Trade, Labor Markets, and Intergenerational Mobility in Vietnam*

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Abstract

This paper investigates the impact of a large export shock on intergenerational mobility in Vietnam. We use eight rounds of Vietnam Household Living Standards Surveys (VHLSSs) spanning over almost two decades to measure intergenerational mobility based on education levels of fathers and sons within households. Exploiting the US-Vietnam Bilateral Trade Agreement (BTA) in 2001 as an export shock and a difference-in-difference research design, our analysis suggests that the BTA shock has led to substantial upward occupational mobility, accounting for one-third of overall increase in mobility in Vietnam during our sample period. We also show that this effect potentially works through improvements in educational attainment. Furthermore, our results reveal that both increases in exports overall and export unit-value in particular have contributed to the upward mobility.

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1 Introduction

Intergenerational mobility refers to the extent to which socioeconomic status is able to change across generations. By many standards, it is a key element of human progress (World Bank (2018)). And yet, while intergenerational mobility has been studied extensively in labor economic literature (see for example Solon (1999), Chetty et al. (2014), Chetty and Hendren (2018*b*), Chetty and Hendren (2018*a*)), little is known about the relationship between social mobility across generations, economic development and international trade. Given that globalization has played a major role in promoting economic growth around the world in the past decades, it is important to ask whether international trade, as an external shock, reinforces or breaks down 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, Vietnam.

Intergenerational mobility is a key element of economic and social development. If mobility is impeded by factors such as market imperfections and inefficient social mechanisms, for instance credit market imperfections or caste-based society, greater mobility implies a more efficient allocation of resources. Furthermore, higher levels of 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). If mobility is structurally related to these desirable aspects of society, enhancing mobility can have meaningful and long-term impacts on development.

To shed light on the impacts of international trade on intergenerational mobility, we use eight rounds of Vietnam Household Living Standard Surveys (VHLSS) from 2001/2002 to 2015/2016 to measure intergenerational mobility, and exploit a large and exogenous export shock in Vietnam induced by United States-Vietnam Bilateral Trade Agreement (henceforth, BTA) to identify the impacts. This empirical context is ideal to answer our question because Vietnam is a good example of a developing economy that has experienced fast growth as

well as many structural changes, while at the same time has benefited immensely from trade openness during this sample period. We focus our attention on occupational mobility as our main dimension of mobility because (1) occupation is likely to be directly related to workers' welfare through corresponding income and job stability and (2) occupation is reflective of skill demand, which are influenced by trade. In addition, in the context of a developing country such as Vietnam, having a formal job plays a particularly important role in poverty alleviation and welfare of workers (World Development Report (2006), Emran and Shilpi (2011)).[1]

The US-Vietnam BTA was a major trade shock and has had very large impacts on Vietnam's trade and economic growth. The BTA took effect in December 2001. Following its implementation, US's tariffs on their imports from Vietnam decreased from an average of more than 23% to about 2.5%. The BTA tariff reductions were large and allowed Vietnam immediate access to the large and prolific US market. An attractive feature of the BTA shock is that the US's tariff reductions for Vietnam were plausibly exogenous (McCaig (2011), McCaig and Pavcnik (2018)). We therefore exploit the BTA tariff reductions to identify the impact of trade shocks on intergenerational mobility in our analysis.

Our analysis in this paper delivers three key contributions to the current literature on trade and intergenerational mobility. First, we find that the BTA has raised occupational mobility by about 5.11 percentage points, accounting for almost one-third of the overall increase in mobility in Vietnam during our sample period from 2001 to 2015. The effect of the BTA is larger in the long-run than in the short-run. Second, we show that the BTA might have also worked through higher educational attainment of younger generations i.e. sons. Finally, we also show that both improvements in Vietnam's export value overall as well as unit-value in particular are channels through which the BTA affects occupational mobility.

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

Related Literature

Our paper is related to the broad literature on trade, labor markets and inequality. Most closely related to our paper is a paper by Ahsan and Chatterjee (2017) in which they study the impact of trade liberalization on intergenerational occupational mobility in India. Ahsan and Chatterjee (2017) is the very first study that examines international trade as a potential determinant of mobility. They find that following India's trade liberalization in 1991, sons living in the urban districts with greater exposure to trade liberalization are more likely to have better occupations as compared to their fathers. Our findings in this paper are different from their findings in three important ways. First, our paper focuses on the impacts of export liberalization due to tariff reductions by a trading partner, in this case the U.S., rather than import competition liberalization by the home country. Second, time variation due to multiple rounds of household survey data permits a difference-in-difference (DID) research design and allow us to examine the short- and long-run effects of trade shocks. In contrast, Ahsan and Chatterjee (2017) only use cross-sectional variations in their empirical strategy. Finally, we are able to purge a link between improvements in both exports and unit-value (proxied for quality) on skill demand and mobility. These differences allow us to make new contributions to the scant literature on trade and intergenerational mobility.

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 by improving intergenerational mobility and reducing inequality along this (vertical) dimension.

Methodologically, our paper is related to a large literature on trade and labor market that employs local labor market approach. In particular, we measure trade exposure following Hasan, Mitra and Ural (2007), Topalova (2010), 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).[2] We adopt this approach in our analysis in which the units of local labor market are provinces and central cities in Vietnam.[3]

The paper is organized as follows. In section 2, we describe our Vietnam household survey data and provide descriptive analyses of the labor market in Vietnam during our sample period from 2001 to 2015. Section 3 describes how we measure intergenerational occupational mobility and several patterns of mobility in Vietnam. Section 4 summarizes background on Vietnam's international trade. In sections 5 and 6, we estimate the impact of the BTA on mobility and explore its mechanisms. Section 7 concludes.

2 Labor Market in Vietnam from 2001 to 2015

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

Description of the Household Survey Data

Our main data source is Vietnam Household Living Standard Surveys (VHLSS) from 2001/2002 to 2015/2016, which are representative and implemented biennially by Vietnam's General Statistics Office (GSO). The stated goals of VHLSSs are to "monitor systematically the liv-

[2] In the general economics literature, this local labor market approach dates back to Bartik (1991).

[3] 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.

ing 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" (The World Bank (2015)).[4] VHLSSs contain rich information on household- and individual-level demographics, employment, household expenditures, health and other aspects. We use the demographics and employment modules in this paper. For each VHLSS round, the recall period for expenditures and employment modules is 12-month, meaning that answers to questionnaire refer to what happens during the most recent 12-month period.[5] Whenever suitable, we also utilize data from the Vietnam Living Standards Survey (VLSS) for 1997/1998, which is a predecessor of VHLSS.[6]

Table 1 provides main summary statistics of our datasets. In all rounds of VHLSS, almost 45,000 households are interviewed. However, due to current data restrictions from Vietnam's GSO, we only have access to samples of about 30,000 households for 2001/2002 round and 9,000 households for 2011/2012 round. Breaking down by 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 fraction of male and female remains relatively balanced, with the share of male individuals of about 50% across years. In what follows, we break down further several demographic characteristics with a particular focus on workers participating in the labor market drawn from the sample.

[4]On top of that, 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 The World Bank (2015)). These surveys are designed and implemented with the technical assistance from UNDP and the World Bank.

[5]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).

[6]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 household interviewed appears to be biased towards urban/rural areas for many provinces in the VLSS 1997/1998. See also the Data Appendix and McCaig (2011) for details and some other issues.

Sectoral and Occupational Structure

During the period from 2001 to 2015, there are 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 happens in agriculture sector. In particular, from 2001 to 2015, employment share of agriculture sector decreases 14.98 percentage points, from 59.51% to 44.53%. This decrease in agricultural employment share is reallocated towards all other sectors, with manufacturing experiencing a 4.37 percentage points increase in share, up from 11.25% in 2001 to 15.62% in 2015. Construction sector sees a 2.66 percentage points increase in share while the rest is allocated to service sector. Overall, we observe a large movement in share of workers out of agriculture during this sample period. This resonates with the findings of McCaig and Pavcnik (2013) using Census Data in 1989, 1999, 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 the high aggregate labor productivity growths in Vietnam during this period.

Table 3 illustrates the allocation of workers across 10 broad categories of occupation over time. These broad categories include: (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 Trades Workers, (8) Machine Operators and Assemblers, (9) Elementary Occupations. Classification of these 10 broad categories are based on occupation codes recorded in the VHLSSs. 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)).[7]

[7] VHLSSs record occupation codes at a more disaggregate 2-digit level. We observe some concordance

Table 3 shows the structure of the Vietnam's labor force across the occupations. In 2001, more than 75% of workers were affiliated with elementary occupations, while by 2015, this share decreased significantly to 56.51%, recording a 19.31 percentage points reduction. Workers in elementary occupations are mainly reallocated to jobs including Crafts and Related Trades Workers (4.68 percentage points increase) and Machine Operators and Assemblers (4.63 percentage points increase), Technicians and Associate Professionals (3.42 percentage points increase). 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.

3 Intergenerational Mobility

To investigate the degree of intergenerational mobility, we narrow our focus to a sample comprised of sons and fathers within households. Following Hnatkovska, Lahiri and Paul (2013) and Ahsan and Chatterjee (2017) for India, we abstract from studying mobility among female members of households because working-age female members' labor market outcomes tend to be correlated with the decision to co-reside with biological parents in Vietnam, which we cannot control for based on information in the VHLSSs. In contrast, coresident rate is much higher for adult sons due to Vietnam's cultural values.[8] As mentioned in section 1, we also focus on intergenerational occupational mobility as our main outcome of interest. As a result, our sample is restricted to son-father pairs in which both members are contemporarily participating in the labor market. Our final working sample is comprised of

issues at 2-digit level between VHLSS rounds before and after 2010. Therefore, we use 1-digit occupation level as our main point of reference. Table B1 in the Appendix provides the allocation of workers across 2-digit occupations recorded in VHLSSs.

[8] Using a 2011 nationally representative survey dataset of elderly parents of age 60 and above, Teerawichitchainan, Pothisiri and Long (2015) document that 41% of parents live with their adult sons while only 26% of parents live with their adult daughters.

sons aged between 16 and 40 since the majority of working sons in our sample are within this range. Furthermore, fathers of sons aged above 40 are also more likely to have retired, which can potentially bias our subsequent analyses.

Our first task is to construct a ranking of occupations. Conceptually, we generally think of a "good job" as containing a high level of skill intensity. Our baseline measure of skill intensity is therefore based on information about the average education level of workers within each occupation, similar to the ranking approach in Ahsan and Chatterjee (2017).[9] Specifically, for each 1-digit occupation in Table 3, we construct an education index EI_o as follow:

$$EI_o = \sum_{i \in o} \left(\frac{w_i}{\sum_{k \in o} w_k} \right) \times Edu_i. \tag{1}$$

In equation (1), 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. The weighted summation is performed across all individuals within occupation o.[10] Here, we use our full sample of workers aged between 16 and 64 to compute the education index in equation (1) to ensure the representativeness of the index. Table 4 illustrates our education index and ranking results.

