TRADE LIBERALIZATION AND LABOR MARKET ADJUSTMENTS IN VIETNAMESE MANUFACTURING

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January 2013

ABSTRACT. Using both industry and firm level data sets during the period 2003-2008, this paper provides the first comprehensive investigation of the impact of trade liberalization on employment and wages in Vietnamese manufacturing. Overall, we find empirical evidence that trade liberalization has a negative effect on employment and wages. However, the impact magnitude is modest with a decline within 2.4%-3.5% in real wages and 0.76% and 0.17% reductions in industry and firm employment respectively on average over the period. We further investigate the effects of trade liberalization on gender and skill earning gaps and the role of trade unions by location. The analysis shows that trade liberalization appears to reduce the gender and skill earnings differentials.

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1   Introduction

Trade openness has historically gone hand in hand with better economic performance, in both developed and developing economies, creating new opportunities for workers, consumers and firms around the globe through a positive business climate, flexible labor markets, high-quality education and skill training systems (OECD, 2012). Still, once a developing country has opened up to international markets, concerns over employment and wage decline have been posed.

Trade particularly affects employment and wages in several ways. First, trade can increase per capita incomes though output growth, resulting in real average wage increases.[1] Second, increased exports and imports can raise productivity growth, creating higher skill and higher wage jobs.[2] However, trade liberalization may, at least in the short term, put pressure on less competitive industries, triggering unemployment and downward wage trends. Third, skill-biased technological change may increase demand for skilled labor, leading to wage inequality (Feenstra and Hanson, 1997). Fourth, the impact of trade liberalization possibly increases industry wage premium, which reflects industry rents. Furthermore, due to imperfect competition, different levels of rent sharing between firms and workers among industries can cause wage differentials (Ghazali, 2011).

Previous empirical studies have found conflicting results about labor market adjustment to trade liberalization which could manifest itself through increasing imports, exports, and offshoring, or decreasing tariffs and non-tariffs barriers, leading to changes in the effective rate of protection (ERP). For instance, Stone and Cepeda (2011) find that imports have a strong and positive effect on wages in 55 OECD and non-OECD countries, but Ravenga (1997) produces evidence of negative effects of trade reforms on employment and wages in Mexican manufacturing. Goldberg and Pavcnik (2005) find a positive relationship between tariffs and

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[1]The OECD Growth Study estimated that a 10 percentage point increase in trade openness translates over time into an increase of around 4% in per capita income in the OECD area. China and India demonstrate how policies thatliberalize trade and investment can contribute to raising incomes in developing countries (OECD, 2012).

[2]Exporters in the United States on average pay wages that are about 6% higher than non-exporters (Bernard et al., 2007)

the industry wage premium. Focusing on the impact on employment, Sakurai (2004) concludes that increased trade negatively impacts employment for the case of Japan. By contrast, Sen (2002) points out that international trade caused positive employment growth in Bangladesh and Kenya. Currie and Harrison (1997) find no impact of trade openness on employment in Morocco.

The specific objective of this study is to investigate how labor markets respond to trade liberalization in Vietnam over the period 2003-2008. We follow and build upon the approach by Revenga (1997) and analyze the link between trade liberalization, employment and wages using empirical models at both the industry and firm level. As in Revenga (1997) we allow trade protection (measured as effective rate of protection, ERP) to affect wages and employment directly at industry level and indirectly at firm level through changes in output and quasi rents. More specifically, in the firm level analysis, we use trade policy variables, i.e. ERP and import penetration, as instruments for the endogenous independent variables, i.e. output and quasi rents. We use panel datasets at industry and firm levels for manufacturing sectors which come from the Vietnamese General Statistics Office (GSO) and the Danish International Development Agency (DANIDA)'s small and medium enterprise (SME) surveys.

Since opening up to the world economy in 1986, Vietnam has strongly embarked on the trade liberalization process by being involved in many bilateral and multilateral agreements (Japan, China, US, ASEAN, APEC, EU, WTO), reflecting decreasing ERP and increasing import penetration due to tariff reductions. Based on this background, we show a negative impact of trade reforms on wages and employment at both industry and firm levels in Vietnamese manufacturing over the period 2003-2008. Additionally, the paper improves our understanding of trade liberalization effects by taking into account the rent sharing[3] between firms and employees as an adjustment mechanism to face trade policy changes. We find trade-induced decreases in quasi rents which represent a decline in wages.

The approach on quasi rents further allows us to identify heterogeneity in bargaining power across firms by gender and skill composition. A firm with a greater fraction of unskilled (production) or female workers shows a lower ability of workers to capture part of the quasi

[3]Martins (2007) define rent sharing as "referring to a situation in which rents are shared by the firm, at least in some part, with the employees of that firm".

rents. This finding provides evidence for gender and skill earning differentials in Vietnamese manufacturing. However, trade liberalization can moderate these gaps as in line with Ghazali (2011) for the case of Tunisia.[4] In addition, trade unions and collective agreements seem to have a role in reducing the skill earning inequality. To the best of our knowledge, these relationships have not been comprehensively investigated for the case of Vietnam.

The structure of this chapter is as follows. Section 2 and 3 respectively provide the literature and some facts on trade liberalization and labor markets. Section 4 presents the data and some preliminary evidence. Section 5 discusses the industry level analysis, while Section 6 presents the firm level results. The final section produces some conclusions.

2 Literature on Trade Liberalization and Labor Market

The Heckscher-Ohlin model and its companion Stolper-Samuelson theorem (HO/SS) set up a theoretical background on the labor market effects of trade liberalization whereby trade openness increases the relative returns to abundant factor and lowers that of the scarce factor, expecting increases in wages and reduction in wage inequality. Some recent studies provide support for a HO/SS view of trade (see Friedman et al., 2012; Stone and Cepeda, 2011; Bernard et al., 2007) in contrast to the others which find rising wage gaps in both developed and developing countries (see Gottschalk and Smeeding, 1997; Berman, Bound, and Machin, 1998; Pavcnik, 2003). Growing wage inequality can be explained in part by the change in the structure of labor demand in favor of skilled workers, resulting from skill-biased technological change induced or accelerated by trade liberalization (Acemoglu, 2003). Particularly, the underlying causes of changes in labor demand in developing countries are based on the increase of capital flows and capital assets from developed to developing countries in the era of globalization (Feenstra and Hanson, 1997).

Referring to employment adjustments, existing literature have found mixed results.[5] Difference in employment response to trade liberalization possibly depends on firm behavior in

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[4]Ghazali (2011) indicates that trade reforms appear to have reduced wage inequality between skilled and unskilled labor in Tunisia.

[5]For example, McMillan and Verduzco (2011) show that employment in manufacturing fell in Latin America, the Middle East and North Africa and in Sub-Saharan Africa but increased in East Asia and Eastern Europe. Exports

lower/higher profit periods or whether labor markets are in short run or long run. Firms can reduce their profit margins rather than adjusted employment or instead, they raise productivity of the existing workforce and efficiency gains can be achieved without firing labor (see Currie and Harrison, 1997; Tybout and Westbrook, 1995). Unemployment could increase in the short run due to external or domestic shocks but decline in the long run with permanent changes in trade liberalization when labor market returns to long-run employment equilibrium (Dutt, Mitra and Ranjan, 2009; Stone and Cepeda, 2011).

