Export markets and labor allocation in a low-income country[1]

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Abstract

We study labor allocation across employers in response to new export opportunities in a setting where a majority of the labor force works for small, less productive, household-owned businesses, rather than employers in the registered enterprise sector. We find the incidence of employment in household businesses declines more in Vietnamese industries that face larger U.S. tariff cuts on exports induced by the 2001 U.S.-Vietnam Bilateral Trade Agreement. The magnitude of this reallocation is larger for workers in more internationally integrated provinces and in younger cohorts. Declines in export costs expand industry employment among employers in the enterprise sector.

JEL Codes: F16

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1. Introduction

Employment in low-income countries is heavily concentrated in small, less-productive, informal, household-run businesses and economic development requires the reallocation of workers from these businesses toward more productive establishments in the formal modern enterprise sector (Kuznets (1966), Buera and Kaboski (2012)). International trade has the potential to contribute to this labor reallocation. Low-income countries have drastically increased their engagement in international trade, with their share of total world exports growing from 21 to 43 percent between 1992 and 2008 (Hanson (2012)). Export growth outpaced output growth in low-income countries, with the share of exports in GDP more than doubling from 26 to 55 percent between 1994 and 2008 (Hanson (2012)). In this paper, we examine the effect of export opportunities on the allocation of labor across employers in a low-income country setting. In particular, we study the effect of the declines in the cost of exporting for Vietnamese firms to the U.S. induced by the 2001 U.S.-Vietnam Bilateral Trade Agreement on the allocation of labor across the household business and formal enterprise sectors.

The prevalence of employment in household businesses in low-income countries makes studying labor reallocation in response to trade particularly challenging. Much of the existing evidence on labor reallocation is based on firm-level data that usually cover firms with 10 or more employees or administrative matched employee-employer data covering registered firms, which are excellent sources of information for the formal manufacturing sector.[2] However, in a low-income country setting, these data sources cover only a small share of the overall labor force because small, household run farms or businesses provide the main source of income for the majority of individuals in low-income countries (Banerjee and Duflo (2007), Golin (2002)). For example, in Vietnam in 2001, only 15 percent of all workers worked for formal, registered employers. This does not simply reflect the well-documented prevalence of agriculture in low-income countries (Caselli (2005), Restuccia, Yang, and Zhu (2008), Golin, Lagakos, and Waugh 2012). Informal business employment accounts for 66 percent of the manufacturing workforce in Vietnam and for 70 to 80 percent of the manufacturing workforce in countries such as India and Ghana (see Nataraj (2011), Hsieh and Klenow (2009, 2011), Golin (2008)).

[2] See, for example, Menezes-Filho and Muendler (2011).

Our study relies on labor force modules of several rounds of the Vietnam Household Living Standards Surveys (VHLSS) to examine the effect of a decline in export costs on the allocation of labor across employers. A major benefit of this data is its comprehensive and nationally representative coverage of workers in all industries and in all types of employers, including household businesses. The data records whether a worker works for an employer in the household business sector or the registered enterprise sector, enabling the examination of adjustment to export market opportunities along a margin that is not observed in conventional firm-level data.[3] The systematic relationship between economic development and household business employment across countries (Restuccia and Rogerson (2008), La Porta and Schleifer (2008)) and large labor productivity differences between household-run businesses and other employers (Golin (2008), La Porta and Schleifer (2008)), highlight the potential importance of this margin of adjustment for aggregate productivity.[4]

We examine labor allocation in response to increased export market opportunities. A large literature establishes the importance of export opportunities for firm productivity, quality and technology upgrading, and investment (Verhoogen (2008), Bustos (2011), Trefler (2004), Brambilla, Porto, and Tarozzi (2012), Brambilla, Lederman, and Porto (2012)). Interestingly, labor allocation responses to export opportunities are less understood than those to unilateral trade reforms.[5] Labor market reallocation in response to export market opportunities are of particular interest given policy attempts to further liberalize market access for developing countries through the WTO negotiation rounds and bilateral and regional free trade agreements.

The principle trade policy change induced by the U.S.-Vietnam Bilateral Trade Agreement (henceforth, the BTA) was an immediate drop in U.S. tariffs on Vietnamese exports. The BTA reduced tariffs on Vietnamese exports to the U.S. on average by 23.4 percentage points, substantially lowering the cost of exporting Vietnamese products to the to the U.S. The growth in exports to the U.S. subsequent to the BTA represented a substantial shock to Vietnam's economy

[3] In Vietnam a household business is a business that has not registered as an enterprise under Vietnam's Enterprise Law. Not all businesses are required to register as an enterprise. See Section 4 for further details.

[4] The existing literature on trade and informality focuses on a different aspect of informality, namely compliance with payroll taxes and other labor market regulation among the formal firms in middle-income countries in Latin America (see, for example, Menezes-Filho and Muendler (2011), Goldberg and Pavcnik (2003), Cosar, Gunar and Tybout (2011)).

[5] See Menezes-Filho and Muendler (2011), Kovak (2011), Topalova (2007, 2010), Attanasio, Goldberg, and Pavcnik (2004) and studies surveyed in Goldberg and Pavcnik (2007) for evidence on trade and labor reallocation in response to unilateral import tariff liberalizations.

(see Figure 1). Vietnamese exports to the U.S. grew from 7.1 to 19.0 percent of Vietnam's total exports (Figure 2) and grew from 3.9 to 12.5 percent of Vietnam's GDP between 2001 and 2004.[6] We show that Vietnamese industries that faced greater decline in U.S. tariffs observed greater export growth.

To examine the effect of new export opportunities on the allocation of labor across different types of employers within industries and across industries, we link the BTA-induced tariff cuts on Vietnamese exports to information on industry of employment and type of employer using the Vietnam Household Living Standards Surveys (VHLSS) spanning the policy change. As we discuss in detail in Section 3, the nature of the BTA, which induced declines in U.S. tariffs by the U.S. moving Vietnam from Column 2 to the pre-existing MFN tariff schedule, makes the industry-specific tariff declines in U.S. tariffs plausibly unrelated to industry-specific economic conditions in Vietnam during the early 2000s (McCaig (2011)). We rule out spurious correlation between declines in U.S. tariffs and concurrent global demand or supply shocks in Vietnamese products. While Vietnamese industries that faced greater decline in U.S. tariffs observed greater export growth, U.S tariff declines were not predictive of Vietnamese export growth prior to the agreement nor were they correlated with Vietnamese export growth to the European Union, another high-income export destination.

Our analysis suggests that the reallocation of labor from household businesses to employers in the enterprise sector provides an important margin of adjustment to new exporting opportunities. The aggregate share of workers in household businesses declined in Vietnam during the early 2000s, with approximately half of this decline due to the relative contraction of industries that tend to organize production in small household businesses, namely agriculture and aquaculture. The remaining half owes to the reallocation of labor from household businesses to larger, more formal employers within industries. This within-industry component is particularly pronounced in manufacturing. Industries that experience larger declines in tariffs on Vietnamese exports to the U.S. observe a greater decrease in the incidence of household business employment. Our estimates imply that expanded export opportunities could account for 40 percent of the increase in enterprise sector employment in manufacturing during this period. Our results are

[6] The share of Vietnam's exports going to the US is based on Vietnam's reported exports in UN Comtrade while the ratio of U.S. exports to GDP also uses World Development Indicators data on exports of goods and services as a percentage of GDP in Vietnam.

robust to a falsification check, where we find no evidence of the relationship between U.S. tariff reductions and declines in the incidence of household business employment prior to the implementation of the agreement. Our data also contains a smaller individual panel component, enabling us to confirm the robustness of our findings to time-invariant unobserved heterogeneity across workers.

Our results are consistent with the predictions of the Melitz (2003) style models and models such as Lucas (1978), whereby an increase in labor demand (induced by trade) leads to a reallocation of workers toward more productive establishments. This mechanism is also supported by McCaig (2011), who finds that the BTA-induced declines in US tariffs lead to decreases in poverty and increases in wages (especially for less educated workers) in geographic areas of Vietnam more exposed to exporting. We also find that not all individuals are affected equally. Individuals living in more internationally integrated provinces and younger workers are more likely to reallocate from household businesses toward more formal employers in response to export opportunities.

Overall, while changes in the economy-wide structure of employment across industries appear uncorrelated with tariff changes, export opportunities have shifted the structure of employment across industries among the registered, enterprise employers, which are most directly impacted by new export opportunities. The new export opportunities lead to a more pronounced expansion of industry employment in the enterprise sector.

