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Tariff Policies and Wages in Manufacturing Industries: New Evidence from Viet Nam

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Abstract: *This paper reviews the tariff policies and their impact on the wages of workers in manufacturing during the substantial trade liberalisation period in Viet Nam from 2011 to 2015, the four years following Viet Nam becoming a middle-income country. The key results are as follows. At the industry level, decreasing trends of input tariffs the net effective rate of protection (ERP) are observed in accordance with the reduction in output tariffs. Positive ERP is only found in some manufacturing of final products, while negative ERP remains in several high-intensive technology industries. At the provincial level, higher ERP was found in provinces in the northern key economic zone in 2011, however the ERP of these provinces dropped in 2015. At the firm level, given the global trade modes of firms, the decrease in the ERP as well as the ITR and the NRP induces better earnings for workers in low-skilled, labour- intensive firms. This new evidence may suggest that in the era of new-generation free trade agreements in which negotiating for better market access for imported inputs is in focus, more attention should be paid to the ERP in technology-intensive industries and the better earnings of workers in high-skilled, labour-intensive firm. Additionally, the localised effects of tariff structures should be considered for regional development.*

Keywords: Viet Nam, localised, tariff policies, effective rate of protection.
JEL Classification: F10, F16.

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1. Introduction

Liberalisation in trade induces two pro-competitive forces driving the productivity of firms (Topalova and Khandelwal, 2011). The first force is the competition that is caused by lowering the tariffs that are imposed on imported final goods (output tariffs) (Melitz, 2003; Melitz and Ottaviano (2008). The second force is the access of firms to better imported inputs because of reduction in tariffs on imported intermediates (e.g. Goldberg et al., 2009).

Amiti and Davis (2011) explained the mechanism whereby tariff policies can stimulate wages through the causal impact of the policies on the profit of firms. They show empirical results that the influence of reductions in input and output tariffs on wages in manufacturing in Indonesia depends on the mode of a firm in globalisation (importing or exporting).[1] Theoretically and empirically, Luong (2011) showed that the effect of tariff policies on total factor productivity and wages depends on the degree of differentiation in input markets. In a study of Viet Nam, poverty decreases faster in provinces in the country that were more exposed to the cut in export tariff under the bilateral trade agreement between Viet Nam and the United States (McCaig, 2012). Nevertheless, evaluating the net effect of trade protection on an industry requires measurement of the effective rate of protection (ERP), which is calculated from both the input and output tariffs. Athukorala (2006) stated that the interactions amongst the output tariff, input tariff, and free trade input shares play an important role as overall protection on value added. Topalova and Khandelwal (2011) recommended using the ERP to capture the net effect of tariff policies on firm-level total factor productivity.

Little evidence in the literature gives a complete study of the tariff structures (ITR, NRP, and ERP) at both the industry level and regional level, or the impact of tariff policies on firm-level wages in a developing country, such as Viet Nam. Our study is the first to review the tariff structures (ITR, NRP, and ERP)[2] of Viet Nam for 16 two-digit

[1] The authors found that wages in exporting firms are higher and wages in importing firms are lower when there is a decrease in the output tariff. A fall in the input tariff raises wages in importing firms but lowers wages in exporting firms.

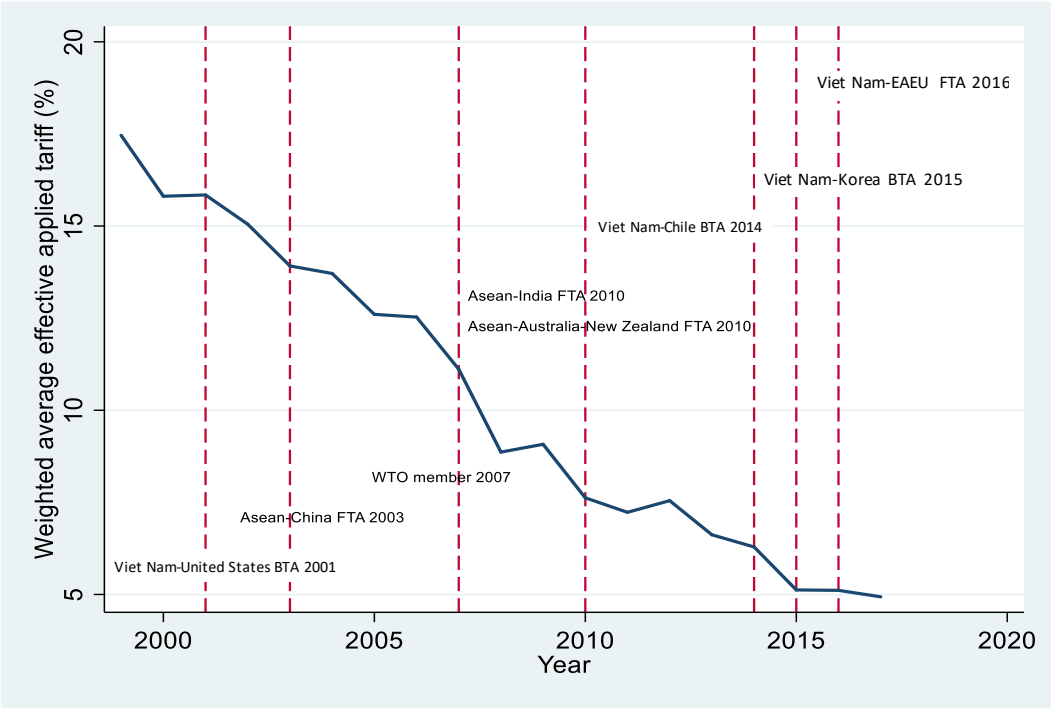
2 The tariff policies analysed in this study include the effective rate of protection (ERP), input tariffs (tariffs imposed on imported intermediates; ITR) and output tariffs (tariffs imposed on imported final goods; and the nominal rate of protection (NRP).

manufacturing industries and proposes an updated measurement to map the tariff structures into 63 provinces in the country. Moreover, we conduct an insightful investigation and present fresh empirical results on the impact of the tariff policies on wages paid by manufacturing firms in different modes of trade integration (import, export, foreign invested, and domestic owned).

Viet Nam is an interesting case study for analysing the effects of localised tariffs on wages in light of trade liberalisation, especially for the period between 2011 and 2015. The year 2011 is a milestone for the economic development of Viet Nam because it marks the country becoming a middle-income country. Importantly, the period between 2011 and 2015 witnessed substantial trade reforms in the country. A number of bilateral trade agreements (BTAs) and free trade agreements (FTAs) wear signed and negotiated, for example the ASEAN–India FTA and the ASEAN–New Zealand FTA in 2010; the Viet Nam–European Free Trade Association (EFTA) in 2012 (in negotiation);[3] the Regional Economic Comprehensive Partnership (RCEP) in 2013 (in negotiation); the Viet Nam–Chile BTA in 2014, the Viet Nam–Republic of Korea (henceforth, Korea) BTA in 2015; and the Viet Nam–Israel BTA in 2015 (in negotiation). Figure 1 plots the weighted average of effectively applied tariffs for goods imported into Viet Nam in the timeline of some key BTAs and FTAs. Before 2007, to prepare for the accession to the World Trade Organization (WTO), BTAs and FTAs between Viet Nam and other countries were signed,[4] so that the country and its BTA/FTA trade partners could mutually lower the tariff rates for their trading goods. Since becoming a member of the WTO in 2007, the tariff rates on goods traded mutually by Viet Nam and its WTO members have been sharply reduced. After 2007, Viet Nam signed and negotiated more FTAs, which allow the country to enjoy even lower tariff rates than the applied most-favoured nation (MFN) rate committed to with members of the WTO.[5] Additionally, Figure 2 shows the more active integration of Viet Nam into the total global value chain (GVC) relative to other economies on average (during 1995–2011).