From another perspective, trade liberalization can impact wages and employment directly at industry level but indirectly at firm level. A reduction in trade protection that shifts industry product demand will tend to move employment in the same direction (Revenga, 1997). Industry wage response in turn depends on wage-setting mechanism. With a competitive setting, wages react to market-clearing rates of labor supply and demand. In contrast, under imperfect competition, because of the presence of unions for instance, wage and employment adjustments could be based on industry wage premium.[6] Industry wage premium channel should be considered in short to medium term horizons where prevent free movements of workers across sectors. The premiums can take the form of industry rents in the trade models that introduce imperfect competition and rent sharing.

Although trade reforms are usually implemented at the industry level, firm-level wage and employment adjustments are expected to vary depending on firm characteristics, for example market power level, capital or labor intensity, or workforce composition. Also, the responses are based on a wage-setting mechanism which presents the bargaining power of workers with the presence of unions or collective agreements. Revenga (1997) produces the results that many of the rents generated by trade protection were absorbed by workers in the form of a wage premium in Mexican manufacturing. Trade liberalization reduced the rents available to be captured by firms and workers. Ghazali (2011), following the approach of Revenga (1997) for

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can contribute to job creation (Heo and Park, 2008; Milner and Wright, 1998; Fu and Balasubramanyam, 2004). Gaston (1998) also shows that exports positively affect employment, but imports cause a negative impact in Australia.

[6]Goldberg and Pavcnik (2005) define it as the portion of individual wages that cannot explained by worker, firm, or job characteristics, but can be explained by the worker's industry affiliation.

the case of Tunisia, documents that the quasi rents reduction, which is one of the adjustment mechanisms used by Tunisian firms to face trade openness, reduces wage inequality as skilled labor was more able than unskilled labor to capture rents before trade reforms.

In regards to the role of union in dealing with the rent sharing, higher rates of unionization as well as higher coverage and coordination of collective bargaining have been found to be associated with higher wages, lower levels of income inequality and wage disparity, a lower gap between the wages of skilled and unskilled workers as well as a lower gap between men and women (Friedman et al. 2012; Aidt and Tzannatos, 2002; Hayter and Weinberg, 2011). On the contrary, Reinecke and Valenzuela (2011) argue that the potential role of unions and collective bargaining in improving the distribution of wages has been used in a very limited manner in Chile.

Meanwhile, rent sharing can reduce employment fluctuations to trade openness due to the presence of unions. Revenga (1997) shows that organized labor is important in Mexico. The restrictive labor market regulations in this country make it difficult and expensive to fire a worker. The author confirms that if wages contain a rent component, workers can be willing to trade off wages to preserve jobs. In contrast, Krugman (1996) argues that in countries with rigid wage setting institutions, trade may perhaps have larger effects on employment than wages. Görg and Görlich (2011) point out adjustments through employment levels in Germany as wage setting arrangements in this country was a high degree of inflexibility, which is done by large unions at the sectoral level.

3   Labor Market in Vietnam under Trade Liberalization

3.1   Trade liberalization and some Facts

The economic restructuring process (called *Doi Moi*) started in 1986 when Vietnam transformed from a centrally-planned economy to a market-oriented economy. GDP growth accelerated to 9.8% annually from the early 1990s to 1998 then fell to 7.3% from 2000 to 2009 (GSO). The economic structure has changed with the tendency towards industrialization. During the period 1990 to 2010, the contribution of the agriculture sector dropped from 38.7% to 20.9% while that of industry and construction, and service sectors changed from 22.7% and 38.6% to 40.2% and 38.9% respectively.

Figure 1: Vietnam's Imports and Exports, 1990-2010
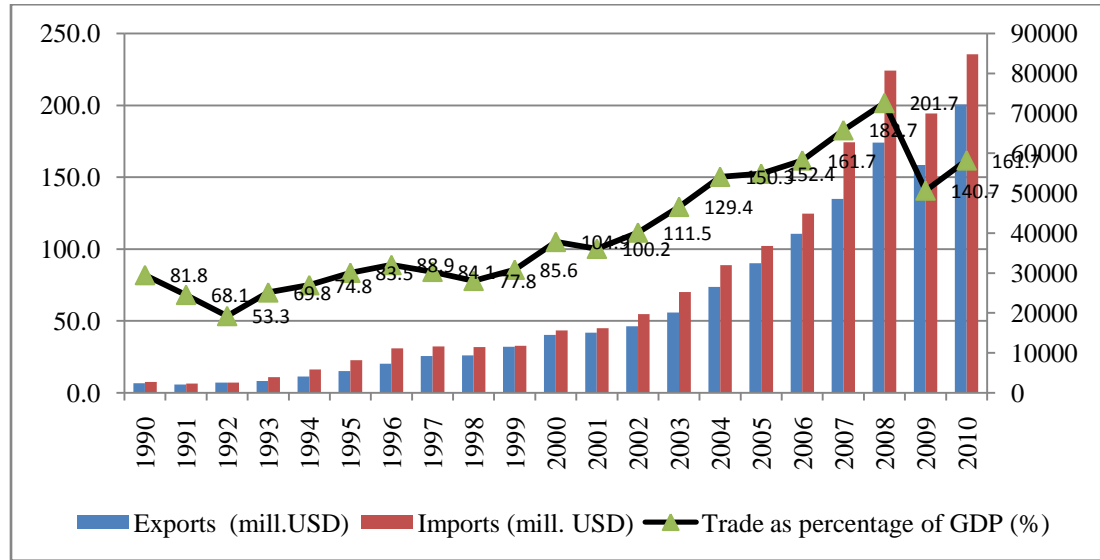
Vietnam's total export volume grew from around US$ half a million to reach US$ 71.6 billion in 2010, which is equivalent to an annual growth rate of 20% (GSO, 2006, 2011). Imports are generally higher than exports but trade deficits are not very large. Trade liberalization contributed to a growing intensity in terms of exports and imports relative to GDP (*Figure 1*).

Since opening up the economy, Vietnam has been party to multilateral and bilateral trade agreements and MFN agreements with over 80 nations (MUTRAP, 2011). For example, bilateral trade agreements with the European Union and the United States were signed in 1992 and 2000 respectively. Joining ASEAN in 1995, Vietnam started implementing tariff reductions under the Common Effective Preferential Tariff of the ASEAN Free Trade Area (CEPT/AFTA) which began in 2001 and was completed by the beginning of 2006. Agreements under ASEAN auspices with China and Japan came into effect in 2002 and 2003 respectively. The country joined APEC in 1998 and signed an MFN agreement with Japan a year later. In addition, as a member of the WTO since 2007, it is bound to many MFN agreements. Each time such a major agreement was reached, Vietnam's trade with that region expanded, and these trade agreements were clearly an impetus to ongoing domestic economic reforms (Abbott, Bentzen and Tarp, 2009). In the period 1997-2003, average tariffs on merchandise

were reduced slowly from 21% to 20.3% while ERP decreased quickly from 121% to 46% (Athukorala, 2004).

