration (lag)			0.447	0.138	0.421
			(0.559)	(0.452)	(0.587)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	0.051	-0.255	-0.364*	-0.431**	-0.407*
	(0.105)	(0.152)	(0.174)	(0.185)	(0.220)
Observations	84	64	58	58	58
R-squared	0.810	0.865	0.882	0.890	0.882

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Authors' estimation

Self-employments in the manufacturing industries seem to decrease as coefficients of year dummies almost have the negative sign with the base of year 2010; however, none of estimated coefficients are statistically significant. This same result is observed for the wage work in HHBs.

Returning to our alternatives of measures of the opening up the domestic market, all coefficients are statistically insignificant that implies the opening up the domestic market have not had significant impacts on the labor allocation. This result is different from that of McCaig

and Pavcnik (2012) who reported significant impacts of the VN-US bilateral trade agreement on labor allocations between HHBs and the formal sectors. The opposite in liberalization directions under studying, export versus import, is potential reason for the differences in the results.

Table 6. Labor allocation: wage work in HHBs versus the formal sectors

Variables	(1)	(2)	(3)	(4)	(5)
Year 2002	0.010				
	(0.362)				
Year 2004	-0.080	-0.108	-0.203	-1.147	-0.440
	(0.220)	(0.266)	(0.312)	(2.345)	(0.736)
Year 2006	-0.578	-0.614	-0.762	-1.231	-0.808
	(1.182)	(1.148)	(1.310)	(2.250)	(1.410)
Year 2008	-0.169	-0.083	-0.175	-0.403	-0.195
	(0.329)	(0.228)	(0.270)	(0.586)	(0.295)
Year 2010			Base		
Simple average tariff (lag) (MFN)	0.016			0.031	
	(0.039)			(0.054)	
Simple average tariff (lag) (Asean)	-0.019			0.097	
	(0.030)			(0.255)	
Effective rate of protection (lag)		0.036			0.718
		(0.665)			(1.536)
Import penetration (lag)			-1.012	-1.408	-1.170
			(1.206)	(2.199)	(1.558)
Constant	0.789	0.961***	1.224*	0.431	0.966***
	(0.471)	(0.261)	(0.621)	(0.908)	(0.317)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	84	64	58	58	58
R-squared	0.399	0.402	0.406	0.410	0.408
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Source: Authors' estimation

Tables 7 and 8 present estimation results of income differentials between self-employers, wage workers in HHBs and wage workers in the formal sectors respectively. Estimated coefficients of year dummies exhibit two different trends in the differentials. Negative sign of the coefficients observed in the results between workers in HHBs and their counterparts in the formal sectors indicate a reduction in the differentials. However, only several coefficients are significant at 10% level. Meanwhile, a majority of the coefficients in the results of the income differentials between self-employers and wage workers in the formal sector is positive that implies an increase in the gap but none of them are significant.

Table 7. Income differentials between self-employers and wage workers in the formal sectors

	(1)	(2)	(3)	(4)	(5)
Year 2004	-0.392*	-0.154	-0.132	-0.279	-0.100
	(0.213)	(0.161)	(0.150)	(0.243)	(0.177)
Year 2006	-0.271*	-0.152	-0.103	-0.183	-0.097
	(0.146)	(0.120)	(0.119)	(0.141)	(0.124)
Year 2008	-0.016	-0.008	0.023	-0.025	0.025
	(0.181)	(0.142)	(0.145)	(0.190)	(0.147)
Year 2010			Base		
Simple average tariff (lag) (MFN)	0.007			0.007	
	(0.008)			(0.009)	
Simple average tariff (lag) (Asean)	0.037			0.013	
	(0.031)			(0.039)	
Effective rate of protection (lag)		0.014			-0.095
		(0.165)			(0.213)
Import penetration (lag)			0.329*	0.267	0.350*
			(0.158)	(0.208)	(0.188)
Constant	-0.512***	-0.263**	-0.383***	-0.541***	-0.349***
	(0.100)	(0.104)	(0.085)	(0.088)	(0.107)
Observations	67	64	58	58	58
R-squared	0.751	0.733	0.764	0.768	0.765
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Source: Authors' estimation

For the opening up the domestic market, none of them are significant for the case of the income differentials between wage workers in HHBs and their counterparts in the formal sectors. Meanwhile, the coefficients of the import penetration are positive and statistically significant at 10% level in two specifications for the income differentials between the self-employment and the wage work in the formal sectors. This result indicates that the opening up the domestic market may increase the income gap between these types of employment. However, as import penetration includes variances in the intra-industry trade, we cannot conclude the opening up the domestic market or the changes in intra-industry trade have this impact. That means we need better measures of the opening up the domestic market.