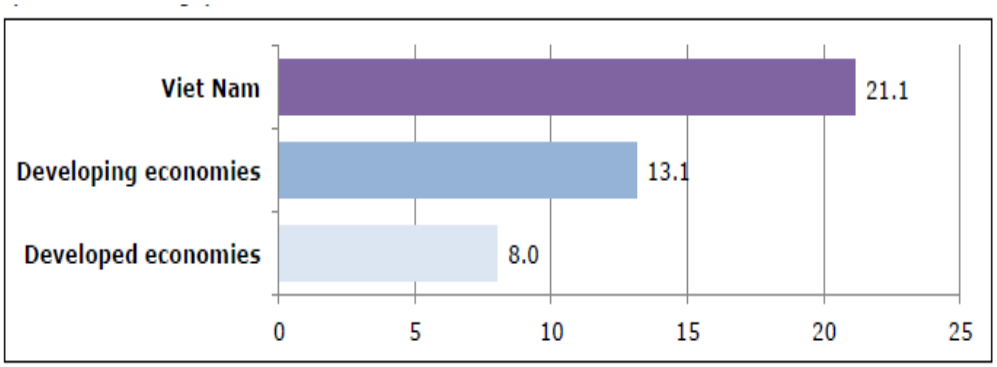
[3] The EFTA includes members Switzerland, Norway, Iceland, and Liechtenstein.
[4] For example, the Viet Nam–United States BTA in 2001, the ASEAN–China FTA in 2003, and the ASEAN–Korea FTA in 2006.
[5] For example, the ASEAN–Japan FTA in 2008, Japan–Viet Nam Economic partnership 2009, ASEAN–India FTA and Asean–New Zealand FTA in 2010, Viet Nam–EFTA in 2012 (still in negotiation), Regional Economic Comprehensive Partnership in 2013, Viet Nam–Chile BTA in 2014, and Viet Nam–Korea BTA in 2015, etc.

Figure 1: Weighted Average of the Effectively Applied Tariff on Imported Goods to Viet Nam (1999–2017)



Note: The weighted average effectively applied tariffs include preferential tariffs when applicable in the case of new FTAs or BTAs in effect.
Source: The weighted average effectively applied tariffs are downloaded from http://wits.worldbank.org. The timeline of selected BTAs/FTAs signed and in effect are downloaded from www.wtocenter.vn

Figure 2: Evolution of Total GVC Participation of Viet Nam (1995, 2011)



Source: www.wto.org

Our study focuses on several research questions. *At the industry level,* we calculate the ERP, ITR, and NRP to investigate the tariff structures in 16 two-digit manufacturing industries in Viet Nam. *At the provincial level,* we measure the localised input tariffs and output tariffs, and map the localised ERP for 63 provinces in the country

in 2011 and 2015. *At the firm level,* (i) we search for empirical evidence of whether trade openness in Viet Nam can lift growth in firm-level real wages through reductions in the ERP, ITR and NRP; (ii) we also investigate whether there are wage differences between importing and non-importing firms, and exporters and domestic market-oriented producers that are caused by the exposure of the tariff structures.

We use a novel dataset compiled from firm-level data in manufacturing (2006, 2011, and 2015) provided by the General Statistics Office of Viet Nam (GSO), the inter-country input–output (ICIO) table for the year 2011 (OECD, version 2016), and weighted average applied effective tariff data for Viet Nam for the respective years (WITS). *At the industry level,* our results for the two-digit industries (ICIO classification) show that the calculated input tariffs and the net effect of protection were decreasing during 2011–2015.[6] The net effective rate of protection remains high in some industries for final goods, such as textiles and transport vehicles. *At the provincial level*, the ERP of provinces in the northern key economic zone were higher than the others in 2011. However, that pattern changed in 2015. Particularly, the ERP in these provinces dropped, while the ERP rose in other provinces in either the southern or central regions. This adds to the existing literature fresh evidence of localised net effects of tariffs in developing countries. *At the firm level*, we find that a reduction in the ITR raises wages in importing firms more than their non-importing counterparts, and a cut in the NRP leads to higher earnings for workers paid by exporters compared to non-exporters. The impact of trade liberalisation on wages in Viet Nam is particularly larger in low-skilled, labour-intensive firms, given their mode of international trade integration, through the channel of input and output tariff reduction. Reducing the ERP also leads to better earnings for workers in firms hiring more low-skilled employees in the global integration modes. In short, the stakeholders who earn more from the global value chain integration of Viet Nam are workers in the less-skilled firm. It is noted that Viet Nam's comparative advantage in international trade is its low-skilled labour force. These results support the pro-competitive hypothesis in Topalova and Khandelwal (2011) and the discussion of the different impacts generated from the NRP or IRP on wages paid by exporters or importers by Amiti and Davis (2011). The results are also in line with the common thoughts that

[6] This is because of a sharp reduction in the nominal rate of protection (NRP) in these industries when Viet Nam was preparing for membership and the became a member of the WTO in 2007, and the country also signed additional FTAs and BTAs afterwards (see Figure 1).

international trade helps individuals to move out of extreme poverty in developing countries (Pavcnik, 2017).

This paper is organised as follows. The next section reviews the literature relevant to tariff policies and the causal effects on wages. The third section discusses the methodology applied in our research. The fourth section describes the data used in this research. The fifth section presents the empirical results, and the last section gives conclusions.

2. Literature Review

Theoretically, Amiti and Davis (2011) hypothesised that lower output tariffs reduce the wages paid by importers but raise the wages paid by exporters, and a fall in the input tariff raises wages for workers in importing firms compared to non-importing firms. They provide supportive empirical evidence using the case study of Indonesian manufacturing (1991–2000). Positive income growth in regions exposed more to trade between the years 2002 and 2004 in light of the Viet Nam–United States (US) BTA (signed in 2001) is discussed by McCaig (2011) and Fukase (2013). McCaig (2011) concluded that growth in provincial wages is negatively correlated with the increase in nominal tariffs only, but the causal effect is only significant for the group of workers with at most primary school education. Fukase (2013) indicated that provinces exposed more to export liberalisation gain higher growth in wages paid for low-skilled labour, but wages paid to high-skilled labour grow at lower rate. Fukase (2013) improved on the literature by proposing an export index that takes into account whether an industry is export oriented. The studies of Fukase (2013) and McCaig (2011) measured the changes of the tariff policies. However, they only consider the reduction of nominal tariffs on goods exported from Viet Nam. For the case study of Vietnamese manufacturing during the period of important trade reforms (2001–2009), Ha (2015) finds that a reduction in output tariffs is harmful to firm-level total productivity but a cut in input tariffs stimulates productivity. Vu et al. (2018) stated that workers in processing exporting firms were paid lower than those in non-exporting firms in Viet Nam. For the case study of Chinese manufacturing firms, Brandt et al. (2017) showed that a cut in output tariffs reduces mark-up and raises TFP, but a reduction in input tariffs pushes up both the mark-up and TFP of firms. However, none of these authors look at the net effects of tariffs on wages.

In a more complete investigation of tariff structures, Athukorala (2006) estimated the ERP of industries in Viet Nam during the period 1997–2003. Athukorala (2006) showed that highly protected industries contributed less to total industrial output and employment. Topalova and Khandelwal (2011) studied the two forces driving firm-level productivity, which are induced respectively from the reduction of input and output tariffs as well as ERP for the net effects of trade policies on productivity. The empirical results given by Topalova and Khandelwal (2011) indicated that the two pro-competitive forces stimulate the total factor productivity of firms in India. Trade liberalisation and poverty reduction in terms of better earnings for low-skilled workers in developing countries are also discussed in Pavcnik (2017).