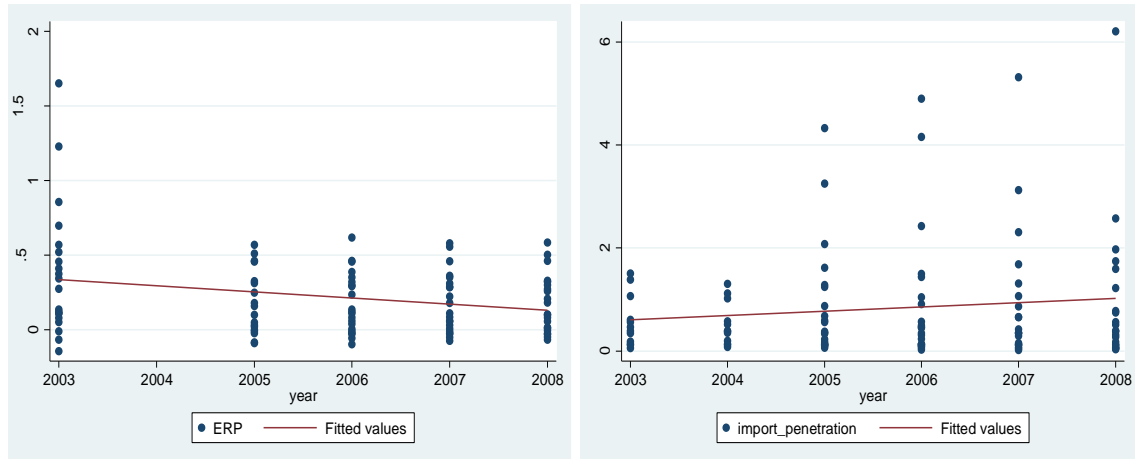**Figure 2: Tendency of ERP and Import Penetration at Industry Level, 2003-2008**

Figure 2 shows the trends in ERP and import penetration in the following years from 2003 to 2008, using the industry level data used in this study. As we can see, ERP continued a downward trend with values lower than 50%. Labor intensive sectors such as Wearing Apparel, Tanning and Dressing of Leather are more highly protected than others. ERP are positive for most industries; reflecting that returns to capital and labor are higher in these industries than they would have been in the absence of tariff protection. However, negative ERP shows that firms in these industries can be harmed by intervention, i.e. Manufacture of Refined Petroleum Products, or they would be worse off under free trade because of being highly supported by state intervention (*Appendix 1*).

The import penetration rate has an upward tendency from 2003 to 2008 (if we ignore the Coke and Refined Petroleum Products industry[7]), reflecting the gradual lifting of trade protection. However, import penetration rates still keep decreasing in many sectors including Tanning and Dressing of Leather, Wearing apparel, Medical Precision and Optical Instruments (*Appendix 2*).

Under CEPT/AFTA, Vietnam is committed to reducing tariffs on all but few sensitive items from AFTA member countries to less than 5% by the year 2006. Within the WTO accession

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[7]Vietnam exports crude oils but imports over 90% of refined oil and petroleum. The import penetration ratio of this industry is always over 3,000 % per year, which can mislead the average indicator for the whole economy.

framework, the 2006 average tariff levels will be reduced from 17.4% to 13.4% after the implementation period, generally from 5 to 7 years. The average reduction of tariffs for industrial products is from 16.3% to 12.2% over 12 years. Vietnam's participation in the Information and Technology Agreement was the most significant, by which about 330 tariff lines for information technology products will be reduced to 0% over a period of 3-5 years. Its participation in the Textile and Clothing Agreement leads to a significant tariff reduction for these items, in particular textiles from 40% to 12%, and clothing from 50% to 20% (MUTRAP II, 2008).

3.2 Labor Market in Vietnam: An Overview

Vietnam's population is estimated at approximately 89 million in 2010, of which over 61.6% is under 25 years of age. Approximately 15.5% of the population are considered to be trained or skilled workers (with elementary qualifications or higher) (MUTRAP, 2011). The labor force increased by 2.4 million to a total of 49.3 million persons from 2007 to 2009, together with an increase in the labor force participation rate of 2.1% to76.5% in 2009. Labor has a tendency to move from the countryside to large cities like Hanoi, Ho Chi Minh city (HCMC), leading to continuous increases in the proportion of the urban population of working age. For example, 1.8 million people moved during 2007-2009 (MOLISA[8], 2010). The restructuring of state owned enterprises and opening up to foreign direct investment has led to a redistribution of the labor force, with workers moving from the state sector to private enterprises.

After WTO accession, employment continues to undergo structural changes with a decreasing share in the agriculture sector but increasing shares in the industry and service sectors. During the period 1999-2009, the percentage of workers in agriculture, forestry and fishing sectors reduced from 64.1% to 51.9%, while that in industry and construction and service sectors increased from 12.4% and 23.4% to 21.4% and 26.7% respectively. The unemployment and underemployment rates in urban areas are 4.6% and 3.3% in 2009 (GSO, 2000, 2010[9]).

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[8]Ministry of Labor, Invalids and Social Affairs

[9]Statistical Year Book 2000, 2010 (GSO)

Only 23.1% of the labor force are contracted employees, while the majority of workers are self-employed (38.47%) or work in a family business (38.43%). However, demand for skilled labor in Vietnam has increased. The rapid development of the private sector in Vietnam is the key cause behind the growing demand for labor (VCCI, 2008). In the period 2006-2008, 54% of employees were based in the private sector, 22.2% in the foreign invested sector, and 23.8% in the state sector. Taking into consideration the gender composition, female workers accounted for circa 44% of the total workforce. A larger proportion of female workers are present in industries such as manufactures of Wearing apparel, Dressing, or Leather Tanning and Dressing (82%-83%) while male workers tend to work in manufactures of Coke, Petroleum, Metal products or Transport Equipment (80%). Interestingly, more female than male workers appear in high-tech manufactures which produce office machinery, communication equipment, or medical instruments (70-75%) (GSO, 2010).

Wages of employees are subject to minimum rates determined by MOLISA at district levels and by enterprise ownership (e.g. 1.2 VND million per month, app. 70-75 US$, in Hanoi 2008, for employees in foreign enterprises; and 0.8 VND million for those in domestic enterprise).[10] Average salary levels were highest in state enterprises, followed by FDI firms and non-state enterprises. For instance, the values are 4.067; 3.005; and 2.273 VND million per month in 2008 respectively. A worker in the manufacturing sector can, on average, earn 2.342 VND million per month in 2008 (GSO, 2010).

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[10]The minimum wage in 2012 in Hanoi is 1.550 VND million for foreign enterprises, or 1.350 VND million for domestic enterprises.

Overview on SMEs

Table 1: Number and Share of SMEs by Size of Capital and Employees

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total No. of enterprises	42,297	51,680	62,908	72,012	91,756	112,950	131,318	155,771	205,689
No. of SMEs and growth rates (No. of employees <300)	39,897 -	49,062 *23.0%*	59,831 *21.9%*	69,697 *16.5%*	88,222 *26.6%*	109,338 *23.9%*	127,593 *16.7%*	1517,80 *19.0%*	201,580 *32.8%*
Shares of SMEs in total	94.3%	94.9%	95.1%	96.8%	96.1%	96.8%	97.2%	97.4%	98.0%
No. of SMEs and growth rates (Registered capital <10 VND billion)	36,306 -	44,670 *23.0%*	54,217 *21.4%*	61,977 *14.3%*	79,420 *28.1%*	98,232 *23.7%*	114,341 *16.4%*	131,888 *15.3%*	171,231 *29.8%*
Shares of SMEs in total	85.8%	86.4%	86.2%	86.1%	86.6%	87.0%	87.1%	84.7%	83.2%

Source: Authors' calculations based on many versions of Statistical Year Books (GSO, 2001-2009)

An enterprise is small or medium when its number of employees is lower than 300 or its registered capital is less than 10 VND billion (nearly 500, 000 US$). According to the GSO from 2001 to 2009, SMEs in the whole economy, on average, accounted for 96% of total enterprises in terms of employee size or 86% in terms of registered capital. The growth rate of SMEs in terms of number of employees or registered capital is around 22% annually (*Table 1*). Also, SMEs in the manufacturing sector accounted circa 87% of total manufacturing enterprises in terms of employee size in the period 2005-2009.