Table 8. Income different between wage works in household businesses and formal sectors

	(1)	(2)	(3)	(4)	(5)
Year 2004	0.244*	0.137*	0.025	0.115	0.097
	(0.127)	(0.068)	(0.095)	(0.272)	(0.124)
Year 2006	0.101	-0.013	-0.033	0.028	-0.019
	(0.088)	(0.061)	(0.067)	(0.095)	(0.061)

Year 2008	0.064	-0.014	-0.023	0.025	-0.017
	(0.087)	(0.065)	(0.064)	(0.077)	(0.063)
Year 2010			Base		
Simple average tariff (lag) (MFN)	-0.010			-0.008	
	(0.008)			(0.008)	
Simple average tariff (lag) (Asean)	-0.015			-0.005	
	(0.015)			(0.030)	
Effective rate of protection (lag)		-0.274			-0.219
		(0.159)			(0.226)
Import penetration (lag)			-0.078	-0.040	-0.030
			(0.097)	(0.129)	(0.113)
Constant	0.137	0.023	-0.071	0.079	0.007
	(0.174)	(0.077)	(0.045)	(0.182)	(0.107)
Observations	67	64	58	58	58
R-squared	0.612	0.631	0.620	0.634	0.637
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Source: Authors' estimation

6. Conclusion

The current paper aims at exploiting the associations between trade liberalization and labor allocations as well as income differentials across types of employments in Vietnam. Informality status of laborers is the original base for our classification. However, information for precisely defining the informality status of laborer is not available in the used data and we employ institutions of employments as a proxy. Accordingly, employments are divided into self-employment, wage work in household businesses and formal sectors of state-owned, private and FDI enterprises.

The empirical models include two steps. Employment attainments and income of individuals are estimated in the first step to derive differences in employments and income at the industry level. Associations between the employment allocation, the income differences and opening up the domestic market measures at the industry level are investigated in the second step. Results of the first step are reasonable and industry individual effects are demonstrated to be relevant in determining employment attainments and income of laborers. Meanwhile, relative high goodness of fits in estimation results in the second step exhibit the capacity of the specifications in the step of capturing variances of dependent variables- different types of employment across industries and pair-employment income differentials.

Opening up the domestic market does not have on labor allocations and income differentials between wage workers in HHBs and formal sectors. The result on labor allocation is different from that of McCaig and Pavcnik (2012) who report significant impacts of the VN-US bilateral trade agreement on labor allocations between HHBs and the formal sectors. The opposite in liberalization directions under studying, opening up the domestic market versus increasing accessing to foreign markets, is a potential reason for the differences in the results.

It also does not have significant effects on labor allocation between self-employment and wage-work in the formal sectors. However, the effects on income gap between these types of employment are not clear.

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Appendix 1. Estimation results of multinomial logit models for employment attainments

Years	2002				2006				2010			
Variables	RRR (1)		RRR (2)		RRR (1)		RRR (2)		RRR (1)		RRR (2)	
Male	0.985		1.627	***	0.681	***	1.395	**	1.212		1.548	***
Age (log)	0	***	0.003	***	0	***	0	***	0	***	0.001	**
Age (log) square	15.054	***	2.374	***	11.298	***	4.371	***	15.153	***	3.183	**
Being household head	1.058		1.007		1.291		1.083		1.078		0.756	*
Kinh-Hoa	0.638		1.075		0.775		0.875		0.366	***	0.968	
Urban	0.802	*	1.103		0.775		0.845		0.701	**	1.026	
Household size (log)	0.927		1.656	***	0.292	***	1.136		0.318	***	1.123	
Household composition												
Proportion of children aged 0-5	4.543	***	0.992		9.105	***	1.163		9.763	***	0.605	
Proportion of children aged 6-10	2.092	**	0.979		11.998	***	4.802	***	11.166	***	3.443	**
Proportion of children aged 11-15	1.766	*	0.902		15.401	***	1.47		12.112	***	1.901	
Proportion of members aged 16-60					Base							
Proportion of adults aged over 60	1.574		1.213		2.691	**	1.349		2.759	**	0.931	
Education												
No degree	0.871		1.323	**	0.909		1.488	*	0.839		0.914	
Primary					Base							
Lower secondary	0.988		0.813	**	0.952		0.831		0.915		0.729	**
Upper secondary	0.501	***	0.372	***	0.572	***	0.486	***	0.687	*	0.288	***
Vocation	0.145	***	0.095	***	0.181	***	0.178	***	0.195	***	0.144	***
College/University	0.065	***	0.038	***	0.04	***	0.029	***	0.04	***	0.069	***
Marital status												
Unmarried	0.684	***	0.853		0.806		1.068		0.762		0.851	
In marriage					Base							
Widow, divorced	0.64	**	0.789		0.617		1.005		0.573	*	0.961	
Non-employment income (log)	1.026		0.437	***	3.543	***	0.504	***	3.732	***	0.598	***
Owning the house	1.477	**	0.958		0.94		1.107		4.365	***	3.719	***
Commune characteristics												
Commune is the remote area	0.664	**	0.826		0.633	*	0.479	***	1.378		1.643	**
Village has permanent car road	0.687	***	0.754	***	0.809		0.894		0.611	**	0.893	
Village has passenger transport stop	1.289	**	1.033		0.709	*	0.878		0.783		1.524	
Workers in commune have wage work	0.475	***	0.668	***	0.61	**	0.954		0.502	***	0.808	

opportunities

	(1)		(2)		(1)		(2)		(1)		(2)	
Commune has nonfarm traditional production	3.237	***	2.191	***	1.872	***	1.027		2.534	***	1.755	***
Constant	6.86E+11	***	98900607	***	47124712		2.49E+09	***	34075.1	*	20544435	***

