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IZA DP No. 15243

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ISSN: 2365-9793

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ABSTRACT

Enhanced Intergenerational Occupational Mobility through Trade Expansion: Evidence from Vietnam*

Using eight rounds of the Vietnam Household Living Standards Surveys (VHLSSs) spanning 16 years and exploiting the US-Vietnam Bilateral Trade Agreement (BTA) in 2001 as a large export shock, we investigate the impact of this shock on intergenerational occupational mobility in Vietnam employing a difference-in-differences research design. Our analysis suggests that the BTA has led to substantial upward occupational mobility, allowing both sons and daughters to have better occupations than their parents, with the effects being larger for daughter-mother pairs. The effect is larger in the long-run compared to the short-run. We find evidence that the driving force is an increase in skill demand via gender-biased expansion in export volumes. The effects are largely driven by intersectoral resource reallocation rather than within-sector upgrades. In addition, the BTA induced a higher likelihood of college education for both sons and daughters, but of vocational training only for sons. Overall, the BTA shock accounts for 36% of the overall increase in mobility for both genders. Our results control for Vietnam's own tariff reductions, which do not seem to have any statistically significant impact on mobility.

JEL Classification: F13, F16, F66, J62, O19

Keywords: international trade, export market access, intergenerational mobility

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* We would like to thank seminar participants at the 2021 North American Winter Econometric Society Meetings (part of ASSA Annual Meetings), 2021 Canadian Economic Association Meetings, 2021 UNU-WIDER Jobs and Development Conference: Better Jobs for Development, the 6th InsTED Conference at the University of Nottingham, UK, 2021 Southern Economic Association Meetings, the International Trade Workshop at the University of Virginia and the 2022 Australasian Trade Workshop (organized by the University of Canterbury, NZ) for helpful comments and discussions. We are especially grateful to Reshad Ahsan, Kerem Cosar, James Harrigan, Giovanni Maggi, John McLaren and Hale Utar for very useful suggestions. The standard disclaimer applies.

1 Introduction

Intergenerational mobility refers to the extent to which socioeconomic status is able to change across generations. It is a key element of human progress and economic development. An improvement in intergenerational mobility is found to be highly associated with higher economic growth, faster poverty reduction, lower inequality and a more stable society (World Bank, 2018). In other words, enhancing mobility has meaningful and long-term impacts on development. Given that globalization is believed to have played a major role in promoting economic growth around the world, especially the developing world, in the past decades, it is important to understand whether international trade, as an external shock, reinforces or diminishes the persistence of socioeconomic status across generations. In this paper, we examine to what extent trade liberalization affects intergenerational mobility in a small but rapidly developing country, namely Vietnam.

How intergenerational mobility changes over time and across different segments of society has been studied extensively in the labor economics and public economics literatures (see for example Solon (1999), Chetty et al. (2014*a*), Chetty and Hendren (2018*b*), Chetty and Hendren (2018*a*)). However, besides the work on India by Ahsan and Chatterjee (2017) (which we will discuss later in this paper), very little is known about how and through which mechanisms and channels trade expansion affects intergenerational mobility. Vietnam has experienced a massive export expansion due to the United States-Vietnam Bilateral Trade Agreement (henceforth, BTA), which has resulted in a large reallocation of resources towards export-oriented sectors in response to an increase in demand (McCaig and Pavcnik, 2018). The quality of exported products (proxied by unit value) has also clearly improved due to the BTA. This has coincided with a major improvement in mobility where the likelihood of an offspring having a better occupation than their parents has increased from around 15% to around 30% for sons and 40% for daughters. This paper contributes to the literature by investigating the effect of this large export expansion in Vietnam on intergenerational mobility for sons and daughters who lived all or part of their schooling and working age years under the BTA trade regime. The exogenous nature of this trade shock and the resulting structural change in Vietnam provides a perfect setting to investigate this understudied area of international trade and economic development.

In both developed and developing countries, it is well-established that international trade has gender-specific effects on wages and employment (see Berik, Rodgers and Zveglich (2004), Black and Brainerd (2004), Menon and Rodgers (2009)). These effects work through the impact of trade on human capital investments and on fertility, potentially resulting in improvements in women's endowments and better allocation of women's skills, and in turn raising productivity (Galor and Weil, 1996; World Bank, 2012). The focus on son-father pairs in studying intergenerational mobility, therefore, can potentially leave out a key component of the relationship between trade and mobility. This paper, thus, investigates the impact on both sons and daughters and reveals that mechanisms through which trade affects labor market outcomes and consequent mobility outcomes vary across genders. While an extensive body of work has investigated the effects of trade on gender inequality, to our knowledge, this is the first paper that studies how an export expansion has differential multi-generational effects on men and women in a developing country.

The analyses are based on eight rounds of the Vietnam Household Living Standards Surveys (VHLSS) from 2001/2002 to 2015/2016. We focus our attention on occupational mobility as our main dimension of mobility because (1) a person's occupation is likely to be directly related to her welfare through income and job stability, and (2) his/her occupation is affected by the nature of a country's specialization and consequent skill demand, which are influenced by international trade. In addition, in the context of a developing country, such as Vietnam, the proportion of formal-sector jobs (often associated with higher-level occupations) in the economy plays a particularly important role in poverty alleviation and worker welfare, as those are the relatively good jobs that offer higher wages and greater stability (Emran and Shilpi, 2011; World Development Report, 2006).[1]

The U.S.-Vietnam BTA took effect in December 2001 and was a major trade shock that has been shown to have had very large impacts on Vietnam's trade and economic growth. Following its implementation, U.S.'s tariffs on their imports from Vietnam decreased from an average of more than 23% to about 2.5%. These large tariff reductions allowed Vietnam immediate access to the vast and diverse U.S. market. An attractive feature of the BTA shock is that U.S. tariff reductions on their imports from Vietnam were arguably exogenous as those reductions took place just by switching from Column 2 tariffs on imports from socialist countries to Column 1 (MFN) tariffs, the former vector determined through the Smoot-Hawley Act (1930) and the latter at the GATT's Uruguay Round (1986-94) (McCaig, 2011; McCaig and Pavcnik, 2018). We, therefore, exploit the BTA tariff reductions to identify the impact of trade shocks on intergenerational mobility of sons and daughters in Vietnam.

This paper delivers several key contributions to the literature. First, the paper is the first to provide evidence on the intergenerational impact of an export expansion in a developing country (through a partner country's tariff cuts). The literature on the impact of trade on inequality largely focuses on import competition and not expansion of export opportunities. While, unlike Ahsan and Chatterjee (2017), our focus is on the effects of export expansion, in controlling for the effects of Vietnam's own tariff reductions (primarily through its WTO accession), we also look at the effects of import competition, if any. In addition, focusing exclusively on the change in inequality as an outcome, as many of the papers on the impacts of export expansion as well as import competition have done, could divert attention from persistent social structures (such as caste systems) or economic barriers (such as credit constraints) that prevent new generations from moving out of low-skilled occupations associated with low incomes and poverty.

Second, we contribute to the gender and development literature by investigating the

[1]In Emran and Shilpi (2011), Vietnam is considered a "rural" economy with a very large share of workers in agriculture. As will be clear in Section 2, this is indeed the case. Even until 2016, 44.53% of workers were still working in farm-related sectors.

effects for daughter-mother pairs and son-father pairs while the only existing work on intergenerational mobility and trade prior to ours (namely, Ahsan and Chatterjee, 2017) focuses on son-father pairs only and abstracts away from the gender aspects. Looking at intergenerational occupational mobility for both genders is probably the biggest advance our paper makes on this issue of trade and mobility. By doing so, we reveal substantial between-gender differences in intergenerational mobility and the channels through which these effects differ.

Third, we study the potential mechanisms through which trade affects intergenerational mobility by differentiating between quality and quantity of exports, the within-industry and across-industry impacts of U.S. tariff reductions due to the BTA, as well as the effects of the BTA on educational outcomes of sons and daughters. By tracing these skill-specific labor demand and labor supply channels, we offer several potential mechanisms as to how this massive export expansion in Vietnam has helped move sons and daughters into better job opportunities compared to their parents (or parents-in-law).

Fourth, we provide evidence on both short-run and long-run effects as intergenerational mobility is expected to take some time, and both improvements in export performance as well as mobility tend to expand beyond the initial years of the trade agreement.[2] In this context, it is important to mention that a key advance over previous work in this literature is the panel approach we take, using a relatively long panel dataset covering every 2 years over a 16-year period, allowing us to study the dynamics of intergenerational mobility in response to export liberalization.

Fifth, yet another advance over the existing literature is that we also investigate the impact of trade expansion on intergenerational income mobility. We find that increased intergenerational occupational mobility has only translated into greater income mobility for males, indicating the possibility of gender discrimination as well as different trade-offs women may face within the family relative to men.

[2]For regional employment and earnings responses, Dix-Carneiro and Kovak (2017) show persistent long-run effects of import liberalization. At the worker level, Utar (2018) shows that the long-run effects of a trade shock can differ from short-run effects and is heterogenous across skill levels.

Our main empirical methodology is based on comparing the exposure of Vietnamese provinces to the U.S.-Vietnam BTA tarrif reductions based on their initial composition of industries, and the gender-specific likelihood of intergenerational mobility (also varying across provinces) before and after the implementation of the BTA. Because trade affects demand for skills, we first classify and rank occupations based on their skill intensity and indicate sons and daughters as experiencing upward mobility if they have strictly higher-ranked occupations than their parents (where ranks are based on the initial average educational attainment within each occupation). The results show that the BTA has raised the likelihood of intergenerational occupational mobility by about 6.58 percentage points for sons and 8.31 percentage points for daughters, both accounting for almost 36% of the overall increase in mobility in Vietnam during our sample period from 2001 to 2015. These effects are larger in the long run than in the short run since the effect of the BTA takes the form of export growth playing out over several years, and younger generations joining the labor force have lived larger parts of their lives under the trade agreement.

To shed light on the impact of the BTA on labor markets, we next use product-level data and study the dynamics of the composition of export expansion in terms of quality and quantity of exports to the U.S., then estimate the effect of BTA on skill-specific labor demand, wages, and wage inequality for male and female workers at the province level. The results show expansions in Vietnam's export volumes as well as increases in unit values (proxy for quality) relatively more in products that experienced higher BTA tariff reductions. Nonetheless, quality upgrading only accounted for 10% of the overall export expansion. During this period of time, province-level employment shares and wages of high-skilled and medium skilled workers also saw a relative rise in provinces experiencing greater exposure to BTA tariff reductions. At the industry level, there were no statistically significant skill-specific employment share responses, thereby suggesting that province-level skill-demand responses were mainly taking place through resource reallocation across sectors, in turn, through trade-induced specialization. In our context, the results point to a more important role of resource reallocation rather than within-industry upgrading channel as in Verhoogen (2008).

We next turn to skill supply responses. As trade can increase incentives for education, thus affecting the supply of skilled labor, we next investigate the effect of the BTA on the educational outcomes of individuals. The results show that sons and daughters of younger cohorts living in provinces that received a relatively large BTA shock generally had a lower likelihood of dropping out of education after secondary school. Nonetheless, BTA had gender-specific effects on vocational training and college education. While sons' likelihood of both vocational training and college education was relatively enhanced, daughters' likelihood of vocational training was unaffected, yet the latter group experienced significant and larger impacts on the likelihood of college education. Across the board, the BTA induced higher educational attainments of younger cohorts relative to older cohorts who had likely already completed their education by the time the BTA was implemented.

In 2001, Vietnam had a relatively skilled labor force for a developing country at a similar level of development, which may have helped the extent to which the country benefited from the opening of U.S. markets to Vietnamese products.[3] Within Vietnam, we show that provinces with a higher initial level of education were able to take advantage of the opening of US markets and experienced higher mobility responses to the export exposure induced by the BTA. Furthermore, the BTA effects on occupational mobility turn out to be heterogeneous across parents' skills and sectoral affiliation. Sons and daughters with parents in the primary sectors (agriculture and mining) and services experienced higher levels of mobility due to the BTA, so did the sons and daughters with parents in low-skilled and medium-skilled occupations. These results show that the effects of the BTA on intergenerational mobility were not limited to the lower end of the skill distribution and in the agricultural households.

[3] In 2001, Vietnam was a Low Income Country according to the World Bank Country Classification. However, education spending in Vietnam as a percentage of GNI (3.2%) was much higher than in Low-Income Countries (2.5%), and Lower-Middle-Income Countries (2.8%), but was comparable to Upper-Middle-Income Countries (3.4%). In 2009, Vietnam moved up in the world rankings to the Lower-Middle-Income Country category. However, by 2015, Vietnam's spending on education as a share of GNI (4.6%) had surpassed all other groups and was comparable to High-Income Countries (4.5%) (World Bank, 2021)

Related Literature

This paper is related to the broad literature on trade, labor markets and inequality. The literature on trade and inequality has provided empirical evidence that even though trade is beneficial overall, it can raise inequality (Verhoogen (2008), Helpman et al. (2017)). In most of these studies, the main empirical interest is cross-sectional (horizontal) inequality. Similar to Ahsan and Chatterjee (2017), we show that trade liberalization can promote equality of opportunities, leading to greater intergenerational mobility and potentially reducing inequality along this (vertical) dimension.

Ahsan and Chatterjee (2017) study the impact of trade liberalization on intergenerational occupational mobility in India. It is the very first study that examines international trade as a potential determinant of intergenerational mobility. They find that, following India's trade liberalization in 1991, sons living in urban districts with greater exposure to trade liberalization were more likely to have better occupations relative to their fathers. They use a cross-section of household survey data post-liberalization period to measure mobility and regress this mobility measure on district-level tariff exposure. The main proposed mechanism was that import competition forces firms at or close to the efficiency frontier to innovate, thereby increasing the demand for skilled-labor. As previously mentioned, our paper differs and adds to this scant literature by (1) looking at both the impacts of export expansion and import competition, (2) investigating the impacts on both son-father and daughter-mother mobility and differentiating between them, (3) further disentangling mechanisms, (4) making methodological improvements, and, finally, (5) exploring implications for income mobility.

Our paper is also related to the literature on gender-specific effects of trade as well as its gender-inequality implications. Trade tends to increase competition and reduce discriminatory practices in a Becker-type framework (see Berik, Rodgers and Zveglich (2004), Black and Brainerd (2004), Menon and Rodgers (2009)). However, trade can also lead to gender-specific responses, for instance, in fertility, household formation and household decision-making, that worsen female workers' welfare. Keller and Utar (2022) find that female workers respond to a trade shock by increasing the likelihood of childbirth and marriage, which can lead to long-run losses in labour earnings. This channel is found to be insignificant for male workers. Mansour, Medina and Velasquez (2022) find that import competition has longer-lasting negative effects on female workers in Peru, while Erten and Keskin (2021) find that trade liberalization increases incidents of domestic violence in Cambodia. Our paper adds to this literature by investigating gender-specific effects of trade along the intergenerational mobility dimension. On this result, our investigation is also related to the literature on technological improvements in exporting firms that reduce the demand for physical skills (or strength), relatively more abundant in male workers, and thus increase the relative demand for female workers (Juhn, Ujhelyi and Villegas-Sanchez, 2014). On the other hand, sometimes the types of jobs in these exporting firms may not be as suitable for female workers (Bøler, Javorcik and Ulltveit-Moe, 2018).

Methodologically, our paper is related to a large literature on trade and labor markets that employs the local labor market approach. In particular, we measure trade exposure following Hasan, Mitra and Ural (2007), Topalova (2007), McCaig (2011), Autor, Dorn and Hanson (2013), Kovak (2013), and Hakobyan and McLaren (2016). This empirical approach has an advantage in that it is grounded in the specific-factors model of local economies as shown in Autor, Dorn and Hanson (2013) and Kovak (2013). In the general economics literature, this local labor market approach dates back to Bartik (1991). We adopt this approach in our analysis in which the local labor markets are provinces and central cities in Vietnam.[4]

The paper is organized as follows. We first provide a very simple economic channel within a trade model with human capital capital formation in Section 2. In Section 3, we describe our Vietnamese household survey data and provide descriptive analyses of the labor market in Vietnam during our sample period from 2001 to 2015. Section 4 describes how we measure

[4]Provinces and central cities are equivalent administrative units in Vietnam. To simplify the narrative, we use provinces to represent both the actual provinces and central cities in this paper.

intergenerational occupational mobility and several patterns of mobility in Vietnam, and in Section 5, we summarize background on liberalization of Vietnam's exports to the U.S. as well as Vietnam's accession to the WTO. In Section 6, we estimate the impact of the BTA on mobility, and in Section 7 we explore changes in skill demand due to the BTA (as a mechanism). As Vietnam went through a structural transformation, heterogeneous effects with respect to different previous-generation characteristics are studied in Section 8. We investigate the impact of the BTA on income mobility in Section 9. Section 10 concludes.

2 Simple Economics of Trade and Intergenerational Occupational Mobility: Theory

The economics behind our empirical work can be conveyed through a very simple model. We present here a Heckscher-Ohlin model with three goods, namely Food (f), Light Manufactures (l) and Heavy Manufactures (h). There are two factors of production: high-skilled labor (H) and low-skilled labor (L). The output of each of the goods produced (Food, Light Manufactures and Heavy Manufactures respectively, denoted by Q_f, Q_l and Q_h) is increasing and concave in low- and high-skilled labor used in its production. This production function is constant-returns-to-scale, and is given by

$$Q_i = F_i(L_i, H_i), i = f, l, h \tag{1}$$

We assume that Food production is the least skill-intensive and the production of Heavy Manufactures the most skill-intensive, with Light Manufactures somewhere in the middle. We rule out factor intensity reversals, so for any factor price vector (w_L, w_H) we have $(H_h/L_h) > (H_l/L_l) > (H_f/L_f)$. We assume that Vietnam is a small country relative to the U.S., so border or world prices faced by Vietnam are not affected by Vietnamese policies, i.e., those prices are taken as given by Vietnam.

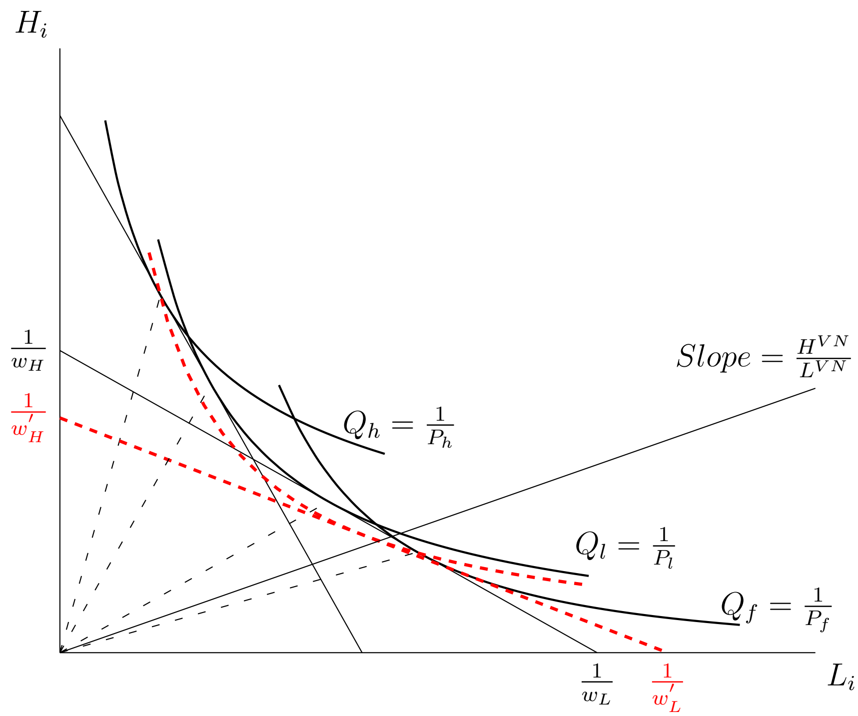


Figure 1: A Lerner Diagram for Vietnam's Economy

In Figure 1, we present the unit value isoquants, i.e., representing output levels $Q_i = 1/p_i$ where p_i is the price of good $i = f, l, h$. We treat Food as the numeraire. Placing Vietnam's endowment line in the diversification cone consisting of Food and Light Manufactures means that the country specializes in these two goods under trade. With the U.S. lying in the other diversification cone consisting of Light and Heavy Manufactures (or even higher, specializing fully in heavy manufactures). U.S. then imports Light Manufactures and Food from Vietnam.