Our results not only contribute to the literature on labor allocation and trade, but also relate to the recent literature on firm heterogeneity and aggregate output differences in developing countries. Recent studies quantify the productivity losses associated with the misallocation of resources across heterogeneous sectors or firms in developing countries (see for example, Caselli (2005), Rodrik and McMillan (2011), Banerjee and Duflo (2005), Restuccia and Rogerson (2008), Hsieh and Klenow (2009)). Our study suggests that the elimination of a product market distortion, such as export market liberalization, induces a movement of labor away from household businesses, which tend to be less productive and pay lower wages for observationally equivalent workers, to larger, more productive formal firms. Our estimates imply that the BTA induced reallocation of workers from household businesses into enterprises increased labor productivity (as measured by revenue per worker) within manufacturing by 5.6 percent per year. The reallocation of labor from household businesses to other employers might thus lead to aggregate productivity gains through the reallocation of labor toward more productive uses.

The rest of the paper is organized as follows. Section 2 summarizes a conceptual framework to examine how changes in export market opportunities affect the allocation of labor across employers. Section 3 provides a detailed description of the BTA. Section 4 describes the data. Section 5 discusses our empirical methodology and results. Section 6 concludes.

2. A conceptual framework

We examine the allocation of labor across employers and industries in response to increased export market access. In this section we highlight two channels through which a reduction in industry tariffs on Vietnamese exports induced by the BTA could influence the composition of employment between smaller, less formal employers (such as household businesses) and larger, more formal employers.

First, the BTA differentially increased export market access across several industries. Models of trade based on comparative advantage suggest that export market opportunities will induce workers to move into industries that experienced greater increases in foreign market access (i.e., large foreign tariff cuts) and away from industries that are less affected by cuts in foreign tariffs. In this setting trade policy could affect the incidence of aggregate employment in smaller, less formal firms (such as household businesses) by changing the composition of industries that differ in their reliance on household business production. If the expanding industries are industries that rely more heavily on household business production, then it is possible that trade liberalization would lead to an increase of employment in non-household businesses in the aggregate. For example, suppose that production in agriculture is more prone to be organized around household businesses than in apparel. If export market opening increases the relative demand for apparel, the expansion of the apparel sector will decrease the aggregate share of jobs in household businesses in the economy. However, if trade liberalization increases the relative demand for agriculture, the aggregate share of household business employment could increase. This example illustrates that, more generally, the total effect of trade on the composition of employment across employers through the between industry channel depends on the nature of the trade liberalization in question and the relative informality of the industries subject to the biggest reductions in foreign tariffs.

Second, a reduction in an industry tariff on Vietnamese exports to the United States will increase demand for Vietnamese products and induce an increase in labor demand in that industry. The increase in the industry product and labor demand will likely not be equally distributed across

firms/employers if new exporting opportunities have a differential effect on the profitability of employers. There are likely many dimensions of heterogeneity between household businesses and more formal firms, including differences in productivity. One possible explanation for these heterogeneous effects is given in Melitz (2003), where firms differ in underlying productivity and face a fixed cost of accessing export markets. Because trade increases the relative profitability of exporting for larger firms (but not smaller firms), the new export opportunities are expected to lead to the reallocation of labor from smaller to larger firms within industries as workers lose jobs in smaller firms, and are rehired by larger, more successful firms. Only initially more productive firms benefit from this expansion because they are the ones profitable enough to cover the fixed cost of exporting. This leads to increased output and employment in existing exporters and entry of some firms into the export market (i.e., new exporters). Less efficient firms that only serve the domestic market and now also face higher labor costs observe a contraction in output and employment and potentially exit. Expanded export opportunities thus shift the industry composition of employment away from smaller, less productive employers, such as household businesses, toward more productive employers.[7]

The above example assumes that household businesses compete with more productive firms on the product market, which is potentially a strong assumption. More generally, lack of product market competition between household businesses and exporting firms does not imply that household businesses would be unaffected by export market opportunities through the general equilibrium labor market channel. For example, new export opportunities could affect employment in household businesses through the general equilibrium wage effects of trade. Exporting opportunities increase the labor demand among exporters and raise wages (see McCaig (2011)). If household businesses compete for labor with larger, more formal forms, the increased employment opportunities in the export sector will increase the opportunity cost of working for household businesses and lead to the relative contraction of household business employment.

The above discussion provides guidance for our empirical analysis in Sections 5. In Section 5 we examine changes in the allocation of labor across types of employers and examine how BTA-induced tariff cuts affected the allocation of jobs between household businesses and other, more

[7] See also extensions where initially better performing firms tend to pay higher wages, for example, due to efficiency wage or profit-sharing (Verhoogen (2008), Davis and Harrigan (2007), Amiti and Davis (2012)).

formal employers within Vietnamese industries, as well as how BTA-induced tariff cuts affected net reallocation of jobs across industries, as emphasized in neoclassical trade models.

3. Background on the U.S.-Vietnam Bilateral Trade Agreement

In this section we describe the U.S.-Vietnam Bilateral Trade Agreement (BTA) and highlight its key features that we utilize in our empirical methodology and identification strategy in Section 5.

The BTA was implemented on December 10, 2001.[8] The agreement led to negligible changes in Vietnam's import tariff commitments to the U.S. because Vietnam already applied Most Favored Nation (MFN) tariffs on U.S. imports.[9] The main trade policy change was for the U.S to immediately grant Vietnam Normal Trade Relations (NTR) or MFN access to the U.S. market. Prior to the BTA Vietnam was subject to tariffs according to Column 2 of the U.S. tariff schedule. With the BTA, Vietnam became subject to MFN tariff rates. In our analysis, we use industry-level U.S. import ad-valorem equivalent tariffs applied to Vietnamese exports constructed from these two tariff schedules, as in McCaig (2011), as the main policy variable to measure the industry-level policy cost of accessing export markets.[10]

Our identification strategy in Section 5 relies on several features of the U.S. tariff declines. Table 1 summarizes industry-level tariffs and changes overall and for broad sectors. First, the U.S. tariff cuts were large, as the BTA on average reduced tariffs by 21.1 percentage points from 23.4 to 2.4 percent. The large magnitude of tariff cuts makes it ex-ante plausible to separate the effects of changes in tariffs from confounding changes in the Vietnamese economy. Our empirical methodology in Section 5 relies on the variation of tariff declines across industries to identify the effects of lower exporting costs on labor allocation across employers. Thus, a second useful feature

[8] See STAR-Vietnam (2003) and McCaig (2011) for an extensive discussion of the BTA.

[9] The BTA required Vietnam to reduce import tariffs on approximately 250 (out of approximately 6000) 6-digit HS agricultural and manufactured food products. As these tariff cuts were small in comparison to the U.S. tariff cuts and only affected a relatively small number of products, we do not discuss them in detail. Our results are robust to controlling for these tariff cuts. As part of the BTA, Vietnam was required to implement various regulatory and legal changes over a period of 10 years following the implementation of the BTA. These included commitments to improve market access in services such as banking and telecommunication, intellectual property rights, and protection of foreign direct investment (STAR-Vietnam (2003)).

[10] McCaig (2011) uses detailed information on U.S. tariffs for both of these tariff schedules from the U.S. International Trade Commission's online Tariff Information Center and computes the ad valorem equivalent of any specific tariffs. He then matches the tariff lines to industries by the concordance provided by the World Bank via the World Integrated Trade Solution database to construct industry-level tariffs according to 2-digit ISIC industry nomenclature. This classification matches the industry classification in the VHLSSs.

of the BTA is that the tariff cuts varied widely across industries. As Table 1 suggests, the standard deviation of the industry tariff decline is 17.9 percentage points. Industries within manufacturing experienced the largest average tariff cut of 30 percentage points, with the average tariff falling from 33.8 to 3.4 percent.

Importantly, these tariff declines significantly impacted the volume and structure of Vietnamese exports to the U.S. and worldwide. During this period, Vietnam's aggregate worldwide exports were expanding, but the exports to the U.S. grew even more. Figures 1 and 2, also reported in Fukase (2012), show the value and the share, respectively, of Vietnamese exports to the U.S. from 1997 through 2006. The implementation of the BTA led to a significant surge in exports, which is evident from the break in trend in 2001 in Figure 1. This break is especially pronounced for manufactured exports, which experienced substantially larger BTA tariff cuts than primary sector exports. Figure 2 indicates that the share of Vietnamese exports going to the U.S. grew rapidly from 5.1 percent in 2000 to 19.0 percent in 2004 and this increase was primarily driven by manufacturing, where U.S. exports accounted for 26.1 percent of Vietnamese exports by 2004.[11] The top eight exports to the U.S. according to 2004 value by industry were apparel; footwear; textiles; food products and beverages; furniture; agriculture; refined petroleum; and office, accounting and computing machinery.

Figure 3 shows the relationship between growth in exports to the US between 2001 and 2004 and tariff cuts across 2-digit ISIC industries. A strong negative relationship suggests that industries that received greater tariff cuts experienced faster export growth. Appendix Table 1 reports the industry-level regression of the change in log exports to the U.S. between 2001 and 2004 on the change in U.S. tariffs, which yields a statistically significant estimate of the coefficient on the change in US tariffs for traded industries and for manufacturing. The estimate in column 1 implies that an industry that received the average tariff cut, 21.1 percentage points, experienced average annual export growth to the U.S. of 48 percent.