Our analysis is built closely from the existing literature, particularly the theoretical framework on trade liberalisation and wages of Amiti and Davis (2011) and other empirical studies by Athukorala (2006), McCaig (2011), Topalova and Khandelwal (2011), and Fukase (2013). In detail, this paper reviews the tariff structure of Viet Nam between 2011 and 2015 by analysing the tariff structure (ERP, ITR, and NRP) at the two-digit industry level following the studies of Athukorala (2006), Topalova and Khandelwal (2011) and Corden (1966). From that calculation, we go one step further from the literature (Topalova and Khandelwal, 2011; McCaig, 2011; Fukase, 2013; Brant et al., 2017) to map the localised index of the ERP for 63 provinces in Viet Nam for two years, 2011 and 2015. For an in-depth analysis of tariff structure on the average real wages of firms divided by group of low- and high-skilled labour intensity in different globalisation modes (such as importers and exporters, foreign-invested firms and domestic firms), we apply the first-difference estimator using firm-level data on manufacturing in Viet Nam between 2011 and 2015 (see McCaig (2011) and Fukase (2013)).

We develop a measurement of the localised index of the ERP from the calculated ITR and the NRP to conduct a complete review of the tariff structures in Viet Nam at the provincial level. Apart from that, we contribute new firm-level evidence on how tariff policies influenced wages in Viet Nam for 4 years after the country became a middle-income country in 2011.

Table 1 summarises the mixed empirical results on the impact on total factor productivity, mark-up, and wages induced from tariff policies in developing countries.

Table 1. Summary of Selected Studies for Developing Countries

Authors	Result	Policy Implication	Country	Data	Tariff
Brandt et al. (2017)	Cut in NPR reduces mark-up, raises total factor productivity (TFP). Cut in ITR stimulates both mark-up and TFP	Pro-competitive effects of trade liberalisation on firm-level mark-up and total factor productivity.	China	Firm data 1998–2007	NRP ITR
Amiti and Davis (2011)	Cut in NPR lowers wages at import-competing firms, raises wages at exporting firms. Cut in ITR raises wages at firms using imported intermediates.	Impact of tariff policies on wages via global engagement.	Indonesia	Firm data 1991–2000	NRP ITR
Topalova and Khandelwal (2011)	Reduction in NRP and ITR boosts firm-level TFP. ITR induces larger impacts. Lower ERP increases firm-level TFP.	Pro-competitive effects of trade liberalisation impact on productivity and industrial reforms.	India	Firm data 1989–1996	ERP NRP ITR
Luong (2011)	Cut in ITR stimulates firm-level TFP and wages when industry has input differentiated. Cut in NRP causes opposite results.	Gain from trade liberalisation.	Mexico	Industry data 1984-1990	NRP ITR

3. Methodology

3.1. Measurement of tariff structures (ITR, ERP)

First, we follow Topalova and Khandelwal (2011) and Amiti and Davis (2011) to calculate the input tariff rate ITR_{jt} of industry *j* in year t in equation 1.

$$ITR_{jt} = \sum_{s} \left(\delta_{js,2011} \times NRP_{jt}\right) \qquad \text{(Equation 1)}$$

Where:

NRP_{jt} (nominal rate of protection of industry j at time t) is the tariff imposed on imported goods in industry j at year t. $\delta_{js,2011}$ is the value share of the imported input *s*

used in the value of output in industry *j*. Intuitively, ITR_{jt} is the weighted average of the nominal rate of protection applied in industry j at year t using a fixed share of input *s* imported into industry j in year 2011.

Adding to the existing literature,[7] we take a further step to calculate the NRP and ITR that are localised at the provincial level. They are constructed, respectively, using the share of labour in industry j in province p in the year 2006, which is: $\frac{L_{jp,2006}}{L_{p,2006}}$.

$$NRP_{pt} = \sum_{j} \frac{L_{jp,2006}}{L_{p,2006}} NRP_{jt} \qquad \text{(Equation 2)}$$

$$ITR_{pt} = \sum_{j} \frac{L_{jp,2006}}{L_{p,2006}} ITR_{jt} \qquad \text{(Equation 3)}$$

At the industry level, we measure ERP_{jt} for industry j at year t using NRP_{jt} (tariff on import goods of industry j at year t) and ITR_{jt} (input tariff of industry j at year t); δ_{js} is the coefficient calculated from the OECD–WTO inter-country input–output table (year 2011) to show the share of input *s* in the value of output *j*. δ_{js} is assumed to be unchanged between 2011 and 2015, and Cobb–Douglas technology is assumed (this assumption is in line with Amiti and Davis (2011)).

$$ERP_{jt} = \frac{NRP_{jt} - ITR_{jt}}{1 - \sum_{s} \delta_{js,2011}} \qquad \text{(Equation 4)}$$

Then, we propose an index to measure the net effects of trade protection in industry *j* experienced by province *p* as follows:

$$ERP_{pt} = \sum_{j} \frac{L_{jp,2006}}{L_{p,2006}} ERP_{jt} \qquad \text{(Equation 5)}$$

In equations 2, 3 and 5, we choose the year 2006 as the pre-WTO time-invariant labour data because Viet Nam joined the WTO in 2007. The analogous consideration for time-invariant labour data can be found similarly in McCaig (2011) and Topalova (2010). By applying this method, equations 2, 3, and 5 only consider the variation of the NPR, ITR, and ERP but not the variation of labour at the provincial level.

[7] See, for example, McCaig (2011), Fukase (2013), Topalova and Khandelwal (2011), and Amiti and Davis (2011).

3.2. Baseline specification to estimate the impact of localised trade liberalisation at the provincial level

We apply the first-difference estimator (FD) to examine the impact of the localised trade liberalisation on the provincial average income and labour productivity of Vietnamese manufacturing in 2015 (see Amiti and Davis (2011), McCaig (2011), and Fukase (2013) for the same approach). The FD has the advantage of controlling for time-variant uncontrolled variables that may have an influence on both the dependent and independent variables. In other words, when working with provincial-level data, this estimator is unbiased and consistent, and it can remove the provincial fixed effects from the climate, topology, and resource endowments of each province (the 'first nature geography', Redding (2010)). In our study, because the number of years is 2, the FD estimator is numerically equivalent to the fixed effects estimator. The dependent variables in focus are the log values of provincial real output and the log values of real output per capita (as the proxy for labour productivity).

Our baseline estimation is:

$$\Delta \, LnY_{pt} = \beta_0 + \beta_1 \, \Delta NRP_{pt} + \beta_2 \, \Delta ITR_{pt} + \Delta \, \varepsilon_{pt} \quad \text{(Equation 6)}$$

$$\Delta \, LnY_{pt} = \beta_0 + \beta_1 \, \Delta ERP_{pt} + \Delta \, \varepsilon_{p} \quad \text{(Equation 7)}$$

Where:

$\Delta \, LnY_{pt}$: the first-differencing in log values of the average real wage in province *p* at time *t*. (Alternatively, $\Delta \, LnY_{pt}$ is the first-differencing in log values of the real output per capital in province *p* at year *t*).

ΔNRP_{pt} (nominal rate of protection): the first-differencing of the NRP in province *p* at time t.

ΔITR_{pt} (input tariff rate): the first-differencing of tariffs in province *p* at time *t*.

ΔERP_{pt} (effective rate of protection): the first-differencing of the ERP of province *p* at time t.

Section 3 gives details that explain how to construct the variables using the available data.

3.3. Baseline specification to estimate the impact of tariff policies on firm-level average wages

Evaluating the localisation of trade and the integration of each province is challenging due to the data limitation. Firm-level data show more clues for the connection between tariff liberalisation and its impact on firm performance, such as wages (income per capita).

We are interested in the influences of tariff structures, including the net effects from trade liberalisation on firm-level average wages. Similarly, the dependent variables in focus are the log values of average wages (LnW_{ij}) and the log values of real output per capita (as the proxy for labour productivity).

Our specification for the firm-level analysis is similar to Amiti and Davis (2011), however we do not use instrumental variable estimation as we do not have the issue of endogeneity of trade policies as noted later in section 4.2.1.