From Table 4, the top occupation category is (2) High-level Professionals with an education index of 11.9, meaning weighted average education in this category is a high school degree. This category includes jobs such as scientists, high-level experts in technical fields and high-level experts in life and health sciences. As expected, the subsequent categories are (3) Technicians and Associate Professionals and (4) Clerical Support Workers with education indices of 11.4 and 11.1 respectively. (1) Leaders has an index of 10.8. The next group of occupations are (8) Machine Operators and Assemblers, (5) Services and Sales Workers and

[9] Since we use occupation codes at 1-digit aggregate level, we do have rankings based on task-based measures. We present some of these results in the Appendix.

[10] Slightly different from Ahsan and Chatterjee (2017), we have detail information about grade completed by each individual rather than indicators for degree received in VHLSSs. This will distinguish, for example, workers who complete grade 8 versus workers who complete grade 5 only. One disadvantage of our data is that we do not have detail 3-digit level occupation codes as in India's context.

(7) Crafts and Related Trades Workers with education indices indicating that and 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 6.6 and 6.5, 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 nonfarm sectors, which is an important avenue to gain stable income streams and escape poverty (World Development Report (2006), Emran and Shilpi (2011)).[11]

Based on our ranking of occupations, we construct an indicator variable of upward occupational mobility $Upward_i$. In particular, this indicator equals 1 if son i works in a higher-ranked occupation than his father and equals 0 otherwise.

$$Upward_i = \begin{cases} 1 & \text{if} \quad \text{Rank(Son)} > \text{Rank(Father)} \\ 0 & \text{otherwise.} \end{cases} \tag{2}$$

Figure 1 illustrates the persistence of upward occupational mobility for all years in our sample. The top panel shows the distribution of son's occupation conditioning on being born to fathers with top occupation (High-level Professionals) while the bottom panel shows the same distribution conditioning on being born to fathers with bottom occupation (Elementary Occupations and Agricultural, Forestry and Fishery Workers). The top panel suggests that more than 50% of sons being born to fathers who are high-level professionals also become high-level professionals. On the other hand, 73% of sons being born to fathers who are unskilled and agricultural workers also become unskilled and agricultural workers, as shown in the bottom panel of Figure 1. Overall, Figure 1 indicates a very high correlation of occupational choice across generations in the VHLSS sample.

[11]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).

This high level of intergenerational occupational persistence masks important underlying changes in social mobility over time. Figure 2 illustrates the evolution of upward occupational mobility from 2001 to 2015. In 2001, less than 15% of sons had better jobs than their fathers. Nonetheless, this fraction has increased consistently. By 2010, about 24% of sons are able to move up the ranking, and by 2015, this fraction increases to about 32.5%. Figure 2 implies that there has been a substantial increase in upward occupational mobility. We are interested in investigating how much of this increase in mobility can be attributed to the US-Vietnam Bilateral Trade Agreement. In the next sections, we describe the background of the US-Vietnam BTA in details and explore its implications for intergenerational mobility in Vietnam during this period.

4 Background on Vietnam's International Trade

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.[12] 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 procedures 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. Even though, Vietnam also committed to cut tariffs for 250 out of more than $6,000$ HS-6 U.S. products, the average

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

tariff reductions are negligible since Vietnam already applied its low tariffs to U.S. before the BTA.[13]

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 is subjected to a lengthy negotiation process on both sides, the magnitude of US tariff changes to Vietnam is largely *predetermined* and not influenced by either US or Vietnam's bargaining position. 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.[14] To this extend, the BTA tariff reductions of U.S. to Vietnam are plausibly exogenous to any domestic conditions or political processes of Vietnam (see also 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 decrease 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, the BTA was followed by extensive and immediate changes in Vietnam's exports to U.S..

Vietnam's Exports to U.S.

We document two most salient features of Vietnam's exports to U.S during the past two decades following the BTA: (1) exports have increased substantially and consistently and (2) export structure swiftly shifts to much higher value products.[15]

Figure 3 illustrates Vietnam's export value to U.S. from 1996 to 2016. Prior to the BTA,

[13] 80% of these 250 tariff concessions was in the agriculture sector.

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

[15] All values in this subsection are in nominal term.

exports to US was about 1.04 billion US dollars, accounted 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 U.S. grew to 2.6 billion US dollars, a 147% increase. By 2006, annual exports to U.S. amounted to 9.2 billion US dollars, a nine-fold increase, and accounted for 23% of total exports and almost 14% of GDP.[16] By 2016, Vietnam exported 43.6 billion U.S. dollars to U.S., which represented 20% of total exports and almost 21% of GDP.[17] Figure 3 also shows that the bulk of increase in Vietnam's exports to U.S. is manufacturing. Specifically, the share of manufacturing exports increased from an average of 40% prior to the BTA to around 67% in 2002 and 87% in 2006 respectively. By 2016, this share was 92%.

A parallel and significant change in Vietnam's exports to U.S. following the BTA is a sharp increase in average unit value of exports. Consider the following regression:

$$ln(UnitValue)_{kt} = \sum_{y=1998}^{2015} \theta_{1y} \mathbb{1}\{y = t\} \times \tau_j^{BTA} + \lambda_j + \lambda_t + \varepsilon_{kt} \tag{3}$$

where k is the HS 10-digit level product categories. By controlling for the product fixed effects, we assess the time variation in unit value of any given product that is exported to the US. In Figure 11, we plot $\hat{\theta}_y$ for each year with confidence intervals. The estimates reveal that there is a sharp upward trend in unit values starting 2001 when BTA occurred. In subsequent empirical analyses in Section 6, we show that tariff reductions following the BTA is the key underlying determinant driving the improvements in both Vietnam's exports and export quality to U.S..

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

[16] See Figure B1 in the Appendix where we zero in on the changes in period from 1996-2006 and shows a sharp increase in exports following the BTA.

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

Vietnam had been preparing for this event by implementing reforms on three major fronts: (1) administrative procedure, (2) gradual removal of trade barriers, and (3) conformation of their legal system to international trade law.[18] For our purpose, we focus on the removal of tariffs during Vietnam's accession to WTO period.

Upon WTO accession, Vietnam immediately cut average tariffs by about 3 percentage points across all industries. Figure 4 illustrates Vietnam's average applied tariffs from 1998-2016. As shown in Figure 4, tariffs had already been cut gradually over time before WTO accession. From 1998 to 2007, average tariff decreases from 17.3 percentage points to 13.4 percentage points. In 2008, average tariff dropped sharply another 3 percentage points and remained at the level of about 9 percentage points since 2013. 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 advantages and political economy motives in setting the tariffs to protect its manufacturing sectors while at the same time opening up the primary sectors for competition and access to intermediate inputs.

There was much expectation about the beneficial prospects at the time of Vietnam's WTO accession. Nevertheless, the evidence on such benefits are scant and less conclusive. Pham (2011) and Vo and Nguyen (2009) are among the few studies that examine the economic impacts of Vietnam's WTO accession. One of the robust findings in both studies is that Vietnam's imports and inward foreign direct investments (FDI) appear to increase substantially due to the accession, although WTO membership did not have any direct impact on exports. To this end, we control for trade liberalization due to Vietnam's WTO accession in our analyses since earlier research such as Ahsan and Chatterjee (2017), Hasan, Mitra and Ural (2007), Edmonds, Pavcnik and Topalova (2010) have shown that import liberalization can have important impacts on labor market outcomes in general and intergenerational mobility in particular.

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

5 Impact of the BTA on Intergenerational Mobility

A key interest in 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

We adopt a local labor market approach that widely used in the international trade and labor market 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 initial industrial structure across provinces. Our measure of provincial exposure is as follows:

$$\tau_p^{BTA} = \tau_p^{MFN} - \tau_p^{\text{Column 2}} < 0, \tag{4}$$

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, and defined as:

$$\tau_p^X = \sum_j s_{jp} \times \tau_j^X, \tag{5}$$

where $X \in \{MFN, \text{Column 2}\}$ and τ_j^X is the respective US tariff for industry j.[19] The share s_{jp} captures the variation in initial industrial structures across provinces and is computed as:

$$s_{jp} = \frac{\sum_i w_{ijp}}{\sum_{k,m} w_{kmp}}, \tag{6}$$

[19]Tariffs are from McCaig and Pavcnik (2018) and measured as $ln(1 + \tau_j)$ where j is 2-digit industries.

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 employment share of industry j within province p at the beginning of our sample period (pre-BTA).[20] Similar to Hasan, Mitra and Ural (2007) and Kovak (2013), but different from McCaig (2011) and Topalova (2010) however, we compute the employment share only within traded industries (scaled exposure) rather than including the non-traded sectors. This empirical approach is grounded in theory as suggested by Kovak (2013).[21]

Figure 5 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 63 provinces and central cities, the BTA tariff exposure, measured as provincial tariff reductions in equation (4), range from 5.80 percentage points to 27.58 percentage points.[22] The top-4 BTA exposure includes Ho Chi Minh City, Da Nang, Hanoi (and Ha Tay combined) and Binh Duong. The bottom-4 BTA exposure includes 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 expose the most to the BTA shock.

Empirical Strategy - Baseline

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

$$Upward_{ipt} = \theta \times PostBTA_t \times \tau_p^{BTA} + \gamma \tau_{pt}^{VN} + X'_{ipt}\beta + \lambda_p + \lambda_t + \varepsilon_{ipt}. \tag{7}$$

[20] As in equation (1), we restrict our sample in equation (6) to workers aged between 16 and 64 recorded in the VHLSS 2001/2002.

[21] Importantly and similar to Kovak (2013), we find that including the non-traded sectors in the BTA exposure computation magnifies our estimates of the effects and make these estimates more significant. The results for this approach are available upon request.

[22] Prior to 2003, Vietnam has 61 provinces and central cities. From 2003 to 2008, it splits several provinces into smaller administrative units and increases this number to 64. Since 2008 until now, the number decreases to 63 due to the merge of Hanoi and Ha Tay. See the Data Appendix for the geographic concordances.

In equation (7), $Upward_{ipt}$ is an upward mobility indicator of son i in province p and year t, defined as in equation (2). $PostBTA_t$ is an indicator variable for post-BTA years. Specifically in our sample, data in the VHLSS 2001/2002 round are treated as pre-BTA while data in the later VHLSS rounds are considered as post-BTA.[23] τ_{pt}^{VN} is Vietnam's tariff of province p in year t and defined analogously to τ_p^{BTA} as in equation (6).[24] The inclusion of τ_{pt}^{VN} controls for the province-level protection on Vietnam's side and WTO accession as mentioned in section 4. X_{ipt} is a vector of demographic controls including age, age squared, father's age, father'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's education index as a proxy for unobservable genetic traits. Whenever suitable, we also add measures of sons' educational attainment to control for education channel of mobility. λ_p and λ_t are province and year fixed effects respectively.