Our data show that under the BTA, the biggest tariff reductions by far by the U.S. were on imports of manufactures from Vietnam. In our model, we, therefore, assume for simplicity that tariffs were reduced only on imports of Light Manufactures (the type of manufactures Vietnam exports). This increases the world price of Light Manufactures faced by Vietnam (since as a result of this tariff reduction Americans demand more of these Vietnamese Light Manufactures).[5] Now the unit value isoquant for Light Manufactures

[5]The unit value isoquant for Food does not shift because it is the numeraire. The shift in the unit value isoquant for Heavy Manufactures, if any (in the case of non-negligible cross-substitution or complementarity effects with respect to Light Manufactures), is not shown in the figure, as it is irrelevant to Vietnam as long

becomes a lower isoquant (a higher price means that a smaller amount of the good will now fetch a dollar). Vietnam's unit isocost line, which is a common tangent to the unit-value isoquants for Food and Light Manufactures, now has a bigger horizontal intercept, $1/w_L$ but a lower vertical intercept, $1/w_H$. Thus w_L is lower and w_H is higher, leading to an increase in wage inequality, w_H/w_L.

We next assume that the amount of high-skilled labor, H is endogenous along the lines of Findlay and Kierzkowski (1983). Their model is a T-period overlapping-generations model, with N people being born and the same number dying each year (meaning, effectively, one offspring per person). Out of the T periods, if one wants to acquire skills, one will have to spend the first few periods (lets say V periods) on education, while an unskilled or low-skilled worker can start working right away. Thus, the opportunity cost of education, in addition to the present value of all tuition (and one can include disutility) costs, includes the present value of the low-skilled wage income stream foregone during one's schooling and during ones's employment as a skilled worker.

Out of N individuals born each year, let N_H each year decide to get an education to acquire human capital. Then the total quantity of human capital or skilled labor produced each period in the steady state is assumed to be given by a CRS production function as follows

$$Q_H = g(N_H, A; V) \tag{2}$$

where A is the education-specific factor (lets say educational infrastructure) available in the economy (Q_H is CRS in N_H and A). The amount of human capital per skilled worker then equals Q_H/N_H, with each skilled worker earning $w_H Q_H/N_H$. The total amount of human capital in the economy at any point in the steady state is $H = (T - V)Q_H$

Findlay and Kierzkowski (1983) show that an individual's net benefit (which is the present discounted value of benefits minus that of costs), NB from acquiring human capital as a

as it remains in the Food-Light Manufactures diversification cone.

ratio of the unskilled wage is given by

$$(NB/w_L) = \phi(N_H, w_H/w_L, r) \tag{3}$$

where r is the rate of interest. ϕ is shown to be a decreasing function of N_H and r but an increasing function of w_H/w_L.[6]

In equilibrium, the marginal worker is indifferent between acquiring human capital and remaining unskilled, i.e., $NB = 0$. ϕ is a downward sloping function with respect to N_H, with the latter measured along the horizontal axis. This function's horizontal intercept gives us the endogenous equilibrium N_H and, in turn, the equilibrium H. An increase in w_H/w_L leads to an upward shift in this curve, and, thereby, to an increase in N_H and H. Thus, the partner country U.S.'s tariff liberalization (the BTA), through an increase in w_H/w_L, leads to more individuals acquiring skills, making intergenerational occupational mobility more likely, as in the next generations more skilled workers than merely the offsprings of current ones will emerge in equilibrium. Even if those offsprings have an advantage in acquiring human capital over others, there will be others acquiring skills in the new equilibrium, thereby contributing to enhanced intergenerational mobility

Introducing some heterogeneity in benefits and/or costs of acquiring human capital, which can have some idiosyncratic as well as parents' skill dependent components, can add clarity to increased intergenerational mobility arising from the BTA. Such liberalization will bring those with relatively low ranked ϕ's into the fold of skill acquisition, with those with the lowest ranked ones still remaining unskilled.

[6] A fixed amount of A leads to diminishing returns with respect to N_H in the production of human capital, thereby leading to ϕ being a decreasing function of N_H. A high r heavily discounts the future income stream through human capital acquisition, while a high w_H/w_L clearly leads to a relatively high income stream from skilled (as opposed to unskilled) labor.

3 Labor Market in Vietnam from 2001 to 2015

Before analyzing changes in intergenerational mobility, we characterize the main features of Vietnam's labor market during our sample period from 2001/2002 to 2015/2016 using the Vietnam Household Living Standard Surveys (VHLSS) data. This section first describes the household survey data and provides descriptive statistics regarding trends in Vietnam's demographic characteristics, occupational and sectoral structures, which eventually help us to find a link between changes in overall labor market conditions due to trade and intergenerational mobility.

Description of the Household Survey Data

Our main data source is the series of Vietnam Household Living Standard Surveys (VHLSS) from 2001/2002 to 2015/2016. These surveys are representative and implemented biennially by Vietnam's General Statistics Office (GSO). The stated goals of the VHLSSs are to "monitor systematically the living standard of Vietnam's societies" and to "exercise the monitoring and assessment of the implementation of the Comprehensive Poverty Alleviation and Growth Strategy defined in Country Strategy Paper approved by the Government Prime Minister" (World Bank, 2015).[7]

The VHLSSs contain rich information on household- and individual-level demographics, employment, household expenditures, health and other aspects. We use the VHLSS demographic and employment modules in this paper. For each VHLSS round, the recall period for expenditures and employment modules is 12 months, meaning that answers to their questionnaire inform us about what happened during the most recent 12-month period.[8]

[7]Additonally, the VHLSSs also "serve the evaluation of realization of the Millennium Development Goals and the Socio-economic Development Goals set out by Vietnamese Government" (see also in World Bank (2015)). These surveys are designed and implemented with technical assistance from the UNDP and the World Bank.

[8]This detail is important for our subsequent analyses on the impacts of the BTA because the BTA came to force in December 2001. This means that VHLSS 2001/2002 captures information in the pre-BTA period. See also McCaig (2011) and McCaig and Pavcnik (2018).

Whenever suitable, we also utilize data from the Vietnam Living Standards Survey (VLSS) for 1997/1998, which is the predecessor of VHLSS.[9]

Table 1 provides the main summary statistics of our datasets.[10] In each round of the VHLSS, about 45,000 households are interviewed. However, due to current data restrictions from Vietnam's GSO, for two of the rounds we only have access to samples of about 30,000 households (for the 2001 round) and 9,000 households (for the 2011 round). For each of the other rounds, the number of households in the sample is slightly over 45,000. Breaking down using the urban-rural criterion, the fraction of households in urban areas increases over time, from 23% in 2001 to 30% in 2015. Furthermore, the average household size decreases significantly over time, from about 4.5 heads per household in 2001 to 3.8 heads per household in 2015. In terms of individuals in the sample, the fractions of males and females remain relatively balanced, with the share of males being about 50% across years. In what follows, we provide further breakdowns by occupational and sectoral categories.

Sectoral and Occupational Structure

During the period from 2001 to 2015, there have been several significant changes in the structure of Vietnam's labor market. Table 2 illustrates the allocation of workers across broad economic sectors over time. As shown in Table 2, the four dominant sectors of Vietnam's economy during our sample period are: Agriculture, Manufacturing, Construction, and Services (combined). This structure remains relatively stable with the largest change happening in the agricultural sector. In particular, from 2001 to 2015, the employment share of agriculture decreases 14.98 percentage points, from 59.51% to 44.53%. This decrease in the agricultural employment share is reallocated towards all other sectors, with manufacturing experiencing a 4.37 percentage point increase in its share, up from 11.25% in 2001

[9] There are some differences in terms of sample size and level-of-detail in questionnaire between VLSS and VHLSS. Most notably, VLSSs cover much fewer households (6,000 for VLSS 1997/1998). In addition, the number of households interviewed appears to be biased towards either urban or rural areas for many provinces in the VLSS 1997/1998. See also the Appendix A and McCaig (2011) for details about data and some other issues.

[10] For brevity, we refer to the survey rounds by the fist year survey was initiated.

Table 1: Number of Households and Individuals in our VHLSSs Sample across Years

Year	2001	2003	2005	2007	2009	2011	2013	2015
No. of Households	29,533	45,910	45,945	45,945	46,995	9,399	46,995	46,381
Urban	6,909	11,240	11,520	11,760	13,245	2,703	13,905	13,890
	(23%)	(24%)	(25%)	(26%)	(28%)	(29%)	(30%)	(30%)
Rural	22,621	34,670	34,425	34,185	33,750	6,696	33,090	32,490
	(77%)	(76%)	(75%)	(74%)	(72%)	(71%)	(70%)	(70%)
No. of Individuals	132,385	202,585	197,135	191,432	185,696	36,655	180,919	175,242
Male	65,535	99,655	96,835	93,965	91,165	18,034	89,089	86,162
	(50%)	(49%)	(49%)	(49%)	(49%)	(49%)	(49%)	(49%)
Female	66,849	102,930	100,300	97,467	94,531	18,621	91,830	89,079
	(50%)	(51%)	(51%)	(51%)	(51%)	(51%)	(51%)	(51%)
Average Household Size	4.5	4.4	4.3	4.2	4.0	3.9	3.8	3.8

Notes: Source: Eight rounds of Vietnam Household Labor Standard Survey (VHLSS) from 2001/2002 to 2015/2016. The number of households in 2011 is smaller due to data restrictions by General Statistics Office of Vietnam.

to 15.62% in 2015. The construction sector sees a 2.66 percentage points increase in share while the rest is allocated to the service sector. Overall, we observe a large movement in the share of workers out of agriculture during this sample period. This matches the findings of McCaig and Pavcnik (2013) using Census Data for 1989, 1999 and 2009 (and other aggregate data sources). McCaig and Pavcnik (2013) document workers moving out of agriculture from 1990 to 2008 as a major structural change in Vietnam's labor market and show that this movement has contributed to high aggregate labor productivity growth in Vietnam during this period.

Table 3 illustrates the allocation of workers across 10 broad categories of occupations over time. These broad categories, along with their VHLSS codes in parentheses are: (0) Army, (1) Leaders, (2) High-level Professionals, (3) Technicians and Associate Professionals, (4) Clerical Support Workers, (5) Services and Sales Workers, (6) Agricultural, Forestry and Fishery Workers, (7) Crafts and Related Trade Workers, (8) Machine Operators and

Table 2: Sectoral Structure (in Employment Shares) from 2001-2015

Sector	2001	2003	2005	2007	2009	2011	2013	2015	Δ 2001-2015 (%)
Agriculture, Sylviculture & Aquaculture	59.51	56.13	53.28	51.43	45.25	46.32	45.67	44.53	−14.98
Mining	0.72	0.69	0.68	0.63	0.49	0.45	0.41	0.39	−0.33
Manufacturing	11.25	12.71	13.01	13.43	16.66	15.79	15.35	15.62	+4.37
Electricity, Gas, Water Production & Distribution	0.24	0.34	0.34	0.38	0.35	0.31	0.42	0.40	+0.16
Construction	4.48	4.93	5.26	5.56	6.55	6.77	6.88	7.14	+2.66
Trading & Reparation of Motor Vehicles & Household Tools	10.18	10.23	11.12	11.04	11.84	11.36	11.71	11.93	+1.75
Hotel & Restaurant	2.77	3.06	3.49	3.52	3.97	3.91	3.92	4.46	+1.69
Transportation & Storage	2.82	3.00	3.20	2.98	2.90	2.81	2.61	3.01	+0.19
Finance	0.27	0.33	0.36	0.42	0.59	0.54	0.66	0.64	+0.37
Science & Technology Activities	0.08	0.07	0.09	0.17	0.18	0.16	0.15	0.15	+0.07
Consulting & Business Services	0.43	0.57	0.61	0.77	0.93	0.92	1.01	1.09	+0.66
Education & Training	2.58	2.74	2.95	3.06	3.24	3.29	3.74	3.42	+0.84
Health & Social Relief	0.62	0.77	0.80	0.82	0.88	0.93	0.72	0.92	+0.30
Cultural & Sport Activities	0.33	0.34	0.37	0.81	0.93	0.89	1.07	1.03	+0.70
Communist Party	1.99	2.45	2.85	2.77	2.92	3.06	3.24	2.95	+0.96
Public & Personal Services	1.12	1.08	1.14	1.75	1.79	1.79	1.86	1.78	+0.66
Housework Services	0.59	0.55	0.45	0.45	0.50	0.66	0.56	0.52	−0.07
International Organizations	0.02	0.01	0.01	0.01	0.02	0.01	0.00	0.01	−0.01
Total (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	

Notes: Source: Eight rounds of Vietnam Household Labor Standard Survey (VHLSS) from 2001/2002 to 2015/2016. Concordance tables are used to make industry classifications consistent across rounds. Observations are weighted by the sampling weights to ensure national representative estimates.

Table 3: Occupational Structure (in Employment Shares) from 2001-2015

Occupation	2001	2003	2005	2007	2009	2011	2013	2015	Δ 2001-2015 (%)
0. Army	0.41	0.32	0.33	0.32	0.32	0.27	0.30	0.27	−0.14
1. Leaders	1.02	1.24	1.47	1.33	1.11	1.13	1.22	1.17	+0.15
2. High-level Professionals	1.83	2.27	2.83	3.61	4.58	5.04	5.50	5.25	+3.42
3. Technicians and Associate Professionals	2.86	3.08	3.31	3.41	3.68	3.50	3.31	3.27	+0.41
4. Clerical Support Workers	1.20	1.47	1.45	1.38	1.77	1.89	2.01	1.93	+0.73
5. Services and Sales Workers	2.71	2.94	3.65	4.11	4.19	4.61	4.80	5.13	+2.42
6. Agricultural, Forestry and Fishery Workers	3.11	2.05	2.42	3.87	6.08	7.11	7.12	6.12	+3.01
7. Crafts and Related Trade Workers	8.97	9.85	10.96	11.58	12.64	12.97	13.24	13.65	+4.68
8. Machine Operators and Assemblers	2.06	2.29	2.58	3.06	4.85	5.69	5.63	6.69	+4.63
9. Elementary Occupations	75.82	74.50	71.00	67.31	60.78	57.77	56.88	56.51	−19.31
Total (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	

Notes: Source: Eight rounds of Vietnam Household Labor Standard Survey (VHLSS) from 2001/2002 to 2015/2016. Shares are in percentage points. Observations are weighted by the sampling weights. Concordance tables are used to make occupation classifications consistent across rounds.

Assemblers, and (9) Elementary Occupations. Classification of these 10 broad categories is based on occupation codes recorded in the VHLSSs.[11] This 1-digit classification is also designed such that it is consistent with the International Standard Classification of Occupations (ISCO-08) proposed by the International Labour Organization (International Labour Organization (2012)).[12]

As shown in Table 3, in 2001, more than 75% of workers were in elementary occupations, while by 2015, this share decreased significantly to 56.51%, recording a 19.31 percentage point reduction. Workers in elementary occupations have been mainly reallocated to other jobs, including Crafts and Related Trade Workers (4.68 percentage point increase), Machine Operators and Assemblers (4.63 percentage point increase), and Technicians and Associate Professionals (3.42 percentage point increase).[13] Nevertheless, workers in elementary occupations still account for more than half of all employed workers. Large increases are also observed in the shares of Services and Sales Workers (2.42 percentage points) and Agricultural, Forestry and Fishery Workers (3.01 percentage points). Table 3 demonstrates clearly how Vietnam's occupation structure evolved over time, moving workers out of unskilled and towards more skilled jobs.

4 Intergenerational Occupational Mobility

To investigate the degree of intergenerational mobility, we construct two samples using the VHLSS rounds. The first sample is focused on son-father pairs where each son represents a unit of observation, and the second sample one is for daughter-mother pairs where each

[11]Two adjustments are made for VHLSSs 2010-2016. First, for these survey rounds, the occupation code 63 is changed to 92 to be consistent with the definition of low-skilled workers in agriculture, sylviculture, aquaculture. Second, in occupation code 52, we assign sale staff without information on wage as 95 (street-based and sales-related workers) to make it consistent with other rounds.

[12]The VHLSSs record occupation codes at a more disaggregate 2-digit level. However, it is not possible to build concordance at the 2-digit level due to definition changes across the VHLSS rounds before and after 2010. Therefore, we use 1-digit occupation level as our main point of reference. Appendix Table B1 provides the allocation of workers across 2-digit occupations recorded in the VHLSSs.

[13]Examples of elementary occupations include simple services on the street such as shoe shining, laundry, ironing, garbage collection, scavenging, letter delivery, unskilled work in agriculture, forestry, fishery, mining, construction, industry and transportation etc.

daughter represents a unit of observation. The inclusion of females in our analysis improves upon previous work where the focus is on males, and female mobility is not considered (Hnatkovska, Lahiri and Paul (2013), Ahsan and Chatterjee (2017)).

As our main outcome of interest is intergenerational occupational mobility, our samples are restricted to son-father pairs and daughter-mother pairs in which both members are simultaneously participating in the labor market. In our construction of son-father and daughter-mother pairs, we include both biological as well as in-law children for three reasons. First, except for the VHLSS 2001/2002 survey round, the household survey data do not contain enough information for us to clearly distinguish between biological and in-law children.[14] Secondly, as the in-law children are also likely to reflect the socio-economic status of the next generation in a household overall (as marriages are likely to take place between families of similar socio-economic status), understanding their mobility pattern is of our interest. Thirdly, because the co-resident likelihood is likely to be different between biological sons and daughters, by also looking at in-law children, we are more likely to make consistent comparison between son-father and daughter-mother pairs. Our final working samples are comprised of sons or daughters aged between 15 and 40 since the majority of working second generation in our sample are within this range. Furthermore, parents of those aged above 40 are also more likely to have retired, which can potentially bias our subsequent analyses.[15,16]

Our first task is to construct a ranking of occupations. Conceptually, we generally think of a "good job" as one with a high skill intensity. Our baseline measure of skill intensity by occupation is, therefore, based on information on the average education level of workers within each occupation, similar to the ranking approach in Ahsan and Chatterjee (2017). Specifically, for each 1-digit occupation (denoted by o) in Table 3, we construct an education

[14]For the VHLSS 2001/2002 survey round, data indicate that the share of son-in-law of all sons in our working sample is 3.47%. The corresponding share of daughter-in-law of all daughters is 25.37%.

[15]About 25% of households heads in Vietnam are female. A father, for example, can be the spouse of the household head. We thus identify mother and father as the household heads or the spouses of the household heads.

[16]Appendix Figure C2 illustrates the age distributions of child and parent across households.

Table 4: Education Indices (EIs) and Ranking of Occupations

Rank	Occupation	EI (Base)	EI (Adjusted)	ISCO Code (2008)
1	High-Level Professionals	11.9	15.4	2
2	Technicians and Associate Professionals	11.4	13.1	3
3	Clerical Support Workers	11.1	12.4	4
4	Leaders	10.8	12.3	1
5	Machine Operators and Assemblers	9.4	10.0	8
6	Services and Sales Workers	9.0	9.3	5
7	Crafts and Related Trade Workers	8.5	8.7	7
8	Elementary Occupations	6.6	6.7	9
8	Agricultural, Forestry and Fishery Workers	6.5	6.6	6

Notes: Education indices are based on VHLSS 2001/2002 and computed using Equation (4). VHLSSs record 1-digit occupations of individuals that are consistent with ISCO-08 at the 1-digit level. EI (Base) is constructed using grade completed (from 1 to 12) in the data. EI (Adjusted) is constructed using college and vocational training enrollment information. In this ranking, Elementary Occupations (ISCO08=9) and Agricultural, Forestry and Fishery Workers (ISCO08=6) are assigned the same rank. Armed Forces (ISCO08=0) are excluded from the analysis.

index EI_o as follows:

$$EI_o = \sum_{i \in o} \left(\frac{w_i}{\sum_{k \in o} w_k} \right) \times Edu_i. \tag{4}$$

In Equation (4), w_i and w_k are individual i and k's sample weights in VHLSS 2001/2002 (base year). Edu_i is grade level completed by individual i in the base year. The weighted summation is performed across all individuals within occupation o.[17] Here, we use our full sample of workers aged between 15 and 65 to compute the education index in Equation (4) to ensure the representativeness of the index.