[11] As a non-member of GATT and the WTO, Vietnam was not subject to the Multi-Fibre Agreement and thus did not initially face any export quotas for textile and apparel products destined for the U.S. In July 2003 a bilateral textile agreement came into force, which imposed quotas on Vietnamese textile and apparel exports to the U.S. This agreement is likely responsible for the reduction in the rate of growth of the share of US-bound Vietnamese manufacturing exports following 2003. In the analysis below, this is one of the reasons why we restrict our period to the two years immediately following the implementation of the BTA. To the extent these quotas affected Vietnamese households in 2003 they would likely attenuate our findings.

This BTA-related expansion of U.S. exports is not driven by industry-specific global demand shocks. Appendix Table 1 also reports results for Vietnamese exports to the European Community as an outcome variable for traded industries and for manufacturing. Unlike exports to the U.S., Vietnamese exports to the E.U. were already subject to MFN tariffs prior to the implementation of the BTA (STAR-Vietnam (2003)). As a high-income export market destination, the E.U. likely faces similar industry-specific demand for low-income country exports as the U.S. market. To the extent that U.S. tariff changes are correlated with these shocks, BTA-induced tariff changes would also be spuriously correlated with Vietnamese exports to the EU. However, the coefficients on tariffs reported in columns 3 and 4 are all statistically insignificant and an order of magnitude smaller, indicating that the change in U.S. tariffs was not associated with a statistically significant change in Vietnamese exports to the EU. This suggests that it is unlikely that BTA-induced tariff changes are spuriously correlated with industry-specific global demand shocks.

In fact, a fourth useful feature of the U.S. tariff cuts induced by the BTA is that the usual concern about the political economy of protection and the endogeneity of tariff changes are potentially less severe. Industry-specific tariff cuts occurred by the U.S. granting Vietnam the status of Normal Trade Relations (i.e., Most Favored Nation status). The U.S. tariff cuts were presented as an all-or-nothing package whereby exports from Vietnam into the U.S. would immediately be covered by MFN tariff rates (negotiated among the WTO members in a round that concluded by 1995) instead of Column 2 tariff rates (i.e. originating from the US tariff rates from the Tariff Act of 1930 (Pregelj (2005), McCaig (2011)). The movement of Vietnam from one pre-existing U.S. tariff schedule to a second pre-existing tariff schedule implies that neither U.S. nor Vietnamese industries had an opportunity to influence the tariff cuts faced by specific industries at the time of the implementation of the BTA.[12]

We further confirm this lack of correlation between BTA-induced tariff changes and pre-existing industry trends and levels. In particular, BTA-induced tariff changes do not appear to be related to pre-existing trends in Vietnamese exports to the U.S nor other high-income destinations such as the E.U. A falsification check of growth of exports to the US between 1997 and 2000, where the industry-level pre-BTA tariffs are matched with exports in 1997 and the post-BTA tariffs are matched with exports in 2000, yields an insignificant coefficient on the change in tariffs (see

[12] See McCaig (2011) for further discussion of institutional details.

Appendix Table 1, Panel B, columns 1 and 2). A similar finding is obtained for growth of exports to the E.U. between 1997 and 2000 (see Appendix Table 1, Panel B, columns 3 and 4).[13] Thus, the export growth to the U.S. following the BTA is not simply the continuation of pre-existing trends. In addition, we regressed the change in U.S. tariffs on a measure of the unskilled labor intensity of an industry (measured by the share of workers with less than 10 years of education) and the share of workers within the industry working in household businesses prior to the implementation BTA. The respective partial correlations, all statistically insignificant, are 0.090, and 0.073. Overall, this discussion suggests that neither contemporaneous growth in demand for Vietnamese exports from other high-income countries, nor pre-existing trends in industry exports, nor-baseline industry characteristics are statistically correlated with the BTA-induced industry tariff changes.

4. Data and Aggregate Trends in Household Business Employment

4.1 Definition of a household business

In Vietnam, firms either operate in the household business sector or the registered enterprise sector. The registered enterprise sector covers firms of four ownership categories: state, collective, foreign, and (domestic) private as defined by the Enterprise Law.[14] All state, collective, and foreign businesses have to legally register as an enterprise. Private businesses can legally operate either as a household business or a registered private enterprise. Thus, a household business is a private business that is not registered as a private enterprise. The legal guidelines for when a private business must register as an enterprise are at times vague, but they consistently require registration as an enterprise for private businesses that regularly employ workers or employ more than 10 workers, or businesses that operate in more than one location.[15] Thus, while small, single-location businesses may operate as household businesses or enterprises, all larger businesses are required to operate as enterprises. Being a household business therefore does not necessarily imply that a business operates illegally (although some private businesses required to register might not do so and illegally operate as a household business). Household businesses can operate in the

[13] A similar regression for worldwide exports between 1997 and 2000 also yields statistically insignificant findings, further suggesting that tariff changes were not correlated with pre-existing trends.
[14] See law No. 13-1999-QH10 Law on Enterprises.
[15] Decrees No. 02/2000/ND-CP of 3 February 2000 and No. 109/2004/ND-CP of 2 April describe household business and enterprise registration requirements during our study period.

physical premise of a household (or farm), market stalls, industrial zones, trade centers, and in variable locations (e.g., street vendors).

Most household businesses are household farms (agriculture and aquaculture). Non-farm household businesses predominately operate in services (70%). Of the 30% of household businesses in manufacturing, the most common activities are production of food and beverages, wood processing, clothing, furniture, and textiles. The difference in registration status is predictive of important differences in underlying firm characteristics in the household business and enterprise sectors. For example, household businesses are substantially smaller and have lower labor productivity than firms that operate in the enterprise sector. The average household business has only two workers, while the average employment size for employers in the enterprise sector is 63.8. Household businesses in manufacturing have on average eight times lower labor productivity than enterprises. [16]

Registered enterprises are required by the Enterprise Law to follow formal accounting standards and to report comprehensive information about their financial position, including information on their workforce. Consequently, as in other less developed countries, in Vietnam, workers in the enterprise sector are captured in the conventional firm-level datasets based on administrative records covering the formal sector whereas workers in the household business sector are not. The next section describes how we use comprehensive household surveys to observe workers in both sectors.

4.2 Data Description

We use two waves of the Vietnam Household Living Standards Surveys (VHLSS) conducted by the General Statistics Office (GSO) of Vietnam in 2002 and 2004 as our primary data source. The surveys are nationally representative, have a 12 month recall, and cover 2001/2002 and

[16] The descriptive information is based on the authors' calculations from the household business and employment modules of the 2002 VHLSS and the 2001 Enterprise Survey, which covered all officially registered enterprises in Vietnam.

2003/2004.[17] While the VHLSS is a repeated cross section of households, it also contains a smaller panel subsample, which we employ in several specification checks.[18]

We focus on employed individuals, ages 20 to 64, in their main job (i.e., the most time consuming). [19,20] We create variables on workers' demographic and educational characteristics (gender, age, highest level of completed education, ethnic minority status), geographic location (urban residence, province), occupation, and industry affiliation. The survey distinguishes between 60 2-digit ISIC (Rev 3) industries overall, 34 in the traded sector, and 22 in manufacturing. We use industry affiliation to link individual-level data to industry-level U.S. tariffs on Vietnamese exports, described in detail in section 3.

We construct the main variable of interest, an indicator for whether a worker works for a household business from a survey question about the worker's employer type. The question distinguishes whether a worker is self-employed, works for another household, the state sector, the collective sector, the private enterprise sector, and the foreign sector. The indicator takes the value one if an individual works in his/her own household businesses or in another household's business and zero otherwise.[21] This definition of employment in a household business is consistent with the distinction between household businesses and registered enterprises as per Vietnam's Enterprise Law as discussed in section 4.1.[22]

[17] The BTA was implemented on December 10, 2001. The 2002 survey interviewed households throughout the year. With a recall period of 12 months, individuals interviewed at the start of 2002 have a recall period that almost entirely precedes the BTA while individuals interviewed at the end of 2002 have a recall period almost exclusively after the implementation of the BTA. Our results thus potentially underestimate the full impact that the BTA has had on labor reallocation.

[18] In robustness checks, we rely on two additional data sources: the 1992/93 and 1997/98 Vietnam Living Standard Surveys (VLSS), predecessors to the VHLSS, and Vietnam's Enterprise Survey for 2000 and 2003, a firm-level dataset that covers all registered firms in the enterprise sector.