From equation (7), our identification is obtained by comparing the change in fractions of sons who have experienced upward mobility across provinces before and after the BTA, and who are exposed differentially to the BTA shocks due to initial industrial structures of provinces. Standard errors are clustered at province-year level, which is the level of variation of the BTA shock. Our main parameter of interest is θ, which captures the average effect of the BTA on intergenerational occupational mobility.

Table 5 presents our baseline model's results. Column (1) shows the baseline result without any control. Columns (2) and (3) add the vector of demographic controls and Vietnam's tariffs progressively. Column (4) adds education controls. Across columns (1)-(4), the estimated effects of the BTA are stable and significant. In particular, the magnitude of the estimates ranges from -0.418 to -0.498. This suggests that a 1 percent decrease in the BTA provincial tariff leads to a 0.418-0.498 point increase in upward occupational

[23] As mentioned in section 2, the recall period of VHLSSs is 12-month. The BTA entered into force in December 2001. This means that VHLSS 2001/2002 records pre-BTA data. Furthermore, we expect the effect of the BTA on mobility takes time to realize.

[24] In particular, $\tau_{pt}^{VN} = \sum_j s_{jp} \times \tau_{jt}^{VN}$.

mobility. Taking our preferred estimate in column (3) -0.498 and combining it with the fact that the average BTA exposure across province is -10.27 points, our baseline result suggests that the BTA has induced 5.11 percentage points increase in upward occupational mobility. This accounts for almost one-third of overall increase in mobility during our sample period from 2001 to 2015.[25] This is one of our key results in this paper.

Extended DID Model

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

$$Upward_{ipt} = \sum_{y=2001}^{2015} \theta_{1y} \mathbb{1}\{y = t\} \times \tau_p^{BTA} + \sum_{y=2001}^{2015} \theta_{2y} \mathbb{1}\{y = t\} \times \tau_{py}^{VN} + X'_{ipt}\beta + \lambda_p + \lambda_t + \varepsilon_{ipt}. \tag{8}$$

In equation (8), the effect of τ_p^{BTA} is allowed to vary over time. This heterogeneity is captured by the interactions between τ_p^{BTA} and the year indicators $\mathbb{1}\{y = t\}$.[26] In this extended DID model, we also control for the WTO accession in a similar manner. In particular, τ_{py}^{VN} is defined as $\tau_{py}^{VN} \equiv \tau_{p,y}^{VN} - \tau_{p,2006}^{VN}$. This approach effectively normalizes tariffs in 2006 to zero and allows Vietnam's tariff reductions due to WTO affect mobility differently over time.

Table 6 presents our extended model's results. Column (1) shows the result without WTO controls. Column (2) shows the effects of WTO without the BTA shocks. Column (3) includes both BTA and WTO. Across all columns, we include the vector of demographic controls. From column (1), we observe that the average effect in column (2) of table 5 are decomposed over time. Specifically, the effects of the BTA become larger and more

[25] Recall from section 3 that overall mobility increases from 15% in 2002 to 32.5% in 2016.

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

statistically significant over time (except for 2013). In column (2), WTO accession alone does not appear to have large and persistent effects on occupational mobility. Only in 2007, which is one-year after Vietnam's WTO accession, we see that provinces/central cities more exposed to WTO accession have higher mobility. This is consistent with the findings of Ahsan and Chatterjee (2017) that import competition can induce upward mobility.[27] In column (3), we decompose further the effects of the BTA which might be influenced by the WTO accession. In this column, the effects of the BTA becomes much stronger and more statistically significant while the effects of WTO accession almost disappear. Figure 6 illustrates the column (1) (top) and column (3) (bottom) results from table 6. Overall, a robust pattern is that the long-term effects of the BTA are larger than the short-term effects, suggesting persistent and long-lasting effects of the BTA on intergenerational occupational mobility. This is our second key result.

6 Mechanism

In this section, we explore potential mechanisms through which the BTA affects intergenerational occupational mobility. We consider two mechanisms. First, since better jobs generally require higher level of education, we examine whether sons living in the areas with more exposure to the BTA shocks attain more education. Second, as shown in figures 3-11 and discussed in section 4, it is possible that BTA-induced improvements in both Vietnam's exports and unit-value (proxied for quality) have contributed to the mobility. We show that these are indeed the case.

Education Channel

To explore the effect of the BTA on educational attainment of sons within households, we first estimate our extended DID model similar to equation (8) with education-related dependent

[27] Nevertheless, in their empirical context, Ahsan and Chatterjee (2017) study the effects 9 year post-liberalization and they use a cross-sectional variation rather than a DID research design for identification.

variables:

$$Edu_{ipt} = \sum_{y=2001}^{2015} \theta_{1y} \mathbb{1}\{y = t\} \times \tau_p^{BTA} + \sum_{y=2001}^{2015} \theta_{2y} \mathbb{1}\{y = t\} \times \tau_{py}^{VN} \tag{9}$$
$$+ X'_{ipt}\beta + \lambda_p + \lambda_t + \varepsilon_{ipt}.$$

In equation (9), Edu_{ipt} is a measure of education level of son i in province p and year t. The first three panels of figure 7 illustrate the model results with dependent variables being indicators for completing primary school, secondary school and high school respectively as highest educational accomplishment. These results correspond to column (3) of table 6. From figure 7, sons living in the provinces that expose more to the BTA shocks appear to be less likely finish only primary or secondary school. The decreases in such likelihood are much stronger for secondary-school completion. On the other hand, sons living in these areas are more likely to obtain a high-school degree. These results suggest that the BTA might have induced sons' human capital investment through education.

To further link sons' educational attainment to the intergenerational mobility dimension, we consider a measure of intergenerational educational mobility where mobility is defined as an indicator for sons having a high-school degree but not their fathers. The last panel of figure 7 captures the effects of the BTA on educational mobility. As illustrated in this panel, sons living in areas that expose more to the BTA shocks are more likely completed high school as compared to their fathers.[28] Overall, figure 7 displays a very similar pattern as compared to figure 6 in that the effects of the BTA seem to be increasingly strong and persistent over time.

[28] We also find that the BTA shocks decrease downward educational mobility and increase probability of both sons and fathers having high-school degree.

The Effect of BTA on Exports and Unit Value

The analysis so far focused on the reduced-form impact of the BTA tariff reductions on intergenerational occupational mobility. This section aims to disentangle how the BTA tariff reductions worked through improvements in Vietnam's exports. First, the increase in export quantity can improve mobility through higher demand for labour in the export-oriented sector, leading to better employment and income outcomes for households, thereby improving their ability to pay for child education. Second, the increase in quality of the exported products may increase relative demand for skilled labour, allowing the younger generation to access higher-skilled occupations. Higher demand for skill can also change the perceived returns to schooling, thus increasing incentives for schooling (Jensen, 2010). In order to shed light on these mechanisms, we begin with establishing the relationships between the BTA tariff reductions and the total value of exports. Consider the following regression:

$$log(Exports)_{kt} = \sum_{y=1998}^{2015} \theta_{1y} \mathbb{1}\{y = t\} \times \tau_j^{BTA} + \lambda_j + \lambda_t + \varepsilon_{kt} \tag{10}$$

where k represent HS-10 products and j represent 2-digit industry category.

We estimate this model for years from 1998 to 2015 for which trade data is available .[29] Standard errors are clustered at two-digit industry and year level. The results represented in Figure 8 show that BTA has very large and positive effect on exports both in the short run and in the long run. While the effect on the export growth is stable, it is persistent and BTA continues to influence export growth throughout the period of study. The results at the 2-digit industry level, presented at Figure 9, and at the province level, presented in Figure 10 show that the results are robust.[30]

In order to disentangle the effect on mobility, we begin by constructing province-level

[29] Our choice of initial year 1998 here is due to the fact that this is the first year Vietnam introduces its own MFN tariff rates, according to Import and Export Duties Law of Vietnam which is substantially amended in 1998. This choice is also consistent with our VLSS 1997/1998 data.

[30] The corresponding regression results are presented in Table B2.

export index similar to province-level tariffs in equation (6). In particular, export index of province p in year t is computed as:

$$EXI_{pt} = \sum_j s_{jp} \times log(Export_{jt}) \tag{11}$$

where $log(Export_{jt})$ is the natural log of exports to US in industry j and year t.[31] s_{jp} is the employment share of traded industry j within province p drawn from VHLSS 2001/2002 as defined in equation (6).

To investigate whether the BTA has worked through total exports in affecting upward occupational mobility, we estimate the following model:

$$Upward_{ipt} = EXI_{pt} + X'_{ipt}\beta + \lambda_p + \lambda_t + \varepsilon_{ipt} \tag{12}$$

The model is first estimated with ordinary least squares (OLS). Columns (1) and (3) of Table 8 show the results for exports. Column (1) suggests that a one point increase in export index leads to 0.037 points increase in upward mobility. It is possible that EXI_{pt} might be endogenous in equation 12 due to technological shocks or local demand shocks that drive both demand for skilled labor and exports. To allow for this possibility, we estimate equation with an instrumental variable (IV) approach in which we use the BTA tariff change as an instrument for EXI_{pt}. The results are displayed in columns (2) show that our previous findings remain robust with IV estimation.

The trade liberalization with the US increased not only the total exports, but also unit value of exports. Consider the regression:

$$ln(UnitValue)_{kt} = \theta_1 * [Trend_k * I(t > 2001)] + \theta_2 * I(t > 2001) + \theta_3 * Trend_k + \lambda_k + \varepsilon_{kt} \tag{13}$$

[31] This construction ensures that $dEXI_{pt} = \sum_j s_{jp} \times dlog(Export_{jt})$

where $Trend_k$ is the time trend and $I(t > 2001)$ is an indicator variable that takes the value of 1 after BTA. The results presented in Table 7 show that unit values of products exported to US have increased by about 3 percent post-liberalization, on average.

We next investigate the effect of BTA on the unit value of exports is by estimating Equation 10 at the 10-digit level with the unit value as the outcome variable. The results presented in Figure 12 show that BTA had a positive and significant effect on the quality of exports both in the short run and in the long run.

In order to investigate the effect of unit value on upward occupational mobility, we construct a similar index for unit value based on the time difference for each HS-10 product from the base year 2015, which is the year with the most available number of observations. These are then aggregated up to 2 digit industries that are comparable to the industry classifications in the household data. Finally, the index $UVAL_{pt}$ is constructed for each province using the employment weights, similar to the export index.