4   Data Descriptions

The industry level data used in this study come from the GSO, which is an institution directly under Ministry of Investment and Planning, conducting statistical operations and providing socio-economic statistical information at both micro- and macro- levels in Vietnam. The firm level data is obtained from the DANIDA's SME surveys collected in 2005, 2007 and 2009. The sample sizes are 2,603 in 2005 (representing 13.2% of total manufacturing

enterprises), 2,492 in 2007 (8.8%) and 2,492 in 2009 (5.1%). The SME surveys are funded by DANIDA and conducted by the Department of Economics, University of Copenhagen in collaboration with the Vietnamese Institute of Labor Science and Social Affairs (ILSSA) and Central Institute for Economic Management (CIEM). Although they are implemented in 10 selected provinces (Ha Noi, Phu Tho, Ha Tay, Hai Phong, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, Ho Chi Minh City, and Long An), a stratified random sample was chosen such that the data set is representative at the provincial level. A rich and intensive range of questionnaires cover many modules such as general characteristics, enterprise history, production characteristics, employment, investments, etc.[11] Each survey in a year collects information for two previous years (e.g. the survey in 2005 aims to obtain data in the years 2003 and 2004).

Especially, the surveys are suitable for studies in labor markets. For example, the employment module produces information on employment by gender, full-time/ part-time status, occupation, workers' training, labor union, workers' benefit, recruiting and firing process, and wage setting process. Unfortunately, the survey does not specifically ask about educational or skill levels of the employees, only their occupation, i.e., managers, professionals, sales, service or production workers. Professionals are defined as those having university/college degree (Phan, 2009). Since the information on educational or skill levels of the employees are not given, we proxy for the skill composition of employment by using the share of production workers in total firm employment, as in Revenga (1997).[12]

Panel data sets are used for the empirical analysis, comprising 93 industry observations and 8,849 firm observations from 19 manufacturing sectors in the period 2003-2008. The firm-level data set retrieved from DANIDA is merged with the industry-level data, i.e. ERP and import penetration. ERP are collected from MUTRAP II (2008), MUTRAP III (2010) for the years

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[11]For instance, some studies, using the same source of data, investigate the role of unions (Torm, 2012), or the informal sector wage gap among Vietnamese micro-firms in Vietnam (Rand and Torm, 2012). Torm, Larsen, and Rand (2011) examine the impact of recruitment ties on wages in Vietnam.

[12]Skilled labor activities include engineering, management, administration, and general office tasks while the activities of unskilled workers include machine operation, production supervision, repair, maintenance and cleaning (Hanson and Harrison, 1995).

2005-2008 and Chu and Kalirajan (2011) for the year 2003.[13] ERP in 2004 are assumed equal to the indicator in 2003 due to lack of data. Import penetration ratios are calculated based on data collected from the GSO's reports on International Merchandise trade of Vietnam in several years.[14]

Table 2 presents means and standard deviations of key variables, separated into two periods 2003-05 and 2006-08 at industry and firm levels. The calculation strategy and explanations for these variables are given in *Appendix 3*. Vietnam is involved more in trade liberalization in the latter period when completing the AFTA agreement in 2006 and joining the WTO in 2007. Thus ERP reduced to 17.7% in this period as tariff barriers were gradually lifted. The average import penetration ratio increased over this period, as would be expected.

Since liberalizing the economy, average industry employment increased, accompanied by a higher proportion of female workers. Average SME firm size was smaller in terms of employment, together with a reduction in the presence of male and production workers.[15] An SME's real output increased by 9.6% over the two periods. Wages cost of capital and log capital stock/value added also increased. Real quasi rents per worker increased from 13.4 million VND to 20.5 million VND. Furthermore, the decreased share of production workers, representing a higher proportion of skilled workers in a firm, may strengthen the bargaining power.

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[13]ERP of an industry is measured by industry value added at domestic price, divided by that at world price, then minus 100%.

[14]Theoretically, import penetration ratios should be measured as the share of imports in domestic demand (imports/[production + import – exports]); however, there are problems with measuring domestic demand in some industries, which give rise to inconsistencies such as negative domestic demand (Jenkins, 2004).

[15]Shares of female and production workers are only available for the years 2004, 2006, and 2008. We assumed these indicators in the previous years are the same as at the current years.

Table 2: Summary Statistics, 2003-2008

Variables	Industry-level data		Firm-level data	
(Mean and Standard Deviations)	*2003-5*	*2006-8*	*2003-5*	*2006-8*
Total employment	123,911	161,136	18.99	15.46
	[148,278]	[188,384]	[128.59]	[34.74]
- *Share of female workers (%)*	44.9	48.6	33.8	35.1
	[18.9]	[19.6]	[27.1]	[26.5]
- *Share of production workers (%)*			78.5	65.7
			[18.7]	[19.8]
Real output (bill.VND)	25,500	41,300	2.5	2.74
	[28,500]	[45,300]	[17.5]	[12.3]
Real annual earnings per worker (mill. VND)	17.9	20.6	7.51	10.8
	[8.7]	[7.8]	[10.5]	[11.5]
ERP (%)	28.97	17.70		
	[36.90]	[19.55]		
Import penetration ratio (%)	70.3	94.0		
(Except Manufacture of Coke and Refined Petroleum)	[84.3]	[132.5]		
Cost of capital (mill. VND)			29.5	62.2
			[377]	[526]
Price raw materials (mill. VND)			1,810	1,910
			[14,700]	[9,210]
Real quasi rents per worker (mill. VND)			13.4	20.5
			[103]	[82.8]
Log Capital stock/Value Added			1.134	1.160
			[1.326]	[1.230]

* Standard Deviations are in parentheses.

5 Employment and Wage Effects of Trade Liberalization at the Industry-Level

We start off by investigating the impact of trade liberalization on employment and wages using industry level data. To do so, we follow Milner and Wright (1998) and Revenga (1997) and estimate simple reduced form employment and wage equations in the following form,

$$\ln L_{jt} = \sigma_0 + \sigma_1 \ln W_{jt} + \sigma_2 \ln Q_{jt} + \sigma_3 TL_{jt} + d_j + d_t + \varepsilon_{it} \tag{1}$$

and

$$\ln W_{jt} = \omega_0 + \omega_1 \ln L_{jt} + \omega_2 \ln Q_{jt} + \omega_3 TL_{jt} + d_j + d_t + v_{it} \tag{2}$$

where L_{jt}, W_{jt}, Q_{jt} is respectively total employment, the average real wage measured in terms of annual earnings, and total output, in industry j at time t.[16] TL_{jt} is a vector of trade liberalization variables, including ERP and import penetration. The equations also include time (t) and industry (j) specific effects. All nominal variables are deflated by producer price index.

The results in Table 3 present the industry-level employment and wage responses to trade liberalization. For the purpose of estimations, equations (1) and (2) are differenced in order to transform out the specific effects, then the OLS and within estimates are applied. Unlike time specific effects, industry specific effects are eliminated by the difference transformation of variables.

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[16]This labor demand equation can be derived based on a Cobb-Douglas production function, assuming that the cost of capital is captured by time dummies (Milner and Wright, 1998).