We compute two education indices. The first one, EI (base), is constructed using years of (K-12 equivalent) education completed, and the second measure, EI (adjusted) includes years spent in college and vocational training programs in addition to K-12 years.[18] Because

[17]Slightly different from Ahsan and Chatterjee (2017), we use information about the grade completed by each individual rather than indicators for the degree received. This will distinguish, for example, workers who complete grade 8 versus workers who complete grade 5 only. Another difference is that we use our occupation codes at the 1-digit level to maintain concordance across survey rounds. For this reason, we will only capture larger movements across broadly defined occupation ranks and not the mobility within each one-digit occupation. Therefore, the mobility we capture in our data is likely lower than mobility based on more narrowly defined occupations.

[18]VHLSS records college and vocational training completion as indicator variables and not the actual

the rankings of occupations based on the two measures are exactly identical, we use this common ranking for our subsequent analyses.

In Table 4, we present our education indices and their rankings. The top occupation category is (2) High-level Professionals with an EI (base) index of 11.9 and an EI (adjusted) index of 15.4. This category includes jobs such as scientists, high-level experts in technical fields and high-level experts in life and health sciences. The subsequent categories are (3) Technicians and Associate Professionals and (4) Clerical Support Workers with base education indices of 11.4 and 11.1, respectively. (1) Leaders category has an index of 10.8. The next group of occupations are (8) Machine Operators and Assemblers, (5) Services and Sales Workers and (7) Crafts and Related Trade Workers with education indices indicating that an average worker has completed secondary schooling. The final group comprises of (9) Elementary Occupations and (6) Agricultural, Forestry and Fishery Workers. Because the education index of Elementary Occupations is very similar to that of Agriculture, Forestry and Fishery Workers, which are 6.7 and 6.6, we assign the same bottom rank for these two occupation categories. This assignment is consistent with the notion that mobility out of agriculture provides workers access to better jobs in non-farm sectors, which provide them with stable income streams and help them escape poverty (World Development Report (2006), Emran and Shilpi (2011)).[19]

To further check for the robustness as well as the stability of our ranking across survey years, we also construct our education indices and ranking using other survey years' data and show these rankings in Figure B1. Our ranking remains highly stable over time.[20]

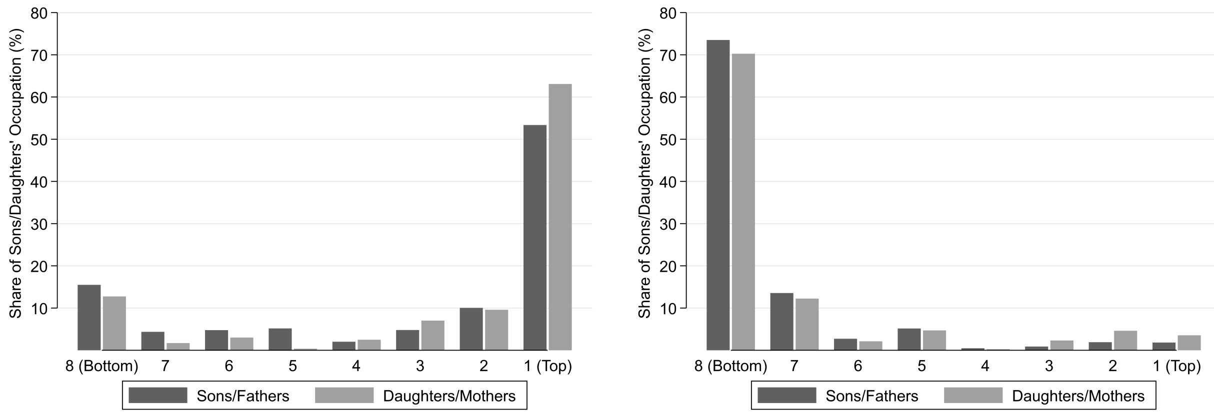
Based on our ranking of occupations, we construct an indicator variable of upward occu-

years participated. We impute 4 years for college education and 2 years for vocational training to compute the EI(adjusted). See more information on Vietnam's vocational training system in the technical report by the Australian Department of Education and Training (2018).

[19]This assignment is also consistent with a major structural change in Vietnam during our sample period associated with workers moving out of agriculture sectors as documented in McCaig and Pavcnik (2013).

[20]The only few exceptions that change ranking slightly are: category (1) Leaders after 2009, and category (5) Services and Sales Workers after 2011. The stability of the ranking also clearly shows us that there are three distinct clusters of occupations. In Section 7, we exploit these clusters to classify occupations into high-, medium-, and low-skilled groups.

Figure 2: Persistence of Upward Occupational Mobility: Top Fathers (Left) and Bottom Fathers (Right)



(a) Born to Top Fathers/Mothers

(b) Born to Bottom Fathers/Mothers

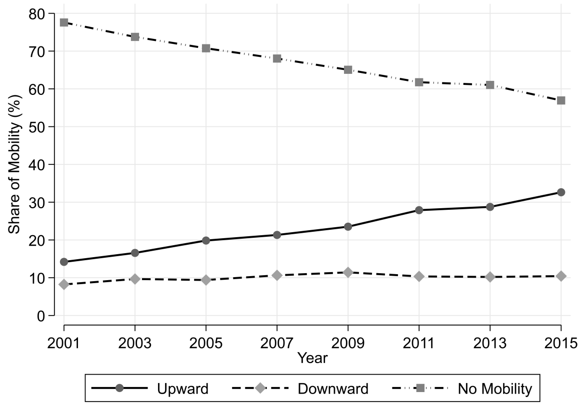
<u>*Notes:*</u> Panel (a) shows distribution of sons/daughters' occupation conditioning on having top fathers/mothers (High-level Professionals). Panel (b) shows distribution of sons/daughters' occupation conditioning on having bottom fathers/mothers (Unskilled and Agricultural Workers).

pational mobility $Upward_i$. In particular, in the son-father database, this indicator equals 1 if the son i works in a higher-ranked occupation than his father, and equals 0 otherwise. Similarly, in the daughter-mother database, this variable indicates observations where the daughter i has a higher-ranked occupation than her mother. In other words, upward mobility is defined as follows:

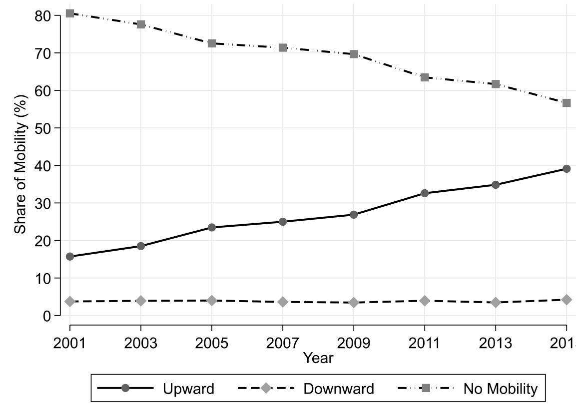
$$Upward_i = \begin{cases} 1 & \text{if Son (Daughter) is ranked strictly higher than Father (Mother)} \\ 0 & \text{otherwise.} \end{cases} \tag{5}$$

This definition is applied to our sample of sons or daughters who co-reside with their parents (the previous generation). This raises the econometric issue of endogeneity of the decision of adult sons/daughters to co-reside with parents or in-laws (as opposed to living independently). We address this issue by investigating whether the BTA has had any significant effects on the probability that working-age sons or daughters live independently from their

Figure 3: Intergenerational Occupational Mobility from 2001 to 2015



(a) Son-Father



(b) Daughter-Mother

<u>*Notes*:</u> Upward occupational mobility is fraction of sons/daughters that have better jobs than their fathers/mothers in each year. Similar definitions apply for downward and no mobility. The working sample is restricted to sons/daughters aged between 15 and 40 who are contemporarily participating in the labor market.

parents. We find no evidence supporting the endogeneity of co-residence (see Appendix C for details and Table C1 for regression results).

Figure 2 illustrates the persistence of upward occupational mobility for all years in our sample. The left panel shows the distribution of son/daughter's occupation conditioning on being born to fathers/mothers with top occupation (High-level Professionals) while the right panel shows the same distribution conditioning on being born to fathers/mothers with bottom occupation (Elementary Occupations and Agricultural, Forestry and Fishery Workers). The left panel suggests that 53.4% of sons being born to fathers and 63.1% of daughters being born to mothers who are high-level professionals also become high-level professionals. On the other hand, the right panel shows that 73.5% of sons being born to fathers and 70.2% of daughters being born to mothers who are unskilled and agricultural workers also become unskilled and agricultural workers, as shown in the bottom panel of Figure 2. Overall, Figure 2 indicates a very high correlation between occupational choices across generations in the VHLSS sample for both genders.

This high level of intergenerational occupational persistence masks important underlying changes in social mobility over time. Figure 3 illustrates the evolution of upward occupational mobility from 2001 to 2015. In 2001, the upward mobility was similar for both genders, with 14.3% upward mobility for sons and 15.7% upward mobility for daughters. This fraction increased monotonically over the years for both genders, with a much faster increase for females. By 2015, about 32.6% of sons had higher ranked occupations relative to their fathers, and about 39.1% of daughters had higher ranked occupations relative to their mothers. In this paper, we investigate how much of this increase in mobility can be attributed to the U.S.-Vietnam Bilateral Trade Agreement. We also have specifications where we control for the effect of increased import competition through Vietnam's own tariff reductions prior to and upon its WTO accession. In the process, we are also able to check, to the extent possible, for the existence, if any, of the impact of import competition on intergenerational occupational mobility. In the next sections, we describe the background of the U.S.-Vietnam BTA in detail and explore its implications for intergenerational mobility in Vietnam during this period.

5 Background on Vietnam's International Trade

The United States-Vietnam Bilateral Trade Agreement (BTA)

The United States-Vietnam Bilateral Trade Agreement (BTA) took about five years to negotiate and entered into force in December 2001.[21] The trade agreement was negotiated following the formal normalization of diplomatic relations between U.S. and Vietnam starting 1995. Following the BTA, the most important change on the U.S. side was to grant Normal Trade Relations (NTR)/Most Favored Nation (MFN) status to Vietnam and allowed Vietnam's exports immediate access to the U.S. market. In exchange, Vietnam made extensive commitments in terms of changing its laws, regulations and administrative proce-

[21] The primary sources of information for the description of the BTA in this section are STAR-Vietnam (2003) and McCaig (2011).

dures that comply with international trade norms and standards. However, due to its status as a developing country, Vietnam's commitments are "phased-in", meaning that they are scheduled for implementation in a number of years following the BTA. Although Vietnam also committed to cut tariffs for 250 out of more than 6,000 HS-6 U.S. products, the average tariff reductions are negligible since Vietnam already applied its low tariffs to the U.S. before the BTA.[22]

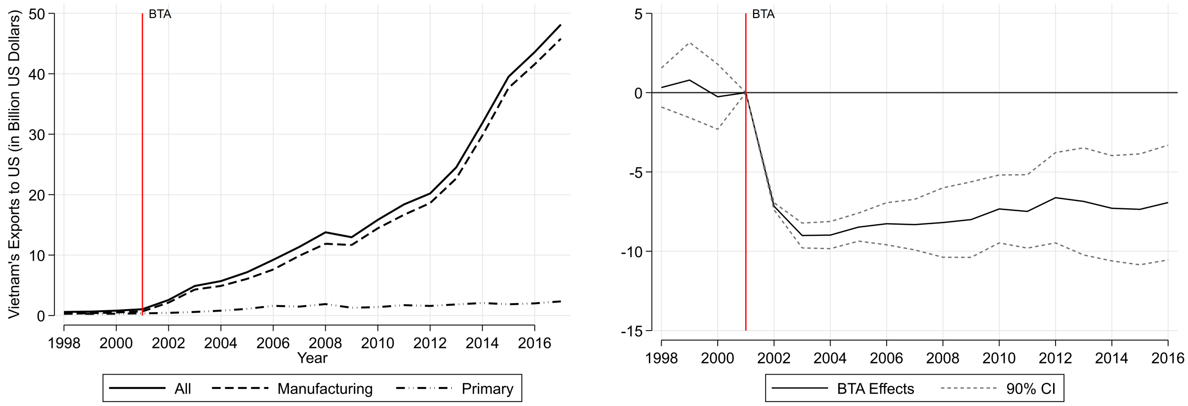
Upon being granted NTR/MFN status, Vietnam was moved from the "Column 2" to "Column 1" (MFN) of the U.S. tariff schedule. Importantly, although the BTA was subjected to a lengthy negotiation process on both sides, the magnitude of changes to U.S. tariffs on imports of Vietnamese products was largely *predetermined* and not influenced by either U.S. or Vietnam's bargaining positions. In particular, the "Column 2" tariffs are the tariffs assigned to nonmarket economies under the Smoot-Hawley Tariff Act of 1930. On the other hand, the MFN tariffs are the tariffs offered to all WTO members by the U.S. and determined through a multilateral bargaining process with other countries long before 2001.[23] To this extent, the BTA tariff reductions by the U.S. on Vietnamese products are plausibly exogenous to any domestic conditions or political processes or forces within Vietnam (see also similar exogeneity arguments in McCaig (2011), Fukase (2013), McCaig and Pavcnik (2018)).

The BTA tariff reductions are also large in magnitude. Following the BTA, the ad valorem U.S. tariffs to Vietnam's products went down from an average of 23.4% to 2.5%. The decrease is largest for the manufacturing sector, from an average of 33.8% to 3.6% and is much more modest for the agriculture and other primary sectors. As we will show next and in Section 7, the BTA was followed by immediate and extensive changes in Vietnam's exports to the U.S.. In all of our analyses, we use the BTA tariff data at the 2-digit industry level that match with Vietnam's industrial classification constructed by McCaig and Pavcnik

[22] 80% of these 250 tariff concessions were in the agriculture sector.

[23] Upon China's accession to WTO in 2001, China also experienced a similar treatment from the U.S., which is exogenous in the U.S. and China's industries' perspectives. However, in the case of China, such treatment is interpreted as removal of trade policy uncertainty rather than an actual trade policy change. See also Pierce and Schott (2016) for details.

Figure 4: Vietnam's Exports to the U.S. from 1998-2016 following the BTA



(a) Vietnam's Exports to the U.S.

(b) Changes in Vietnam's Exports Due to BTA

Notes: Panel (a) illustrates Vietnam's exports to the U.S. from 1998-2016. The primary sectors include agriculture and mining. All values are in nominal term. Panel (b) plots the effects of BTA shock on Vietnam's exports to US at 10-digit product level across years. The effects are obtained from the regression $\ln(Exports)_{ht} = \sum_{y=1998,y\neq 2001}^{2016} \theta_y \mathbb{1}\{y = t\} \times \tau_j^{BTA} + \lambda_h + \lambda_t + \varepsilon_{ht}$, where h is the HS 10-digit level product category and τ_j^{BTA} is the BTA tariff change measured at 2-digit industry level. The graphs are based on authors' calculations with the trade data from the U.S. Census.

(2018).[24]

Vietnam's Exports to the U.S.

Panel (a) of Figure 4 illustrates Vietnam's export value to U.S. from 1998 to 2016. Prior to the BTA, exports to U.S. were about 1.04 billion U.S. dollars, accounting for only 6.5% of total exports and 3.2% of GDP in 2001. In 2002, immediately after the BTA came to force, exports to the U.S. grew to 2.6 billion U.S. dollars, a 147% increase. This was a massive expansion of exports. By 2006, annual exports to the U.S. amounted to 9.2 billion U.S. dollars, a nine-fold increase, and accounted for 23% of total exports and almost 14% of GDP. By 2016, Vietnam exported 43.6 billion U.S. dollars to the U.S., which represented

[24]The industry affiliation of each individual in the VHLSS is at the 2-digit level, which leaves us with no option but to use the 2-digit tariff as an industry-level determinant of individual labor-market outcomes. To remain consistent in figuring out our channels, we use the 2-digit level tariff on the right-hand side also while investigating the effect of the BTA shock on the decomposition of exports into volume and unit value. And this decomposition into volume and unit value is feasible in a meaningful way only at the 10-digit level

20% of total exports and almost 21% of GDP.[25] Figure 4 also shows that the bulk of the increase in Vietnam's exports to the U.S. is in manufacturing. Specifically, the share of Vietnam's manufacturing exports in total exports to the U.S. increased from an average of 40% prior to the BTA to around 67% in 2002 and 87% in 2006 respectively. By 2016, almost the entire portfolio was manufacturing as this share increased to 92%.

To further illustrate the strong and significant effects of BTA on Vietnam's exports to the U.S. in the years after 2001, we consider the following regression:

$$\ln(Exports)_{ht} = \sum_{y=1998, y\neq 2001}^{2016} \theta_y \mathbb{1}\{y = t\} \times \tau_j^{BTA} + \lambda_h + \lambda_t + \varepsilon_{ht}, \quad (6)$$

in which $\ln(Exports)_{ht}$ is the log of exports of the 10-digit level product category h in year t. τ_j^{BTA} is the BTA tariff change measured at 2-digit industry level j, which is computed as the difference between the Column 1 and Column 2 U.S. tariffs. λ_h and λ_t are product and year fixed effects, respectively. We plot the estimates of $\hat{\theta}_y$ in the panel (b) of Figure 4.[26] As demonstrated in this figure, the effects of BTA were immediate and significant. The coefficients imply that a one percentage point reduction in BTA tariff has led to 7 to 9 percentage point increase in exports. The effects are permanent and have overall brought about a 180% increase in Vietnam's exports to the U.S. by 2006.[27]

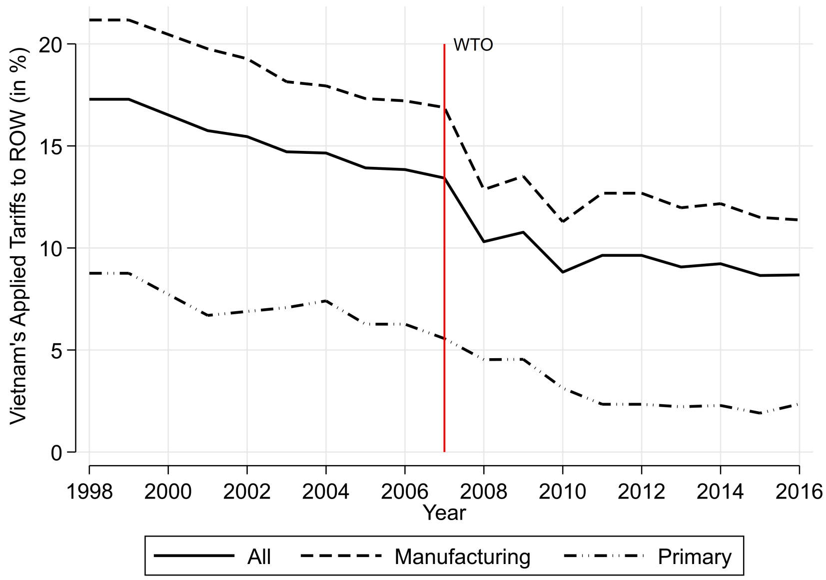
In Section 7, we further decompose the effects of BTA on Vietnam's export quantity as well as export quality (proxied by unit-value) to the U.S. to shed further light on how BTA affected labor markets, in particular the demand for skills, and thus shares of occupations

[25] By this time, Vietnam was able to diversify its export portfolio with second- and third-largest export partners being China and Japan respectively.