[19] For each individual in the household the survey collects information on whether the individual is employed, unable to find work or out of the labor force. Unemployment is very infrequent in our data. For example, among individuals age 20 to 64 in the 2004 VHLSS, 89.3 percent report working during the past 12 months while only 6.2 percent of those not working (or 0.7 percent of the age group) report being unable to find a job.

[20] Among workers age 20 to 64 in the 2004 VHLSS, 43 percent reported working more than one job during the past 12 months. Among these individuals the average annual hours worked was 1355 and 511 in their primary and secondary jobs respectively as compared to 1907 hours for workers that reported working only one job.

[21] In a subset of our analysis we also rely on an indicator for whether an individual is self-employed.

[22] The 2004 VHLSS distinguishes between self-employment in a household business and self-employment in a private enterprise, while the 2002 VHLSS does not. To be consistent across surveys we classify all self-employed individuals as working for a household business. This is not a very egregious grouping since self-employment in the private sector is only 0.7 percent of self-employment across all industries and 1.6 percent of self-employment in manufacturing in the 2004 VHLSS.

One potential problem with the construction of a household business indicator is that the individuals might not know whether they work for a household business or a private enterprise. While this is a concern, the survey provides detailed instructions to the enumerators about how to record the answers to questions. Furthermore, most household business workers work for their own household business and presumably know its registration status. If workers could not distinguish between working for a household business or a private enterprise, one would not expect to observe differences in worker outcomes such as earnings and benefits for workers that work in household businesses and other establishments. In unreported analysis, we find notable differences in wages and benefits received between workers in the household business and enterprise sectors.[23] For example, workers in a household business earn about 14 percent less than observationally equivalent workers working in the same industry, province, and occupation. Controlling for unobserved worker characteristics, workers that switch to work for an enterprise tend to earn 5 percent more than when they work for a household business. Workers that work for household businesses also receive lower benefits, which is consistent with the literature on firm size and earnings and on informality (see for example Marcouiller, Ruiz de Castilla, and Woodruff (1997) and Goldberg and Pavcnik (2003)). To the extent that there is some measurement error in our dependent variable, it would reduce the precision of our estimates and bias us toward finding no significant impact.

While we can capture worker allocation between employers in the household business and enterprise sectors, a margin that is not observed in conventional firm-level or matched employee-employer administrative data, we do not observe allocation of workers across firms within employer types. Our study thus complements the literature on labor allocation across heterogeneous employers in the formal sector (see Levinsohn (1999), Menezes-Filho and Muendler (2011), Krishna, Poole, and Senses (2012)).

Appendix Table A.2 provides summary statistics for the sample of 152,388 workers in 2001/02 and 96,407 workers 2003/04.

4.3. Aggregate trends in household business employment

Table 4, Panel A reports the aggregate share of individuals that work in household businesses in Vietnam in 2001/02 and 2003/04 and motivates the importance of this employment

[23] In unreported tabulations, we have also redone the analysis for private enterprises alone and continue to find large differences.

margin. The results are presented for workers in all industries, in industries other than agriculture and aquaculture, and in manufacturing. The major fact to emerge is that employment in household businesses is very high in Vietnam. Economy-wide, 85 percent of workers are employed in household businesses in 2001/02. This prevalence of employment in household businesses does not merely reflect the large overall share of employment in agriculture and aquaculture, as the share continues to be high, at 67 percent, when we exclude agriculture and aquaculture.[24] We observe similarly high levels of working for household businesses, 66 percent, within manufacturing, consistent with evidence from India (Nataraj (2011)). Thus, even in manufacturing, where most of the existing work on labor allocation with firm-level data is done, the usual focus on employment in formal enterprise firms captures a small share of employment.

The second key fact to emerge from Table 4 is that the prevalence of working in household businesses fell between 2001/02 and 2003/04. Economy-wide the share of workers in household businesses fell by 3.3 percentage points (or 4 percent). The drop was particularly pronounced in manufacturing, where the share of workers employed in household businesses fell by 5.6 percentage points (or 9 percent). The conceptual framework in Section 2 emphasizes that trade can influence the composition of employment through the reallocation of employment across employers within industries and between industries that differ in their level of reliance on household businesses. We examine whether the observed aggregate changes in the incidence of employment in household businesses stem from changes in the structure of employment across industries (e.g., new export market opportunities may have expanded employment in industries that tend to organize their production in household businesses) or from within-industry reallocation of workers across employers. We decompose the change in the share of workers in household businesses in total employment between 2001/02 and 2003/04, denoted by ΔH, into within and between industry shifts, respectively:

$$\Delta H_t = H_t - H_{t-1} = \sum_j \Delta h_{jt} E_j + \sum_j \Delta E_{jt} h_j \ , \qquad (1)$$

where E_{jt} is the share of industry j's employment in total employment at time t, h_{jt} is the share of workers in household businesses in total employment in industry j, $E_{j.} = .5(E_{jt} + E_{jt-1})$, and $h_{j.} = .5(h_{jt} + h_{jt-1})$. The first summation term captures the importance of mobility of workers across

[24] The middle panel also excludes forestry, but this is a very small sector and hence, for brevity, we refer to agriculture and aquaculture only.

employers *within* an industry and the second summation term captures the prevalence of mobility of workers *across* industries as sources of changes in aggregate employment in household businesses.[25]

Panel B of Table 4 presents the results of the decomposition. Economy-wide, the between and within industry channel contribute equally toward the decline in the aggregate share of employment in household businesses. The between-industry changes account for 48 percent of the aggregate decrease in employment in household businesses. The between component is predominately driven by the relative contraction of employment in agriculture and aquaculture, where almost all workers work in household farms. Excluding agriculture and aquaculture the within-industry channel accounts for 87 percent of the decline in employment in household businesses. The within-industry channel plays an even larger role in manufacturing, where it accounts for over 100 percent of the decline in the share of household business employment.

Overall, the decomposition suggests that the declines in the aggregate share of employment in household businesses are driven by both the reallocation of workers toward industries with a lower prevalence of household businesses and by the reallocation of workers across employers from household businesses toward employers in the registered enterprise sector within an industry. These aggregate trends motivate our empirical analysis, which we turn to next.

5. Empirical Implementation

5.1 Empirical Methodology and Main Results

We exploit large differences in declines in U.S. tariffs on Vietnamese exports induced by the BTA across industries to investigate the relationship between declines in the cost of exporting and the allocation of workers between employers in the household business and enterprise sector. The empirical methodology relies on a comparison of the probability that a worker works for a household business before and after implementation of the BTA across Vietnamese industries differentially exposed to the declines in U.S. tariffs. In the initial empirical specifications, we estimate the following linear probability model:

$$H_{ijt} = X_{ijt}\delta + tariff_{jt}\beta + \gamma_p + \lambda_j + \theta_t + \varepsilon_{ijt} . \quad (2)$$

[25] A similar decomposition is often used in the literature on skill-upgrading to decompose the change in the share of skilled workers between and within industries.

H_{ijt} is an indicator for whether a worker *i* employed in industry *j* at time *t* works for a household business, X_{ijt} is a vector of worker characteristics (this vector includes age, age squared, and indicators for education (primary, lower secondary, upper secondary, with no formal education as the excluded category), gender, ethnic minority status, an indicator for whether a person lives in a rural area), $tariff_{jt}$ is the U.S. tariff on Vietnamese exports in industry j at time t. The specification also includes province, industry, and post-BTA fixed effects. The main parameter of interest is the coefficient on tariffs. A positive coefficient implies that a decline in tariffs is associated with a decline in the probability of working in a household business and the reallocation of labor away from household businesses. Standard errors are clustered by industry to account for general forms of heteroskedasticity and serial correlation in the error term within an industry.

Inclusion of individual worker demographic characteristics in equation 2 sweeps out differences in worker composition across industries, employers, and time that could simultaneously affect the allocation of labor and tariff levels. The post-BTA fixed effect controls for aggregate economy-wide adjustments in household business employment coinciding with the implementation of the BTA agreement. Province fixed effects absorb any time-invariant features of provinces affecting labor market conditions in a province, while industry-level fixed effects capture all time-invariant industry characteristics correlated with tariff levels and industry incidence of household business employment. In this set up, the coefficient on tariffs is identified with the differential changes in U.S. tariffs across industries.