Table 3: Industry Employment and Wage Equations with OLS and within estimates

	Employment		Wages	
	OLS	**Within**	**OLS**	**Within**
	(1)	(2)	(3)	(4)
Employment			-0.523***(0.112)	-0.657***(0.057)
Average real wage	-0.639***(0.123)	-0.829*(0.445)		
Output	0.101 (0.168)	-0.050 (0.195)	0.026 (0.174)	-0.097 (0.278)
ERP	0.061 (0.213)	0.045 (0.162)	0.110*(0.063)	0.166 (0.114)
Import penetration	-0.016**(0.006)	-0.020***(0.004)	-0.006*(0.003)	-0.013*(0.006)
Year dummies	Yes	Yes	Yes	Yes
R-squared	0.52	0.69	0.38	0.58
Observations	60	60	60	60

Notes: (1) ***, **, and * denote significance level of 1%, 5%, and 10% respectively.
(2) Robust standard errors in parentheses.
(3) All regressions include a constant term.

Columns 1 and 2 provide the results for the estimated employment equation. Increases in average wage rates cause a fall in employment, whereas changes in industry output and ERP appear to have no impact on demand for labor. Furthermore, the results indicate the negative and significant impact of rising imports on employment. An increase in import penetration from 57% to 95% is associated with a mere 0.76% (=0.38*0.02) decline in labor demand. Alternatively, we only find evidence for a modest impact of the increasing import penetration on industry-level employment. This finding could potentially reflect the existence of rent sharing agreements between firms and workers in Vietnam. As explained by Revenga (1997) "to the extent that the dissipation of rents is fully absorbed through lower industry wages there need not be any effect on employment".

Columns 3 and 4 present the similar findings for the estimated wage equation in the same period. The results for the wage effect of trade liberalization are more statistically significant

compared to those obtained for employment. The coefficient on import penetration is negative and statistically significant, indicating that an increase in imports reduced real wage. However, the implied wage responses are minor: an increase in import penetration from 57% to 95% is associated only with a 0.49% (=0.38*0.013) decline in real wages. Furthermore, the coefficient on ERP is significant in OLS or closes to being significant in within estimates implies that reduction in ERP is associated with decreasing industry wages. A decline in ERP from 39% to 17% reduced real industry wages by 2.4%-3.5%.

In sum, the existence of a minor negative employment effect of trade liberalization seems to support the rent sharing model. Furthermore, as proposed by Feliciano (1994) and Currie and Harrison (1997), we can also link this phenomena to the existence of restrictions to the firing of workers and the imperfections of product market in Vietnam. By contrast, the industry regression reveals a bigger negative association between trade reform and wages. Unfortunately, the industry-level analysis cannot go further in explaining what causes the trade-induced decline in wages and employment in Vietnam. Hence, we now turn to a firm-level analysis in order to look more closely at possible channels.

6 Employment and Wage Effects of Trade Liberalization at the Firm-Level

Our analysis at the firm level follows closely Revenga (1997), Ghazali (2011) and Abowd and Lemieux (1993).We adopt a wage-setting model allowing for the presence of rent-sharing behavior under union influence, and competitive wage determination. Accordingly, firms and the union bargain only over wages, and then employment is set unilaterally by the firm at the level that maximize its profit.

$$w_{it} = \delta_i w_{it}^U + (1 - \delta_i)w_{it}^A = \delta_i(w_{it}^U - w_{it}^A) + w_{it}^A \tag{3}$$

where δ_i reflects the bargaining power of worker in firm i, w_{it}^U is the union's preferred wage outcome, and w_{it}^A is the alternative/outside wage, representing comparative wage (assumed to be the wage in the corresponding industry). As the union's preferred wage outcome is not observed, $(w_{it}^U - w_{it}^A)$ could represent product market competition, namely the quasi rents per worker. Equation (3) can be rearranged as:

$$w_{it} = \alpha\delta_i QR(w_{it}) + w_{it}^A \qquad \text{with } \alpha \leq 1 \tag{4}$$

where $\alpha\delta_i$ is considered as a quasi-rent-splitting parameter, reflecting how much of the quasi rents is captured by the union.[17]

If there is heterogeneity in workers' bargaining power, we can rewrite equation (4) as follows:

$$w_{it} = \alpha\bar{\delta}_i QR(w_{it}) + w_{it}^A + \epsilon_i QR(w_{it}) \tag{5}$$

The error component in this equation is correlated with the regressor $QR(w_{it})$. Thus, we need to use instrumental variables estimation. As shocks to quasi rents per worker are likely to result from shocks to product demand or shocks to the costs of production, trade policy changes would be relevant instruments, which can influence the behavior of both firms and unions.[18]

For the empirical implementation, we apply the following equation for firm wage determination:

$$\ln W_{it} = \varphi_i + \tau_t + \delta_1 \ln QR_{it} + \delta_2 \ln W_t^A + \delta_3 \ln K\_VA_{it} + v_{it} \tag{6}$$

where W_{it}, W_t^A, QR_{it} are as above. All nominal variables are deflated by the producer price index. φ_i, τ_t are firm and time fixed effects. We include the ratio of capital to value added K_VA_{it} that shows the firm efficiency in using capital stock and, hence, can determine wages (Ghazali, 2011).

Through the rent sharing approach, trade policy changes can affect firm-level wages through two different channels: (1) Changes in industry-level trade barriers should have a direct impact on the outside wage by shifting the total industry labor demand; and (2) Trade liberalization is able to reduce the sector rents and, hence, to reduce the rent component of wages in the firms where rent-sharing exists. We use two trade policy instruments for quasi

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[17]As in Revenga (1997), quasi rents per worker are constructed as $QR_{it} = (Y_{it} - M_{it} - r_{it}K_{it} - w_{it}^A N_{it}) / N_{it}$ where Y_{it} is sales, M_{it} is the cost of material inputs, $r_{it}K_{it}$ is the cost of capital inputs, N_{it} is total employment in firm i at time t.

[18]Abowd and Lemieux (1993) rely on export and import price indexes as the instruments for quasi rents in the case of Canadians firms. Alternatively, Revenga (1997) uses industry-level tariffs and quotas for the case of Mexican manufacturing.

rents per worker, namely, the ERP (e.g., Ghazali, 2011; Krishna, Poole, and Senses, 2012)[19] and import penetration (e.g., Feliciano, 2001; Kien and Heo, 2009).

In the empirical analysis we also augment equation (6) by adding some more independent variables and instruments depending on our purposes in investigating skilled-unskilled and male-female wage gaps under the impacts of trade liberalization and the role of unions.

As regards a firm's employment response to trade liberalization, changes in trade policy can influence employment through their effect on wage setting. If workers are willing to trade off wages (e.g., by giving away rents), they may be able to preserve jobs. In the case workers prefer to maintain the level of wages, a larger employment effect may be observed. Furthermore, trade policy changes directly affect employment by shifting firm's output. As a result, output is endogenously determined in the firm-level employment equation. Therefore, we also use ERP and import penetration as instrumental variables.

$$\ln L_{it} = \varphi_i + \tau_t + \emptyset_1 \ln W_{it} + \emptyset_2 \ln W_{it}^A + \emptyset_3 \ln Q_{it} + \emptyset_4 \ln C_{it} + \emptyset_5 \ln K\_VA_{it} + u_{it} \qquad (7)$$

where L_{it}, W_{it}, W_{it}^A, Q_{it}, C_{it}, K_VA_{it} are respectively the number of workers, annual average real wage, annual industry real wage, real output, the cost of capital, and the ratio of capital to value added in firm i at time t. u_{it} is the disturbance term.