Our baseline estimation using the first-difference estimator is:

$$\Delta LnW_{ijt} = \beta_0 + \beta_1 \Delta NRP_{jt} + \beta_2 \Delta ITR_{jt} + \beta_3 \Delta LnX_{ijt} + \Delta \varepsilon_{ijt} \quad \text{(Equation 8)}$$

$$\Delta LnW_{ijt} = \beta_0 + \beta_1 \Delta ERP_{jt} + \beta_2 \Delta LnX_{ijt} + \Delta \varepsilon_{ijt} \quad \text{(Equation 9)}$$

Equation 8 examines the separate effects from NRP_{jt} and ITR_{jt} (see Topalova and Khandelwal (2011) and Amiti and Davis (2011)). Equation 9 investigates the impact of ERP_{jt}. Regarding ΔLnX_{ijt}, we take advantage of the available information in the firm-level data, such as export and import status and foreign ownership, to construct dummy variables to investigate the differences in wage premium paid by exporters and importers under exposure to the tariff liberalisation. We also study the difference in the impact of the tariff structure when firms employ more skilled workers compared to others.

4. Data Description

We use firm-level data from the Vietnamese enterprise survey (VES) for the years 2006, 2011, and 2015 for our analysis. In addition, data from the OECD–WTO input–output (IO) table for 2011 are also merged with the firm data. The tariff data imposed on

imported goods to Viet Nam are the weighted effectively applied tariffs downloaded from database of the World Bank.[8] The tariffs are the applied MFN rates, which include the lower rate of the preferential tariff when it is applicable in the case of FTAs or BTAs.

The 2-digit 2007 Vietnamese Standardized Industry Classification (VSIC 2007) in the firm-level data (the VES data) is equivalent to ISIC Rev.4 (International Standardized Industry Classification). To link the VES data with the IO table for the year 2011 (2016 edition, OECD), the classifications of the industries in the VES data are converted from ISIC Rev.4 to ISIC Rev.3 using the concordance of the General Statistic Office of Viet Nam (GSO). Some of the industries in the VES are also combined consistently in line with the 2-digit industry classification of the IO table (see Table 8 in the Appendix). When calculating the NRP for the industries that are combined from other industries, we use the trade weight to calculate weighted average tariff. The weight of trade is also downloaded from the World Bank.

We exploit the firm-level data for two years, 2015 and 2011, which gives a 4-year difference. Technically, difference of four years could remove the unit roots and measurement errors (Amiti and Davis, 2011). Importantly, 2011 marks when Viet Nam became a middle-income country. During the period between 2011 and 2015, the country also signed and negotiated a number of new FTAs and BTAs (as noted in the introduction). The data for this substantial trade reform period Viet Nam can give updated, fresh empirical evidence of the rise in wages under the causal effects of tariff polices in Viet Nam (2011–2015) relative to the results under the exposure of the Viet Nam–US BTA between 2002 and 2004 (McCaig, 2011; Fukase, 2013). For more details about the measurement of the variables used in this study, see Table 2.

[8] See http://wits.worldbank.org

Table 2. Measurement of Variables

Variable	Measurement	Data	Source
$\mathbf{LnW}_{p,t}$	Log values of average real wages in province p at year t deflated by year 2010. Log value of total real wages in province p at year t deflated by base year 2010.	VES 2011 and 2015 WB GDP deflator	General statistics office of Viet Nam (GSO)
$\mathbf{NRP}_{j,t}$ (%)	Weighted effectively applied tariffs on goods imported to industry j in year t.	2-digit ISIC.Rev 3 converted to industry classification of the input–output table (OECD version 2016)	http://wits.worldbank.org
$\mathbf{ITR}_{j,t}$ (%)	Weighted average of nominal rate of protection applied in industry *j* at year *t* using a fixed share of input *s* imported into industry *j* in year 2011 (%).	2-digit ISIC.Rev 3 converted to industry classification of the input–output table (OECD version 2016)	Authors' calculations using NRPj,t downloaded from http://wits.worldbank.org
$\mathbf{ERP}_{j,t}$ (%)	Equation 4; closely follows Topalova and Khandelwal (2011).	Weighted applied tariff for years 2010 and 2014	http://wits.worldbank.org
$\mathbf{ERP}_{p,t}$	Equation 5	Weighted applied tariff for years 2010 and year 2014 Labour weight of province by industry, 2006	
$\mathbf{X}_{p,t}$	Log values of labour intensity of province p; log of female ratio in the workforce in province p, etc.	Aggregate at provincial level from VES 2011 and 2015	General Statistics Office of Viet Nam
$\mathbf{X}_{ij,t}$	Log values of labour intensity export/import status, foreign ownership, profit, etc.	VES 2011 and 2015	General Statistics Office of Viet Nam
Input–output coefficient		Inter-country input–output table year 2011	OECD (edition 2016)
Real output	Log values of output deflated by base year 2010.	VES 2011 and 2015, and WB GDP deflator	General Statistics Office of Viet Nam and the World Bank

4. Results and Discussion

4.1. Industry-level tariff structures

Table 3 indicates the nominal rate of protection (NRP, weighted effectively applied tariffs imposed on final goods imported to Viet Nam), input tariffs (ITR, tariffs on intermediate goods), and the effective rate of protection (ERP) for manufacturing

industries in Viet Nam for two years, 2011 and 2015. Remarkably, being highly protected from imported competition is revealed in industries that were imposed high NRP, such as: motor vehicles and textiles. Highly subsidised industries with high ITR are textiles, chemicals, rubbers and plastics products, and fabricated metal products. Overall, the tariff structure shows a decreasing trend during the period. The decrease in the ITR and ERP is because of the reduction in the NRP since the country enjoys MFN tariffs (committed to in the WTO) and lower preferential tariffs (committed to in new FTAs/BTA that came into force during the period). We find high correlation between the ITR and NRP (about 0.95) for both 2011 and 2015.

The results of the ERP in Table 3 demonstrate the proportionate change in the per unit value added of domestic industries induced by the structure of the tariff protection during 2011–2015 in Viet Nam. The sharp drop of the ERP in 2015 compared to 2011 was recorded for the manufacture of electrical machinery and apparatus, n.e.c; motor vehicles, trailers, and semi-trailers; and other transport and manufacture of equipment. The negative values for the ERP are presented in the manufacture of chemical products and computer, electronic, and optical equipment, which are industries for intermediate products. In contrast, the highest positive net effects of protection in positive values are shown in the manufacture of final goods, such as textiles, leather and footwear, motor vehicles, trailers and semi-trailers, and manufacturing n.e.c; recycling. These results for the ERP at the industry level for manufacturing in Viet Nam from 2011 to 2015 are in line with the tariff structures of the country in 2003 as analysed by Athukorala (2006). However, highly protected industries in trade in 2011 and 2015, such as the manufacture of textiles and the manufacture of fabricated metal, count for substantial shares in the total output and total labour for manufacturing in Viet Nam. For example, the output share of the textiles industry was 8.80% and 10.72% in 2011 and 2015, respectively. The textile industry created 27.22% and 30.89% in total jobs, accordingly, in 2011 and 2015. This finding is not similar to the result found by Athukorala (2006) that highly protected industries do not substantially contribute to the total output and labour force for manufacturing.