[26] Note that in regression Equation (6), the coefficient at the year 2001 is omitted as the base year (i.e. $\hat{\theta}_{2001} = 0$). Standard errors are clustered two-way at the 2-digit industry and year level. The exact estimation results for this regression are provided in column (1) of the Appendix Table D1.

[27] In order to understand the gender bias in trade liberalization, we run Equation (6) for female-dominated and male-dominated industries separately, where a female-dominated industry is defined as one where more than 50% of workers are female in VHLSS 2001/2002. The results presented in Appendix D show that BTA has led to a significantly higher expansion of exports in female-dominated industries, particularly in the earlier years of liberalization.

Figure 5: Vietnam's Applied Tariffs to the Rest of the World



Notes: Source: World Integrated Trade Solutions (WITS) Database. The primary sectors include agriculture and mining.

with different skill intensity.[28]

WTO Accession in 2007

During the period from 2001 to 2015, Vietnam implemented another major trade reform following its accession to WTO in January 2007. Accession to WTO was a lengthy process and Vietnam had been preparing for this event by implementing reforms on three major fronts: (1) administrative procedures, (2) gradual removal of trade barriers, and (3) conformation of their legal system to international trade laws.[29] For our purpose, we focus on the removal of tariffs during the period of Vietnam's accession to the WTO.

Upon WTO accession, Vietnam immediately cut average tariffs by about 3 percent-

[28]One consideration is that our log-linear regression in Equation (6) might be biased due to the presence of zero trade flows from Vietnam to the U.S. in years before and after the BTA for some 10-digit products. As a robustness check, we perform a Poisson pseudo maximum likelihood (PPML) regression for a multiplicative form of Equation (6) where exports are included in level in Appendix E. The results essentially do not change.

[29]See Pham (2011) for a brief description of these reforms.

age points across all industries. Figure 5 illustrates Vietnam's average applied tariffs from 1998-2016. As shown in Figure 5, tariffs had already been cut gradually over time before Vietnam's WTO accession, where the average tariff went down from 17.3 percentage points to 13.4 percentage points between 1998 to 2007. In 2008, the average tariff dropped sharply another 3 percentage points. After a few ups and downs, the average tariff level remained at around 9 percentage points (there was a very minor decline between 2014 and 2016). Decomposing by broad sectors, manufacturing tariffs have always been higher while primary sectors' tariffs have always been lower than the average tariffs. This reflects the country's comparative advantage forces and political economy and infant-industry motives in setting tariffs to protect its manufacturing sectors while at the same time opening up the primary sectors to promote competition and enable access to cheap intermediate inputs.

There was much expectation about the beneficial prospects of Vietnam's WTO accession at the time (and before) it happened. The benefits to consumers should be obvious. Nevertheless, the evidence on such benefits to domestic firms is scant and inconclusive so far. Pham (2011) and Vo and Nguyen (2009) are among the few studies that examine the economic impacts of Vietnam's WTO accession. A robust finding in both studies is that Vietnam's imports and inward foreign direct investments (FDI) appeared to have increased substantially due to its WTO accession. However, WTO membership did not directly impact Vietnamese exports. The problem in the identification of such an effect may be that increase in exports in an industry may not be related to the industry's own tariff reductions but to those in other industries (by Lerner symmetry). We control for trade liberalization through Vietnam's WTO accession in our analyses because of the strong evidence that exists on the impact of increased import competition on intergenerational mobility and other labor-market outcomes in developing countries (Ahsan and Chatterjee (2017), Hasan, Mitra and Ural (2007), Edmonds, Pavcnik and Topalova (2010) for instance).

6 Impact of the BTA on Intergenerational Occupational Mobility

A key objective of this paper is to understand how the BTA affected intergenerational mobility in Vietnam. We first briefly describe how we measure households' exposure to trade shocks associated with the BTA in 2001. We then specify our empirical models used to estimate causal impacts of the BTA exposure on intergenerational mobility.

Measuring the BTA Exposure

Our empirical approach compares changes in the fractions of sons/daughters within provinces who have experienced upward mobility before and after the BTA, and who are exposed differentially to the BTA shocks due to differences in initial composition of employment in provinces. We adopt a local labor market approach that is widely used in the international trade and labor literature. In particular, following Hasan, Mitra and Ural (2007), McCaig (2011), Topalova (2010) and Kovak (2013), we exploit provincial variation in the BTA exposure that arises due to differences in the initial industrial employment structure across provinces. Our measure of provincial exposure is as follows:

$$\tau_p^{BTA} = \tau_p^{MFN} - \tau_p^{\text{Column 2}} < 0, \tag{7}$$

where τ_p^{BTA} is the BTA tariff exposure of province p. τ_p^{MFN} and $\tau_p^{\text{Column 2}}$ are the provincial MFN and "Column 2" tariffs respectively, defined as:

$$\tau_p^X = \sum_j s_{jp} \times \tau_j^X, \tag{8}$$

where $X \in \{MFN, \text{Column 2}\}$ and τ_j^X is our (modified) US tariff measure for industry j, which we define in natural logs as $ln(1 + \bar{\tau}_j{}^X)$ where $\bar{\tau}_j{}^X$ is the standard ad valorem tariff for that industry in corresponding tariff columns.[30] The share s_{jp} captures the variation in initial industrial structures across provinces and is computed as:

$$s_{jp} = \frac{\sum_i w_{ijp}}{\sum_{k,m} w_{kmp}}, \tag{9}$$

where w_{ijp} and w_{kmp} are individual weights in the VHLSS 2001/2002. In this equation, i, k index individual and j, m index industry. In economic terms, s_{jp} represents the employment share of industry j within province p at the beginning of our sample period (pre-BTA).[31] Similar to Hasan, Mitra and Ural (2007) and Kovak (2013), yet slightly different from McCaig (2011) and Topalova (2010), we compute the employment shares only within traded industries (scaled exposure) rather than including the non-traded sectors. This empirical approach is grounded in a specific-factors model of a local economy as suggested by Kovak (2013).

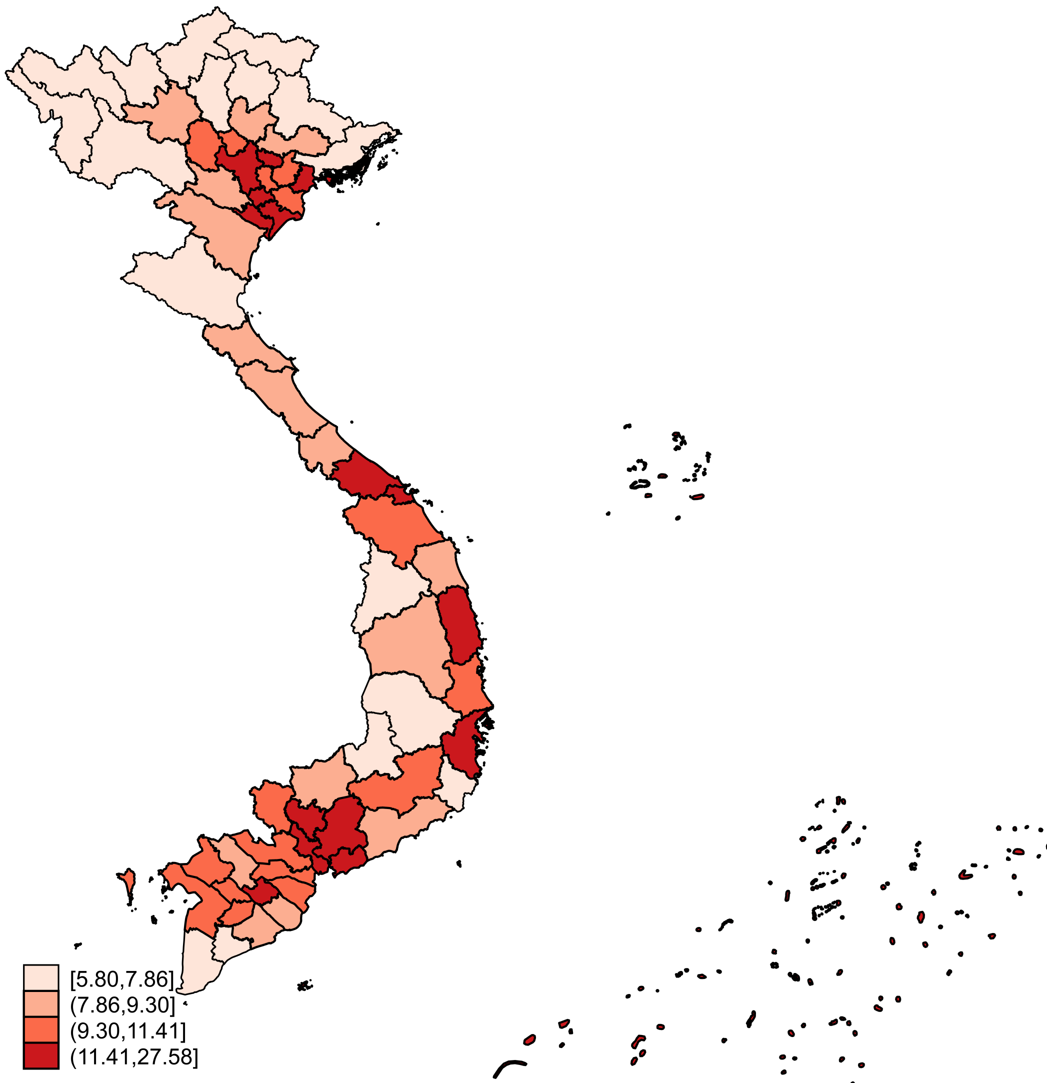
Figure 6 illustrates a map of Vietnam's provinces/central cities with variation in the BTA exposure. In the figure, lighter areas were exposed to smaller BTA tariff cuts, while darker areas were exposed to larger cuts. Across 60 provinces and central cities, the BTA tariff exposure, measured as provincial tariff reductions in Equation (7), range from 5.80 log points to 27.58 log points, with our measure of industry-level tariffs, as mentioned earlier, being measured as $ln(1+\tau_j)$.[32] The top-4 BTA exposure locations are Ho Chi Minh City, Da Nang, Hanoi (and Ha Tay combined) and Binh Duong, while the bottom-4 BTA exposure locations are Ca Mau, Quang Ninh, Ha Giang and Son La. As is clear from the map, the Red River Delta, Central Coast and Mekong Delta are among the regions that have been exposed the most to the BTA shock. BTA exposure is much smaller for inland provinces in the northern and central mountainous areas.

[30]Tariffs are at 2-digit industry level and are obtained from McCaig and Pavcnik (2018).

[31]As in Equation (4), we restrict our sample in Equation (9) to workers aged between 15 and 65 recorded in the VHLSS 2001/2002.

[32]Prior to 2003, Vietnam has 61 provinces and central cities. From 2003 to 2008, several provinces were split into smaller administrative units, and this number increased to 64. From 2008 until now, the number has decreased to 63 due to an administrative merge of Hanoi and Ha Tay. We concord provinces to a common code with 60 provinces across survey years. See Appendix A for geographic concordances.

Figure 6: The BTA Exposure across Vietnam's Provinces and Central Cities



Notes: The BTA exposure is measured as the weighted average of tariffs in which the weights are employment shares of the various traded industries within each province/central city, computed from the VHLSS 2001/2002 round, following Equation (8). To calculate employment shares, we restrict ourselves to workers aged between 16 and 65 recorded in the VHLSS. Traded industries comprise industry codes ranging from 1 to 34 using Vietnam's industrial classification system (industry codes 40, 74, 92, 93 are excluded). The top-4 BTA exposure locations are Ho Chi Minh City, Da Nang, Hanoi (Ha Tay combined) and Binh Duong. The bottom-4 BTA exposure locations are Ca Mau, Quang Ninh, Ha Giang and Son La.

We exploit this geographical variation to identify how the BTA affected labor markets and intergenerational mobility for male and female individuals, how the BTA-induced changes in the structure of skill demand played a role, and how wage inequality and income mobility within provinces have responded to the BTA shock. The exogenous nature of the BTA shock in Vietnam and the inherent geographical variation provides us with a unique setting to improve our understanding of the whether a developing country can experience generational effects from an expansion in export markets, and the mechanisms through which these effects manifest. In many of our specifications, we also control for changes in Vietnam's own tariffs, thereby confirming whether those tariff reductionss also had any contribution to Vietnam's intergenerational mobility.

Empirical Strategy - Baseline

To examine the impact of the BTA on intergenerational occupational mobility, we begin with a baseline difference-in-differences (DID) model specified as follows:

$$Upward_{ipt} = \theta \times PostBTA_t \times \tau_p^{BTA} + \gamma \tau_{pt}^{VN} + X'_{ipt}\beta + \lambda_p + \lambda_t + \varepsilon_{ipt}. \tag{10}$$

This model is estimated for the son-father sample and the daughter-mother sample separately. $Upward_{ipt}$ is an upward mobility indicator for son/daughter i in province p and year t, defined as in Equation (5). $PostBTA_t$ is an indicator variable for post-BTA years. Specifically, in our sample, data from the VHLSS 2001/2002 round are treated as pre-BTA while data from the later VHLSS rounds are considered as post-BTA (McCaig and Pavcnik, 2018).[33] τ_{pt}^{VN} is Vietnam's tariff of province p in year t and defined analogously to τ_p^{BTA} as in Equation (**??**).[34] The inclusion of τ_{pt}^{VN} controls for the province-level import protection and potential effects of Vietnam's WTO accession in 2007 as described in Section 5.

[33] As mentioned in Section 3, the recall period in the VHLSSs is 12 months. The BTA entered into force in December 2001. This means that VHLSS 2001/2002 records mostly pre-BTA information. In addition, we expect the effect of the BTA on mobility takes time to realize.

[34] In particular, $\tau_{pt}^{VN} = \sum_j s_{jp} \times \tau_{jt}^{VN}$ where τ_{jt}^{VN} is defined as the natural log of 1 + the actual tariff, but no deviation is taken from the base year, which, in this case, is the WTO accession year in 2007.

X_{ipt} is a vector of demographic controls including age, age squared, father/mother's age, father/mother's age squared, marriage status, urban status, minority status, household size and share of male members within the household. In addition, similar to Emran and Shilpi (2011) and Ahsan and Chatterjee (2017), we also control for father/mother's occupation rank as a proxy for unobservable genetic traits. λ_p and λ_t are province and year fixed effects, respectively. Standard errors are clustered at the province-by-year level, which is the level of variation of the BTA shock.

From Equation (10), our identification is obtained by comparing across provinces the changes in the fractions of sons (or daughters) who have experienced upward mobility before and after the BTA, and who are exposed differentially to the BTA shocks due to differences in initial industrial composition of provinces. Our main parameter of interest is θ, which captures the average effect of the BTA on intergenerational occupational mobility (more precisely, the effect of a change in provincial exposure relative to the average province and to the pre-BTA period on the change in intergenerational occupational mobility).[35]

Table 5 presents the results separately for the son-father sample and the daughter-mother sample. Columns (1a) and (1b) show the baseline result without any controls. Columns (2a) and (2b) add the vector of demographic controls, while Columns (3a) and (3b) further control for Vietnam's provincial tariffs. Across columns (1a)-(3a), the estimated effects of the BTA are robust and significant. In particular, the point estimates for sons suggests that a 1 log point decrease in the BTA provincial tariff leads to a 0.417-0.641 percentage point increase in the probability of upward occupational mobility. Taking our preferred estimate in column (3), which is -0.641, and combining it with the fact that the average BTA exposure across provinces is -10.27 points, our baseline result suggests that the BTA has induced 6.58 percentage points increase in the probability of upward occupational mobility for sons. This accounts for 35.97% of the overall increase in mobility for sons during our sample period

[35] Our research design and identification here is most in line with the shift-share framework proposed in Borusyak, Hull and Jaravel (2022), in which identification is obtained based on the strong exogeneity condition of industry-level tariffs. In our case, we have 24 2-digit industries with the average employment share across industry and province sufficiently small (equals to 0.077).

from 2001 to 2015.[36]

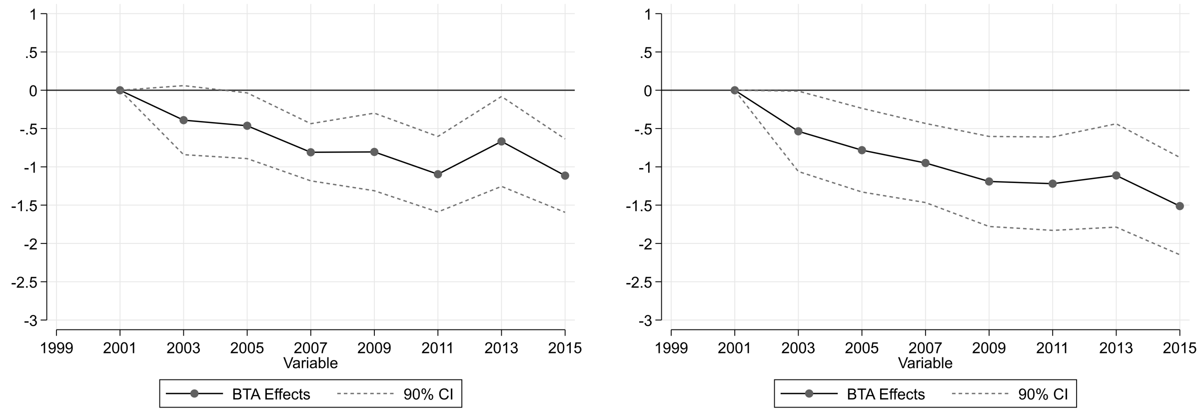
The coefficients for daughters are much larger in magnitude and vary between −0.757 to −0.809 between columns (1b) and (3b). Again using our preferred specification and evaluating at the tariff reduction, the BTA has induced 8.31 percentage points upward mobility for daughters. While the BTA was more effective in lifting daughters to higher-ranked occupations compared to sons, their mobility overall (not just due to trade) has also increased more over time. As a share, the BTA effect accounts for 35.56% of the overall increase in mobility of daughters during the period studied in this paper. The increase in mobility attributable to the BTA, along with its relative share in the overall increase in mobility, is one of the key results in our paper.

The impact on intergenerational mobility is expected to vary across cohorts, as older cohorts had a smaller overlap of their schooling years with the BTA (compared to the younger cohorts), thus providing the former relatively limited opportunity to have their educational outcomes respond to the changes. Therefore, we would expect a higher BTA effect on younger cohorts than on older cohorts. In Vietnam, individuals are generally known to complete their high school education at the age of 18 and their college education by the age of 25 (though we cannot rule out exceptions). In order to check the variation across cohorts, we create an indicator variable for individuals who were born after 1976, thus younger than or equal to 25 years of age when the BTA was implemented. We then add a triple interaction term, $PostBTA_t \times \tau_p^{BTA} \times \mathbb{1}\{\text{Born after 1976}\})$.

The results presented in Columns (4a) and (4b) of Table 5 show that the likelihood of additional upward mobility as a result of the BTA is higher for sons and daughters born after 1976, although the effect was weakly significant for male cohorts born earlier than 1976. On the other hand, for daughters, the effect was insignificant for cohorts who were born before 1976, i.e., was concentrated in the younger cohorts. This raises the possibility that older-cohort daughters face greater labor-market frictions, which prevent them from being able

[36]Recall from Section 4 that overall mobility increased from 14.3% to 32.6% for sons and 15.7% to 39.1% for daughters.

Figure 7: Effects of the BTA on Upward Occupational Mobility over Time



(a) Sons/Fathers

(b) Mothers/Daughters

Notes: Panel (a) plots the coefficients from column (2a) of Table 6. Panel (b) plots the coefficients from column (2b) of Table 6.

to adjust and benefit from the improved labor market conditions due to trade. This is less likely a problem for older-cohort sons.