We begin the empirical analysis with the firm-level employment equation to observe the magnitude of the implied employment response to trade policy changes. We then identify the effect of trade liberalization on firm wages in several steps. First, we explore the importance of rent sharing in firm-level wage determination. Second, we measure the size of firm quasi rents that are affected by trade policy variables and their interactions with the gender composition of a firm's labor force. For further analyses and robustness checks, we also consider heterogeneity in bargaining power depending on the skill composition of the workforce and the role of trade

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[19] Goldberg and Pavcnik (2004, 2005) and Ghazali (2011) emphasize that ERP changes during trade reform episodes are not sector-uniform. ERP movements in many developing countries result from government decisions to fulfill the GATT and WTO directives that bound the behavior of firms or unions in influencing trade policy changes. Hence, this would minimize the endogeneity risk.

union location. Apart from firm fixed effects and year effects, we also add industry fixed effects to control for unobserved time-invariant industry characteristics.[20]

The two stage least squares (2SLS) estimation of equation (7) is reported in Table 4. The dependent variable is the log of total employment. The independent variables are the firm and industry real annual average wage, the price raw materials, and real output. Instruments used for the endogenous real output variable are ERP and import penetration.

We report the F-statistic for the relevance of excluded instruments (associated p-value) from the first-stage regression. When the F-statistic is small (or the corresponding p-value is large), the instrumental variable estimates and confidence intervals would be unreliable. We find that our instruments are appropriate on this criterion. Furthermore, the instruments are valid as indicated by the Sargan test for overidentifying restrictions, which cannot reject the hypothesis of the instrument validity. Additionally, the Durbin-Wu-Hausman test rejects the null hypothesis that the specified endogenous regressor (real output variable) can be treated as exogenous.

The first stage estimates reveal a negative and significant effect of increased imports on firm real output, though the point estimate is small (-0.004). The coefficient on ERP gets the expected sign but is statistically insignificant. The second stage estimates indicate statistically significant parameters for the firm real output and average wage. By contrast, the coefficients on the industry real wage, the cost of capital, and the capital stock to value added are insignificant.

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[20]Goldberg and Pavcnik (2005) find that workers in protected sectors earn less than workers with similar observable characteristics in unprotected sectors when they do not control for unobserved time-invariant industry characteristics. With industry fixed effects, the result reverses: trade protection increases relative wages.

Table 4: Results of 2SLS Firm Employment Equations

	2SLS (First stage)	2SLS (Second stage)
	Dependent variable: real output	**Dependent variable: firm employment**
Real output		1.193** (0.465)
Firm real wage	0.525*** (0.020)	-0.858*** (0.245)
Industry real wage	0.051 (0.051)	-0.005 (0.054)
Cost of capital	0.138*** (0.009)	-0.084 (0.065)
Capital stock/Value added	-0.149*** (0.017)	0.052 (0.071)
ERP	0.056 (0.071)	
Import penetration	-0.004* (0.002)	
Firm fixed effects	Yes	Yes
Year effects	Yes	Yes
Instruments		ERP
		Import penetration
F-test (*p*-value)	0.077	
Sargan test (*p*-value)		0.697
Durbin-Wu-Hausman test (*p*-value)		0.001
Observations	3907	3907

Notes: (1) ***, **, and * denote significance level of 1%, 5%, and 10% respectively.
(2) Standard errors in parentheses.

Empirically, the findings give evidence that increases in import penetration that reduce firm output have a negative effect on employment. Based on the first stage estimates, an increase in import penetration from 57% to 95% reduces firm output by 0.15% (=0.38*0.004). This in turn is associated with a decline in employment by only 0.17% (=0.15%*1.165%). In addition, reductions in ERP do not have any significant effect on output and therefore have no impact on employment. Combining these results with those obtained from the industry-level equation, we can argue that there is minor impact of trade liberalization on employment in Vietnamese manufacturing, as in line with Currie and Harrison (1997) and Feliciano (2001).

We now turn to estimating wage effects. In the industry level analysis we found that there is a negative relationship between trade reforms and wages. In the firm-level analysis, it is possible to explore the mechanisms for that adjustment.

Table 5: Within Estimates of Firm Wage Equations

	Dependent variable: Firm real average wage		
	(1)	(2)	(3)
Quasi rents per worker (QR)	0.165*** (0.005)	0.218*** (0.038)	0.226*** (0.016)
QR*[QR-avg(QR)]		0.007 (0.012)	
QR*female share			-0.055*** (0.015)
Industry real wage	0.380*** (0.055)	0.227*** (0.083)	0.396*** (0.060)
Capital stock/Value added	-0.052*** (0.006)	-0.042*** (.010)	-0.057*** (0.007)
Firm fixed effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
R-squared	0.39	0.34	0.42
Observations	8849	3969	7072

Notes: (1) ***, **, and * denote significance level of 1%, 5%, and 10% respectively.
            (2) Standard errors in parentheses.
            (3) All regressions include a constant term

Table 5 gives results from estimating equation (6) using a within estimator. We find evidence for a positive and statistically significant coefficient on quasi rents across all specifications. Hence, rent sharing appears an important component of wage determination in Vietnam. Technically, the quasi-rent-splitting parameter determines how much of the quasi rents is captured by the union. In the case these rents are completely transferred to union members, we can have a simple figure from the coefficient on the quasi rents per worker in column 1 that, on average, union members get earnings that are about 16% higher than non-union members. This finding to some extent is in line with the results by Torm (2012). Using matched employer-employee panel data, she empirically indicates an average union wage gap of about 13% in Vietnam's SMEs over the 2007-2009.

The coefficients on the industry real wage and the capital stock to value added have expected signs and are highly significant across specifications. This indicates that firm wages are also affected by industry labor market conditions and the efficiency in using capital input. Following Abowd and Lemieux (1993), Revenga (1997), and Ghazali (2011), we also include a term *QR*[QR-avg(QR)]* that measures the deviation of firm-level quasi rents from the sample average. Similar to Revenga (1997), however, we do not find evidence for heterogeneity in

bargaining power for firms in the same sector, as indicated by the statistically insignificant coefficient on this variable.

In column 3, we incorporate an interaction variable that allows the quasi-rent-splitting parameter to vary systematically with the proportion of female workers in the firm workforce. The coefficient on this interaction variable is negative and significant, which shows that the quasi-rent-splitting parameter is inversely correlated with the proportion of female workers in total firm employment. The point estimate is small (-0.055), but gives evidence of male-female earnings inequality in Vietnam.[21] The higher the proportion of female workers, the lower the ability of workers to capture part of the quasi rents.

In case that quasi rents per worker variable is endogenous, the within estimates above might be biased and inconsistent. To deal with this problem, an instrumental variables approach will be used for the endogenous quasi rents per worker. Instruments for QR are ERP and import penetration.

The 2SLS regressions are presented in Table 6. The result in column 2 supports the flexible model of wage setting that captures both the existence of rent sharing behavior and competitive wage determination. However, the first estimates result in column 1 does not show any statistically significant impact of ERP and import penetration on QR. It might be due to the fact that these chosen instruments are weak as the F-test point shows (p-value = 0.179).

In order to attain relevant instruments, the existence of gender earnings differentials in the trade liberalization episode suggests to further include interaction variables that permit trade policy changes to vary with the proportion of the female workers in the firm labor force. Therefore, besides trade policy variables, we also add their interactions with the gender composition of the firm workforce as instruments for QR. F-test and Sargan test now indicate the relevance and validity of the chosen instruments. The Durbin-Wu-Hausman test rejects the null hypothesis of exogeneity of the endogenous variable.

Columns 3 and 4 present the 2SLS estimation results with the interaction variables. The first estimates show a positive and significant effect of ERP on quasi rents per worker.

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[21]Torm (2012) finds evidence that there is a substantial gender wage gap with male earnings being between 14% - 18% higher than for women.