Next, equation 12 is re-estimated by replacing EXI_{pt} with the unit value index $UVAL_{pt}$. The results presented in Columns (3) and (4) of Table 8. OLS model yields a positive coefficient that is very similar to the export index coefficient in magnitude, while it is insignificant. The IV estimate in Column (4) suggest that one point increase in export index leads to 0.166 points increase in upward mobility. Overall, we find that the BTA reductions have worked through both improving exports overall and export unit-value in particular in strengthening intergenerational occupational mobility. This is our last key finding in this paper.

7 Conclusion

In this paper, we study the impact of a large and exogenous export shock on intergenerational mobility in Vietnam, a small and rapid-developing economy. Our results suggest that export liberalization induced by United States-Vietnam Bilateral Trade Agreement (BTA) has led to substantial increase in upward occupational mobility, accounting for one-third of overall

increase in mobility in Vietnam during the past two decades. We also find that the BTA has induced more educational attainment of younger generations and worked through improving exports overall as well as unit-value in particular (proxied for quality) in promoting intergenerational mobility.

Our findings have several important implications. First and most importantly, our paper show that trade can breakdown certain frictions and social structures that impede intergenerational mobility. This leads to more equality of opportunities for younger generations, which is an important margin often missing in the trade and inequality literature. Second, if trade can promote mobility and allow high-ability individuals obtaining better jobs, this can generate additional long-term gains from trade due to more efficient allocation of human capital.

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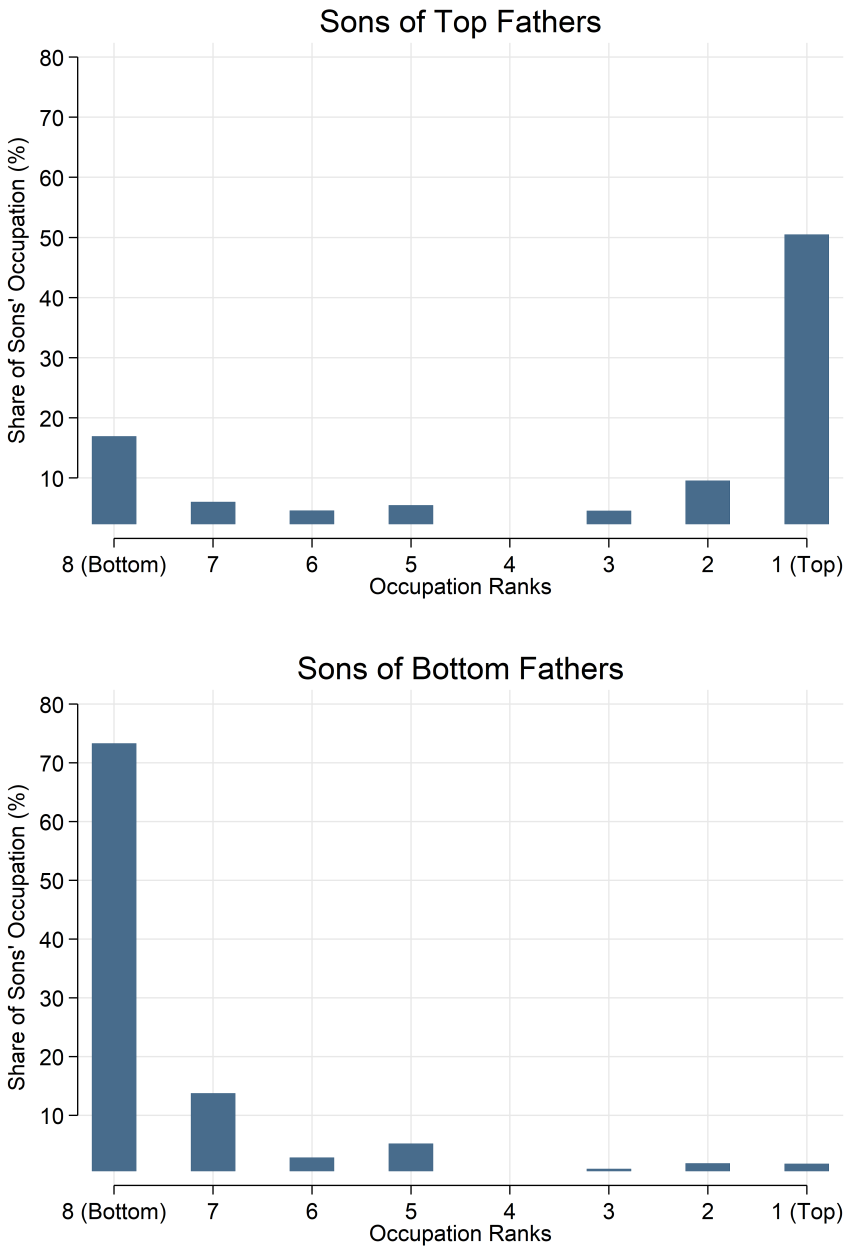
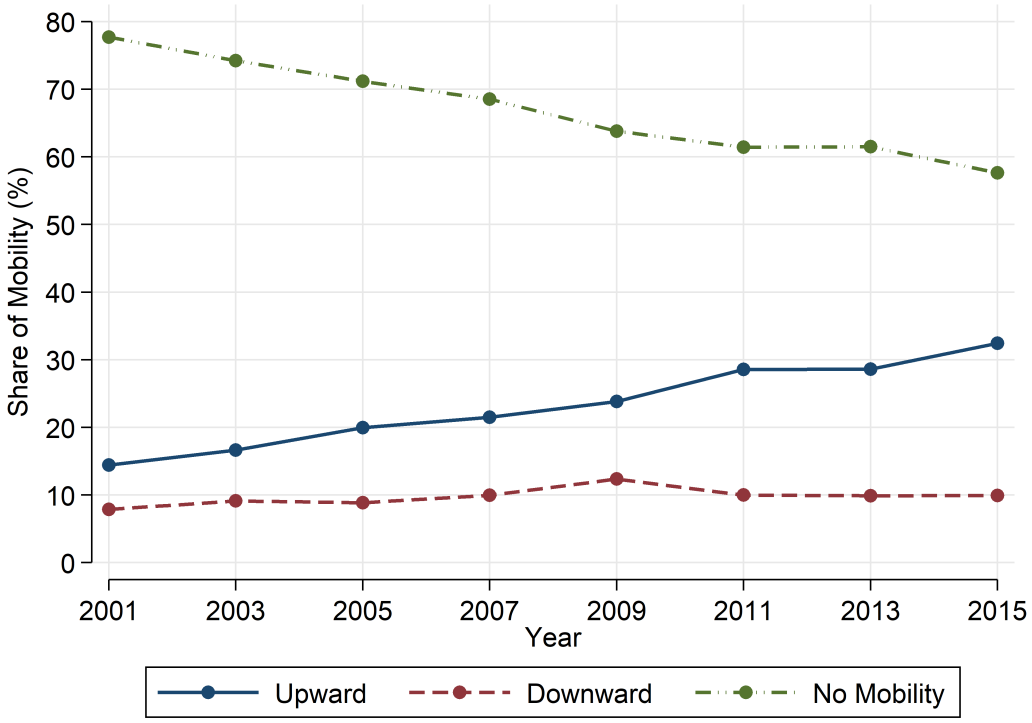
Figure 1: Persistence of Upward Occupational Mobility: Top Fathers (Top) and Bottom Fathers (Bottom)



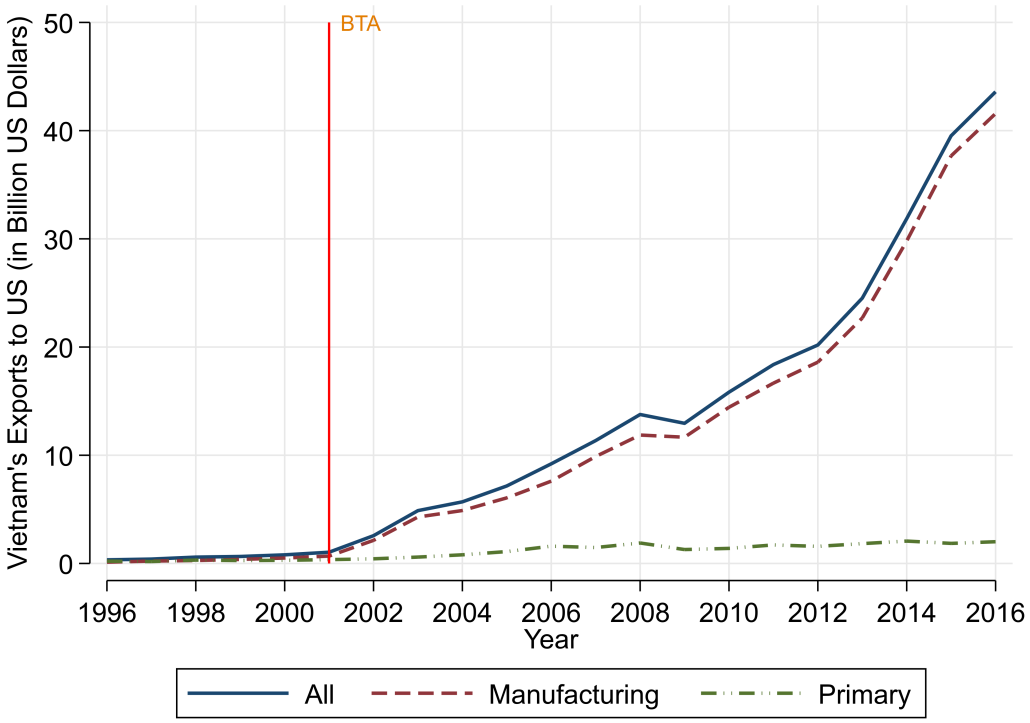
Note: The top panel shows allocation of sons' occupations conditioning on having top fathers (High-level Professionals). The bottom panel shows allocation of sons' occupation conditioning on having bottom fathers (Unskilled and Agricultural Workers).