Table 3: Nominal Rate of Protection (NRP), Input Tariffs (ITR), and the Effective Rate of Protection (ERP) in 2011 and 2015 by Industry (%)

Industry	NRP2011	NRP2015	ITR2011	ITR2015	ERP2011	ERP2015
Chemicals and chemical products	1.650	1.310	3.835	2.522	-6.034	-3.346
Computer, electronic and optical equipment	1.044	1.099	2.751	1.897	-5.528	-2.583
Wood and products of wood and cork	1.170	0.740	0.703	0.490	0.628	0.336
Basic metals	1.610	1.080	1.258	0.880	0.823	0.466
Electrical machinery and apparatus, nec	4.880	1.690	2.165	1.150	4.968	0.988
Machinery and equipment, nec	2.270	1.430	0.925	0.545	1.854	1.219
Other transport equipment	11.730	3.210	3.789	1.678	18.423	3.555
Food products, beverages, and tobacco	5.115	4.208	2.442	1.777	4.594	4.177
Pulp, paper, paper products, printing, and publishing	7.430	5.220	2.570	1.805	7.935	5.577
Coke, refined petroleum products, and nuclear fuel	9.030	5.650	2.223	1.426	10.244	6.356
Fabricated metal products	8.230	5.210	3.745	2.444	13.059	8.054
Rubber and plastics products	9.920	6.590	3.536	2.411	14.004	9.168
Other non-metallic mineral products	9.960	9.650	2.725	2.030	11.017	11.603
Manufacturing nec; recycling	15.800	10.240	1.641	1.066	21.147	13.703
Motor vehicles, trailers, and semi-trailers	18.640	11.140	2.662	1.676	24.463	14.489
Textiles, textile products, leather, and footwear	10.374	8.969	5.707	4.538	15.667	14.877

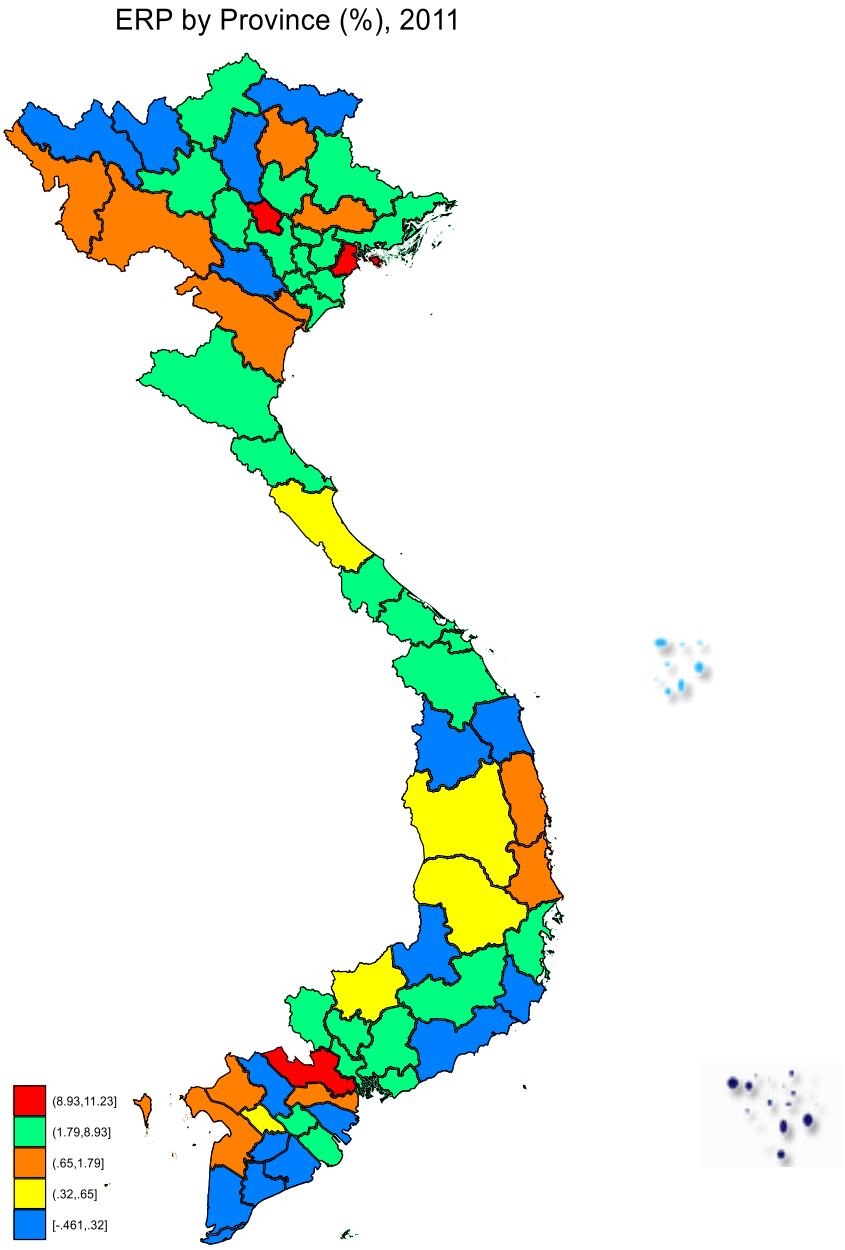
Note: The NRP of merged industries is calculated using the weights of the trade values. The ITR and ERP are measured based on the method in Topalova and Khandelwal (2011). Industry classification follows the classification of the ICIO (see Appendix, Table 8).
Sources: The nominal rate of protection is downloaded from http://wits.worldbank.org. The Inter-country Input–output (ICIO) table for 2011 is provided by the OECD (2016 edition).

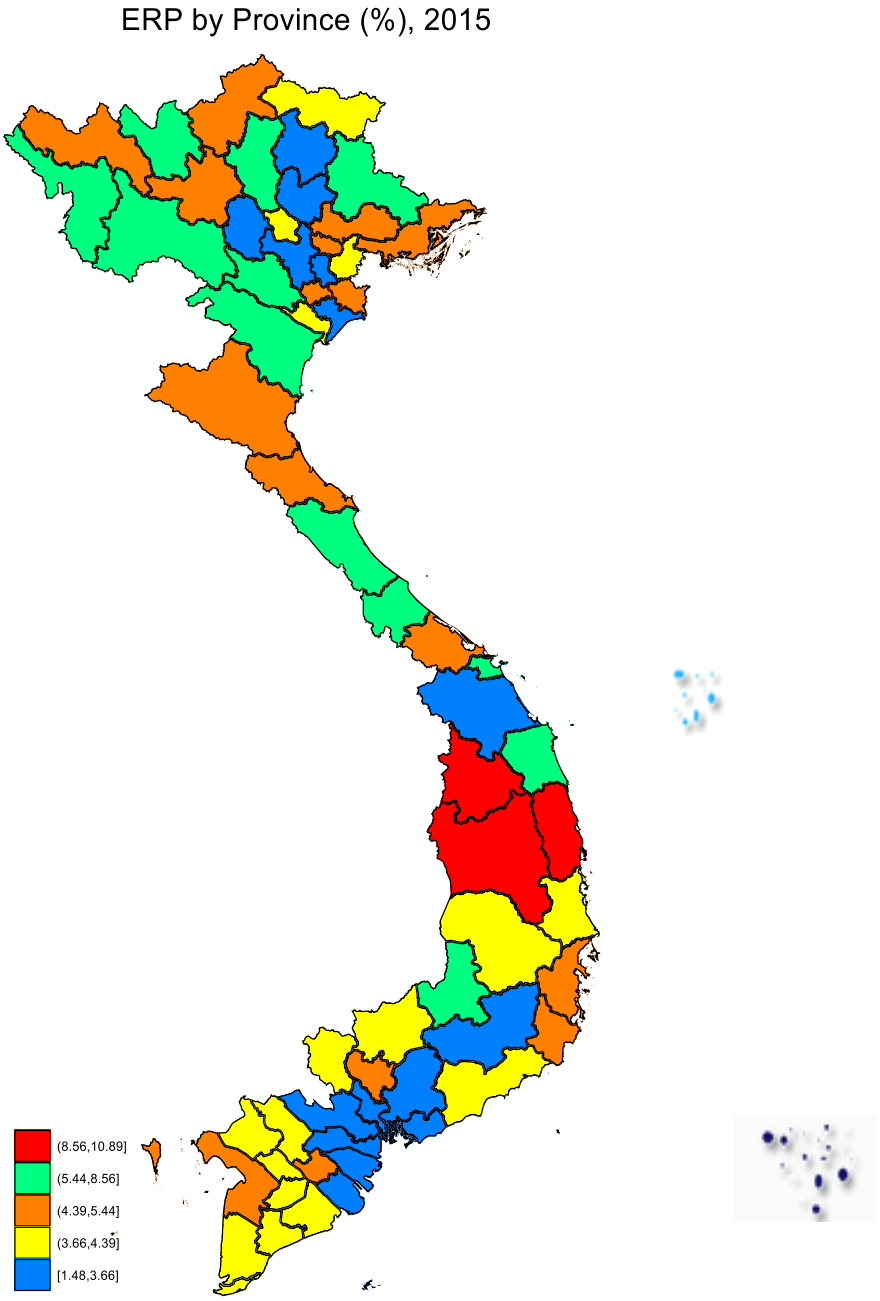
4.2. Mapping tariff structures to provinces

In this section, we measure the localised NRP, localised ITR, and localised ERP to investigate and visualise the net effective rate of protection for 63 provinces in Viet Nam in 2011 and 2015. In this calculation, the tariffs are lagged by one year. This means the indexes for the studied period in 2011 and 2015 are calculated respectively for 2010 and 2014. The lagged years reflect the fact that the economy needs time to react to the effects of tariffs on the input and output markets. The industry labour share in one province, which reflects the industry structure of the province, is fixed for the year 2006 in calculating the weighted NRP, ITR, and ERP (one year before Viet Nam officially became a WTO member in 2007). Hence comparing the provincial ERP in two years accounts for the variation of ERP during the research period.