Extended DID Model

Since we have multiple rounds of VHLSS that span over almost two decades and the BTA occurs towards the beginning of our sample period, it is possible to disentangle the short- and long-term effects of the BTA on mobility. To this end, we estimate an extended version of our baseline DID model, specified as follows:

$$Upward_{ipt} = \sum_{y=2003}^{2015} \theta_y \mathbb{1}\{y = t\} \times \tau_p^{BTA} + \gamma \tau_{pt}^{VN} + X'_{ipt}\beta + \lambda_p + \lambda_t + \varepsilon_{ipt}. \quad (11)$$

In Equation (11), the effect of τ_p^{BTA} is decomposed by year and allowed to vary over time. Similar to the baseline model, we again estimate this model for son-father and daughter-mother samples separately. This heterogeneity is captured by the interaction terms between

Table 5: Effects of the BTA on Intergenerational Occupational Mobility: Baseline DID Models

	(1a)	(2a)	(3a)	(4a)	(1b)	(2b)	(3b)	(4b)
	No control	BTA	BTA & Vietnam	Post-1976 Cohort	No control	BTA	BTA & Vietnam	Post-1976 Cohort
	Sons-Fathers				*Daughters-Mothers*			
Dependent Variable: $Upward_{ipt}$								
$PostBTA_t \times \tau_p^{BTA}$	-0.417*	-0.492**	-0.641***	-0.395*	-0.809**	-0.809***	-0.757**	-0.321
	(0.234)	(0.205)	(0.214)	(0.225)	(0.346)	(0.305)	(0.311)	(0.307)
$PostBTA_t \times \tau_p^{BTA} \times \mathbb{1}\{\text{YOB} > 1976\}$				-0.304***				-0.559***
				(0.083)				(0.109)
τ_{pt}^{VN}			0.823	0.925			-0.278	-0.067
			(0.576)	(0.574)			(0.717)	(0.705)
Age		0.066***	0.066***	0.063***		0.101***	0.101***	0.095***
		(0.003)	(0.003)	(0.003)		(0.003)	(0.003)	(0.004)
Age Squared		-0.001***	-0.001***	-0.001***		-0.002***	-0.002***	-0.002***
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Age of Father/Mother		0.006***	0.006***	0.006***		0.012***	0.012***	0.011***
		(0.002)	(0.002)	(0.002)		(0.002)	(0.002)	(0.002)
Age of Father/Mother Squared		-0.000***	-0.000***	-0.000***		-0.000***	-0.000***	-0.000***
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Married		-0.030***	-0.030***	-0.030***		-0.072***	-0.072***	-0.072***
		(0.004)	(0.004)	(0.004)		(0.005)	(0.005)	(0.005)
Urban		0.105***	0.105***	0.105***		0.094***	0.094***	0.094***
		(0.006)	(0.006)	(0.006)		(0.007)	(0.007)	(0.007)
Minority		-0.123***	-0.124***	-0.123***		-0.139***	-0.139***	-0.138***
		(0.007)	(0.007)	(0.007)		(0.008)	(0.008)	(0.008)
Share of Males in Household		-0.041***	-0.041***	-0.040***		0.018	0.018	0.018
		(0.012)	(0.012)	(0.012)		(0.013)	(0.013)	(0.013)
Household Size		-0.008***	-0.008***	-0.008***		-0.008***	-0.008***	-0.008***
		(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
Father/Mother Occupation Rank		-0.049***	-0.049***	-0.049***		-0.045***	-0.045***	-0.045***
		(0.002)	(0.002)	(0.002)		(0.003)	(0.002)	(0.002)
Observations	76,705	76,705	76,705	76,705	59,831	59,831	59,831	59,831
R-squared	0.097	0.180	0.180	0.180	0.135	0.204	0.204	0.204
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering Province-Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The estimation results for Equation (10) are presented based in data from 2001 through 2015. The dependent variable $Upward_{ipt}$ is an indicator variable that takes the value of 1 if the son/daughter i is employed in a higher-ranked occupation than his/her corresponding father/mother. BTA exposure and VN exposure variables are computed based on Equation (8) and exploit variation in exposure that arises due to differences in initial industrial structure across provinces. Standard errors are clustered at the province-by-year level. ***p<0.01, ** p<0.05, * p<0.1

Table 6: Short-Run and Long-Run Effects of the BTA on Intergenerational Occupational Mobility: Extended DID Models

	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
	BTA	BTA & VN	BTA & WTO	BTA	BTA & VN	BTA & WTO
		Sons/Fathers			*Daughters/Mothers*	
Dependent Variable: $Upward_{ipt}$						
$\mathbb{1}\{y = 2003\} \times \tau_p^{BTA}$	-0.223	-0.390	-0.551	-0.414	-0.536*	-0.648
	(0.267)	(0.273)	(0.584)	(0.322)	(0.318)	(0.576)
$\mathbb{1}\{y = 2005\} \times \tau_p^{BTA}$	-0.224	-0.463*	-0.881	-0.607*	-0.782**	-1.553**
	(0.228)	(0.260)	(0.586)	(0.324)	(0.332)	(0.720)
$\mathbb{1}\{y = 2007\} \times \tau_p^{BTA}$	-0.666***	-0.810***	-1.348**	-0.843***	-0.950***	-1.169*
	(0.219)	(0.226)	(0.552)	(0.324)	(0.313)	(0.686)
$\mathbb{1}\{y = 2009\} \times \tau_p^{BTA}$	-0.489**	-0.805***	-1.709***	-0.961***	-1.191***	-1.192*
	(0.243)	(0.307)	(0.597)	(0.324)	(0.357)	(0.628)
$\mathbb{1}\{y = 2011\} \times \tau_p^{BTA}$	-0.862***	-1.096***	-1.976**	-1.049***	-1.220***	-2.076**
	(0.277)	(0.299)	(0.850)	(0.370)	(0.370)	(0.990)
$\mathbb{1}\{y = 2013\} \times \tau_p^{BTA}$	-0.420	-0.668*	-1.230	-0.928**	-1.112***	-1.849*
	(0.328)	(0.356)	(0.855)	(0.401)	(0.409)	(1.075)
$\mathbb{1}\{y = 2015\} \times \tau_p^{BTA}$	-0.862***	-1.115***	-1.782**	-1.320***	-1.512***	-3.064***
	(0.267)	(0.291)	(0.702)	(0.411)	(0.385)	(0.824)
τ_{pt}^{VN}		1.217	0.765		0.870	0.219
		(0.767)	(0.687)		(0.844)	(0.801)
$\mathbb{1}\{y = 2001\} \times \tau_p^{WTO}$			-0.034			-0.018
			(0.028)			(0.037)
$\mathbb{1}\{y = 2003\} \times \tau_p^{WTO}$			-0.022			-0.006
			(0.023)			(0.026)
$\mathbb{1}\{y = 2005\} \times \tau_p^{WTO}$			-0.005			0.035
			(0.023)			(0.033)
$\mathbb{1}\{y = 2009\} \times \tau_p^{WTO}$			0.025			-0.008
			(0.024)			(0.030)
$\mathbb{1}\{y = 2011\} \times \tau_p^{WTO}$			0.022			0.041
			(0.041)			(0.053)
$\mathbb{1}\{y = 2013\} \times \tau_p^{WTO}$			0.004			0.034
			(0.042)			(0.054)
$\mathbb{1}\{y = 2015\} \times \tau_p^{WTO}$			0.010			0.080**
			(0.031)			(0.040)
Observations	76,705	76,705	76,705	59,831	59,831	59,831
R-squared	0.180	0.180	0.180	0.204	0.204	0.204
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Clustering Province-Year	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows estimation results for Equation (11). The dependent variable $Upward_{ipt}$ is an indicator variable that takes the value of 1 if the son/daughter i is employed in a higher-ranked occupation than his/her corresponding father/mother. Regressions include individual controls for age, age squared, age of the father, age of father squared, marital status, urban status, minority status, household size, the share of males within the household, father/mother's occupation rank. Standard errors are clustered at the province-by-year level. ***p<0.01, ** p<0.05, * p<0.1

τ_p^{BTA} and the survey year indicators $\mathbb{1}\{y=t\}$.[37] In this extended DID model, in addition to controlling linearly for Vietnam's provincial tariffs as in the baseline model in Equation (10), we also attempt to control for the change in Vietnam's protection level due to the country's WTO accession in 2007 in a nonlinear manner as follows:

$$Upward_{ipt} = \sum_{y=2003}^{2015} \theta_y \mathbb{1}\{y=t\} \times \tau_p^{BTA} + \sum_{y=2001, y\neq 2007}^{2015} \gamma_y \mathbb{1}\{y=t\} \times \tau_p^{WTO} + \gamma \tau_{pt}^{VN} + X'_{ipt}\beta + \lambda_p + \lambda_t + \varepsilon_{ipt}, \qquad (12)$$

where τ_p^{WTO} is the immediate Vietnam's provincial tariff cuts right after WTO accession in 2007, and is defined as $\tau_p^{WTO} \equiv \tau_{p,2009}^{VN} - \tau_{p,2007}^{VN}$. This approach effectively captures the differential effects due to a sharp tariff cut at the point of Vietnam's WTO accession in 2007 and allows such effects to vary over time, in addition to controlling linearly for the effect of τ_{pt}^{VN}.[38] Note that we interact also with earlier years the WTO accession tariff cut that becomes effective only after 2007 because, along with detecting and estimating the possible impact of WTO accession, we want to also be able to simultaneously perform a pre-trend check.

Table 6 presents our extended model's results where all specifications account for individual controls X_{ipt}. In Columns (1a) and (1b), we can observe how the average effect in Table 5 is broken down over time. Specifically, the effects of the BTA become larger and more statistically significant over time for both genders, with the exception of 2013. In Columns (2a) and (2b), we control for Vietnam's own tariffs. The BTA effects across years become stronger with this control across all years for both genders, a result consistent with findings from our baseline model. On the other hand, the effect of Vietnam's own trade protection on mobility remains insignificant.

Columns (3a) and (3b) show the results for the regression Equation (12), where WTO

[37] The effect of year 2001 is normalized to 0 as our base year in this extended DID framework.

[38] Here again, we omit the interaction terms for the year 2007 and use that year as the base year for the effects of WTO accession.

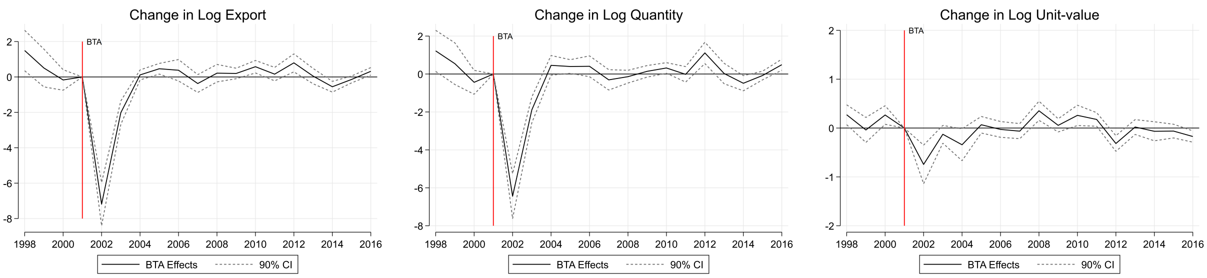
accession is more flexibly controlled for along with a separate effect of Vietnamese provincial protection which is allowed to change over time. The results remain qualitatively unchanged upon the introduction of these controls.

In addition, our results suggests that tariff cuts upon WTO accession do not have any significant effect on intergenerational occupational mobility for either gender. This result differs from Ahsan and Chatterjee (2017) who find that import competition improves mobility in Indian urban districts. We think that several factors contribute to the differences in our results. First, import liberalization in India in 1991 was a much bigger trade shock to the country, relative to what Vietnam experienced at its WTO accession. Second, Ahsan and Chatterjee (2017) study the effects 9 years post-liberalization, which likely allows sufficient time for firms to adjust their production technology to such a large shock. Also, Ahsan and Chatterjee (2017) do not control for export expansion, which happened as well at the same time (by Lerner symmetry). Finally and methodologically, the authors exploit cross-sectional variation, which is in contrast to our approach of a difference-in-differences research design, within a data set (covering 16 years) with both time and space dimensions, for identification.

Figure 7 plots and further visualizes the results from Columns (1a) and (1b) of Table 6. Overall, we find that the effects of BTA become larger and more significant over time for both sons and daughters, suggesting persistent and long-lasting effects of the BTA on intergenerational occupational mobility in Vietnam. This is our second key finding.[39] In addition, as we have seen above, we find that effects of Vietnam's WTO accession on intergenerational occupational mobility are mostly insignificant and lack persistence.

[39] In order to further ensure that we are not picking up a pre-existing trend, we include VLSS 1997/1998 and re-run our model. The results presented in Appendix F show that the coefficients are insignificant and close to zero, thus reassuring that the coefficients are not driven by an underlying trend due to the structure of the industry composition or other factors. We not include VLSS 1997/1998 in our main analysis as the survey is conducted slightly differently, thus not directly comparable to other rounds. Further detail on survey rounds is provided in the data Appendix A.

Figure 8: Effects of the BTA on Composition of Vietnam' Exports to the U.S. (First-Difference Estimation)



(a) $\Delta \ln(Exports)$ (b) $\Delta \ln(Quantity)$ (c) $\Delta \ln(UnitValue)$

Notes: Panel (a), (b), (c) plot the coefficients of the regressions in Equation (13) with dependent variables as the change in log of export ($\Delta \ln(Exports)$), the change in log of export quantity ($\Delta \ln(Quantity)$), and the change in log of unit-value ($\Delta \ln(UnitValue)$), respectively, at 10-digit level product categories. The graphs are based on authors' calculations with the trade data from the U.S. Census.

7 Changes in Skill Demand as a Mechanism

In this section, we investigate further and argue that the change in skill demand is the main mechanism through which the BTA affects intergenerational occupational mobility.

Changes in Export Quantity and Quality

Previously in Section 5, we showed that BTA has significant and permanent effects on Vietnam's exports to the U.S. (Figure 4, Panel (b)). In this section, we delve deeper into this result and decompose the overall effects of the BTA into its effects on changes in export quantity and quality (proxied by unit-value) at 10-digit HS product categories. Since it is not possible to compare quantity and unit-value across products, we estimate first-difference models in which we regress the log changes of quantity and unit value on BTA tariff changes as follows:

$$\Delta \ln(Quantity)_{ht} = \sum_{y=1998}^{2016} \delta_y \mathbb{1}\{y = t\} \times \tau_j^{BTA} + \lambda_t + \varepsilon_{ht}, \tag{13}$$

in which $\Delta \ln(Quantity)_{ht}$ is the change in log of export quantity of the 10-digit level product category h in year t, computed as $\Delta \ln(Quantity)_{ht} = \ln(Quantity)_{ht} - \ln(Quantity)_{h,t-1}$. τ_j^{BTA} is the BTA tariff change measured at 2-digit industry level j, which is computed as the difference between the logs of Column 1 and Column 2 U.S. tariffs. λ_t is the year fixed effect. Similarly, we estimate the same model for the change in log of exports ($\Delta \ln(Exports)$) and the change in log of unit-value ($\Delta \ln(UnitValue)$). We again plot the estimates of $\hat{\delta}_y$ for all three regressions in Figure 8, where panel (a) shows the results for Vietnam's overall exports, while panel (b) and (c) show the results decomposed into quantity and unit value channels.[40]

Panel (a) shows the BTA effects on overall exports consistent with what we see in panel (b) of Figure 4, with the magnitude of the effect in 2002 of about 7.2. As it reveals, the effects of BTA appear right away after BTA in 2002 and 2003, and remain unchanged after 2004. Similar patterns occur for both log changes in quantity and unit value. Nevertheless, in terms of magnitude, the effect of BTA on export quantity in 2002 is about 6.44, while that effect on unit-value is about 0.74. Combining these facts, the effects of BTA on export quantity account for 90% of the overall effects of BTA on Vietnam's exports to the U.S., while those effects on unit-value only account for 10%. Although 10% is a non-trivial part of the substantial increase in Vietnam's exports to the U.S. during our sample period, as we will show next, changes in skill demand appears to be mainly driven by the reallocation of production across 2-digit industry sectors within a province rather than skill-biased changes within-industries such as quality improvements.

Changes in Industry-Level Skill Demand

We next exploit the employment information in the household survey data to directly investigate the effects of the BTA on changes in skill demand. In order to do this, we first use the occupation ranking in Table 4 and in Figure B1 to classify occupations into three distinct

[40]Here again, we omit the coefficient at the year 2001 and use that year as our base year (i.e. $\hat{\delta}_{2001} = 0$). Standard errors are clustered two-way at the 2-digit industry and year level. The exact estimation results for these regressions are provided in columns (2)-(4) of the Appendix Table D1.

groups based on their education indices. The high-skilled group comprises the following four occupations (with their occupational codes in parentheses): (1) Leaders, (2) High-level Professionals, (3) Technicians and Associate Professionals, and (4) Clerical Support Workers. The medium-skilled group consists of three occupations: (5) Services and Sales Workers, (7) Crafts and Related Trade Workers, (8) Machine Operators and Assemblers. Finally, the low-skilled group includes two occupations: (6) Agricultural, Forestry and Fishery Workers and (9) Elementary Occupations. We compute the share of each skill group $S \in \{H, M, L\}$ within each 2-digit industry j in year t as $Skill_{jt}^S = \frac{\sum_{i \in S,j} w_{it}}{\sum_{k \in j} w_{kt}}$, in which w_{it} and w_{kt} are individual's sample weights. With these measures in hand, we estimate the regression model

$$Skill_{jt}^S = \theta \times PostBTA_t \times \tau_j^{BTA} + \lambda_j + \lambda_t + \varepsilon_{jt} \tag{14}$$

for each group $S \in \{H, M, L\}$ (high-, medium-, and low-skilled share, respectively). In addition, we also investigate the effect of the BTA on the relative demand for skills between the high- and low-skilled groups. The results are presented in the top panel of Table 7. Across all columns (1)-(4), the results show that the BTA shock does not appear to affect within-industry changes in relative skill demand. These results suggest that the reallocation of production (and employment) shares across industries due to the BTA might have played a more important role, which we investigate next.

Changes in Province-level Skill Demand

To investigate whether the BTA has induced a reallocation of skill shares across industries, we estimate how the BTA affects the high-, medium-, and low-skilled shares at the province level. In particular, we measure skill shares within each province p and year t for each skill group $S \in \{H, M, L\}$ as $Skill_{pt}^S = \frac{\sum_{i \in S,p} w_{it}}{\sum_{k \in p} w_{kt}}$, in which w_{it} and w_{kt} are individual's sample weights. With such measures of province-level skill shares, we estimate the following regression models:

Table 7: Effects of the BTA on Skill Demand within Industries and within Provinces

	(1)	(2)	(3)	(4)
	High-skilled Share	Medium-skilled Share	Low-skilled Share	High/Low
	Industry-Level Regressions			
$PostBTA_t \times \tau_j^{BTA}$	-0.190	0.032	-0.370	0.996
	(0.282)	(0.361)	(0.362)	(3.401)
Observations	180	185	182	177
R-squared	0.375	0.704	0.726	0.238
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
	Province-Level Regressions			
$PostBTA_t \times \tau_p^{BTA}$	-0.389***	-0.375***	0.763***	-2.674***
	(0.057)	(0.123)	(0.143)	(0.350)
Observations	480	480	480	480
R-squared	0.871	0.878	0.912	0.853
Province Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes

Notes: The results of Equation (14) for industry-level regressions, and Equation (15) for province-level regressions are presented. Standard errors are clustered at industry-year and province level respectively. ** p<0.01, ** p<0.05, * p<0.1

$$Skill_{pt}^{S} = \theta \times PostBTA_t \times \tau_p^{BTA} + \lambda_p + \lambda_t + \varepsilon_{pt}. \qquad (15)$$

A similar set of results is presented in the bottom panel of Table 7. Here, in contrast to the industry-level regression results, province-level skill shares respond significantly to the BTA shock. More specifically, provinces more exposed to the BTA shock see increases in the shares of workers in both high-skilled and medium-skilled occupations and a decrease in the share of workers in the low-skilled occupation group. In addition, the demand for high-skilled relative to low-skilled workers also increases as a result of the BTA. These results strongly suggest that changes in skill demand occur via the reallocation of production and employment across industries of varying skill intensities within each province. Changes in intergenerational occupational mobility, whose construction is as explained in Section 4, are driven by sons/daughters having better and more-skilled jobs than their fathers/mothers.