Figure 2: Occupational Mobility from 2001 to 2015



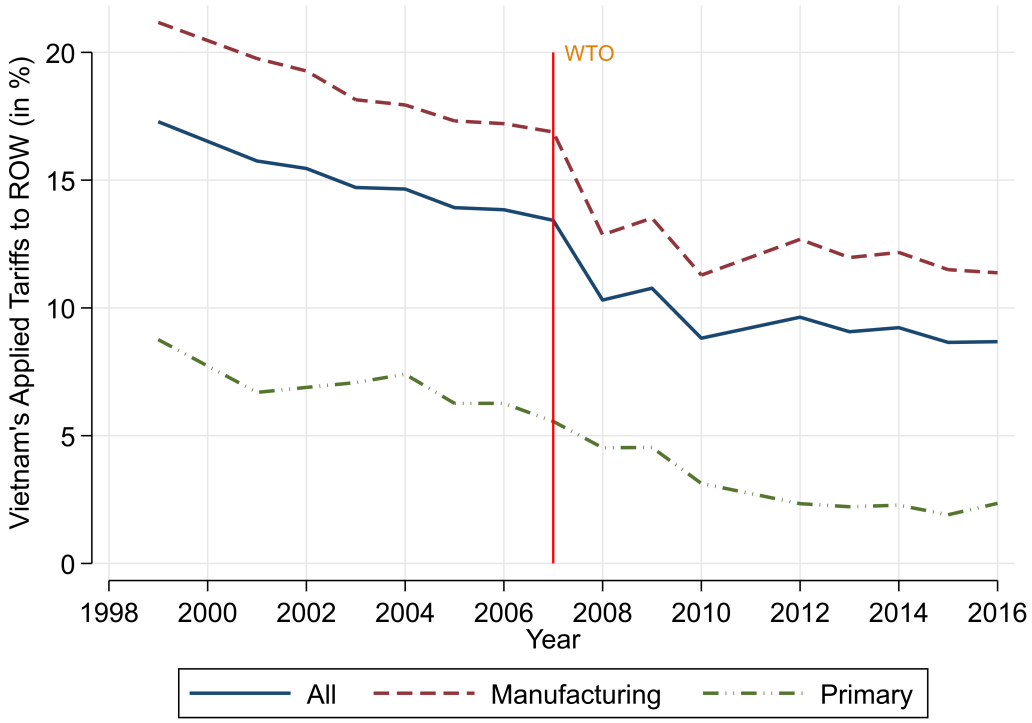
Note: Upward occupational mobility is fraction of sons that have better jobs than their fathers in each year. Similar definitions apply for downward and no mobility. Working sample is restricted to sons aged between 16 and 40 who are contemporarily participating in the labor market.

Figure 3: Vietnam's Exports to US from 1996-2016 (in Billion US Dollars)



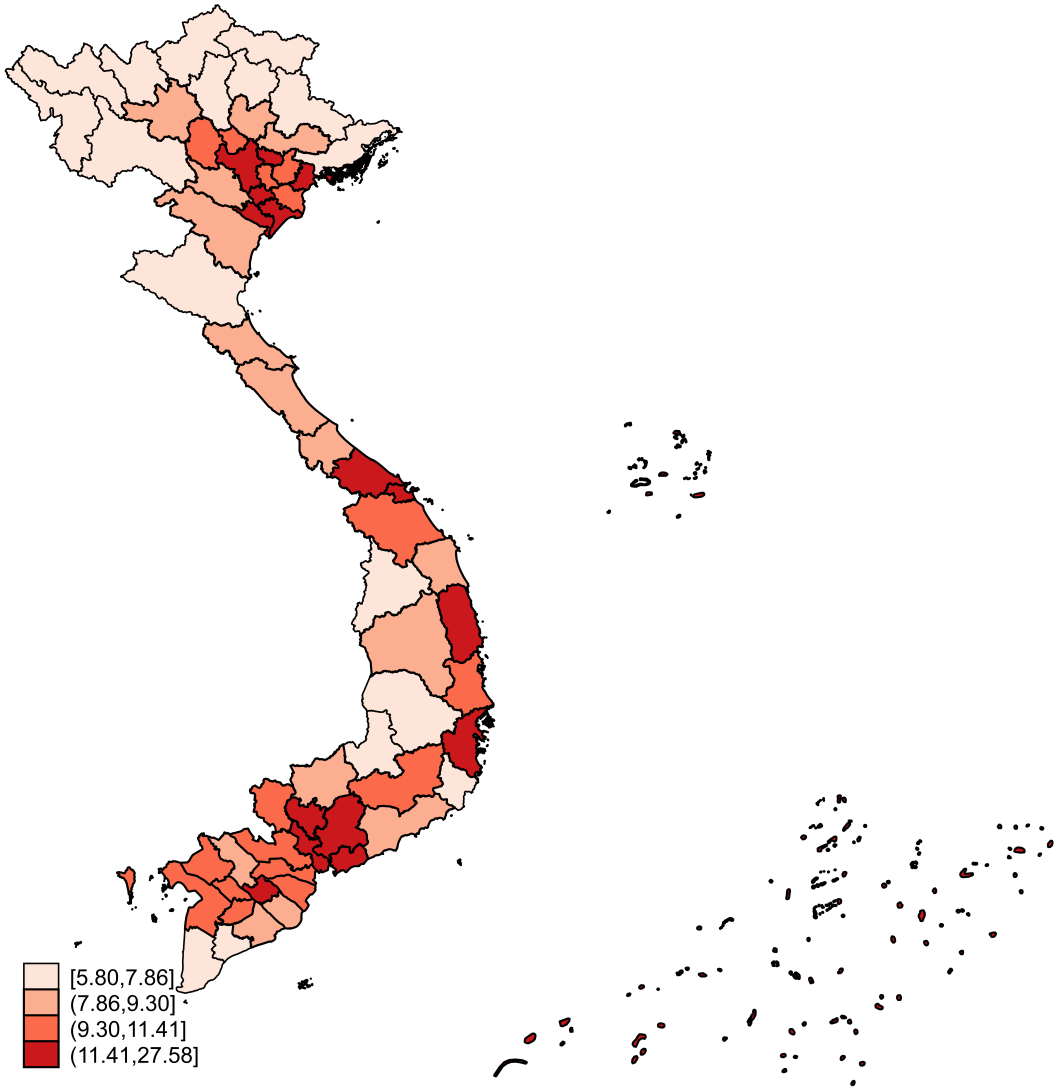
Note: The graph is based on authors' calculations. The primary sectors include agriculture and mining. The data is from US Census. All values are in nominal term.

Figure 4: Vietnam's Applied Tariffs to the Rest of the World (in %)



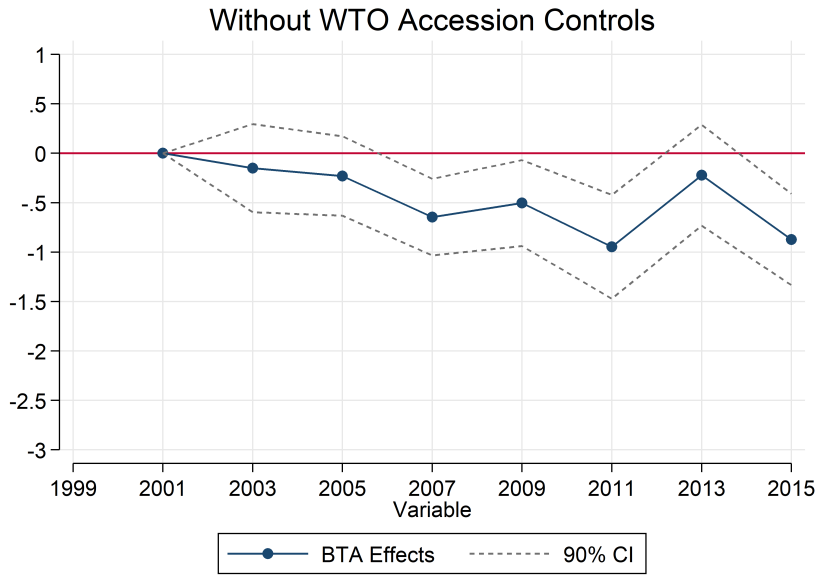
Note: The graph is based on authors' calculations. The primary sectors include agriculture and mining. The data is from WITS.

Figure 5: The BTA Exposure across Vietnam's Provinces and Central Cities



Note: The BTA exposure is measured as the weighted average of tariffs in which the weights are employment share of each traded industry within each province/central city from the VHLSS 2001/2002 round, following approach in Hasan, Mitra and Ural (2007), Kovak (2013). Employment share is share of workers aged between 16 and 64 recorded in the VHLSS. Traded industries include 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 include Ho Chi Minh City, Da Nang, Hanoi (Ha Tay combined) and Binh Duong. The bottom-4 BTA exposure include Ca Mau, Quang Ninh, Ha Giang and Son La.