Any potential threats to the underlying identification assumption would stem from industry specific time-varying factors that simultaneously influence industry tariff changes and industry-specific changes in the propensity to work for a household business. As discussed in detail in Section 3, the institutional implementation of the BTA-induced tariff cuts eliminated the ability of industry-specific contemporaneous conditions in Vietnam or the US to influence the magnitude of industry tariff cuts through the political economy of tariff formation. One could potentially still be concerned about spurious correlation between industry tariff changes and contemporaneous industry-specific changes in global demand for Vietnamese exports. In Section 3, we also show that U.S. tariff changes are not spuriously correlated with contemporaneous industry-specific changes in global demand for Vietnamese exports: the U.S. tariff declines lead to a strong increase in Vietnam's exports to the U.S, but are not associated with changes in export growth to the EU. This also likely eliminates the role of contemporaneous supply shocks in Vietnam, which would be affecting all

global destinations (Autor, Dorn, and Hanson (2013)). We also find no statistically significant association between U.S. tariff changes and industry baseline characteristics, such as the share of household business workers in industry employment and the unskilled-labor intensity of the industry, prior to the implementation of the BTA and nor between U.S. tariff changes and pre-existing industry-specific time trends in Vietnamese exports to the U.S., the E.U., and worldwide. These results, discussed in detail in Section 3, further validate the identification strategy in equation (2). We will provide further support for our identification assumption with a direct falsification test of the specification in equation (2) in Section 5.2.

Figures 4 and 5 present scatterplots of the change in the share of household business workers within an industry and the BTA-induced change in U.S. tariffs for all traded industries and for manufacturing, respectively.[26] The size of the circles reflects the employment size of each industry. The slope of the displayed regression lines is equivalent to the estimate of the coefficient on tariffs β based on equation 2 without controlling for worker characteristics and province fixed effects.[27] The figures show a clear positive relationship: industries with larger tariff cuts experienced larger reductions in the share of workers working in household businesses.

The relationships shown in the scatterplots are robust to controlling for individual characteristics and province fixed effects as specified in equation (2) and reported in Table 5. Column 1 presents estimates of equation 2 for traded industries. We find that workers in industries that faced greater reductions in U.S. tariffs experienced larger decreases in the probability of employment in household businesses relative to observationally equivalent workers in industries with smaller tariff reductions. The magnitude of the coefficient (.21) suggests that an industry that experienced the average reduction in tariffs, 21.1 percentage points, saw the probability of working in a household business fall by 4.4 percentage points relative to an industry facing no reduction in tariffs. In Column 2 we report the estimates of equation 2 for workers in all industries, including non-traded industries, to which we assign a tariff of 0 in both years.[28] The non-traded sectors were not directly impacted by the tariff cuts on exports and observed no change in tariffs. We would thus

[26] Both figures exclude industry 12 (mining of uranium and thorium ores) from the display, but not from the regression line, as it is an extreme outlier and a very small industry in terms of employment. Removing it from the figure makes it easier to display the variation in the data for the remaining industries.

[27] The industry observations are weighted by $n_j^{2002} n_j^{2004} \Big/ \left(n_j^{2002} + n_j^{2004} \right)$ where n_j is the number of workers in industry j in the indicated year.

[28] Equation 2 includes industry fixed effects, which implies that non-traded industries experience no tariff change.

expect that their inclusion in the analysis would dampen the effects of the BTA. As expected, the inclusion of non-traded sectors dampens the magnitude of the coefficient relative to the estimate based on the traded sector alone, although the coefficient continues to be positive and statistically significant. Lastly, in column 3 we estimate equation 2 for the manufacturing sector, a sample that is more comparable to the samples used in most studies of labor reallocation in response to trade reform. The estimated coefficient suggests that the average reduction in manufacturing tariffs of 30.3 percentage points is associated with a 5.0 percentage point reduction in the probability of employment in a household business in that industry.[29]

5.2 Falsification Test

The above results are not driven by differential employment trends across industries that differ in their propensity to organize production in household businesses nor do they capture pre-existing industry-specific trends in the incidence of household business employment. As discussed in Section 3, the industry changes in U.S. tariffs are not related to initial industry conditions, such as the share of household business workers within an industry or industry skill intensity, nor pre-BTA growth in exports to the U.S. A falsification test that uses two rounds of data covering a pre-reform period further finds no evidence that changes in industry tariffs are correlated with pre-existing trends in household business employment across industries. We perform this test using information from the 1993 and 1998 Vietnam Living Standards Surveys (VLSSs). [30] The employment module for the 1993 VLSS does not separately identify employment in a household business from employment in a private sector business.[31] Consequently, we use an indicator for being self-employed as the dependent variable. This indicator is highly correlated with the indicator for working in a household business in the 2002 and 2004 surveys that contain the needed data to construct both measures.

We begin by estimating equation 2 with the indicator for self-employment as the dependent variable using data from 2002 and 2004 VHLSSs to examine the effect of tariffs on self-employment during the period of the BTA's actual implementation. The estimated coefficients on tariffs are presented in columns 1-3 in the top panel of Table 6. The coefficients are positive, statistically

[29] These results are robust to controlling for Vietnam's BTA tariff reduction commitments, which are concentrated in agriculture and the processing of food and beverages. The estimated coefficient on U.S. tariffs is 0.171, 0.130, and 0.188 on traded, all, and manufacturing industries respectively, all of which remain statistically significant at the 1 percent level.

[30] The 1993 and 1998 VLSSs are based on the same sampling framework, which differs from the sampling framework used on the 2002 and 2004 VHLSSs.

[31] Vietnam did not make a legal distinction between household businesses and private enterprises at this time.

significant, and of similar magnitudes as the coefficients on tariffs obtained in the corresponding regressions that use the indicator for household business employment as an outcome variable reported in Table 5. The similar magnitude of the coefficients suggests that movement out of working for household businesses reflects both movements from self-employment and movement from working for another household's business, although movements out of self-employment play a slightly stronger role in manufacturing.

In the falsification test, we use two-rounds of pre-reform data (1993 and 1998) and assign the pre-BTA tariffs (Column 2 tariffs in 2001) to the 1993 data and the post-BTA tariffs (MFN tariffs in 2004) to the 1998 data. If pre-existing trends in household business employment were correlated with industry-specific U.S. tariff cuts, this specification would yield estimates of tariff coefficients of the same sign and similar magnitude to the coefficients obtained in the corresponding analysis using data surrounding the actual policy change. The results are presented in the bottom panel of Table 6. The estimated coefficients on tariffs are close to zero in magnitude, always statistically insignificant, and differ from the estimates of the corresponding coefficients based on data surrounding the period when BTA was actually implemented.[32] Underlying trends therefore cannot account for the strong relationship between the U.S. tariff reductions and the decrease in the probability of working for a household business that are reported in Table 5 and the top panel of Table 6, further validating the identification strategy.[33]

5.3 Heterogeneity in Worker Responses to Tariff Declines

The results show that large BTA-induced declines in industry-specific export costs decrease the probability that Vietnamese workers work for a household business, leading to a reallocation of

[32] The industry codes between the 1993 and 1998 VLSSs do not perfectly match. In particular, 2-digit ISIC revision 3 industries 31 and 32, 34 and 35, and 30 and 33 were merged together since the 1993 VLSS used a more aggregate industry definition in these instances. Additionally, industries 17 and 18 and 20 and 36 have also been merged since the 1998 VLSS appears to have switched assignment of some workers in some of these industries. The low point estimates of the tariff coefficient and the lack of statistical relationship in the validation test do not simply reflect higher level of aggregation. When we estimate the effects of the actual tariffs cuts with data surrounding the reform using industries and industry tariffs defined at this more aggregate level (i.e. specifications that mimic those reported in top panel of Table 6), we continue to obtain positive and statistically significant coefficients on tariffs (.198 (.014) for traded in column 1, .11 (.038) for all in column 2, and .12 (.016) for manufacturing in column 3).

[33] In the 1998 VLSS, where we do have sufficient information to disentangle working for a household business and working for a private enterprise business, among workers age 20 to 64, 83.0 percent of workers work for a household business either as the owner or as an employee. Only an additional 2.4 percent of workers work for a private enterprise business. When we repeat the analysis in Table 6 using this indicator as a dependent variable, we also find no evidence that variation in industry tariffs induced by BTA is related to pre-existing trends in industry-level household business employment.

workers toward the formal enterprise sector. Aggregate effects explored so far might mask heterogeneity in responses of workers. We explore potential heterogeneity in responses of workers to BTA-induced tariff cuts by location and by several worker characteristics: age, gender, and education.

Vietnamese provinces differ in how integrated they are with international markets and this heterogeneity in part reflects proximity to a major seaport. Provinces closer to major seaports are more internationally integrated and more exposed to export opportunities (World Bank, 2011). For example, the information on the value of manufacturing exports from the 2000 Enterprise Survey suggests that 5 provinces with or near to major seaports (Ho Chi Minh City, Dong Nai, Hanoi, Binh Buong, and Hai Phong) account for over three quarters of reported manufacturing exports. To the extent that export opportunities associated with the BTA differentially increase labor demand in the larger firms operating in the export sector, as noted in the conceptual framework in section 2, one would expect a relatively larger increase in labor demand among firms in the enterprise sector in more integrated provinces. Consistent with this view, McCaig (2011) finds that poverty declined and average wages increased relatively more in provinces with a higher concentration of export-oriented industries at the onset of trade reform. Declines in U.S. tariff cuts on the incidence of household business employment would then be more pronounced in internationally more integrated provinces.