*** p<0.01, ** p<0.05, * p<0.1

(1): Self-employment; (2): Wage work in HHBs; (3): Wage work in formal sectors. (3) is the base

Appendix 2. Estimation results of income equations

Variables	Self-employment				Wage worker in Household Businesses				Formal wage work			
	2004	2006	2008	2010	2004	2006	2008	2010	2004	2006	2008	2010
Male	0.139**	0.136**	0.146**	0.203***	0.327***	0.325***	0.336***	0.447***	0.161***	0.157***	0.242***	0.147***
	(0.055)	(0.057)	(0.065)	(0.073)	(0.048)	(0.044)	(0.046)	(0.056)	(0.036)	(0.030)	(0.032)	(0.030)
Age (log)	11.950***	10.429***	12.101***	12.349***	5.875***	6.699***	6.842***	7.046***	4.433***	0.969	3.265***	3.960***
	(0.976)	(1.098)	(1.356)	(1.709)	(1.104)	(0.929)	(1.194)	(1.166)	(1.010)	(0.935)	(0.976)	(0.944)
Age (log) square	-1.687***	-1.462***	-1.692***	-1.723***	-0.84***	-0.97***	-0.99***	-1.02***	-0.59***	-0.094	-0.43***	-0.54***
	(0.143)	(0.158)	(0.193)	(0.245)	(0.162)	(0.139)	(0.176)	(0.172)	(0.152)	(0.140)	(0.144)	(0.139)
Urban	0.174***	0.291***	0.291***	0.491***	0.139**	0.103**	0.172***	0.193***	0.138***	0.138***	0.131***	0.187***
	(0.052)	(0.054)	(0.064)	(0.067)	(0.054)	(0.047)	(0.048)	(0.052)	(0.036)	(0.033)	(0.032)	(0.030)
Kinh-Hoa	0.190**	0.002	0.337**	1.350***	0.311***	0.181***	-0.126	-0.019	0.489***	0.206**	0.073	0.040
	(0.095)	(0.138)	(0.146)	(0.229)	(0.094)	(0.060)	(0.090)	(0.094)	(0.118)	(0.091)	(0.085)	(0.069)
No degree	0.010	-0.029	-0.172*	-0.218*	-0.054	-0.004	-0.152**	-0.135	-0.068	-0.054	-0.054	-0.18***
	(0.084)	(0.080)	(0.097)	(0.123)	(0.068)	(0.055)	(0.062)	(0.096)	(0.058)	(0.060)	(0.073)	(0.065)
Primary school							Base					
Lower secondary	0.018	0.054	0.022	-0.127	-0.070	-0.056	-0.030	0.074	-0.031	0.021	0.037	-0.004
	(0.060)	(0.058)	(0.062)	(0.078)	(0.048)	(0.042)	(0.051)	(0.046)	(0.044)	(0.038)	(0.042)	(0.038)
Upper secondary	0.051	0.030	0.193**	-0.037	0.013	0.102	0.051	-0.061	0.117**	0.065	0.082*	0.078*
	(0.093)	(0.081)	(0.091)	(0.104)	(0.078)	(0.074)	(0.073)	(0.091)	(0.053)	(0.050)	(0.045)	(0.044)
Vocational training	0.173**	0.154*	-0.092	0.190	0.155**	-0.028	0.075	0.063	0.029	0.183***	0.143***	0.197***
	(0.074)	(0.090)	(0.098)	(0.121)	(0.066)	(0.111)	(0.074)	(0.080)	(0.048)	(0.045)	(0.045)	(0.044)
College/University	0.263	0.289	0.515*	0.034	-0.764	0.350	0.461***	0.127	0.426***	0.604***	0.794***	0.711***
	(0.191)	(0.255)	(0.290)	(0.248)	(0.887)	(0.445)	(0.126)	(0.293)	(0.080)	(0.072)	(0.076)	(0.060)
Constant	-19.77***	-16.74***	-19.70***	-20.79***	-9.59***	-10.33***	-10.06***	-10.13***	-7.31***	-0.93	-4.33***	-4.96***
	(1.655)	(1.896)	(2.372)	(2.966)	(1.879)	(1.515)	(2.019)	(1.968)	(1.672)	(1.555)	(1.660)	(1.585)
Observations	945	929	872	880	620	679	747	643	958	1113	1148	1327
R-squared	0.379	0.345	0.346	0.359	0.311	0.284	0.306	0.386	0.334	0.327	0.375	0.363

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' estimation with data from VHLSSs