Overall, the results in Table 7 imply that improvements in mobility arise due to reallocation of production activities across industries through production specialization or structural change induced by the BTA, in particular towards the industries that demand more skilled labor, rather than skill-biased changes within industries. It is important here to note that the relatively skill-intensive industries in Vietnam are the relatively low-skilled labor intensive ones in developed countries like the U.S., and, similarly, the relatively high-skilled workers in Vietnam would be comparable to workers in relatively low category of the skill hierarchy in the developed world. This mechanism would also be consistent with our previous results shown in Figure 8, in which 90% of the increase in Vietnam's exports to the U.S. comes from the changes in export quantity, which would induce substantial reallocation across industries, and only 10% comes from the changes in quality (unit value), which is more likely to be associated with skill-biased changes within industries. It follows that the quality upgrading channel documented in Verhoogen (2008) likely accounts for only a small fraction of the effects of the BTA on mobility in Vietnam.

Changes in Wages and Wage Inequality

Having established that the BTA induces a reallocation of workers across industries of different skill intensities within each province, we further explore whether such reallocation leads to changes in relative residual wages of different skill groups that are consistent with the Stolper-Samuelson effects. To do this, we first measure the residual wage of each individual using the full sample VHLSSs' data for individuals aged between 15 and 65 with available wage information. The residual hourly (or yearly) log wage of individual i is computed using the following regression:

$$\log(wage_{ipt}) = Z'_{ipt}\alpha + \lambda_{pt} + \varepsilon_{ipt}, \tag{16}$$

Table 8: Effects of the BTA on Residual Log Wages and Wage Inequality

	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
Dependent Variable: Residual Log Hourly Wage across Skill Groups						
	Male Workers			*Female Workers*		
	High	Medium	Low	High	Medium	Low
$PostBTA_t \times \tau_p^{BTA}$	-2.665***	-2.078**	0.328	-3.124***	-2.049**	0.435
	(0.994)	(0.893)	(0.378)	(0.870)	(0.875)	(0.690)
Observations	480	480	480	480	476	480
R-squared	0.408	0.561	0.506	0.442	0.470	0.436
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes
Dependent Variable: Residual Log Hourly Wage Inequality across Skill Groups						
	Male Workers			*Female Workers*		
	High/Low	Med/Low	High/Med	High/Low	Med/Low	High/Med
$PostBTA_t \times \tau_p^{BTA}$	-2.993**	-2.407**	-0.587	-3.560***	-2.425*	-0.868
	(1.176)	(1.030)	(0.710)	(1.219)	(1.312)	(0.718)
Observations	480	480	480	480	476	476
R-squared	0.422	0.414	0.423	0.418	0.386	0.397
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Residual log wages across skill groups, province, year and gender are computed as weighted averages of individual residual log (hourly) wages obtained from the log wage regression in Equation (16). Standard errors are clustered two-way, at the province and year level. There are 4 province-year cells that do not have any female workers in the medium-skilled group.*** p<0.01, ** p<0.05, * p<0.1

in which Z_{ipt} is a vector of individual demographic characteristics, including age, urban status, minority status, as well as their second-order terms and all interactions. λ_{pt} is a province-by-year fixed effect term. With the residual log wage measure of each individual $Rwage_{ipt}$, we then compute a weighted average of the residual log wage for each skill group $S \in \{H, M, L\}$ in each province-year block as $Rwage^S_{pt} = \frac{\sum_{i \in S,p} Rwage_{ipt} \times w_{it}}{\sum_{k \in S,p} w_{kt}}$. Measures of residual log wage inequality across skill groups are also obtained by taking ratios of the $Rwage^S_{pt}$ between them.[41]

[41] Our results remain extremely robust to alternative specifications to the Mincer-type wage Equation (16). They are also robust to using yearly wage, to including education variable (grade completed), and to running the regression separately for each province-year block and allowing for effects of the covariates to vary.

The effects of the BTA on changes in residual log wages and wage inequality is examined by running a regression similar to Equation (15):

$$Rwage^{S}_{pt} = \theta \times PostBTA_t \times \tau^{BTA}_{p} + \lambda_p + \lambda_t + \varepsilon_{pt}. \tag{17}$$

We estimate this model for each gender separately. The results are reported in Table 8. In the top panel, the results show that provinces more exposed to the BTA shock see significant increases in residual log wages of the high- and medium-skilled groups for both male and female workers, with slightly higher effects on highly-skilled female workers. On the other hand, the residual log wage of the low-skilled group remains unaffected. The bottom panel shows that BTA has led to increases in residual wage inequality between the high- versus low-skilled groups and between the medium- versus low-skilled groups. Again, the effect on female workers' high/low wage ratio is slightly higher. However, the residual gap between the high- and medium-skilled groups is not significantly affected.

These results illustrate that the BTA might have contributed to the increase in inequality between skill groups, especially for females at the top of the skill distribution relative to the bottom. We interpret these results as consistent with the Stolper-Samuelson effects. The BTA reallocates economic activities towards the manufacturing industries that are relatively intensive in the use of high- and medium-skilled labor, thus increasing labor market returns for these groups as compared to the low-skilled group, who are mostly employed by the agricultural and low-skilled service sectors.[42] This effect is higher for females as the BTA has increased exports relatively more in female-dominated industries, as shown in Figure D1. This further confirms that the demand-side effects of the BTA are the key forces driving labor market outcomes.

[42] As mentioned earlier, the most skill-intensive sectors in Vietnam are likely to be the least skill-intensive in the developed world. Similarly the high-skilled and medium skilled groups in Vietnam could be in the lower end of the skill spectrum in developed countries.

8 Heterogeneous Effects

It is reasonable to expect that the increase in upward mobility in the younger cohorts is primarily driven by improvements in educational outcomes in the younger cohorts. This is not expected in the case of the older cohorts. In Table 9, we first control for son's education level (different levels of school education) in Column (1a) for the son-father sample, and daughter's education level in Column (1b) for the daughter-mother sample. The coefficients remain robust to those controls for both genders compared to the baseline specification in Table 5.

In Column (2a) and (2b), we allow BTA effects to vary by sons' and daughters' educational outcomes, i.e., the BTA variable is interacted with school education levels. The results show that both sons and daughters with higher education levels were more likely to experience upward mobility due to the BTA. The BTA coefficient for individuals with primary education is negative and significant. But, its magnitude is lower compared to the negative coefficients for individuals with secondary and upper-secondary education levels. Note that these coefficients show effects relative to those who do not even have a primary education.

While BTA induced a labor demand shock, translating it to intergenererational mobility outcomes requires a labor force that has the capacity to absorb this shock. Next, we differentiate provinces with respect to their initial education levels (a proxy for province-level educational infrastructure) in Columns (3a) and (3b).[43] The results show that sons and daughters in initially more educated provinces were indeed able to benefit more from the BTA shock.

The effects of labor demand changes due to the BTA may depend on employer-employee attachment where individuals with higher tenure are less likely to change employment and experience upward mobility. In columns (4a) and (4b), we investigate whether the effect of BTA varies by tenure, where tenure is defined as the years in the labor force. Specifically, we

[43] Province's initial education levels are computed using VHLSS.

compute tenure as the difference between age and years of K-12 education of sons/daughters. The results are shown in column (1). Interestingly, the results show that mobility decreases with tenure for sons, while the effect of BTA does not vary by tenure.

Next, in Table 10, we consider two additional education variables, vocational training and college education, to understand whether or not BTA has differential occupational mobility effects on sons and daughters with these educational outcomes. VHLSS codes these variables as indicator variables, separate from the years of education. It is important to note here that vocational training can be received anytime after primary school and thus not mutually exclusive to the other education variables. The results suggest that sons and daughters with a college education and/or vocational training tend to have higher levels of mobility. When we add indicator variables for college and vocational education simultaneously as additional controls (along with other education controls), they absorb the effect of BTA on upward mobility for sons, rendering the BTA effect statistically insignificant. While the BTA coefficient also shrinks for daughters, it still remains significant.

This motivates us to investigate how education levels and training are responding to the BTA shock. To do this, we create indicator variables for individuals with primary school education, secondary education, high school education, vocational training, and college education. We estimate our preferred specification in Equation (10) using these education indicators as the outcome variables, and we estimate this model for the son-father sample and daughter-mother sample separately. The results in the first panel of Table 11 show that the likelihood of having only primary school education did not differentially change in provinces that were more exposed to export expansion. However, the likelihood of having only secondary school education has significantly decreased for both genders. The individuals who complete secondary school may continue to high school, or receive vocational training. Once they are in high school, they again have the option of not completing high school and instead receiving vocational training. Interestingly, we find a significant increase in the likelihood of receiving vocational training in column (3a) only for sons, while the effect

Table 9: Heterogeneous Effects by Education Levels and Work Tenure

	(1a)	(2a)	(3a)	(4a)	(1b)	(2b)	(3b)	(4b)
	Baseline (w/ Education Controls)	Education (Individual)	Education (Province)	Tenure	Baseline (w/ Education Controls)	Education (Individual)	Education (Province)	Tenure
	Sons−Fathers				*Daughters−Mothers*			
Dependent Variable: Upward Occupational Mobility								
$PostBTA_t \times \tau_p^{BTA}$	-0.581***	0.128	-0.162	-0.434*	-0.763***	0.194	-0.292	-0.799***
	(0.207)	(0.226)	(0.235)	(0.248)	(0.286)	(0.289)	(0.352)	(0.303)
τ_{pt}^{VN}	0.032	0.011	-0.110	0.067	-0.423	-0.568	-0.618	-0.427
	(0.555)	(0.543)	(0.545)	(0.557)	(0.701)	(0.684)	(0.695)	(0.701)
Primary Edu	0.047***	0.017**	0.048***	0.017***	0.048***	-0.003	0.049***	0.042***
	(0.004)	(0.008)	(0.004)	(0.007)	(0.005)	(0.009)	(0.005)	(0.007)
Secondary Edu	0.093***	0.038***	0.094***	0.042***	0.108***	0.028**	0.109***	0.097***
	(0.005)	(0.011)	(0.005)	(0.010)	(0.007)	(0.013)	(0.007)	(0.012)
Upper-secondary Edu	0.270***	0.210***	0.270***	0.200***	0.320***	0.262***	0.320***	0.306***
	(0.007)	(0.013)	(0.007)	(0.014)	(0.008)	(0.016)	(0.008)	(0.016)
BTA × Primary Edu		-0.411***				-0.708***		
		(0.107)				(0.103)		
BTA × Secondary Edu		-0.696***				-1.028***		
		(0.127)				(0.139)		
BTA × Upper-secondary Edu		-0.717***				-0.775***		
		(0.132)				(0.158)		
BTA × Province's Initial Edu			-0.196***				-0.205**	
			(0.062)				(0.088)	
Work Tenure				-0.008***				-0.001
				(0.002)				(0.002)
BTA × Tenure				-0.011				0.002
				(0.009)				(0.007)
Observations	76,705	76,705	76,705	76,705	59,831	59,831	59,831	59,830
R-squared	0.220	0.221	0.221	0.221	0.258	0.259	0.258	0.258
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable $Upward_{ipt}$ is an indicator variable that takes the value of 1 if the son/daughter i is employed in a higher-ranked occupation than his/her corresponding father/mother. Regressions include controls for age, age squared, age of father, age of father squared, marital status, urban status, minority status, household size, share of males within household, father/mother's occupation rank. Province-level initial education is computed from VHLSS. Standard errors are clustered at the province-by-year level. ***p<0.01, ** p<0.05, * p<0.1

Table 10: Controlling for Vocational Training and College Education

	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
	Vocational	College	Vocational & College	Vocational	College	Vocational & College
	Sons—Fathers			*Daughters—Mothers*		
Dependent Variable: Upward Occupational Mobility						
$PostBTA_t \times \tau_p^{BTA}$	-0.428**	-0.501**	-0.253	-0.709***	-0.623**	-0.496**
	(0.197)	(0.209)	(0.189)	(0.245)	(0.283)	(0.225)
τ_{pt}^{VN}	-0.027	0.001	-0.095	-0.499	-0.128	-0.134
	(0.551)	(0.539)	(0.519)	(0.697)	(0.691)	(0.677)
Primary Edu	0.045***	0.049***	0.046***	0.045***	0.050***	0.045***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Secondary Edu	0.084***	0.095***	0.083***	0.098***	0.109***	0.096***
	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)
Upper-secondary Edu	0.225***	0.217***	0.135***	0.268***	0.259***	0.163***
	(0.007)	(0.006)	(0.006)	(0.008)	(0.008)	(0.008)
Vocational (Completed)	0.204***		0.295***	0.251***		0.361***
	(0.008)		(0.008)	(0.011)		(0.011)
College (Completed)		0.329***	0.443***		0.325***	0.439***
		(0.009)	(0.009)		(0.010)	(0.012)
Observations	76,705	76,705	76,705	59,831	59,831	59,831
R-squared	0.239	0.247	0.283	0.280	0.287	0.329
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable $Upward_{ipt}$ is an indicator variable that takes the value of 1 if the son/daughter i is employed in a higher-ranked occupation than his/her corresponding father/mother. Regressions include controls for age, age squared, age of father/mother, age of father/mother squared, marital status, urban status, minority status, household size, share of males within household, father/mother's occupation rank. In addition, we add controls for son/daughter completing vocational training or college education. Standard errors are clustered at the province-by-year level. ***p<0.01, ** p<0.05, * p<0.1

on the daughter's probability to receive vocational training was insignificant. However, the likelihood of having college education has increased significantly for both genders (Columns 4a and 4b), with a much higher coefficient for daughters. Our results on the effects of BTA on educational attainment of sons and daughters are consistent with recent results in McCaig, Nguyen and Kaestner (2022) using VHLSS data from 2001/2002 to 2007/2008, in which they find that the BTA leads to a slight increase in the likelihood of school enrollment and a significant rise in educational expenditures, conditioning on enrollment. Our results add to their findings by looking at both college education and vocational training, and by investigating over a longer time period.

As discussed in Section 6, individuals generally complete their high school education at the age of 18 and their college education by the age of 25, though there might be exceptions (as we see with our results on vocational training). Therefore, the BTA should have a smaller and possibly even no effect on individuals' educational choices in the case of those who were old enough to finish college by 2001. Therefore, in the next panel of Table 11, we add an additional triple interaction term, $PostBTA_t \times \tau_p^{BTA} \times \mathbb{1}\{\text{Born after 1976}\}$. The results in the second panel indeed show that the increased likelihood of completing high school, vocational training or college as a result of the BTA is higher for the younger (born after 1976) relative to the older individuals for both sons and daughters. Comparing columns (3a) and (4a) indicates that older sons were probably more likely to respond to the BTA by getting vocational training rather than by going to college. On the other hand, older daughters were more likely to respond to the BTA shock by receiving a college education (Columns 3b and 4b). For both sons and daughters, the younger cohorts' response to acquire college and vocational education due to the BTA was stronger as compared to older cohorts.

The impact of BTA on mobility may be concentrated in agriculture and driven mainly by moving out of agriculture. In the first panel of Table 12, we estimate the effect of BTA separately for fathers (mothers) in primary, manufacturing and service industries (where primary industries include agriculture and mining). For both samples, the magnitude of the coefficient is larger for the primary industries and the service industries, which is consistent with the fact that the bottom occupations tend to be concentrated in this sector. On the other hand, the coefficients were insignificant for parents in manufacturing industries, most likely due to the fact that manufacturing tends to be an organized sector with higher wages and there is less room for the next generation to experience any upward mobility.

Next, we investigate whether the effect of BTA was prominent throughout the education and skill spectrum of the father/mother. The second panel of Table 12 shows the results for sons/daughters with fathers/mothers who are low-skilled, medium-skilled or high-skilled. While the impacts were smallest at the top of the skill spectrum, the BTA had a signifi-

Table 11: The Effect of BTA on Son/Daughter's Completed Education

	(1a)	(2a)	(3a)	(4a)	(1b)	(2b)	(3b)	(4b)
	Secondary	High School	Vocational	College	Secondary	High School	Vocational	College
	Sons–Fathers				*Daughters–Mothers*			
All Age Groups								
$PostBTA_t \times \tau_p^{BTA}$	1.137***	-0.055	-0.658***	-0.240**	1.225***	-0.278	-0.175	-0.659***
	(0.294)	(0.244)	(0.223)	(0.105)	(0.226)	(0.238)	(0.289)	(0.084)
R-squared	0.071	0.227	0.102	0.138	0.107	0.267	0.068	0.180
By Cohorts Born Before-and-After 1976								
$PostBTA_t \times \tau_p^{BTA}$	0.594**	0.398	-0.438*	-0.004	0.719***	-0.003	-0.031	-0.346***
	(0.300)	(0.268)	(0.234)	(0.118)	(0.234)	(0.249)	(0.289)	(0.096)
$PostBTA_t \times \tau_p^{BTA}$	0.622***	-0.521***	-0.252***	-0.270***	0.596***	-0.324***	-0.169***	-0.368***
$\times \mathbb{1}\{YOB>1976\}$	(0.095)	(0.104)	(0.074)	(0.060)	(0.100)	(0.099)	(0.050)	(0.072)
R-squared	0.071	0.228	0.102	0.139	0.108	0.267	0.068	0.180
Observations	76,705	76,705	76,705	76,705	59,831	59,831	59,831	59,831
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variables are indicator variables for having completed primary, secondary, high school education, vocational training, or college education. Regressions include controls for age, age-squared, age of father/mother, age of father/mother squared, indicator variables for marital status, urban, minority, share of males in the household, household size, father/mother's occupation rank. Standard errors are clustered at the province-by-year level. ***p<0.01, **p<0.05, *p<0.1

Table 12: Heterogeneous Effects by Father/Mother's Sectors and Skill Groups

	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
	Sons−Fathers			*Daughters−Mothers*		
	By Father/Mother's Industry					
	Primary	Manufacturing	Services	Primary	Manufacturing	Services
$PostBTA_t \times \tau_p^{BTA}$	-0.854*	-0.492	-0.609**	-1.204***	0.369	-0.686**
	(0.463)	(0.394)	(0.307)	(0.328)	(0.543)	(0.324)
τ_{pt}^{VN}	1.132	1.446	-0.185	-0.094	1.609	-1.794*
	(1.588)	(1.528)	(0.813)	(1.365)	(1.871)	(0.918)
Observations	36,675	5,375	34,655	28,924	4,462	26,445
R-squared	0.183	0.148	0.186	0.194	0.178	0.204
	By Father/Mother's Skill Groups					
	Low-skilled	Medium-skilled	High-skilled	Low-skilled	Medium-skilled	High-skilled
$PostBTA_t \times \tau_p^{BTA}$	-1.055***	-1.317***	0.551*	-0.952**	-1.176**	0.683
	(0.344)	(0.290)	(0.334)	(0.380)	(0.567)	(0.874)
τ_{pt}^{VN}	0.947	2.514***	-2.614**	0.187	0.992	-6.361*
	(0.801)	(0.887)	(1.062)	(0.848)	(1.704)	(3.237)
Observations	61,482	10,496	4,727	53,769	4,194	1,868
R-squared	0.214	0.122	0.199	0.221	0.158	0.276
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The split-sample regressions results by father/mother's sectors and skill groups are presented. The high-skilled group includes four occupations: (1) Leaders, (2) High-level Professionals, (3) Technicians and Associate Professionals, and (4) Clerical Support Workers. The medium-skilled includes: (5) Services and Sales Workers, (7) Crafts and Related Trade Workers, (8) Machine Operators and Assemblers. The low-skilled group includes: (6) Agricultural, Forestry and Fishery Workers and (9) Elementary Occupations. Regressions include controls for age, age-squared, age of father/mother, age of father/mother squared, indicator variables for marital status, urban, minority, share of males in the household, household size, father's occupation rank. Standard errors are clustered at the province-year level. ***p<0.01, ** p<0.05, * p<0.1

cant impact on sons of fathers with low-skill and medium-skill occupations. The effect was insignificant in the case of daughters of mothers in high-skill occupations. Overall, these results show that the estimated effects of BTA on upward mobility were not concentrated at the lower part of the distribution of parental skills, or in the agricultural sector. Also, those BTA effects were virtually non-existent in the case of high parental skills or if parents were employed in the manufacturing sector.