Figure 6: Effects of the BTA on Upward Occupational Mobility



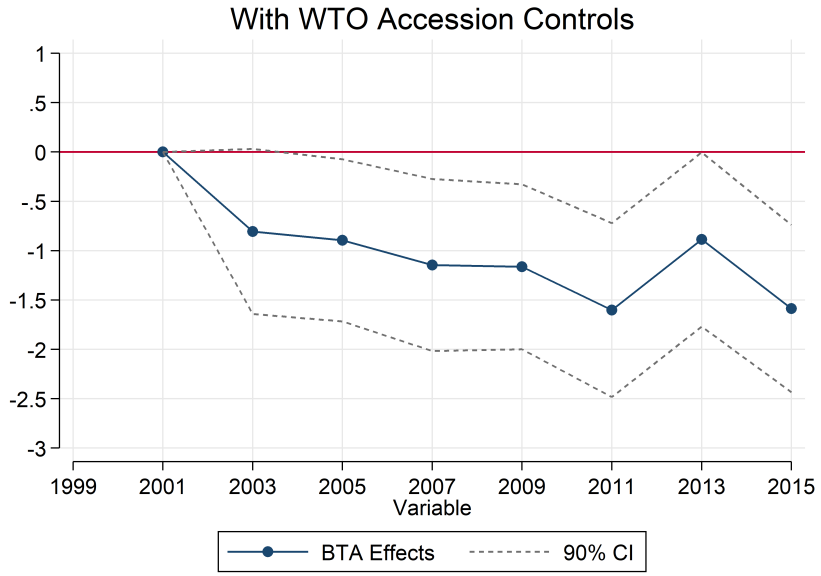


Figure 7: Effects of the BTA on (Highest) Educational Attainment and Mobility

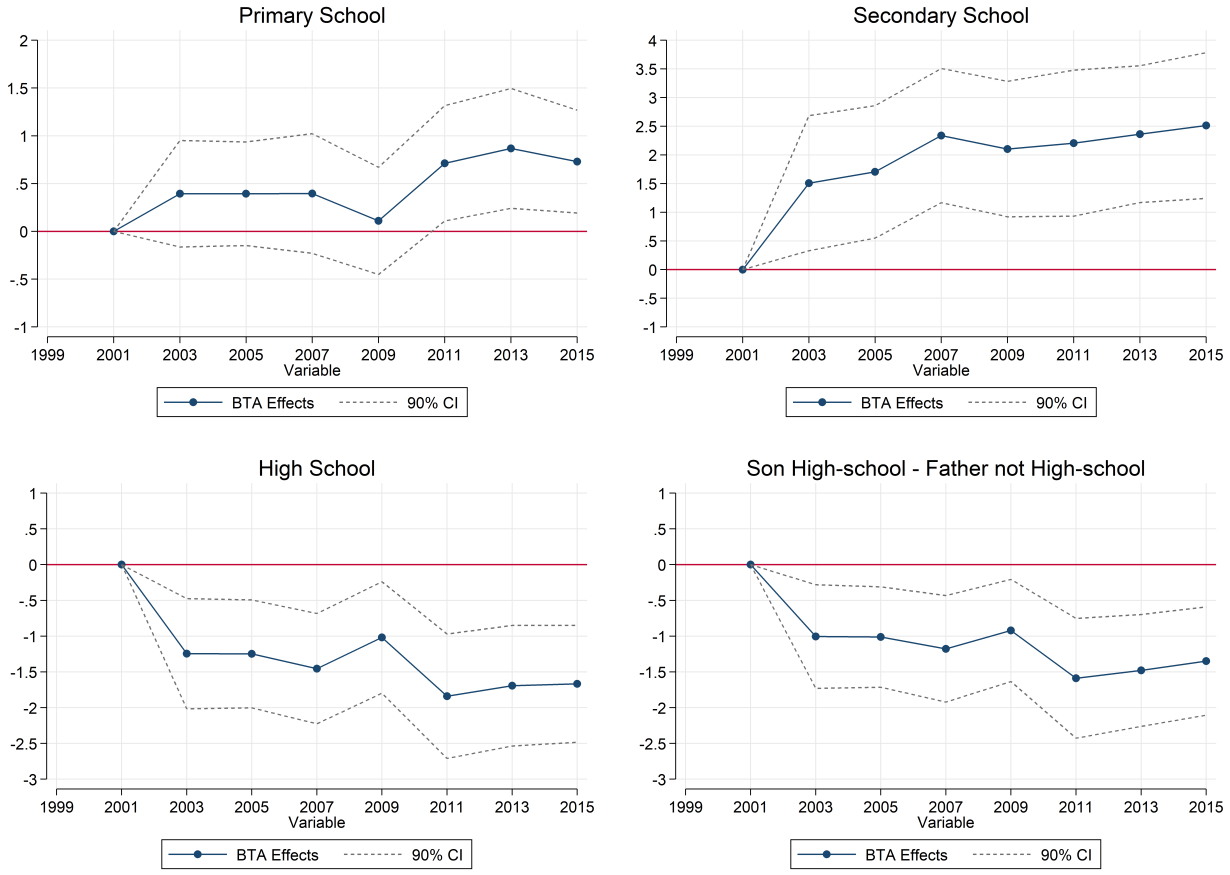


Figure 8: Effects of the BTA on Exports at HS-10 Product Level

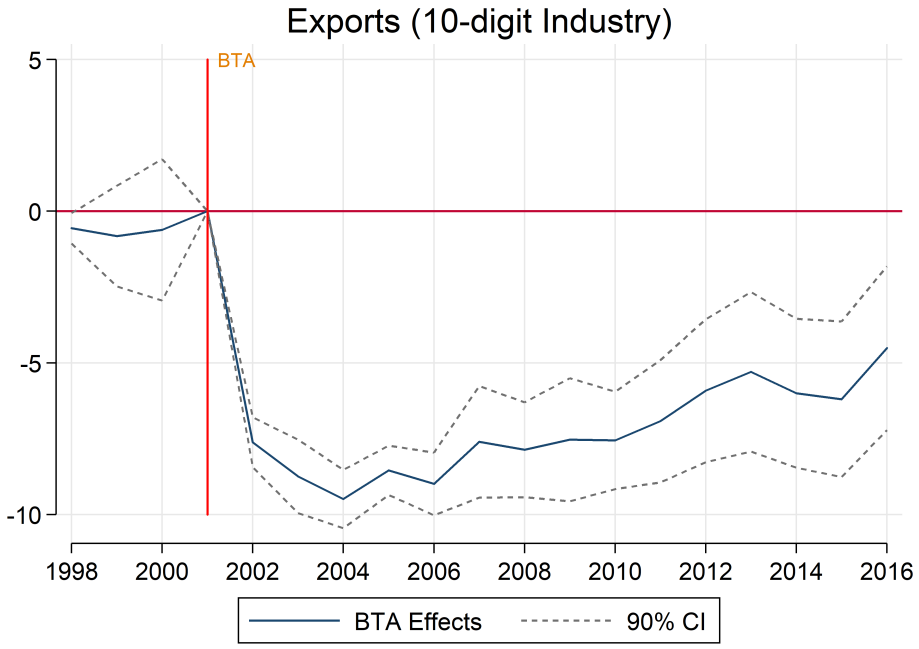


Figure 9: Effects of the BTA on Exports at 2-digit Industry Level

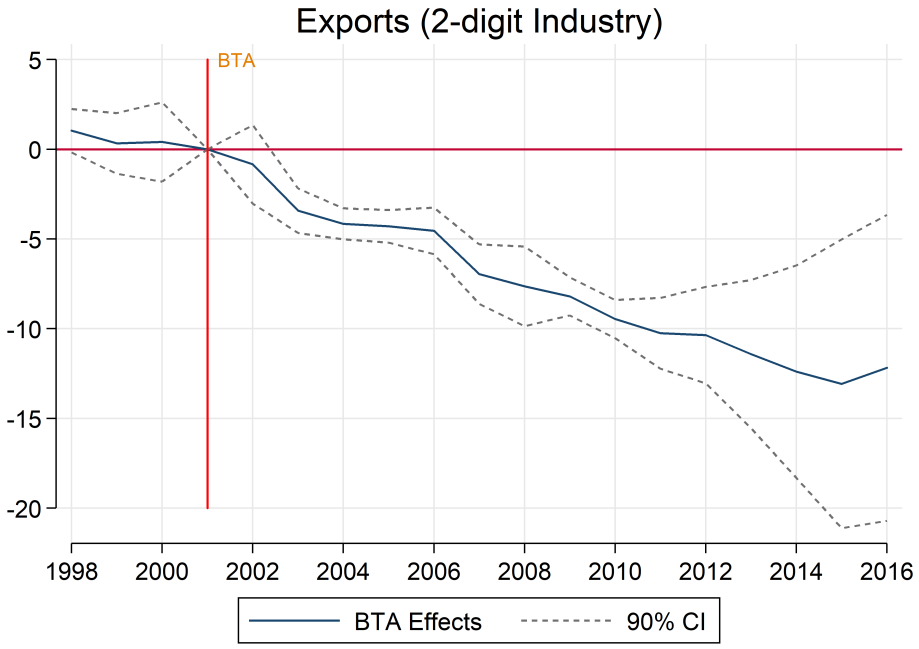


Figure 10: Effects of the BTA on Exports at Province Level

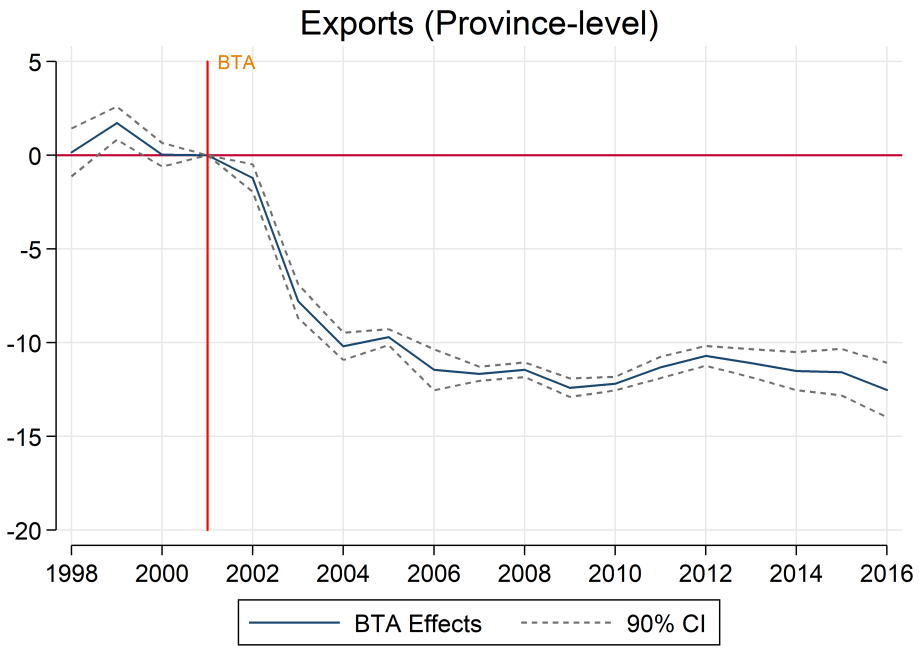
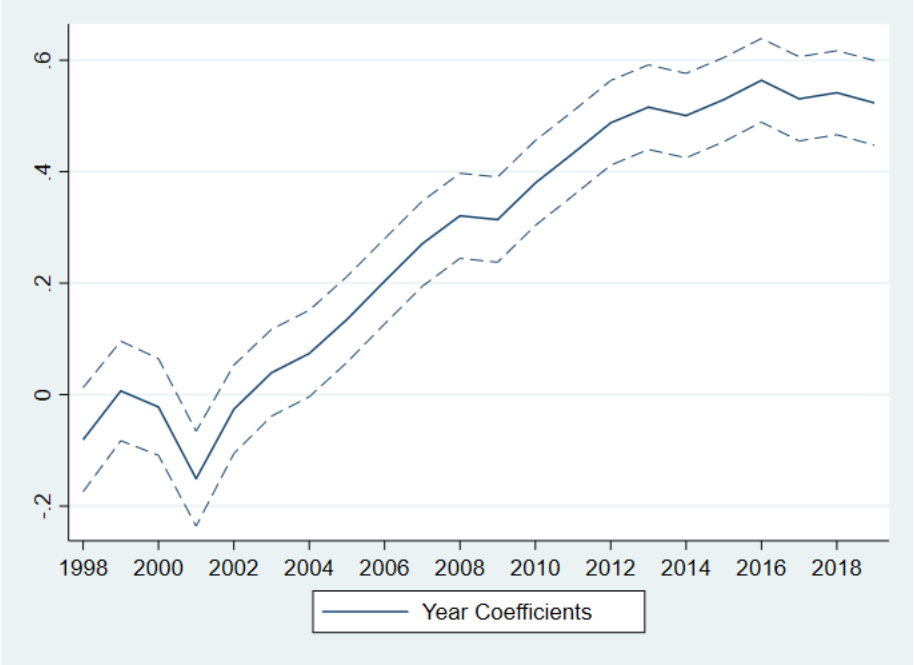


Figure 11: Unit Value of Exports to the US



Note: The graph shows the results for coefficients $\hat{\theta}_y$ from the regression $log(UnitValue)_{kt} = \sum_{y=1998}^{2015} \theta_y \mathbb{1}\{y = t\} + \lambda_k + \varepsilon_{kt}$ where k represent HS-10 digit industry, with 95% confidence intervals presented in dashed lines.