Furthermore, the results point out the gender composition of the workforce appears to be highly relevant. The higher the proportion of female workers in the firm, the less trade liberalization decreases the quasi rents per worker. Hence, these findings indicate that trade liberalization may reduce the gender earnings gap in Vietnam.

The second stage estimates also show a positive and highly significant coefficient on quasi rents per worker. This indicates that decreases in ERP that reduce quasi rents have a negative effect on wages. This is not the case for the import ratio, however. A decrease in ERP from 39% to 17% reduces quasi rents by a 5.4%. This in turn is associated with a 2.6% decline in firm wages. Combining this finding with the industry-level wage estimates, we find wage declines in an interval of 2.4%-3.5% in Vietnamese manufacturing over the 2003-2008 period that is due to trade liberalization.

Table 6: Results of 2SLS Firm Wage Equations Regarding Gender Composition

	2SLS (First stage)	2SLS (Second stage)	2SLS (First stage)	2SLS (Second stage)
	Dependent variable: quasi rents per worker	Dependent variable: firm average real wage	Dependent variable: quasi rents per worker	Dependent variable: firm average real wage
	(1)	(2)	(3)	(4)
Quasi rents per worker		0.549* (0.291)		0.487*** (0.112)
Industry real wage	-0.501*** (0.079)	0.374*** (0.141)	-0.529*** (0.079)	0.340*** (0.067)
Capital stock/Value added	-0.309*** (0.019)	0.074 (0.091)	-0.304*** (0.019)	0.054 (0.036)
ERP	-0.103 (0.088)		0.246* (0.140)	
ERP*female share			-0.650*** (0.196)	
Import penetration	0.005 (0.004)		-0.003 (.006)	
Import penetration*female share			0.031** (0.015)	
Firm fixed effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Instruments	ERP			ERP
	Import penetration			ERP*female share
				Import penetration
				Importpenet*femaleshare
F-test (*p*-value)	0.179		0.000	
Sargan test (*p*-value)		0.853		0.891
Durbin-Wu-Hausman test (*p*-value)		0.052		0.000
Observations	6564	6564	6549	6549

Notes: (1) ***, **, and * denote significance level of 1%, 5%, and 10% respectively. (2) Standard errors in parentheses.

Further analyses and robustness checks

The potential heterogeneity in bargaining power and the existence of union wage gaps suggest that workers do vary in their ability to extract rents across firms and regions. Determinants of this differential ability might come from the influence of unions in the local market and the skill composition of the firm workforce.

We reestimate equation (5) now allowing for interactions of the trade policy variables and the skill composition of a firm's workforce in the first stage estimation. To further check robustness, we add two cost variables in real terms (cost of capital and price raw materials) and one interaction variable that allows the quasi-rent-splitting parameter to vary systematically with the fraction of unskilled workers in the second step. Furthermore, we also add industry fixed effects to control for unobserved time-invariant industry characteristics to the specification.

Results are reported in Table 7. The estimated coefficient on quasi rents per worker is consistent across various specifications and highly significant in both sign and magnitude. The quasi-rent-splitting parameter gets the similar value of about 0.34 across specifications, implying that 34% of quasi rents is captured by the union when skill composition of the firm workforce and industry fixed effects are taken into account.

For all specifications, the coefficients on the interaction variable *QR*unskilled share* are negative and statistically significant (or close to being significant once industry dummies are included) thus, confirming the evidence of skill earnings inequality in Vietnam.[22]

The significant and negative coefficient of ERP*unskilled share*, furthermore, reveals that the higher the proportion of unskilled workers in the firm, the less trade liberalization decreases the quasi rents per worker. This suggests that the bargaining power of unskilled workers may increase following trade liberalization, as in line with a simple HO/SS story. Vietnam specializes in unskilled intensive goods, so trade liberalization means they expand in those goods, giving more power to the unskilled workers.

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[22]Torm (2012) indicates that a worker with education beyond secondary school has a wage that is about 12% higher than a worker with only basic education.

In columns 3 and 4 we do a similar exercise but only include firms located in the North and Centre of Vietnam. Given the historical and institutional context combined with the higher concentration of collective agreements in HCMC, south vs rest of country split may reveal interesting results relating to bargaining power of workers and skill earnings gap across regions.[23]

Column 4 shows that the size of the quasi-rent-splitting parameter is statistically unchanged. However, the coefficients on the interaction variable *QR*unskilled share*, trade policy variables and their interactions with the skill composition of the firm workforce are significantly larger in absolute value compared to those attained for all observations. They suggest that firm wages in the North and Centre are more influenced by the decline in ERP and the increase in imports. Also they reveal that earnings differential between skilled and unskilled labor is more serious in these regions than elsewhere. In column 5 and 6, industry fixed effects are added to the specification to control for unobserved time-invariant industry characteristics. The estimated coefficients on quasi rents per workers, the interaction variable, trade policy variables and their interactions with the skill composition of the firm workforce are in line with priors in terms of sign and statistical significance.

To sum up, the firm-level study provides evidence on negative effects of trade liberalization on employment and wages with similar magnitudes as industry-level analysis. The firm-level analysis also indicates that reductions in quasi rents and firm output in the period of trade reforms are channels for those adjustment mechanisms. Interestingly, increased imports play a

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[23]Before the reunification in 1975, southern trade unions were more independent toward the government than northern trade unions which were under the oversight of the Communist Party (Edwards and Phan, 2008). Despite the reunification, some of the ideological and institutional differences between the two parts of the country are long lasting through today (see Kim, 2008). Zhu et al. (2008) find that firms in Hanoi (the Vietnam's capital in the North) remain more oriented towards traditional personnel practices, including government wage scales and unions' involvement as government agents, whereas firms in HCMC (the biggest city in the South) have a higher rate of adoption of modern human resource management. It is estimated that only 20% of unionized private sector firms have collective agreements, although in HCMC, the figure is around 65% (Clarke, Lee, and Chi, 2007). Torm (2012) also documents that trade unions in southern firms might be more accountable to their members than the rest of the country.

minor part in reducing employment, while decreased ERP is responsible for a larger decline in wages.

7   Conclusion

The vulnerability of wages and employment to trade liberalization is always concerned in developing countries, including Vietnam where has been strongly involved in trade openness in the recent years. Vietnam is characterized by the large proportion of SMEs and high rates of unskilled workers. Trade liberalization in this economy goes hand in hand with commitments to cut down tariffs when joining the AFTA and the WTO. Although trade affects labor market in different ways, the economic model in this study analyzes the response to trade liberalization through the industry wage premium, which in turn, represents rent sharing. By this approach, given trade policy variables such as EPR and import penetration could stimulate a direct effect on wages and employment at industry level but an indirect impact at firm level. Therefore, they are treated as instruments in order to deal with endogeneity in the firm-level analysis. Furthermore, this approach permits us to investigate factors such as worker gender or skill in capturing part of quasi rents.

Our econometric analysis suggests that there is a negative effect of trade liberalization through decreased ERP on wages in Vietnamese manufacturing, although the impact is moderate. As regarding import penetration, we find a negatively significant but minor impact on firm employment. That means imports might not be a cause for rising anxiety over increasing unemployment. In addition, we find evidence of gender and skill earning inequalities in Vietnamese manufacturing, and these gaps decrease under trade liberalization. Furthermore, when taking into account the influence of unions by region, trade unions and collective agreements seem to reduce the skill earnings differentials in Vietnamese manufacturing.