9 Intergenerational Income Mobility

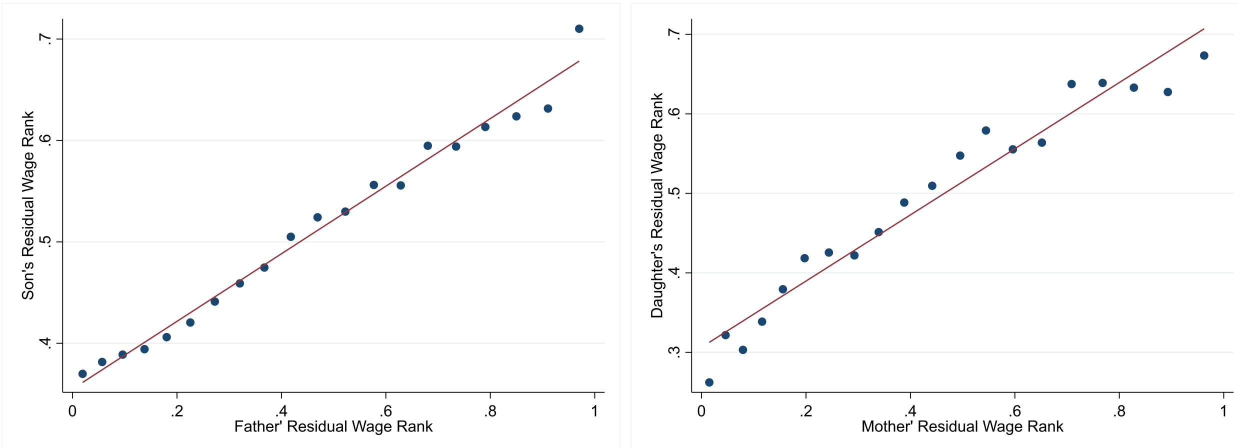
In this section, we explore how the BTA affects intergenerational income mobility in Vietnam. Examining income mobility using household survey data is challenging because income information within these surveys is often incomplete and has many missing values.[44] Nonetheless, we exploit the residual log (hourly) wages calculated in Section 7 to construct a ranking of income among son-father and daughter-mother pairs across the residual log wage distribution for each survey year. More specifically, for each year, we classify the residual log wage of children and parents into 20 quantile bins of the residual log wage distribution. Suppose son/daughter's residual log wage is located in a higher-ranked bin as compared to his/her parent's bin within their respective wage distributions. In that case, we designate this pair as an upward income mobility case, along the lines we defined upward occupational mobility in Section 4. Our approach of measuring income mobility, to a large extent, follows the previous literature, for instance in Chetty et al. (2014*a*) and Chetty et al. (2014*b*), except that in addition to controlling for cohorts (age), we also control for other individual characteristics, including gender, urban-rural and minority status.

To understand the changes in income mobility over time, Appendix Figure G1 illustrates the correlation between ranks for son-father pairs and daughter-mother pairs for years 2001, 2007 and 2015. For all fathers (mothers) in a given quantile measured along the horizontal axis, we plot the average quantile rank of their sons (daughters). The slope is highest in 2001 and keeps declining every year, indicating that the income rank of the offspring keep becoming less dependent on the income rank of the parent, thus income mobility keeps growing. This is in contrast to Chetty et al. (2014*b*), where they show that the income mobility in the U.S. has remained stable for the past decades.

Next, we estimate Equation (10) by replacing the left-hand side with an indicator variable for income mobility, where upward mobility takes the value of 1 if the son/daughter's rank is higher than the father/mother's rank. The results are presented in Table 13 reveal that sign and significance of the BTA effect differ greatly across genders. For sons, the BTA shock significantly induces an increase in intergenerational income mobility, and the coefficient

[44]Households in developing countries are likely to have non-monetary income sources from household enterprises such as household farms and other forms of self-employment, in which cases we would have occupation information but not income. For this reason, income data tend to be less complete than occupation data.

Figure 9: Relationship between Child's and Parent's Residual Log Wage Rank (20 Quantile Bins)



(a) Mean Son Wage Rank By Father's Rank (20 Quantile Bins). Intercept=0.35, Slope=0.33

(b) Mean Daughter Wage Rank By Mother's Rank (20 Quantile Bins). Intercept=0.31, Slope=0.41

Notes: Both figures show the relationship between child and parent's quantile income ranks, based on 20 quantile bins. Panel (a) plots the mean son's rank within each father's quantile rank. Panel (b) plots the mean daughter's rank within each mother's quantile rank. The relationship fits remarkably well with a linear curve, similar to results in Chetty et al. (2014*a*) which exploit administrative data for the U.S. Intercepts and slopes of fitted lines are provided.

remains robust to the inclusion of individual characteristics in (2a) and Vietnam's provincial tariffs in (3a). On the other hand, for daughter-mother pairs, the coefficient is insignificant and positive for our preferred specification in Column (3b), while weakly significant without Vietnam's provincial tariffs in Column (2b).

These results suggest that the BTA-induced upward occupational mobility was not translated to income mobility for daughters. It is a striking result considering that the BTA has increased exports in female-dominated industries relatively more than male-dominated industries, as shown in Appendix Figure D1. Our previous results showed that the BTA has increased the likelihood of college education for daughters, rather than vocational training, and no occupational mobility was observed for older daughters (born before 1976) who had less opportunity to improve their educational outcomes. The income mobility results, in conjunction with occupational mobility results, point to the possible existence of gender discrimination, where women are not being compensated more for higher skills and education in

Table 13: Effects of the BTA on Intergenerational Income Mobility

	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
	No control	BTA	BTA & Vietnam	No control	BTA	BTA & Vietnam
		Sons–Fathers			*Daughters–Mothers*	
Dependent Variable: Upward Income Mobility						
$PostBTA_t \times \tau_p^{BTA}$	-0.707**	-0.579*	-0.739*	0.591	0.729*	0.373
	(0.314)	(0.339)	(0.413)	(0.451)	(0.375)	(0.478)
τ_{pt}^{VN}			0.845			1.900
			(1.326)			(1.500)
Age		0.001	0.001		0.007	0.007
		(0.008)	(0.008)		(0.012)	(0.012)
Age Squared		-0.000	-0.000		-0.000	-0.000
		(0.000)	(0.000)		(0.000)	(0.000)
Age of Father/Mother		0.007	0.007		0.005	0.005
		(0.010)	(0.010)		(0.015)	(0.015)
Age of Father/Mother Squared		-0.000	-0.000		-0.000	-0.000
		(0.000)	(0.000)		(0.000)	(0.000)
Married		0.042***	0.042***		0.009	0.009
		(0.012)	(0.012)		(0.017)	(0.017)
Urban		0.114***	0.114***		0.110***	0.110***
		(0.012)	(0.012)		(0.016)	(0.016)
Minority		0.148***	0.148***		0.097***	0.097***
		(0.019)	(0.019)		(0.030)	(0.030)
Share of Males in Household		-0.055	-0.055		-0.045	-0.044
		(0.035)	(0.035)		(0.046)	(0.046)
Household Size		-0.000	-0.000		-0.006	-0.006
		(0.004)	(0.004)		(0.005)	(0.005)
Father/Mother Occupation Rank		-0.035***	-0.035***		-0.037***	-0.037***
		(0.003)	(0.003)		(0.004)	(0.004)
Observations	13,401	13,401	13,401	5,902	5,902	5,902
R-squared	0.016	0.066	0.066	0.039	0.107	0.107
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows estimation results for Equation (10) with dependent variable as upward *income* mobility indicator. Standard errors are clustered at the province-by-year level. ***p<0.01, ** p<0.05, * p<0.1

a statistically distinguishable way. Also, in the expansion of manufacturing, vocational training may be valued additionally more than college education. Moreover, household dynamics that affect labor market attachment, types of human capital investment, and flexibility of female workers in employer-employee matching may still play important roles in how export liberalization affects mobility. It is also possible that higher hourly wages may induce women to work fewer hours and lead them to spend more time with their family, including investing more in their children. While these mechanisms are beyond the scope of the current paper, they highlight that gender-specific effects may be present more in income outcomes compared to educational or occupational outcomes. That said, for sons, we have strong evidence suggesting that the BTA, by changing demand for skills and improving human capital investment, has contributed to increases in both income mobility and occupational mobility.[45]

10 Discussion and Concluding Remarks

In this paper, we study the impact of a large and exogenous export shock on intergenerational mobility in Vietnam, a small and rapidly developing economy. Our results suggest that export expansion through the implementation of the United States-Vietnam Bilateral Trade Agreement (BTA) has led to substantial increases in upward occupational mobility, accounting for 36% of overall increase in this mobility in Vietnam during the past two decades. We also find that the BTA has induced higher educational attainment for younger generations. We find that BTA effects on intergenerational mobility have worked through growth in exports, comprising mainly export volume growth but also some increases in unit values (that can proxy for quality).

Our findings have several important implications. First and most importantly, our paper shows that trade may help overcome frictions and social structures or barriers that impede intergenerational mobility. This leads to more equality of opportunities for younger generations, which is an important impact of trade not studied adequately in the trade and inequality literature. These effects vary substantially across genders in favor of daughters as compared to sons. Second, if trade can promote mobility and help high-ability individuals to obtain better jobs, this can generate additional long-term gains from trade through a more efficient allocation of human capital.

We improve upon the existing literature on trade and intergenerational mobility (Ahsan and Chatterjee, 2017) by investigating occupational mobility for both sons and daughters, and reveal that mobility outcomes and mechanisms vary across genders. While, unlike Ahsan and Chatterjee, our focus is on the effects of export expansion, in controlling for the effects of Vietnam's own tariff reductions (primarily through its WTO accession), we also look at

[45] However, we note here again that there is an issue with incomplete income data from household surveys, especially for female workers. Therefore, the question on impacts of trade on intergenerational income mobility deserves more investigation using better data and context.

the effects of import competition, which turn out to be non-existent, thereby showing that the effects of import competition on mobility cannot be generalized. In addition, another novel aspect of our paper is the evaluation of labor-market channels through which the BTA may have led to increased intergenerational mobility. We show evidence in support of an increase in demand for skilled labor through structural change in the form of reallocation of production and employment from low-skilled labor-intensive to medium and high skilled labor-intensive sectors. This increase in labor demand has drawn an appropriate supply response. Last but not least, our study takes a panel approach, using a relatively long panel dataset covering every 2 years over a 16-year period, allowing us to study the dynamics of intergenerational mobility in response to trade liberalization. This also we view as a major advance over the recent work on trade and mobility.

Finally, we investigate the impact of trade expansion on intergenerational income mobility. While we see that the BTA has increased intergenerational occupational mobility for both males and females, it has only translated into greater income mobility for the former. This might be a result of gender discrimination as well as different trade-offs women may face within the family as compared to men, which may lead to the reduction of their work hours voluntarily. These we view as questions to be explored in future research.

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Appendix

A Vietnamese Household Surveys

VLSS 1997/1998 There are three main issues with the VLSS 1997/1998. First, as mentioned in Section 2, the number of households interviewed is much smaller in the VLSS as compared to VHLSSs. In VLSS 1997/1998, there are only 6000 households in the sample. Second, even though the VLSS is presumed to be representative of living standards of the population, the sampling design is different from VHLSSs. In particular, the sample is designed to be representative for the **rural** areas of seven geographic regions at that time (Northern Mountains, Red River Delta, North Central, Central Coast, Central Highlands, Southeast, Mekong Delta) and three categories of **urban** domains (Hanoi and Ho Chi Minh City, other cities, other urban areas).[46] As a result, for 24 out of 61 provinces/central cities at that time, there is no urban household interviewed. This in turn also leads to oversampling of urban areas. Finally, two province codes 207 (Bac Kan) and 301 (Lai Chau) are missing in the VLSS 1997/1998.[47] VLSS 1992/1993 has a similar survey design to VLSS 1997/1998. Nonetheless, the occupation codes for VLSS 1992/1993 are totally different from those in VLSS 1997/1998, prohibiting us from also using this former survey for pre-trend checks.

Province and Industry Concordances Throughout the VHLSS survey years spanning 2001-2015, provincial administrative boundaries changed twice. Prior to 2001, Vietnam had 61 provinces and central cities. In 2003, Dien Bien (code 302), Dak Nong (code 606), and Hau Giang (code 816) were created out of Lai Chau (code 301), Dac Lak (code 605), and Can Tho (code 815), respectively. This change increased the number of provinces/central cities to 64. In 2008, Ha Tay (code 105) was merged into Ha Noi (code 101), reducing the total

[46] In later geographic classifications, Northern Mountains are subdivided into Northwest and Northeast, making up a total of eight geographic regions.

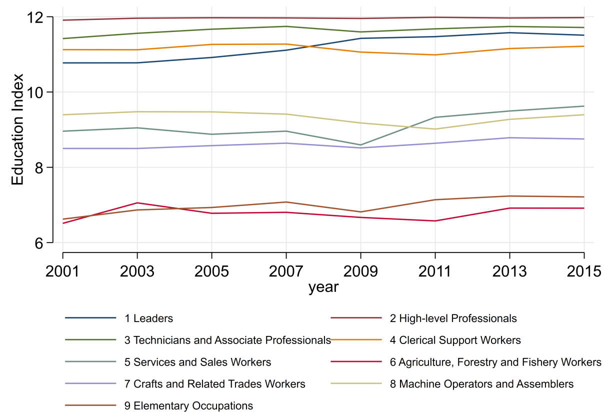
[47] In 1996, Bac Kan (207) and Thai Nguyen (215) were created by splitting Bac Thai. It is likely that code 207 in VLSS 1997/1998 is actually 215 based on VLSS 1993's classification.

number of provinces/central cities to 63 afterwards. We create a provincial concordance for all years that is comprised of 60 provinces/central cities in total.

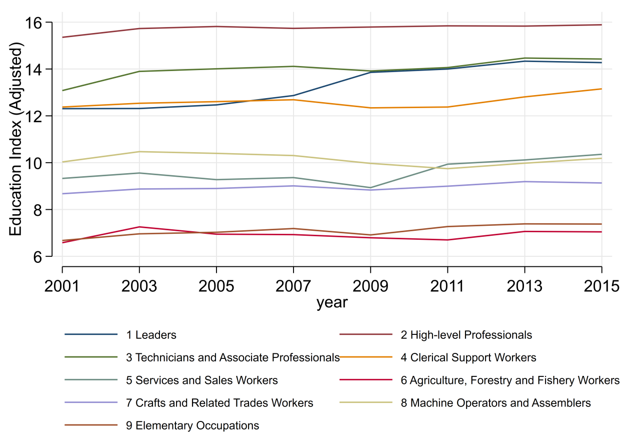
For industry concordances, the two-digit industry codes change slightly over time. We use the industry concordances provided by McCaig and Pavcnik (2018) to concord data between 1998 and 2008, and create our own concordances to concord VHLSS 2009/2010 and later years to the previous 1998-2008 period.

B Structure of Occupations over Time

Figure B1: Education Indices (EIs) and Ranking of Occupations Over Time



(a) K-12 equivalent grade



(b) K-12 equivalent grade plus years in college/vocational training

Note: The figures show education indices (EIs) for each 1-digit occupation over time. Panel (a) shows the EI (base) computed based on information about K-12 equivalent grade completed. Panel (b) shows the EI (adjusted), which include additional years in college and vocational training programs.

Table B1: Allocation of Workers across 2-digit Occupations by Year

	2001	2003	2005	2007	2009	2011	2013	2015	Total
0	0.41	0.32	0.33	0.32	0.32	0.27	0.30	0.27	0.32
11	0.10	0.08	0.10	0.12	0.07	0.05	0.06	0.06	0.08
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
14	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.02
15	0.40	0.55	0.69	0.61	0.25	0.20	0.25	0.26	0.41
16	0.23	0.25	0.28	0.22	0.22	0.23	0.31	0.25	0.24
17	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.01	0.01
18	0.01	0.02	0.02	0.01	0.08	0.12	0.13	0.13	0.06
19	0.23	0.31	0.35	0.34	0.47	0.48	0.45	0.45	0.38
21	0.28	0.31	0.39	0.49	0.65	0.75	0.77	0.65	0.52
22	0.14	0.17	0.19	0.21	0.22	0.24	0.21	0.29	0.21
23	0.74	0.87	1.00	1.21	1.44	1.61	1.80	1.57	1.25
24	0.68	0.91	1.25	1.70	1.68	1.87	2.13	2.14	1.52
25	0.00	0.00	0.00	0.00	0.20	0.16	0.19	0.21	0.09
26	0.00	0.00	0.00	0.00	0.39	0.41	0.41	0.39	0.19
31	0.16	0.20	0.28	0.24	0.45	0.52	0.45	0.34	0.32
32	0.41	0.49	0.51	0.53	0.53	0.56	0.43	0.50	0.50
33	1.59	1.53	1.52	1.36	1.08	0.99	0.77	0.89	1.25
34	0.70	0.85	1.01	1.27	0.33	0.29	0.37	0.36	0.67
35	0.00	0.00	0.00	0.00	0.12	0.10	0.13	0.11	0.05
36	0.00	0.00	0.00	0.00	1.17	1.04	1.14	1.06	0.52
41	0.77	0.92	0.89	0.92	0.55	0.53	0.54	0.55	0.72
42	0.43	0.54	0.56	0.46	0.27	0.24	0.25	0.30	0.39
43	0.00	0.00	0.00	0.00	0.34	0.39	0.37	0.36	0.17
44	0.00	0.00	0.00	0.00	0.61	0.72	0.86	0.72	0.33
51	0.87	1.01	1.14	1.68	1.62	1.90	1.87	1.94	1.49
52	1.84	1.93	2.50	2.43	1.41	1.60	1.69	1.90	1.93
53	0.00	0.00	0.00	0.00	0.34	0.22	0.29	0.35	0.14
54	0.00	0.00	0.00	0.00	0.83	0.89	0.94	0.94	0.42
61	3.11	2.05	2.42	3.87	5.41	6.42	6.26	5.23	4.24
62	0.00	0.00	0.00	0.00	0.67	0.70	0.87	0.89	0.36
71	1.73	1.89	2.41	2.89	3.62	3.89	4.01	4.20	3.05
72	1.13	1.30	1.54	1.59	1.63	1.69	1.78	1.83	1.55
73	0.52	0.76	0.68	0.64	0.61	0.67	0.52	0.68	0.65
74	4.55	4.67	5.16	5.13	0.75	0.70	0.78	0.78	2.92
75	0.00	0.00	0.00	0.00	6.03	6.03	6.15	6.15	2.89
79	1.04	1.23	1.17	1.33	0.00	0.00	0.00	0.00	0.63
81	0.25	0.26	0.25	0.34	2.06	2.86	2.85	3.40	1.48
82	0.42	0.49	0.53	0.74	0.28	0.31	0.35	0.47	0.46
83	1.39	1.54	1.80	1.99	2.50	2.51	2.42	2.82	2.13
91	11.20	11.14	11.72	12.12	0.76	1.05	0.82	0.82	6.48
92	55.63	53.74	50.62	47.19	41.92	40.41	38.77	38.41	46.14
93	8.98	9.62	8.65	8.00	5.71	4.98	5.22	4.95	7.08
94	0.00	0.00	0.00	0.00	0.28	0.21	0.24	0.31	0.13
95	0.00	0.00	0.00	0.00	11.16	10.29	10.75	11.05	5.16
96	0.00	0.00	0.00	0.00	0.96	0.83	1.08	0.97	0.44
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

C BTA and Co-residence of Child and Parent

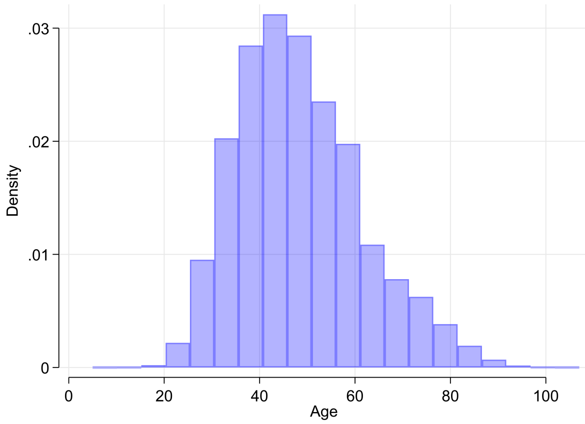
One concern with our key results in the paper is the co-residence issue between a child and his/her parents. The Vietnam household survey data only collect information for members residing within the household, thus potential bias might arise because the child might live in a different household as compared to his/her parent, information about which is not captured by the survey. In principle, the BTA might affect the probability of a child co-reside with parents. To check whether this is the case, we construct indicators for households in the survey that are likely to be headed (or co-headed) by *independent* sons and *independent* daughters (described below), and see if the shares of these households respond to the BTA shock.[48] Conceptually, we think of independent sons and daughters as children that are able to move out and live independently from their biological parents, thus they head or co-head their own households.[49] If there is a response in the shares of these households, the estimate of this effect would be informative about the sign and the magnitude of the bias that might arise due to the co-residence issue, which could affect the estimates of the BTA effects on intergenerational mobility in the main text.