Figure 3 presents the patterns of the ERP in 2011 and 2015 for 63 provinces in Viet Nam. Generally, negative values for the ERP are recorded in some provinces in 2011, but the ERP shows only positive values in 2015. Figure 3 indicates higher values of the ERP in 2011 in municipalities and large provinces such as Hanoi, Hungyen, Vinhphuc, Namdinh, Haiphong, and Quangninh in comparison to ERP values of other provinces. These provinces belong to the key Northern economic zone of the country (except for Namdinh). However, high values of provincial ERP in 2015 were shown in other 'emerging provinces', such as Binhdinh, Vinhlong, Binhduong, Kontum, and Gialai in either the southern or central regions. Higher value of ERP implies a higher proportional rise in per-unit provincial value-added due to the exposure of the provinces to the net effective rate of protection.

Figure 3. Effective Rate of Protection (ERP) in 2011 and 2015 by Province (%)





Source: The nominal rate of protection is downloaded from WITS for lagged years in 2010 and 2014. The Inter-country Input-output (ICIO) table for 2011 is provided by the OECD (2016 edition). The weight is the labour data from the enterprise survey of Viet Nam in 2006 (before the country's WTO accession).
Note: The NRP of merged industries is calculated using the weight of trade values. The ITR and ERP are measured based on the method in Topalova and Khandelwal (2011). The industry classification follows the classification of the ICIO (see Appendix Table 8). Due to the limitation of the administrative data, these maps only show the ERP by provinces of Viet Nam, not all islands of the country.[9]

[9] See the similar mapping application using the administrative data of Vietnam from the Geoinformation system in Nguyen (2017).

Figure A1 visualises the real income per capita for 63 provinces in Viet Nam in 2011 and 2015. The pattern of real income per capita by province does not change much in the two years. Binhduong, Dongnai, Bacninh, Quangngai, Baria Vungtau are amongst the provinces with the highest income per capita for both 2011 and 2015. As presented in section 3, we apply the first-difference estimator in our baseline specification (equations 6 and 7), which is similar to the methodology used by McCaig (2011) and Fukase (2013). However, we do not find a significant impact of localised NRP, ITR, and ERP on provincial real income per capita for the period 2011–2015 in the country. McCaig (2011) also found insignificant impacts of localised export tariff cuts on regional wages in Viet Nam during 2001 and 2003.

4.2 Firm analysis

4.2.1 The endogeneity of trade policies

The existing literature raises the concern about the endogeneity of tariff policies on firm-level productivity and wages. For example, see Brandt et al. (2017), Topalova and Khandelwal (2011), McCaig (2011), and Amiti and Davis (2011), respectively, for case studies of tariff policies in China, India, Viet Nam, and Indonesia. Large firms can lobby the government for adjustments in trade policies; or the government may lower tariffs for industries with high productivity. To detect the endogeneity in our research, we run a simple ordinary least squares (OLS) regression of industrial tariffs (ERP, ITR, NPR) in 2014 on the log of the real total wage bill for firms in 2011 for which the industry effects at two digits are controlled.[10] The real total wage bill can be proxied for the size of the firm. The results show very small coefficients with insignificant impacts; hence, the endogeneity issue of tariff policies during 2011 and 2015 in Viet Nam does not exist (see Table 4). The reason could be that the size of firms in Viet Nam is not big enough, and industry associations in the country are not powerful enough to influence the tariff policies assigned by the government.

[10] Topalova and Khandelwal (2011) also conducted a similar regression but using control variables at the industry level.

Table 4. Placebo Test for the Endogeneity of Tariff Policies

	(1) ERP 2014	(2) NRP 2014	(3) ITR 2014
Firm-level real wage 2011	0.00167 (0.001)	0.00266 (0.001)	0.00048 (0.001)
Industry dummy	Yes	Yes	Yes
Province dummy	Yes	Yes	Yes
Observations	23796	25074	25074
R-squared	0.721	0.727	0.789

Note: Standard errors in parentheses. Significance: * p<0.05 ** p<0.001 *** p<0.001. These results are estimated from a sample of domestic firms only. When including foreign direct invested firms, we find similar insignificant results.
Source: Authors' calculations using data from the Vietnamese Enterprise Survey in 2011, and tariff data for 2014 from the World Bank (http://wits.worldbank.org).

4.2.2 Impact of tariff policies (ITR, NRP, and ERP) on firm-level real wages

To estimate the impact of the tariff structures in trade liberalisation on firm-level real wages, we run a fixed effect estimation in which the dependent variable is log-transformed, i.e. the log of firm-level real wages, and the independent variables are the tariff rates in percentages (ITR, NTR, and ERP).[11] Our model also controls for fixed effects by year and industry. However, the interaction term between year and industry fixed effects (as used in Brandt et al., 2017) was excluded in our estimation because the term can eliminate the industry-level variation of tariff structures by year.

To focus our study on the impact of the tariff structure on the wages paid by the globalisation modes of firms (importing and exporting activities of firms), similar to Amiti and Davis (2011), we use dummy variables to control for the type of firm, and take advantage of the interaction terms between the dummy and the variables controlling for the variation of tariff structures. We assume that importers in our sample import intermediates for their production processes not for trading purposes, and exporters export final goods. Foreign-invested firms are also controlled by a dummy variable because they are expected to pay higher wages compared to domestic firms (see Vu et al., 2018 and Arnold and Javorcik, 2009). Following closely the theoretical assumption of Akerlof (1982) and Amiti and Davis (2011) that firms gaining higher profit pay more

[11] To interpret the results in our estimation, we need to take exponential of the coefficients.

wages, using our data we run a fixed effect regression of wages on profit as a control variable, and find a significantly positive coefficient of profit (0.063).

In Table 5, column (1) shows that while exporters paid higher wages than domestic market-oriented firms, the importers offered lower wages to their workers during 2011 and 2015. The former is because only more efficient firms can engage in global markets (Melitz, 2003; Amiti and Davis, 2011), and they can pay higher wages; the latter is because purchasing intermediates from foreign markets is more costly for producers (Topalova and Khandelwal, 2011), so importers gain less profit, and as a result, the wages in their firms are lower than for non-importers.

The results in column (1) in Table 5 indicate that the reduction in the NRP and ITR raises the real wages paid by firms, but the cut in the ITR induces larger effects on wages. The result for the impact of the NRP on wages in this study is not in line with the results given by Amiti and Davis (2011) for Indonesian industries and Luong (2011) for Mexican industries. However, the sign of the impact is similar to how the reduction in NRP stimulates higher firm-level TFP in China (Brandt et al., 2017). This could be explained as a cut in the NRP induces higher competition in the domestic market and forces inefficient firms to exit. As a result, the more efficient incumbents pay higher wages for workers than the inefficient firms. On the other hand, lowering the ITR reduces input prices for importers so that they can obtain higher profits to pay higher wages.