Figure 12: Effects of the BTA on Unit Value of Exports at the 10-digit Level

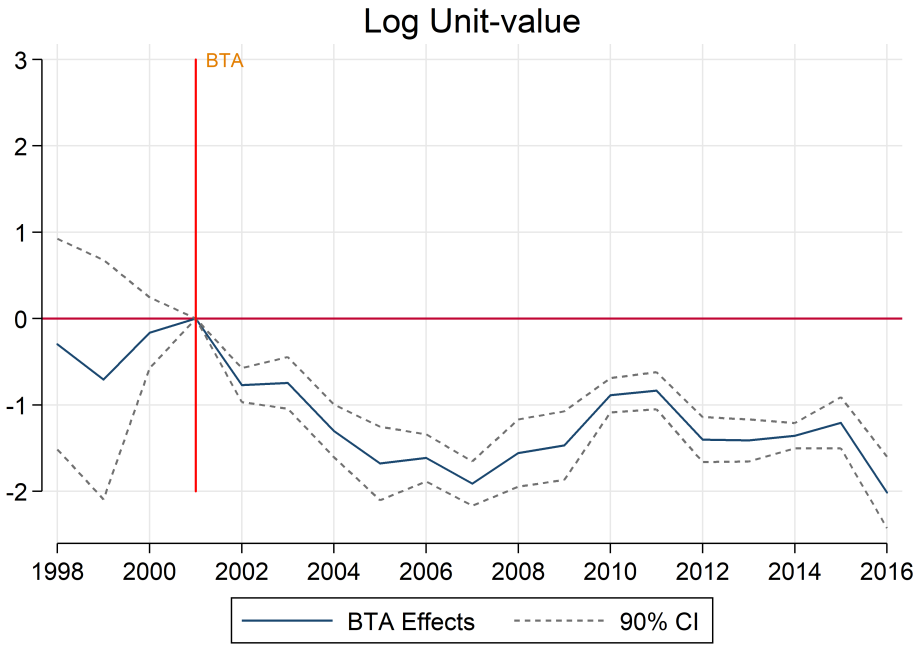


Table 1: Number of Households and Individuals Sampled by VHLSSs across Years

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%)
Household Size	4.5	4.4	4.3	4.2	4.0	3.9	3.8	3.8

Notes: Data are drawn from eight rounds of VHLSSs from 2001/2002 to 2015/2016. The number of households in 2011 is smaller due to data restriction from Vietnam's GSO.

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 & Repairation 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: 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 Trades 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: Shares are in percentage point. Observations are weighted by the sampling weight. Two adjustment are made for VHLSS 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, a large fraction of sale staffs is street-based, which is previously categorized as low-skilled. We assign sale staffs without information on wage as 95 (street-based and sales-related workers). Without these adjustments, there are abrupt jumps in shares of occupation codes 5 and 6 and a sharp decline in share of occupation code 9 from 2008-2010.

Table 4: Education Index (EI) and Ranking of Occupations

Ranking	Occupation	Education Index	ISCO (2008)
1	High-Level Professionals	11.9	2
2	Technicians and Associate Professionals	11.4	3
3	Clerical Support Workers	11.1	4
4	Leaders	10.8	1
5	Machine Operators and Assemblers	9.4	8
6	Services and Sales Workers	9.0	5
7	Crafts and Related Trades Workers	8.5	7
8	Elementary Occupations	6.6	9
8	Agricultural, Forestry and Fishery Workers	6.5	6

Notes: Education indices are computed using VHLSS 2001/2002. VHLSS record 2-digit occupations of individuals that are comparable across years and consistent with ISCO-08 at the 1-digit level. Elementary Occupations (ISCO08=9) and Agricultural, Forestry and Fishery Workers (ISCO08=6) are assigned the same rank. We exclude Armed Forces (ISCO08=0) from analysis.

Table 5: Effect of BTA and VN Tariffs on Mobility: Baseline DID Models

	(1) No control	(2) BTA	(3) BTA and VN	(4) Education Controls
Dependent Variable: $Upward_{ipt}$				
BTA Effects	-0.418*	-0.474**	-0.498**	-0.496**
	(0.249)	(0.224)	(0.228)	(0.224)
VN Effects			0.195	-0.498
			(0.551)	(0.530)
Age		0.071***	0.071***	0.051***
		(0.003)	(0.003)	(0.003)
Age Squared		-0.001***	-0.001***	-0.001***
		(0.000)	(0.000)	(0.000)
Age of Father		0.005***	0.005***	0.003*
		(0.002)	(0.002)	(0.002)
Age of Father Squared		-0.000**	-0.000**	-0.000
		(0.000)	(0.000)	(0.000)
Married		-0.032***	-0.032***	-0.016***
		(0.005)	(0.005)	(0.004)
Urban		0.103***	0.103***	0.082***
		(0.006)	(0.006)	(0.006)
Minority		-0.130***	-0.130***	-0.097***
		(0.008)	(0.008)	(0.008)
Percent of Male		-0.034**	-0.034**	-0.004
		(0.013)	(0.013)	(0.013)
Household Size		-0.008***	-0.008***	-0.003***
		(0.001)	(0.001)	(0.001)
Father Skills		-0.042***	-0.042***	-0.052***
		(0.002)	(0.002)	(0.002)
Primary Education				0.046***
				(0.004)
Secondary Education				0.100***
				(0.005)
Upper-secondary Education				0.268***
				(0.007)
Observations	68,028	68,028	68,028	68,028
R-squared	0.100	0.176	0.176	0.216
Province Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes

Notes: The estimation results for Equation 7 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 i is employed in a higher-ranked occupation than his father. BTA Exposure and VN exposure variables are computed based on Equation and exploits variation in exposure that arises due to differences in initial industrial structure across provinces. Standard errors are clustered at the province and year level. ** p<0.01, ** p<0.05, * p<0.1

Table 6: Short-Run and Long-Run Effects on Mobility: Extended DID Models

	(1) BTA	(2) BTA	(3) BTA and VN
Dependent Variable: $Upward_{ipt}$			
BTA Effects in Year 2003	-0.150		-0.805
	(0.271)		(0.507)
BTA Effects in Year 2005	-0.230		-0.895*
	(0.244)		(0.498)
BTA Effects in Year 2007	-0.646***		-1.145**
	(0.235)		(0.529)
BTA Effects in Year 2009	-0.504*		-1.163**
	(0.264)		(0.507)
BTA Effects in Year 2011	-0.946***		-1.602***
	(0.319)		(0.535)
BTA Effects in Year 2013	-0.222		-0.886*
	(0.310)		(0.536)
BTA Effects in Year 2015	-0.872***		-1.586***
	(0.280)		(0.514)
VN Effects in Year 2001		-1.563	6.363
		(1.600)	(4.006)
VN Effects in Year 2003		0.103	1.261
		(1.676)	(1.895)
VN Effects in Year 2007		-2.719***	-2.044
		(0.942)	(1.950)
VN Effects in Year 2009		0.853	0.284
		(1.162)	(1.224)
VN Effects in Year 2011		2.226	1.589
		(1.731)	(1.622)
VN Effects in Year 2013		0.585	-0.009
		(1.685)	(1.732)
VN Effects in Year 2015		0.162	0.842
		(1.120)	(1.298)
Observations	68,028	68,028	68,028
R-squared	0.176	0.176	0.176
Province Fixed Effects	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
Clustering Province-Year	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Notes: The estimation results for Equation 8 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 i is employed in a higher-ranked occupation than his father. BTA Exposure and VN exposure variables are computed based on Equation and exploits variation in exposure that arises due to differences in initial industrial structure across provinces. Regressions include controls for age, age squared, age of father, age of father squared, marital status, urban status, minority status, household size, percentage of male within household, father's skills, and dummy variables for primary, secondary and upper-secondary education. Standard errors are clustered at the province and year level. ** p<0.01, ** p<0.05, * p<0.1

Table 7: The Unit Value of Exports Over Time

	(1)	(2)
Dependent Variable:ln(Unit Value)		
$Trend_t$	0.034***	0.004
	(0.001)	(0.014)
$I(t > 2001)$		-0.287***
		(0.110)
$Trend_t * I(t > 2001)$		0.031**
		(0.003)
10-digit product fixed effects	Yes	Yes
Observations	58,649	58,649
F-statistics	681.13	1,844.42

Notes: The results from the regression $log(UnitValue)_{kt} = \theta_1 * [Trend_k * I(t > 2001)] + \theta_2 * I(t > 2001) + \theta_3 * Trend_k + \lambda_k + \varepsilon_{kt}$ are presented. The unit of observation is HS-10 digit industry. Robust standard errors are in parenthesis.

Table 8: Impact of Exports and Unit-Value on Upward Mobility

	(1) OLS	(2) IV	(3) OLS	(4) IV
Export Index	0.037***	0.052***		
	(0.013)	(0.019)		
Unit-value Index			0.039	0.166**
			(0.033)	(0.065)
Observations	68,028	68,028	68,028	68,028
R-squared	0.176	0.085	0.001	0.129
Province Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: τ_p^{BTA} used as an instrument in columns (2) and (4). Regressions include controls for age, age squared, age of father, age of father squared, marital status, urban status, minority status, household size, percentage of male within household, father's skills, and dummy variables for primary, secondary and upper-secondary education. Standard errors are clustered at the province and year level. ** p<0.01, ** p<0.05, * p<0.1