To explore the possible heterogeneity by location we split Vietnam's provinces into two groups based on the median distance from one of Vietnam's three major seaports in Hai Phong, Da Nang, and Ho Chi Minh City. We estimate equation (2) in each sample. The results are presented in Panel A of Table 7. As expected, declines in U.S. tariffs are associated with larger relative declines in household business employment for individuals living in more internationally integrated provinces. While all estimates of the coefficient on tariffs are positive, the magnitudes of the coefficients are substantially larger and always statistically significant in provinces closer to major seaports. The difference in the magnitudes and statistical significance of the estimated coefficient on tariffs is particularly notable in manufacturing, the sector most exposed to the BTA tariff cuts.

We also explore heterogeneity in responses to tariff cuts by worker age, gender, and education. This heterogeneity could stem from differences in mobility costs (see Kovak (2011), Dix-Carneiro (2011), Topalova (2007, 2010)) or it could reflect differential labor demand changes induced by the BTA for different groups of workers. These results are also presented in Table 7. We

split workers into five age cohorts, which we follow over time, and estimate equation (2) separately for each of the cohorts. The probability of working in a household business is falling more for young workers (age 20 to 29 in 2002) in response to the US tariff cuts (column 1) in the trade sector and economy-wide (column 2). The heterogeneity in responses to tariffs by age appears at first less pronounced in manufacturing (column 3). However, the implied share of reallocated young workers is above, while the implied share of reallocated workers in older cohorts is below the predicted share of reallocated workers manufacturing-wide. Gender does not appear to differentially affect the responsiveness of probability of working in a household business to tariff cuts. Estimates of equation (2) by gender in Table 7 suggest that men and women were similarly affected by tariff declines. We also estimate equation (2) separately for three education groups: 0 to 5 years of formal education, 40 percent of the total sample; workers with 6 to 9 years of formal education, which account for 45 percent of the total sample; and workers with 10 or more years of formal education, which account 15 percent of the sample). We consistently find that workers with a medium level of education observed smaller declines in the probability of working for a household business than workers with low and workers with high levels of education.

Workers that live in internationally more integrated provinces, younger workers, and more educated workers are less likely to work in the household business sector to begin with. The results above imply that the BTA-induced tariff cuts further increased the gap in probability of working in a household business between younger and older workers and between workers in provinces that differ in access to international seaports. The gap in the probability of working in a household business narrows between the low and middle education group, and it widens between the middle and the highest education group.

5.4 Longitudinal analysis

The VHLSS resurveyed about 20 percent of the households from 2002 in 2004.[34] Using this smaller longitudinal subsample, we examine the robustness of the results to selection on unobserved individual-level heterogeneity into who moves out of household businesses. We restrict the analysis to individuals ages 20-64 in 2002 that worked in both years. [35] We estimate a version of equation (2):

[34] The household panel is based on a random selection of enumeration areas from the 2002 VHLSS.

[35] In order to be part of the household panel, the household, or at least some of its members, must reside in the same location as in 2002. 9.6 percent of panel individuals that report working in 2002 are not in the sample in

$$H_{ijt} = tariff_{jt} \times \beta + \lambda_j + \theta_t + \alpha_i + \varepsilon_{ijt} \quad (3)$$

where the vector of individual characteristics has been replaced by an individual fixed effect α_i.

To establish comparability with the results from section 5.1, we first estimate equation (2) using the longitudinal subsample. The results are reported in columns 1 to 3 in the top panel of Table 8. The estimated coefficients on tariffs confirm the findings from Table 5. The magnitudes of the coefficients based on the longitudinal sample are somewhat lower than the magnitudes of the corresponding coefficients based on cross-sectional data, but they are not statistically different from each other.[36] The specifications so far use the tariff in a worker's contemporaneous industry at time *t* as a measure of exposure to export cost. In longitudinal data, workers' exposure to export cost shocks can also be measured based on the workers' initial industry of employment, further allowing one to control for sorting of individuals across industries. The middle panel of Table 8 reports estimates of equation (2) based on the tariffs associated with the worker's initial industry of employment. The magnitudes of the coefficient on tariffs are similar to those obtained in the top panel of the Table 8 with the contemporaneous industry tariff. In the remainder of this section, we measure workers' exposure to export cost shock through the initial industry of employment.

The empirical strategy so far compared effects of tariff declines on workers with the same observable characteristics within provincial labor markets, some of whom worked in industries that experience large tariff cuts and others who worked in industries with smaller tariff cuts. The specification in equation (3) includes worker fixed effects, directly controlling for time-invariant individual-level heterogeneity in unobserved worker characteristics that might influence selection of workers into industries and the propensity to switch employers, while being simultaneously spuriously correlated with industry tariff changes. The estimates from this specification are reported in columns 1-3 in the bottom panel of Table 8 and confirm the existing findings. Individuals initially working in industries that experience larger tariff cuts face greater declines in

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2004. The attrited individuals are more likely young and better educated, and were more likely employed in the enterprise sector, in industries that received larger tariff cuts, and by an enterprise in industries that received larger tariff cuts in 2002. The attrition might thus bias the coefficient on tariff in the panel estimation downward toward zero, increasing the likelihood we find no relationship between the incidence of household business employment and tariffs.

[36] Lower magnitudes of the coefficients based on longitudinal subsample could reflect attrition and slight differences in the composition of the longitudinal and cross-sectional samples. As discussed earlier, attrition could potentially bias our estimates downward. Second, to track the same individuals over time, the longitudinal sample includes individuals based on initial age (ages 20-64 in 2002), not contemporary age and excludes individuals that enter or exit the workforce because we only have one observation for their work status.

the probability of working for a household business. The inclusion of individual fixed effects somewhat reduces the estimate of the coefficient on tariffs. For example, the magnitude of the coefficient on tariffs for traded sectors falls from .14 to .11, implying that a 21.1 percentage point decline in tariffs was associated with 2.3 percentage point decline in the probability that a worker works for a household business. In manufacturing, the coefficient on tariffs drops from .18 to .09. This implies that a 30.3 percentage point decline in tariffs is associated with a 2.6 percentage point decline in the probability of working for a household business. Thus, even after we measure workers' exposure to export tariff shocks through their initial industry affiliation and account for unobserved time-invariant individual heterogeneity, lower costs of exporting are associated with the reallocation of workers from household businesses to employers in the enterprise sector, although the magnitudes of the effects are attenuated.

5.5 Implications for Industry Employment

The results suggest that industries that experienced larger tariff declines observed a greater expansion of employment among employers in the enterprise sector. One implication of this finding is that within the enterprise sector, the structure of industry employment should shift toward industries subject to greater drops in U.S. tariffs on exports. We examine this relationship in the following specification:

$$s_{jt} = \alpha + \beta tariff_{jt} + \lambda_j + \gamma_t + \varepsilon_{jt} \qquad (4)$$

where s_{jt} is the share of industry j at time t in total employment of the enterprise sector and $tariff_{jt}$ is the U.S. tariff faced by exports from industry j at time t. We estimate equation 4 with industry employment shares obtained from the Enterprise Survey, which covers all firms in the enterprise sector.[37] The results are presented in Panel A of Table 7. The negative estimates of the coefficients on tariffs suggest greater expansion in industry employment in industries with larger tariff cuts. The coefficient estimate for the traded sector in column 1 implies that an industry that experienced a 21.1 percentage point decline in U.S. tariffs, observed a 0.54 percentage point increase in industry share of employment, which represents an annual average increase of 6 percent from the mean industry employment share over a period of 3 years.