Additionally, the results in columns (2), (3), and (4) in Table 5 consistently show the influence of the tariff structure for different firm types. Particularly, a one percentage point reduction in the ITR raises wages in importing firms by 0.107% more than in non-importing firm. Meanwhile, a one percentage point decrease in the NRP raises the wages paid by exporters by 0.081% more than firms producing only for domestic markets. The results in column (5) indicate the negative impacts of the tariff structures on the wages of firms.

Columns (6) and (7) in Table 5 show that reducing the ERP increases the real wages of workers in importing firms relative to non-importers, as well as workers in exporting firms compared to non-exporting firms. Particularly, decreasing the ERP by one percentage point stimulates wages by 0.065% more in importing firms compared to non-importing counterparts, and raises the wages paid by exporters by 0.003% more relative to non-exporters. To estimate the effects of the ERP on firms that both import

intermediates and produce goods for international markets, we run the same FE estimation as presented in equation (9) and keep only a sample of these firms. The results of firms importing input intermediates and serving global markets show that a one percentage point reduction in the net effects of protection raises the wages paid by these firms by 0.005%.

Table 5. Impact of IRP, NRP, and ERP on Real Average Wages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Real wage	**Real wage**	**Real wage**	**Real wage**	**Real wage**	**Real wage**	**Real wage**
Input tariff rate (ITR) %	-0.064***	-0.057***		-0.015			
	(0.014)	(0.014)		(0.015)			
Nominal rate of protection (NRP) %	-0.015***		-0.026***	-0.021***			
	(0.003)		(0.003)	(0.003)			
IMPORT (dummy = 1)	-0.099***	0.034+		0.040*	0.103***	-0.060**	
	(0.011)	(0.019)		(0.020)	(0.011)	(0.019)	
EXPORT (dummy = 1)	0.083***		-0.041*	-0.030	0.087***		-0.025
	(0.013)		(0.020)	(0.021)	(0.014)		(0.021)
FDI (dummy = 1)	0.217***	0.233***	0.203***	0.212***	0.207***	0.213***	0.198***
	(0.029)	(0.029)	(0.029)	(0.029)	(0.032)	(0.032)	(0.032)
IMPORT # IRP		-0.050***		-0.058***			
		(0.007)		(0.007)			
EXPORT # NRP			0.014***	0.017***			
			(0.002)	(0.002)			
Effective rate of protection (ERP) %					-0.005***	-0.004***	-0.006***
					(0.001)	(0.001)	(0.001)
IMPORT # ERP						-0.001+	
						(0.001)	

EXPORT # ERP							0.003***
							(0.001)
Observations	106078	106078	106078	106078	99716	99716	99716
R-squared	0.228	0.227	0.225	0.230	0.226	0.226	0.225
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The ITR and ERP are calculated using the methods of Topalova and Khandelwal (2011). Average real wages are in log values.
Standard errors clustered at the firm level are in parentheses. Significance: + p<0.1 * p<0.05 ** p<0.001 *** p<0.001.
Source: Authors' calculations using the Vietnamese enterprise survey for 2011 and 2015. The NRP is the weighted average of the effectively applied tariff on imported goods to Viet Nam in 2010 and 2014, downloaded from http://wits.worldbank.org.

Next, in Table 6, we group the firms in our panel data into a high-skilled group (the firm-level share of skilled labour in total employees is greater than the median value of the industry) and a low-skilled group (the firm-level share of skilled labour in total employees is less than the median value of the industry) by exploiting the information on the share of skilled labour in total employees by industry in 2011 (we do not have information on skilled workers at the firm level for 2015). The estimation in Table 6 is controlled for fixed effects (FE) by year, province, and industry and includes an interaction between province FE and industry FE. The interaction between province FE and industry FE can control for the industry policy change across provinces.

The results in Table 6 indicate the greater influence of the ITR on low-skilled importers compared to high-skilled importers (for the sample of domestic firms in column (1) and (2) as well as the sample of all firms in column (3) and (4)). Similarly, the rise in the NRP shows a more negative influence on low-skilled exporting firms for both samples. Particularly, reducing the ITR by one percentage point raises the wages paid by high-skilled domestic importers by 0.057% but raises the wages paid by low-skilled domestic importers by 0.07% (columns (1) and (2) in Table 6). Lowering the NRP by one percentage point only increases wages in domestic high-skilled exporters by 0.032% but for domestic low-skilled importers by 0.092% (columns (1) and (2) in Table 6).

Table 6. ITR, NRP, and Firm-level Real Average Wage by Skill Group

	(1)	(2)	(3)	(4)
	Domestic firms		**All firms**	
	High-skilled	**Low-skilled**	**High-skilled**	**Low-skilled**
Input tariff rate (ITR) %	-0.050*	0.020	-0.035+	0.011
	(0.022)	(0.028)	(0.020)	(0.025)
IMPORT (dummy =1)	0.069*	0.039	0.045	0.026
	(0.030)	(0.034)	(0.028)	(0.033)
IMPORT # ITR	-0.062***	-0.070***	-0.047***	-0.061***
	(0.011)	(0.013)	(0.010)	(0.012)
Nominal rate of protection (NRP) %	-0.018***	-0.018***	-0.021***	-0.022***
	(0.005)	(0.005)	(0.004)	(0.004)
EXPORT (dummy = 1)	-0.029	-0.095**	0.005	-0.105***
	(0.035)	(0.034)	(0.030)	(0.030)
EXPORT # NRP	0.015***	0.021***	0.013***	0.023***
	(0.004)	(0.004)	(0.003)	(0.004)
FDI (dummy =1)			0.188***	0.236***
			(0.036)	(0.047)
Observations	40526	55526	45742	60336
R-squared	0.214	0.293	0.218	0.287
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Province # Industry	Yes	Yes	Yes	Yes

Note: The ITR and ERP are calculated using the methods of Topalova and Khandelwal (2011). Average real wages are in log values.
Standard errors are in parentheses. Significance: + p<0.1 * p<0.05 ** p<0.001 *** p<0.001.
Source: Authors' calculations using the Vietnamese enterprise survey for 2011 and 2015. The NRP is the weighted average effectively applied tariff on imported goods to Viet Nam in 2010 and 2014, downloaded from the World Bank (http://wits.worldbank.org).

In Table 7, we look further at the influence of the net effects of protection (ERP) on the wages of high-skilled and low-skilled importers, exporters, and FDI firms. A drop in the ERP stimulates higher wages paid by importers compared to non-importers as well as exporters relatively to non-exporters (columns (1)–(4) in Table 7). The impact is stronger in firms employing more low-skilled workers.

Table 7. ERP and Firm-level Real Average Wage by Skill Group

	(1) High-skilled	(2) Low-skilled	(3) High-skilled	(4) Low-skilled
ERP (%)	-0.004***	-0.005***	-0.005***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
FDI (dummy =1)	0.217***	0.211***	0.207***	0.194***
	(0.051)	(0.041)	(0.050)	(0.041)
IMPORT (dummy =1)	-0.025	-0.120***		
	(0.026)	(0.031)		
IMPORT # ERP	-0.001	-0.000		
	(0.001)	(0.001)		
EXPORT (dummy =1)			0.037	-0.112***
			(0.030)	(0.031)
EXPORT # ERP			0.001	0.005***
			(0.001)	(0.001)
Observations	42956	56760	42956	56760
R-squared	0.211	0.284	0.211	0.283
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Industry # Province	Yes	Yes	Yes	Yes

Note: The ITR and ERP are calculated using the methods of Topalova and Khandelwal (2011). Average real wages are in log values. Standard errors are in parentheses. Significance: + p<0.1 * p<0.05 ** p<0.001 *** p<0.001.

Source: Authors' calculations using the Vietnamese enterprise survey for 2011 and 2015. The NRP is the weighted average effectively applied tariff on imported goods to Viet Nam in 2010 and 2014, downloaded from the World Bank (http://wits.worldbank.org).