In conclusion, we should not have a negative look on the response of labor market to trade openness for the case of Vietnam. Instead of fearing trade liberalization, Vietnam should enhance domestic policies to protect unskilled or female workers by upgrading education and training level, strengthening the role of trade unions in firms, or launching policies to help enterprises improve their productivity in order to ensure greater fairness in the allocation of rents to workers and create more jobs.

Table 7: Results of 2SLS Firm Wage Equations Regarding Skill Composition

	All observations		Observations in the Centre and North		All observations	
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
	QR	Firm real wage	QR	Firm real wage	QR	Firm real wage
	(1)	(2)	(3)	(4)	(5)	(6)
QR		0.342*** (0.097)		0.344*** (0.117)		0.338*** (0. 092)
QR*unskilled share		-0.372** (0.146)		-0.404*** (0.155)		-0.263 (0.174)
Industry real wage	-0.593*** (0.112)	0.115 (0.077)	-0.692*** (0.152)	0.152 (0.095)	-0.888** (0.290)	0.358* (0.199)
Capital stock/Value added	-0.465*** (0.034)	-0.133** (0.054)	-0.462*** (0.052)	-0.144*** (0.053)	-0.478*** (0.034)	-0.087 (0.074)
Cost of capital	-0.002 (0.019)	-0.011 (0.008)	-0.035 (0.026)	-0.012 (0.013)	-0.009 (0.019)	-0.013 (0.008)
Price raw materials	0.186*** (0.030)	0.001 (0.024)	0.149*** (0.045)	-0.025 (0.024)	0.178*** (0.031)	-0.017 (0.030)
ERP	2.375*** (0.433)		2.765*** (0.580)		2.464*** (0.465)	
ERP*unskilled share	-2.788*** (0.539)		-3.209*** (0.705)		-2.821*** (0.556)	
Import penetration	-0.016 (0.022)		-0.018 (0.027)		-0.044 (0.033)	
Import penet*unskilled share	0. 046 (0.030)		0. 060* (0.035)		0. 027 (0.031)	
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	No	Yes	Yes
F-test (p-value)	0.000		0.000		0.000	
Sargan test (p-value)		0.282		0.409		0.567
Durbin-Wu-Hausman test (p-value)		0.020		0.006		0.113
Observations	3023	3023	1889	1889	3023	3023

Notes: (1) ***, **, and * denote significance level of 1%, 5%, and 10% respectively. (2) Standard errors in parentheses.

Appendix 1: Effective Rate of Protection in Vietnam by Industry, 2003-2008

INDUSTRY	2003	2004	2005	2006	2007	2008
Food Products And Beverages	.522	-	.313	.299	.288	.273
Tobacco Products	.857	-	.457	.457	.46	.463
Textiles	1.23	-	.51	.618	.179	.183
Wearing Apparel; Dressing And Dyeing Of Fur	1.651	-		.136	.58	.584
Tanning And Dressing Of Leather ...	.698	-	.463	.463	.558	.503
Wood And Products Of Wood ...	.112	-	-.023	-.023	-.022	-.026
Paper And Paper Products	.412	-	.18	.236	.224	.208
Publishing, Printing And Reproduction Of Recorded Media	.137	-	.1	.12	.06	.1
Coke, Refined Petroleum Products And Nuclear Fuel		-	.05	-.0097	-.0094	-.0056
Chemicals And Chemical Products	.079	-	.022	.111	.11	.102
Rubber And Plastics Products	.345	-		.353	.351	.322
Other Non - metallic Mineral Products	.376	-	.25	.294	.284	.26
Basic Metals	-.067	-	-.01	-.096	-.074	-.067
Fabricated Metal Products ...	.053	-	.03	.0056	.0085	.012
Machinery And Equipment and etc.	-.142	-	-.085	-.057	-.051	-.048
Electrical Machinery And Apparatus and etc.	.12	-	.16	.059	.058	.058
Radio, Television And Communication Equipment	.11	-		.039	.032	.016
Medical, Precision And Optical Instruments ...	-.009	-	0	-.028	-.028	-.029
Motor Vehicles, Trailers And Semi - trailers	.571	-	.326	.32	.31	.3
Other transport equipment	.274	-	-.09	.083	.084	.083
Furniture; Manufacturing and etc.	.457	-	.57	.387	.361	.328

Source: Authors' calculations based on MUTRAP II (2008), MUTRAP III (2010) for the years 2005-2008 and Chu and Kalirajan (2011) for the year 2003

Appendix 2: Import Penetration in Vietnam by Industry, 2003-2008

INDUSTRY	2003	2004	2005	2006	2007	2008
Food Products And Beverages	.135	.135	.129	.129	.154	.175
Tobacco Products	.18	.196	.064	.027	.017	.033
Textiles	1.506	1.121	1.285	1.041	1.065	1.223
Wearing Apparel; Dressing And Dyeing Of Fur	.345	.35	.116	.066	.052	.052
Tanning And Dressing Of Leather ...	.468	.386	.357	.307	.068	.071
Wood And Products Of Wood ...	-	-	.375	.45	.417	.386
Paper And Paper Products	.389	.393	.564	.572	.346	.561
Publishing, Printing And Reproduction Of Recorded Media	.058	.081	.091	.093	.112	.063
Coke, Refined Petroleum Products And Nuclear Fuel	36.107	35.483	38.626	33.057	56.571	30.624
Chemicals And Chemical Products	.607	.518	1.615	1.498	1.685	1.591
Rubber And Plastics Products	.562	.578	.339	.346	.357	.393
Other Non - metallic Mineral Products	.114	.112	.118	.102	.112	.119
Basic Metals	1.386	1.305	2.074	2.429	2.306	2.578
Fabricated Metal Products ...	-	-	.228	.234	.291	.275
Machinery And Equipment and etc.	-	-	4.329	4.901	5.315	6.204
Office, Accounting And Computing Machinery	-	-	.87	.909	.863	.511
Electrical Machinery And Apparatus and etc.	-	-	.588	.496	.655	.749
Radio, Television And Communication Equipment	-	-	1.244	1.435	1.315	1.972
Medical, Precision And Optical Instruments ...	-	-	3.248	4.154	3.124	1.746
Motor Vehicles, Trailers And Semi - trailers	1.064	1.02	.684	.468	.659	.78
Other transport equipment	-	-	.176	.13	.346	.314
Furniture; Manufacturing and etc.	-	-	.135	.131	.134	.126

Appendix 3: Calculation Strategy and Explanations for Key Variables

Real output	Industry or firm output, deflated by the Producer Price Index (base year 2000; unit: bill.VND).
Employment	- Total number of worker in an industry; or, - Total number of full-time workers in firms at the year-end.
Real wage	- Average industry wage; or, - Total payments for employees divided by total firm employment, then deflated by the Producer Price Index (base year 2000; unit: mill. VND).
Cost of capital	Total interest payment of firms in a year, deflated by the Producer Price Index (base year 2000; unit: mill. VND).
Price raw materials	Value of raw materials used, deflated by the Producer Price Index (base year 2000; unit: mill. VND).
Real quasi rents per worker	$QR = (Y - M - r_*K - w^{A*}N) / N$, deflated by the Producer Price Index (base year 2000; unit: mill. VND), where Y, M, r_*K, N respectively denote firm sales, the cost of material inputs, the cost of capital inputs, and total firm employment (Revenga, 1997).
Capital stock/Value Added	Total physical assets at the year-end, divided by total value added, then deflated by the Producer Price Index (base year 2000).
ERP	Effective rate of protection, as in percentage, collected from MUTRAP II (2008), MUTRAP III (2010), and Chu and Kalirajan (2011).
Import penetration ratio	Percentage of imports in total output.

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