The enterprise sector could either grow because workers are leaving jobs at household businesses and finding employment with employers in the enterprise sector or because existing

[37] To match the timeframe of this data closely to the VHLSS, we use end of year firm-level employment in 2000 and 2003. We aggregate firm-level information to compute employment shares at the industry level.

household businesses are formalizing and registering as private enterprises. Detailed analysis of this issue is beyond the scope of this paper, but additional evidence suggests that the majority of workers moving from the household business sector to the enterprise sector appear to be doing so by finding a new job.[38]

Interestingly, although neoclassical trade theory predicts that net employment should expand in industries receiving the largest tariff cuts on exports, the magnitude of the coefficients on tariffs is virtually zero and always statistically insignificant when we consider changes in the overall industry structure of employment. These results, based on estimating equation (4) with industry's employment share in total employment (i.e. employment in household businesses and enterprises), s_{jt} as a dependent variable, are presented in the bottom panel of Table 9. The findings for Vietnam are consistent with the literature on the lack of statistically significant changes in the structure of industry employment in response to large trade liberalizations (Goldberg and Pavcnik (2007), Topalova (2010), Currie and Harrison (1997), Wacziarg and Wallack (2004). In addition, the magnitude of the coefficients in the bottom panel is at least an order of magnitude lower than the magnitude obtained based on the enterprise sector. While this could in part owe to smaller sample sizes of the VHLSS than the Enterprise survey, the lack of relationship between export expansion and overall industry employment highlights the importance of taking into account differential responses to tariff cuts across employers in the enterprise and household business sector. As noted by Bernard, Redding, and Schott (2007), one might expect expansion of net industry employment to be more responsive to tariff cuts among the employers in the enterprise sector, which might more directly benefit from the tariff cuts.[39]

5.6. Worker allocation and Aggregate Output in Manufacturing

The reallocation of workers from household businesses to firms in the enterprise sector has potential implications for aggregate output. We follow the macroeconomic growth literature to

[38] First, summary statistics suggests little mobility of household businesses to the enterprise sector. During this period, the number of registered private enterprises increased significantly, from about 35,000 in 2000 to about 84,000 in 2004 (Malesky and Taussig, 2009). Although this is an impressive growth in the number of private enterprises, it is only a small fraction of the estimated 6 to 7 million operating household businesses during this period (McCaig and Pavcnik, 2013). Second, our panel dataset of workers allows us to track movements of workers that would be consistent with a household business becoming a private enterprise. We can do this for workers that worked for another household's business in 2002. By 2004 10.6 percent of these workers had moved to the enterprise sector and 29.5 percent of these movers had moved to a private enterprise in the same industry, which is consistent with the business they worked for transitioning from a household business to a private enterprise.

[39] For example, products produced by firms in household businesses might not be well substitutable for the products produced by the firms in non-household businesses that are more likely to be exported.

assess the potential impact. Consider an industry composed of two types of firms, household businesses and enterprises, which differ in their underlying labor productivity. A standard decomposition formula from the economic growth literature attributes the change in aggregate labor productivity between two time periods to productivity change owing to changes in average labor productivity within each type of firm and productivity change stemming from the reallocation of labor across the two firm types. More formally,

$\Delta P_t = \sum_h \Delta p_{ht} E_{ht} + \sum_h p_{ht-1} \Delta E_{ht}$, where P_t is the aggregate labor productivity at time t,

p_{ht} is productivity of firm type h at time t, and E_{ht} is the share of firm h type employment in total employment. The first term captures the change in aggregate labor productivity owing to the change in labor productivity within a h-type firm, while the second term captures the productivity change owing to reallocation of labor across the two firm types.

We use this framework to calculate the contribution of labor reallocation from household businesses to the enterprise sector induced by the BTA to labor productivity within the manufacturing sector. The coefficient on the industry tariff in column 3 of Table 5 implies that the BTA reallocated 5.3 percent of the manufacturing workforce from household businesses to enterprises between 2001 and 2003. Within manufacturing, the average productivity in the enterprise sector is about 10 times higher than in the household business sector (185 million dong vs. 18.9 million dong per employee in 2004 prices). Holding the level of productivity in each type of firm in 2002 constant, the reallocation of labor due to the BTA increased productivity by 5.6 percent per year.[40] If this analysis is performed based on the reallocation suggested in the specifications from the panel regression in column 3, of Table 8 (Panel C), the estimates are halved.

The above calculations compute marginal productivity of labor based on the common practice in macroeconomic growth literature (see for example Caselli (2005), Gollin, Lagakos, Waugh (2012). We also use an estimate of marginal productivity of labor based on the coefficient from the Mincerian regression of log wages on an indicator for whether a worker works for a household business. Workers working for a household business earn about 14 percent less than observationally

[40] The large productivity differences within the manufacturing sector between enterprises and household businesses may in part be due to compositional differences in the manufacturing industries in which household businesses and enterprises are more likely to operate. However, a calculation performed just for one important manufacturing industry, apparel, suggests similar effects. Initial productivity is about five times greater in apparel enterprises than apparel household businesses. The BTA induced reallocation of workers increased productivity by 8.0 percent per year within the apparel industry.

equivalent workers working in the same industry, province, and occupation. [41] Controlling for unobserved worker characteristics, workers that switch to work for an enterprise tend to earn 5 percent more than when they work for a household business.[42] This estimate is the lower bound on the earnings gap because individuals working for household businesses are also substantially less likely to receive benefits from their employer. This approach suggests annual productivity increase owing to reallocation ranging from .9 % to 5 %.

6. Conclusion

Vietnam provides an excellent setting to examine how export opportunities affect the reallocation of employment across employers in a poor country, where a majority of workers are employed in household businesses. We find that the reallocation of labor from household businesses to employers in the enterprise sector in Vietnam provides an important margin of adjustment to new exporting opportunities. Industries that face better export opportunities (as measured by larger declines in tariffs on Vietnamese exports to the U.S.) observe a greater reduction in the incidence of household business employment, with workers in more internationally integrated provinces and in younger cohorts responding more strongly. In addition, relative industry employment increased in the enterprise sector in industries that benefited more from expanded export opportunities (as measured by declines in tariffs on Vietnamese exports to the U.S.).

Our results complement the existing literature on labor reallocations among larger firms in response to trade based on conventional firm-level or matched employee-employer data sets covering the manufacturing sector (Levinsohn (1999), Menezes-Filho and Muendler (2011), Krishna, Poole, and Senses (2012)). The lack of data on household business employment would, for example, miss 66 to 80 percent of employment in manufacturing in countries such as Vietnam and India. Our study suggests that even though household business employment is not directly affected by exporting opportunities, it contracts via the general equilibrium effects of trade operating through the labor demand channel.

[41] This number reflects the estimated coefficient on the indicator for working for a household business in a Mincerian regression that regresses log wages on a household business indicator, worker characteristics, urban indicator, year indicator, industry and province fixed effects.

[42] In a cross-section, this dimension of employer heterogeneity alone accounts for 3 percent of the explained variation in log wages across workers. For comparison, all included worker characteristics can jointly account for 11 percent of the explained variation in log wages, industry affiliation accounts for 15 percent, while geographic location accounts for 21 percent of the variation.

Our results also relate to the literature on firm heterogeneity and aggregate output differences in developing countries. Several recent studies (see, for example, Hsieh and Klenow (2009, 2011)) emphasize the implications of misallocation of resources across heterogeneous firms for aggregate output and productivity and the prevalence of small, unproductive firms in poor economies. Our study shows that the elimination of a product market distortion, such as export market liberalization, induces a movement of labor away from household businesses, which tend to be less productive and pay lower wages for observationally equivalent workers, to larger, more formal firms. Elimination of such distortions in export markets might thus lead to aggregate productivity gains through the reallocation of labor toward more productive uses.

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Appendix B: Productivity Calculation Description

In this appendix we describe our procedure for estimating the average productivity gains in manufacturing associated with the reallocation of labor from household businesses to enterprises in response to the U.S.-Vietnam Bilateral Trade Agreement. Specifically, we explain (1) how we calculated revenue per worker using the 2002 VHLSS and the 2001 enterprise dataset, (2) how we estimated the share of workers reallocated from household businesses to enterprises, and (3) how we subsequently calculated the associated productivity gains.

Calculating revenue per worker

All revenue values are converted to January 2004 Dong. For the VHLSS data, household business revenue is converted to January 2004 prices using monthly CPI data based on the month of interview. For the enterprise data we convert from mid-year (i.e., July 2001) to January 2004 using monthly CPI.

For the 2002 VHLSS we calculate revenue per worker by calculating the sum of revenue from all household businesses and divide by the estimated number of workers in household businesses for their primary job.[43] We do not include information on workers engaged in household businesses for non-primary jobs as this information was not collected in the 2002 VHLSS. As such, our estimate of revenue per worker is likely an overestimate of the true value for two reasons. First, our estimate of aggregate revenue from household businesses includes some private enterprises since the business module of the 2002 VHLSS covers *all* businesses operated by the household and does not allow us to distinguish private enterprises from household businesses. Second, a non-trivial number of workers are involved in household businesses for jobs other than their primary job. Both issues would lead to an overestimate of revenue per worker in the household business sector.

For the 2001 enterprise data we calculate revenue per worker within each enterprise based on total annual revenue divided by total employment at year end. Aggregate revenue per worker within the enterprise sector is the employment weighted sum of revenue per worker over all enterprises.

[43] Both estimates are weighted using survey sampling weights.

The reallocation of workers

We estimate the share of manufacturing workers reallocated from household businesses to enterprises based on the estimated coefficient -0.164 from column 3 of Table 3:

$$s_e^{BTA} = \sum_j -0.164 \Delta\tau_j s_j$$

where $\Delta\tau_j$ is the change in tariff for industry j and s_j is industry j's average share of employment within manufacturing over the 2002 and 2004 VHLSSs.

Associated productivity gains

We present three estimates of the productivity gains from workers moving from the household business sector to the enterprise sector within manufacturing.