5. Conclusion

This study gives a complete review of tariff structures at the industry and provincial levels in Viet Nam. Moreover, we show novel empirical results for the impact of tariff policies on firm-level wages in the country. Our results at the industry level indicate that together with the decreasing trend of the NRP and ITR, the ERP has reduced; however, the ERP still remains at high values in some industries for final goods, such as textiles, rubber and plastics products, motor vehicles, trailers, and semi-trailers. The results are in line with the analysis of tariff structures in Viet Nam in 2003 (Athukorala, 2006). Negative values for the ERP are only found in high-technology intensive industries, such as the manufacture of chemicals and computers, electronics, and optical products. At the provincial level, we find that the ERP was higher in municipalities and large cities in 2011 but dropped and remained at high values in emerging provinces in 2015. Importantly, we contribute to the existing literature on trade liberalisation with fresh evidence about the impact of tariff policies on wages in Viet Nam. A reduction in input and output tariffs induces higher earnings for workers in importing and exporting firms, respectively, compared to their colleagues working in domestic market-oriented firms during 2011–2015. Interestingly, under the impacts of openness to foreign markets through the tariff cut, a higher wage premium is shown in low-skilled, labour-intensive firms given their global trade integration modes.

These insightful results are important to Viet Nam as they are presented in the context of four years after the country became a middle-income country and when the country was in a substantial trade reform period when more FTAs and BTAs were being signed and negotiated. Generally, some high-technology intensive industries experience negative net effects of trade protection, and the key stakeholders that gain higher earnings due to trade openness are workers in low-skilled labour-intensive firms. Although these results confirm that international trade can reduce poverty by raising the wages of low-skilled labour in developing countries, such as Viet Nam, high-skilled, labour-intensive firms as well as high-technology intensive manufacturing need more attention from trade policy makers when they negotiate the tariffs in FTAs and BTAs.

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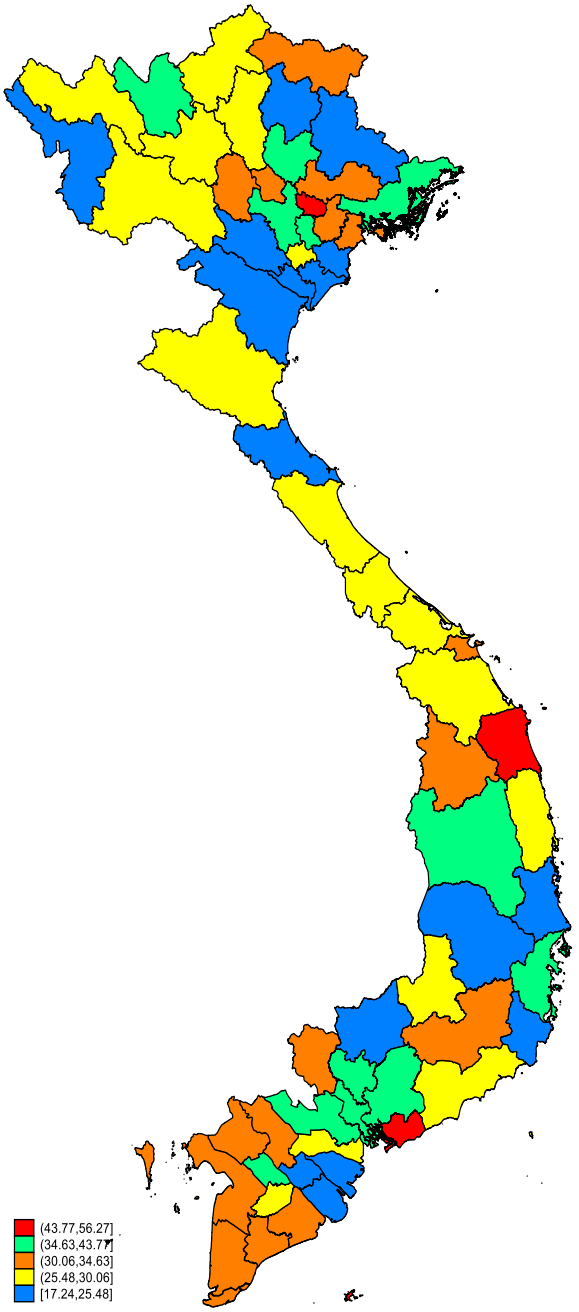
Appendix

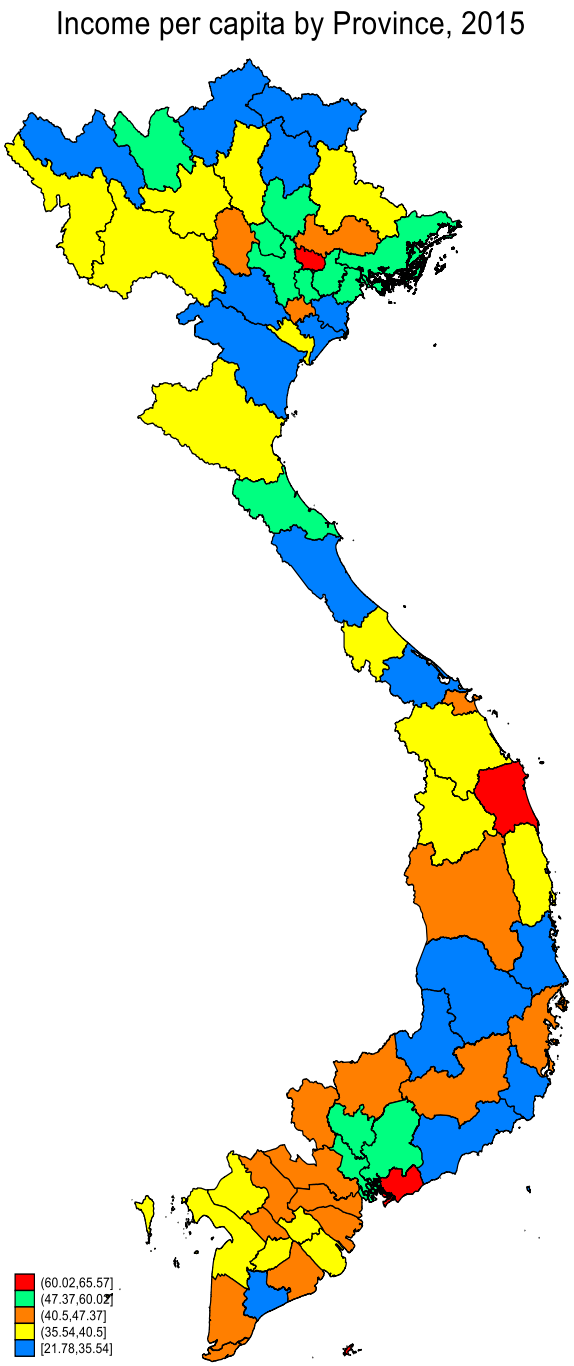
Table A1: Industry Classification

ISIC Rev.3	Industry
C15T16FOD	Food products, beverages, and tobacco
C17T19TEX	Textiles, textile products, leather, and footwear
C20WOD	Wood and products of wood and cork
C21T22PAP	Pulp, paper, paper products, printing, and publishing
C23PET	Coke, refined petroleum products, and nuclear fuel
C24CHM	Chemicals and chemical products
C25RBP	Rubber and plastics products
C26NMM	Other non-metallic mineral products
C27MET	Basic metals
C28FBM	Fabricated metal products
C29MEQ	Machinery and equipment, nec
C30T33XCEQ	Computer, electronic, and optical equipment
C31ELQ	Electrical machinery and apparatus, nec
C34MTR	Motor vehicles, trailers, and semi-trailers
C35TRQ	Other transport equipment
C36T37OTM	Manufacturing nec; recycling

Source : ICIO Table version 2016 from OECD website (http://oe.cd/icio).

Figure A1. Real Income per Capita in 2011 and 2015 by Province (%)





Note: Due to the limitation of the administrative data, these maps only show the income per capita by provinces of Viet Nam, not for all islands of the country.
Source: The Vietnamese enterprise survey (VES) 2011 and 2015.

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