Appendix

A. Data Appendix

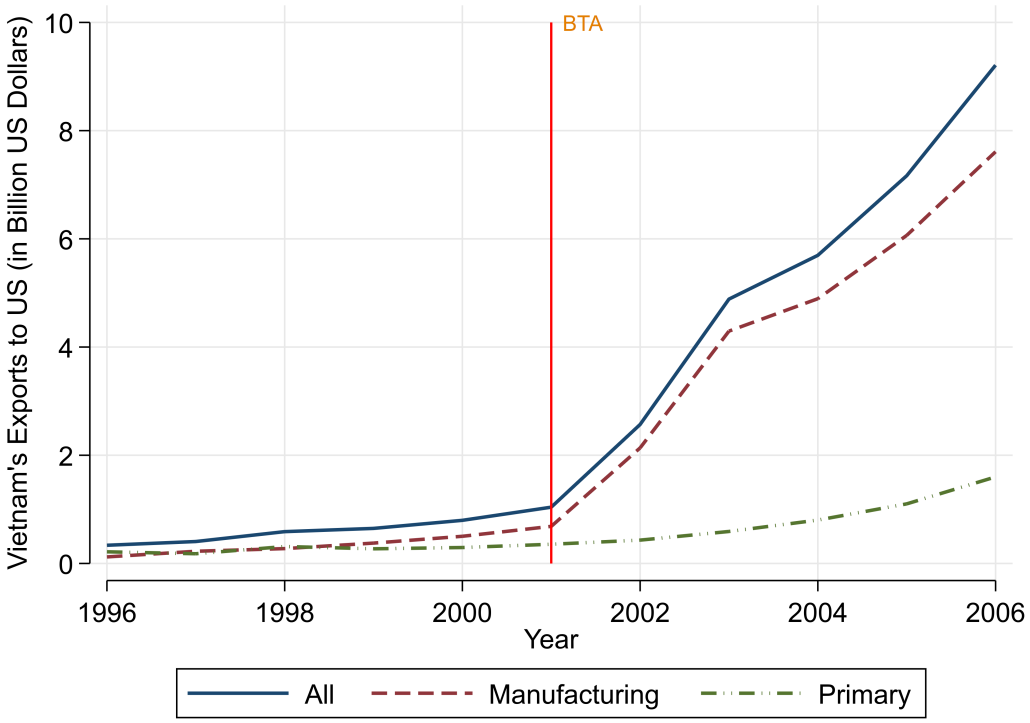
VLSS 1997/1998 There are three main issues with the VLSS 1997/1998. First, as mentioned in section 2, the number of households interviewed is much smaller in the VLSS as compared to VHLSSs. In 1997/1998, there are only 6000 households in the sample. Second, even though the VLSS is presumed to be representative for 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).[32] As a result, for 24 out of 59 provinces/central cites, there is no urban household interviewed. This in turn also leads to oversampling of urban areas without using proper sampling weights. Finally, two province codes 207 (Bac Kan) and 301 (Lai Chau) are missing in the VLSS 1997/1998.[33]

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

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

B. Additional Figures and Tables

Figure B1: Vietnam's Exports to US from 1996-2006 (in Billion US Dollars)



Note: The graph is based on authors' calculations. The primary sectors include agriculture and mining. The data is from US Census. All values are in nominal term.

Figure B2: Effects of the BTA on Exports (First Difference Estimation)

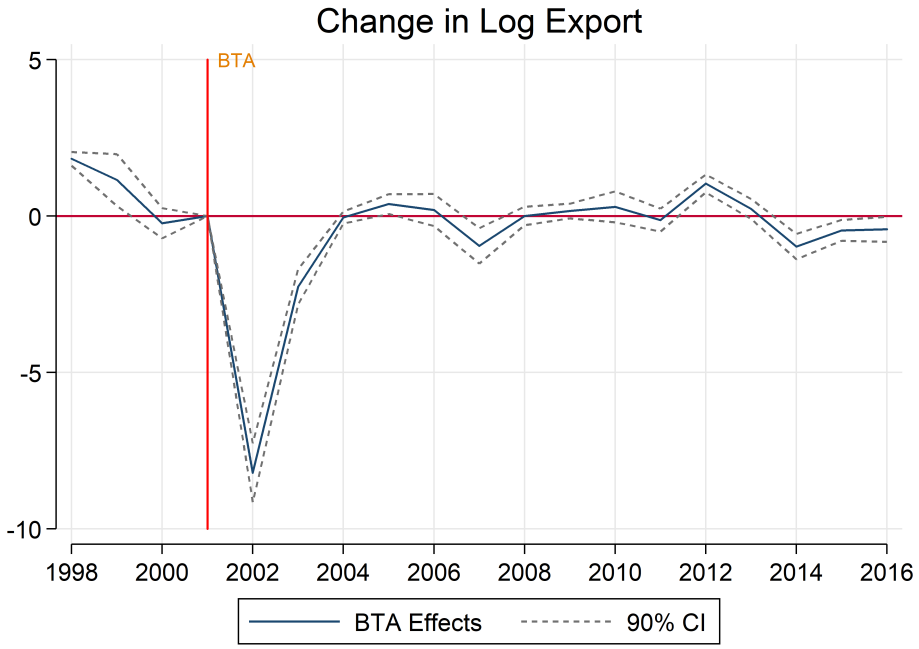


Figure B3: Effects of the BTA on Unit Value (First Difference Estimation)

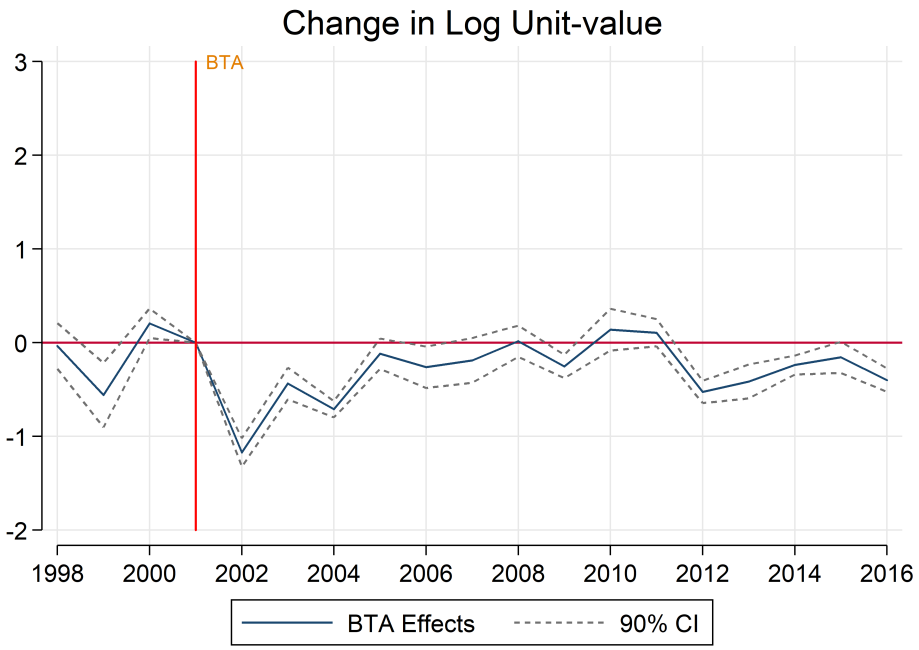


Figure B4: Effects of the BTA on Quantity of Exports (First Difference Estimation)

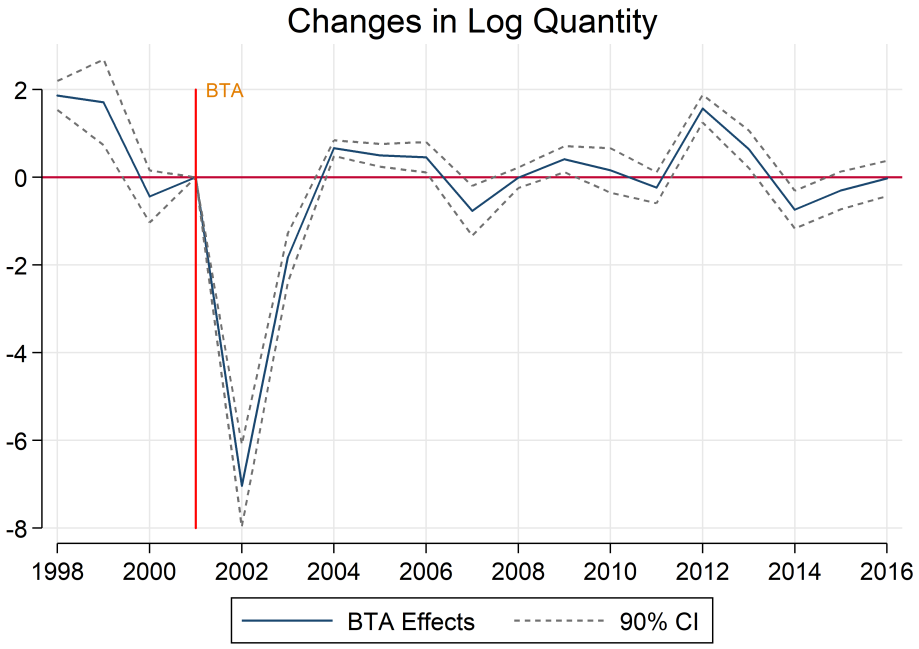


Table B1: Allocation of Workers across 2-digit Occupations by Year

	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

Table B2: Impact of the BTA on Exports

	Exports (Log 10-digit)	Exports (Log 2-digit)	Exports (Log Province)
BTA Effects in Year 1998	-0.149	1.037	0.152
	(0.472)	(0.699)	(0.738)
BTA Effects in Year 1999	0.841	0.323	1.718***
	(0.667)	(0.977)	(0.509)
BTA Effects in Year 2000	-0.313	0.405	0.024
	(0.490)	(1.276)	(0.366)
BTA Effects in Year 2001	-8.546***	-0.840	-1.215**
	(0.700)	(1.261)	(0.423)
BTA Effects in Year 2003	-10.501***	-3.427***	-7.783***
	(0.986)	(0.712)	(0.517)
BTA Effects in Year 2004	-10.428***	-4.155***	-10.191***
	(0.927)	(0.497)	(0.419)
BTA Effects in Year 2005	-9.758***	-4.294***	-9.702***
	(0.793)	(0.524)	(0.245)
BTA Effects in Year 2006	-9.436***	-4.550***	-11.442***
	(1.219)	(0.749)	(0.632)
BTA Effects in Year 2007	-9.857***	-6.960***	-11.656***
	(1.051)	(0.956)	(0.216)
BTA Effects in Year 2008	-9.478***	-7.637***	-11.440***
	(1.335)	(1.280)	(0.225)
BTA Effects in Year 2009	-8.891***	-8.203***	-12.400***
	(1.348)	(0.609)	(0.285)
BTA Effects in Year 2010	-8.357***	-9.462***	-12.181***
	(1.267)	(0.615)	(0.208)
BTA Effects in Year 2011	-8.892***	-10.256***	-11.319***
	(1.170)	(1.139)	(0.328)
BTA Effects in Year 2012	-7.383***	-10.357***	-10.699***
	(1.457)	(1.549)	(0.305)
BTA Effects in Year 2013	-6.841***	-11.414***	-11.091***
	(1.673)	(2.380)	(0.432)
BTA Effects in Year 2014	-7.148***	-12.397***	-11.512***
	(1.721)	(3.413)	(0.585)
BTA Effects in Year 2015	-7.068***	-13.068**	-11.567***
	(1.754)	(4.640)	(0.717)
BTA Effects in Year 2016	-6.696***	-12.180**	-12.525***
	(1.797)	(4.916)	(0.836)
Observations	45,737	491	1,140
R-squared	0.806	0.910	0.989
Industry 2d Fixed Effects	Yes		
Product 10d Fixed Effects		Yes	
Province Fixed Effects			Yes
Year Fixed Effect	Yes	Yes	Yes