Households of Independent Sons We identify households that are headed or co-headed by independent sons as follows. First, among all households in our raw VHLSS sample, we look for households that are headed or co-headed by adult males aged between 15 and 40. Figure 2(a) shows the age distribution of all-male household heads or co-heads. There is a quite substantial fraction of people aged below 40 that we intend to pick up. Second, among these households, we further look for those that do not have any child (son or daughter) who is aged above 15 and has an occupation. This criterion helps us to eliminate a small fraction of households where young (working) adult children co-reside with young parents. Third, we

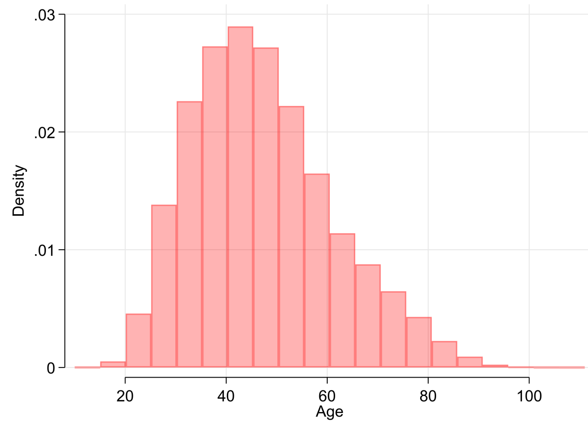
[48] Co-heads are defined as husband or wife of the household heads.

[49] It is important to note that our definition of independent sons and daughters includes in-laws, which is consistent with our treatment of sons and daughters throughout the paper.

Figure C1: Age Distribution of Headed (or Co-headed) Males and Females of Households



(a) Males



(b) Females

Note: The figures show the age distribution of household head or co-head (wife or husband of household head). Panel (a) shows the age distribution for males and panel (b) shows the age distribution for females.

screen out households that have household heads' (co-heads') parents co-reside within. We have 21% of households fall into households of independent sons category.

Households of Independent Daughters We identify households that are headed or co-headed by independent daughters in similar manner. First, we look for households that are headed or co-headed by adult females aged between 15 and 40. The age distribution of all-female household heads or co-heads is presented in Figure 2(b). Second, we also further look for those that do not have any child (including both sons and daughters) who are aged above 15 and has an occupation. And finally, we look for those households that do not have household heads' (co-heads') parents co-reside within. We have 26% of households fall into households of independent daughters category.

Effects of the BTA on Share of Households of Independent Sons and Daughters After obtaining an indicator for households of independent sons and daughters, we regress these indicators on the BTA shock, similar to our baseline regression in Equation (10). The results are presented in Table C1. We do not find any evidence that the BTA (or the change

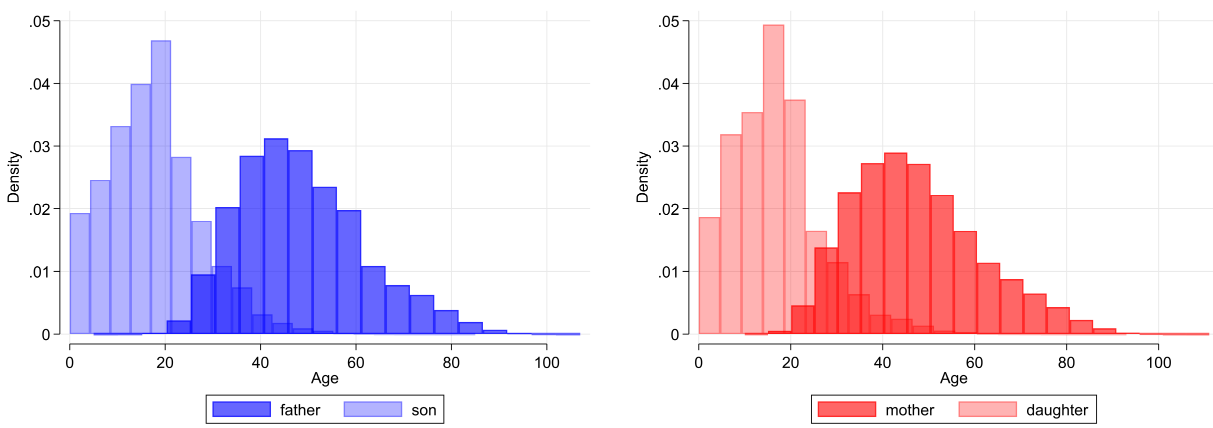
Table C1: Effects of the BTA on Probability of Household Being Headed (Co-headed) by Independent Child

	(1a)	(2a)	(1b)	(2b)
	BTA	BTA & Vietnam	BTA	BTA & Vietnam
	$\mathbb{I}\{\textit{Household of Independent Son}\}$		$\mathbb{I}\{\textit{Household of Independent Daughter}\}$	
$PostBTA_t \times \tau_p^{BTA}$	-0.236	-0.229	-0.176	-0.158
	(0.151)	(0.170)	(0.164)	(0.180)
τ_{pt}^{VN}		-0.033		-0.092
		(0.472)		(0.490)
Observations	317,103	317,103	317,103	317,103
R-squared	0.019	0.019	0.017	0.017
Province Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes

Notes: The table shows estimation results for the effects of BTA on the share of households of *independent* sons and daughters as defined in Appendix Section D. Standard errors are clustered at the province-by-year level. ***p<0.01, ** p<0.05, * p<0.1

in Vietnam's tariffs) has had significant effects on the probability that sons or daughters aged between 15-40 live independently from their biological parents. Nonetheless, we do find that the sign of the coefficients are negative across the four columns of Table C1, indicating that if sons with a better occupation are more likely to move out, then the bias would go into the direction that bias our estimates of the effect of BTA on mobility downward. These results alleviate concerns about the co-residence bias in our estimates.

Figure C2: Age distribution of Sons/Fathers and Daughters/Mothers across Households



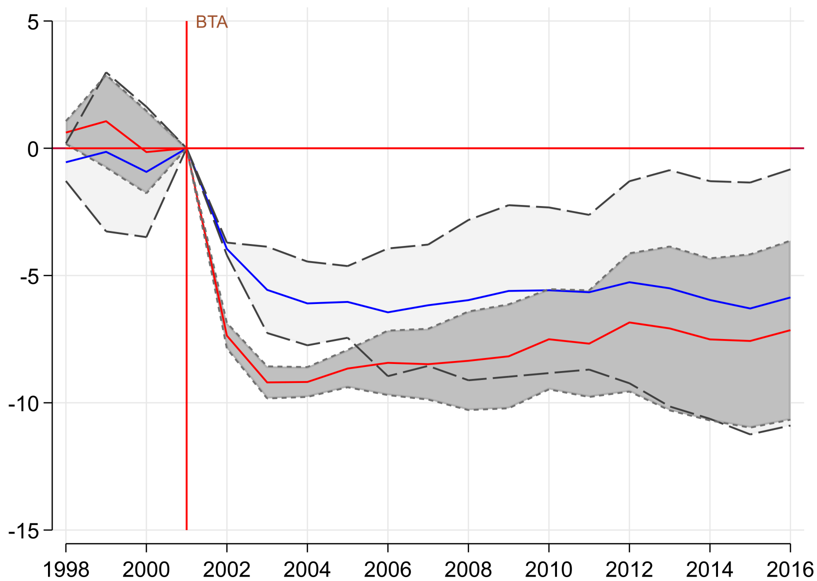
(a) Sons/Fathers

(b) Daughters/Mothers

Note: The figures show the age distribution of Sons/Fathers and Daughters/Mothers across Households. Panel (a) shows the distribution for Sons/Fathers. Panel (b) shows the distribution for Daughters/Mothers.

D Additional Results on the Effect of BTA on Exports

Figure D1: Gender-biased Effect of the BTA shock on Vietnam's Exports to the U.S.



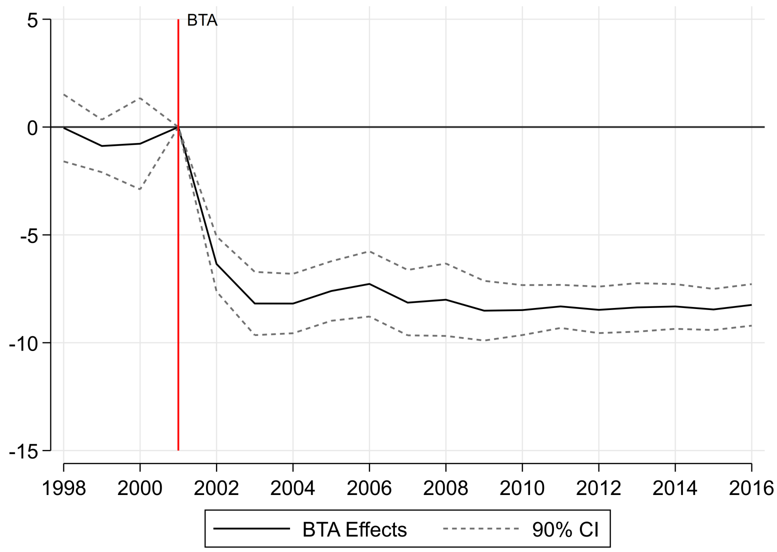
Note: The results from Equation (6) are presented for female and male dominated industries separately. The blue line shows estimates of the BTA on Vietnam's exports to the U.S. for male-dominated industries, while the red line shows estimates for female-dominated industries. Female-dominated industries are classified based on the share of female workers in each 2-digit industry from VHLSS 2001/2002. The threshold is 0.5 (more than 50% of workers are female). Nonetheless, the results are robust to using thresholds as 0.55, 0.6 and 0.7.

Table D1: Impacts of the BTA on Vietnam-U.S. Exports at 10-digit Product Level

	(1)	(2)	(3)	(4)
Dependent Variables	$\ln(Exports)$	$\Delta\ln(Exports)$	$\Delta\ln(UnitValue)$	$\Delta\ln(Quantity)$
BTA Effects in Year 1998	0.322	1.492**	0.272**	1.220*
	(0.708)	(0.659)	(0.117)	(0.625)
BTA Effects in Year 1999	0.790	0.505	-0.039	0.544
	(1.368)	(0.615)	(0.147)	(0.633)
BTA Effects in Year 2000	-0.259	-0.170	0.267**	-0.437
	(1.183)	(0.334)	(0.110)	(0.364)
BTA Effects in Year 2002	-7.161***	-7.186***	-0.744***	-6.441***
	(0.129)	(0.704)	(0.228)	(0.684)
BTA Effects in Year 2003	-9.006***	-2.017***	-0.127	-1.890***
	(0.452)	(0.383)	(0.105)	(0.392)
BTA Effects in Year 2004	-8.981***	0.115	-0.342*	0.457
	(0.494)	(0.163)	(0.188)	(0.299)
BTA Effects in Year 2005	-8.477***	0.463**	0.068	0.396*
	(0.510)	(0.173)	(0.098)	(0.208)
BTA Effects in Year 2006	-8.265***	0.379	-0.028	0.407
	(0.765)	(0.348)	(0.093)	(0.316)
BTA Effects in Year 2007	-8.319***	-0.372	-0.064	-0.308
	(0.920)	(0.290)	(0.089)	(0.310)
BTA Effects in Year 2008	-8.189***	0.214	0.353***	-0.140
	(1.262)	(0.285)	(0.113)	(0.194)
BTA Effects in Year 2009	-8.004***	0.197	0.055	0.142
	(1.373)	(0.171)	(0.078)	(0.175)
BTA Effects in Year 2010	-7.333***	0.579**	0.260**	0.319*
	(1.235)	(0.203)	(0.120)	(0.162)
BTA Effects in Year 2011	-7.488***	0.158	0.176**	-0.017
	(1.334)	(0.220)	(0.080)	(0.235)
BTA Effects in Year 2012	-6.624***	0.797**	-0.316***	1.113***
	(1.642)	(0.292)	(0.092)	(0.324)
BTA Effects in Year 2013	-6.857***	0.048	0.021	0.027
	(1.948)	(0.250)	(0.087)	(0.310)
BTA Effects in Year 2014	-7.290***	-0.553***	-0.066	-0.487**
	(1.914)	(0.175)	(0.112)	(0.230)
BTA Effects in Year 2015	-7.357***	-0.140	-0.062	-0.078
	(2.016)	(0.112)	(0.081)	(0.131)
BTA Effects in Year 2016	-6.929***	0.318**	-0.173**	0.492***
	(2.085)	(0.122)	(0.067)	(0.168)
Observations	45,737	34,738	34,738	34,738
R-squared	0.767	0.052	0.004	0.032
Product FEs (10-digit)	Yes	No	No	No
Year FEs	Yes	Yes	Yes	Yes
Clustering Two-way	Yes	Yes	Yes	Yes

E PPML Regression for Vietnam's Exports to the U.S.

Figure E1: PPML Regression for Vietnam's Exports to the U.S. from 1998-2016 following the BTA



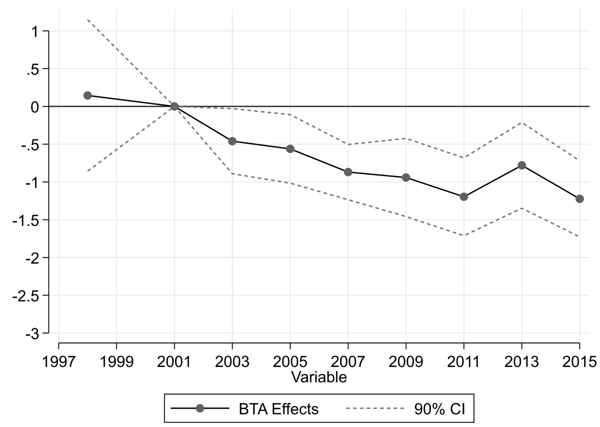
Notes : The figure plots the effects of BTA shock on Vietnam's exports to US at 10-digit product level across years by running a PPML regression version (in levels) of Equation (6).

To ensure that our regression results of the effect of BTA on Vietnam's exports to the U.S. do not suffer from the bias due to zero trade flows (Silva and Tenreyro (2006)), we perform a Poisson pseudo maximum likelihood (PPML) regression for exports in levels, including the zeros, as a robustness check. The PPML regression transforms the log-linear version in Equation (6) to a multiplicative form. We first construct a balanced panel of exports from 1998-2016 for all 10-digit products that appear in the data at least once. For the PPML regression, the dependent variable is exports and tariffs are included in levels. We use the -ppmlhdfe- Stata routine created by Correia, Guimarães and Zylkin (2019) that allows for high-dimensional fixed effects. The results are plotted in Figure E1 below. The results virtually do not change, indicating that the zero trade flows do not affect our log-linear regression results in the paper.

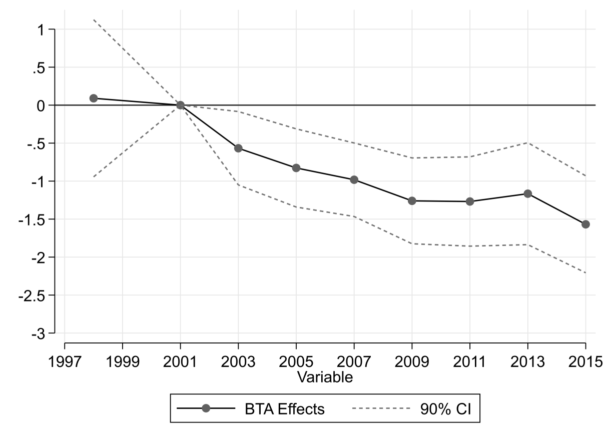
F Pre-trend Checks

For pre-trend checks, we include the data in VLSS 1997/1998 in our extended regression model in Equation (11). The coefficients on the effects of the BTA is plotted in Figure F1 below, similar to those in Figure 7. The effects of BTA in 1998 are close to zero and have large confidence intervals. Even though the VLSS 1997/1998 serves as an imperfect comparison to the VHLSSs in later years, these results help to reassure about the exogeneity of our measured provincial BTA exposure.

Figure F1: Effects of the BTA on Upward Occupational Mobility (Including VLSS 1997/1998)



(a) Sons/Fathers

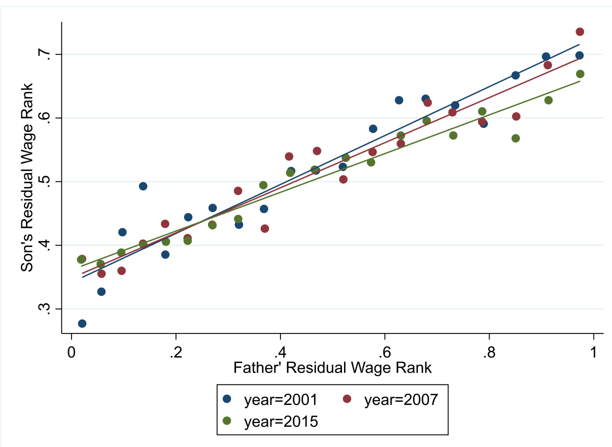


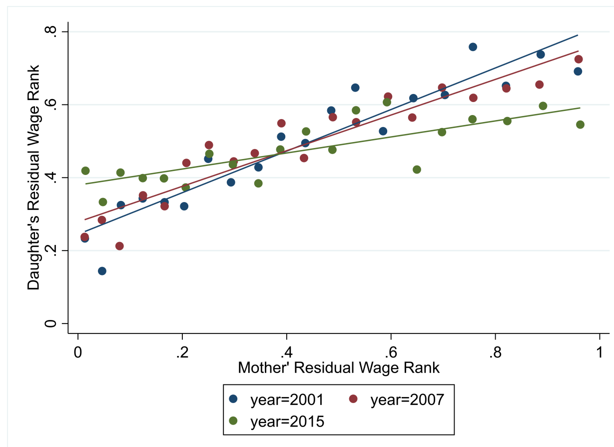
(b) Daughters/Mothers

Note: The figures show results similar to those in Figure 7, but including the VLSS 1997/1998 data in regression Equation (11) as a pre-trend check.

G Intergenerational Income Mobility across Years

Figure G1: Intergenerational Income Rank-Rank Relationship across Years (20 Quantile Bins)





Note: The figures show the rank-rank relationship in Figure 9 over time. The sample years are 2001, 2007, and 2015. The average absolute income mobility does not really change much but the slope stands out as steepest in 2001 and gets flattened in later years for both sons/fathers and daughters/mothers samples.