The first estimate is based on assuming marginal productivity is equal to average productivity in both sectors. The productivity gain is calculated holding productivity levels within the household business and enterprise sectors at their initial levels and then adjusting the share of workers in each sector according to the share of workers reallocated from household businesses to enterprises within manufacturing due to the BTA:

$$\frac{\left(1-s_{hb,2001}+s_e^{BTA}\right)rpw_{e,2001}+\left(s_{hb,2001}-s_e^{BTA}\right)rpw_{hb,2001}}{\left(1-s_{hb,2001}\right)rpw_{e,2001}+s_{hb,2001}rpw_{hb,2001}}-1$$

where $rpw_{e,2001}$ is revenue per worker in the enterprise sector in 2001, $rpw_{hb,2001}$ is revenue per worker in the household business sector, and $s_{hb,2001}$ is the share of workers in manufacturing that work for enterprises.

The second estimate is based on assuming that marginal productivity equals average productivity in the household business sector and that the marginal productivity of a worker that leaves the household business sector for the enterprise sector increases by 14 percent relative to their productivity in the household business sector (based on Mincerian wage regressions described in the paper). Under these assumptions the productivity gain is given by:

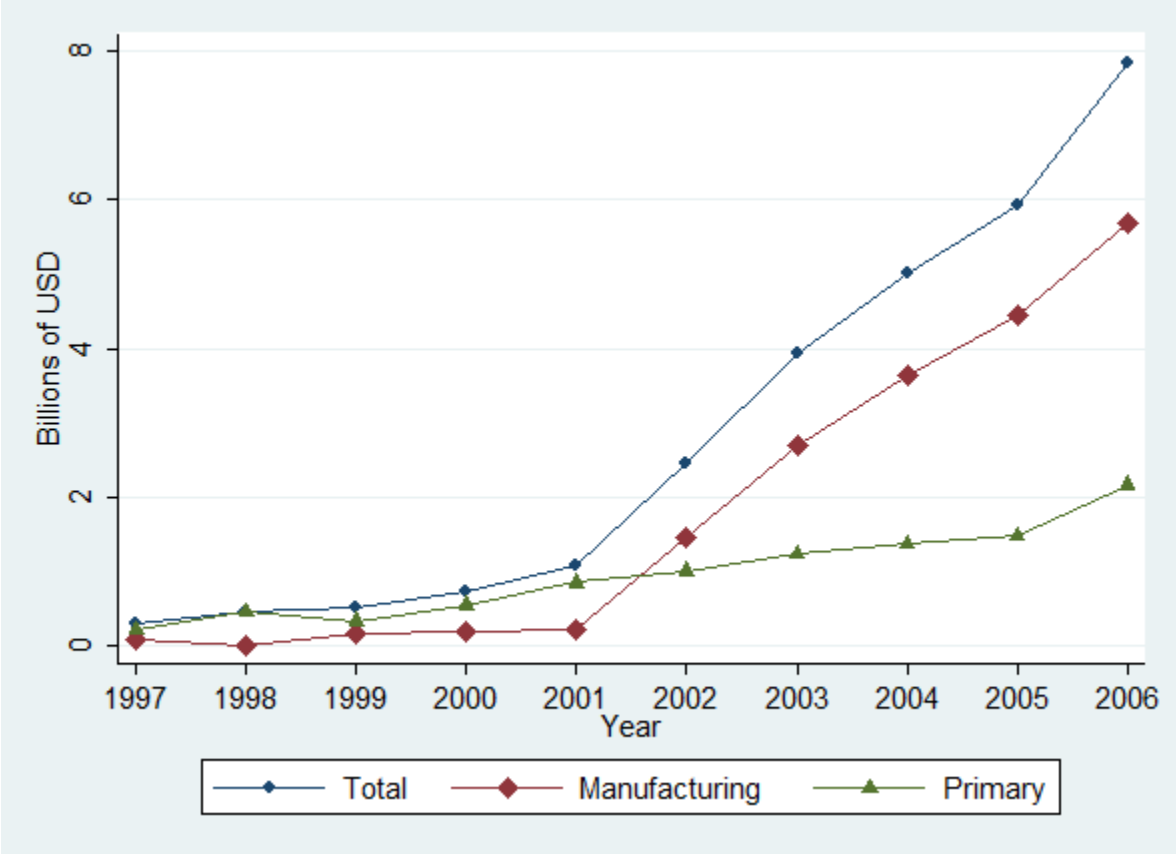
$$\frac{\left(1-s_{hb,2001}\right)rpw_{e,2001}+s_e^{BTA}\left(1.14rpw_{hb,2001}\right)+\left(s_{hb,2001}-s_e^{BTA}\right)rpw_{hb,2001}}{\left(1-s_{hb,2001}\right)rpw_{e,2001}+s_{hb,2001}rpw_{hb,2001}}-1.$$

The third estimate is based on assuming that marginal productivity equals average productivity in the enterprise sector and that the marginal productivity of a worker that leaves the

household business sector for the enterprise sector is 14 percent lower than the average productivity in the enterprise sector. Under these assumptions the productivity gain is given by:

$$\frac{\left(1-s_{hb,2001}\right)rpw_{e,2001}+s_e^{BTA}\left(rpw_{e,2001}/1.14\right)+\left(s_{hb,2001}-s_e^{BTA}\right)rpw_{hb,2001}}{\left(1-s_{hb,2001}\right)rpw_{e,2001}+s_{hb,2001}rpw_{hb,2001}}-1\,.$$

Figure 1: Value of Vietnamese exports to the U.S., 1997 to 2006



Notes: Authors' calculations from COMTRADE.

Figure 2: Share of the United States in Vietnam's Exports

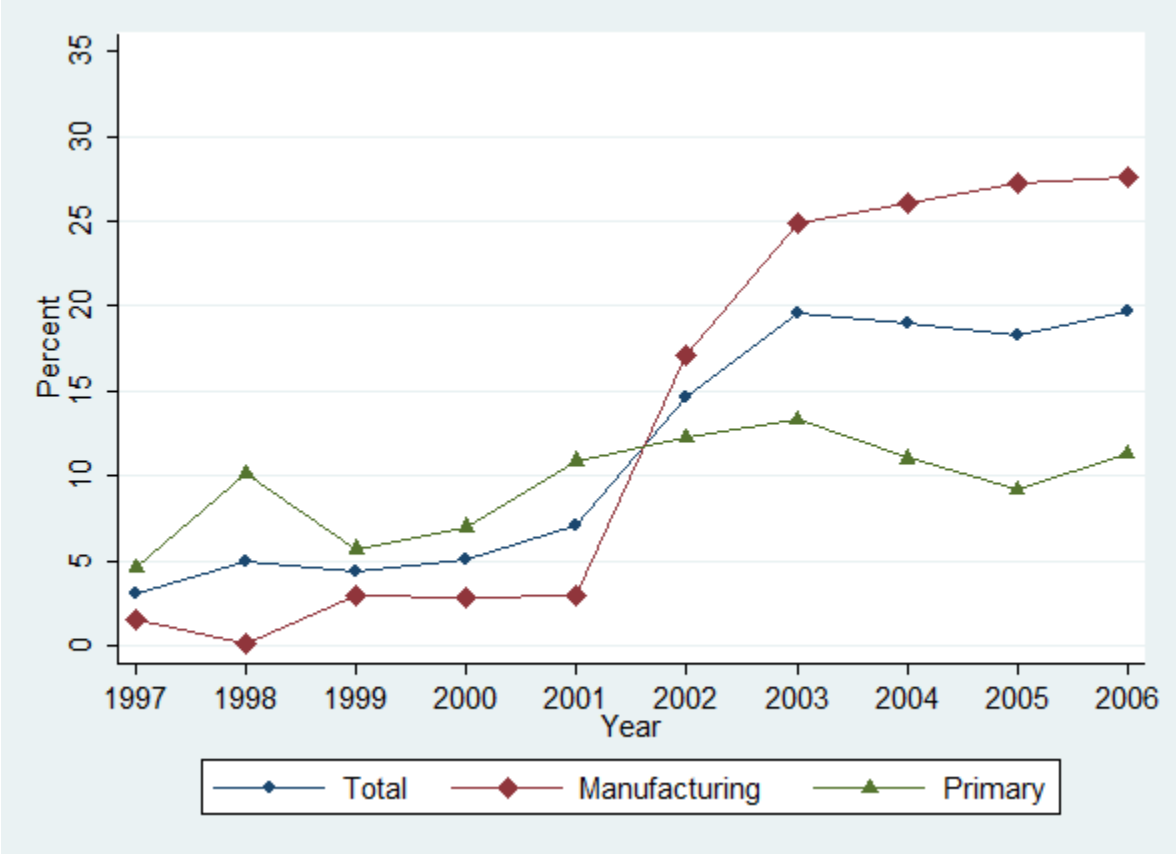
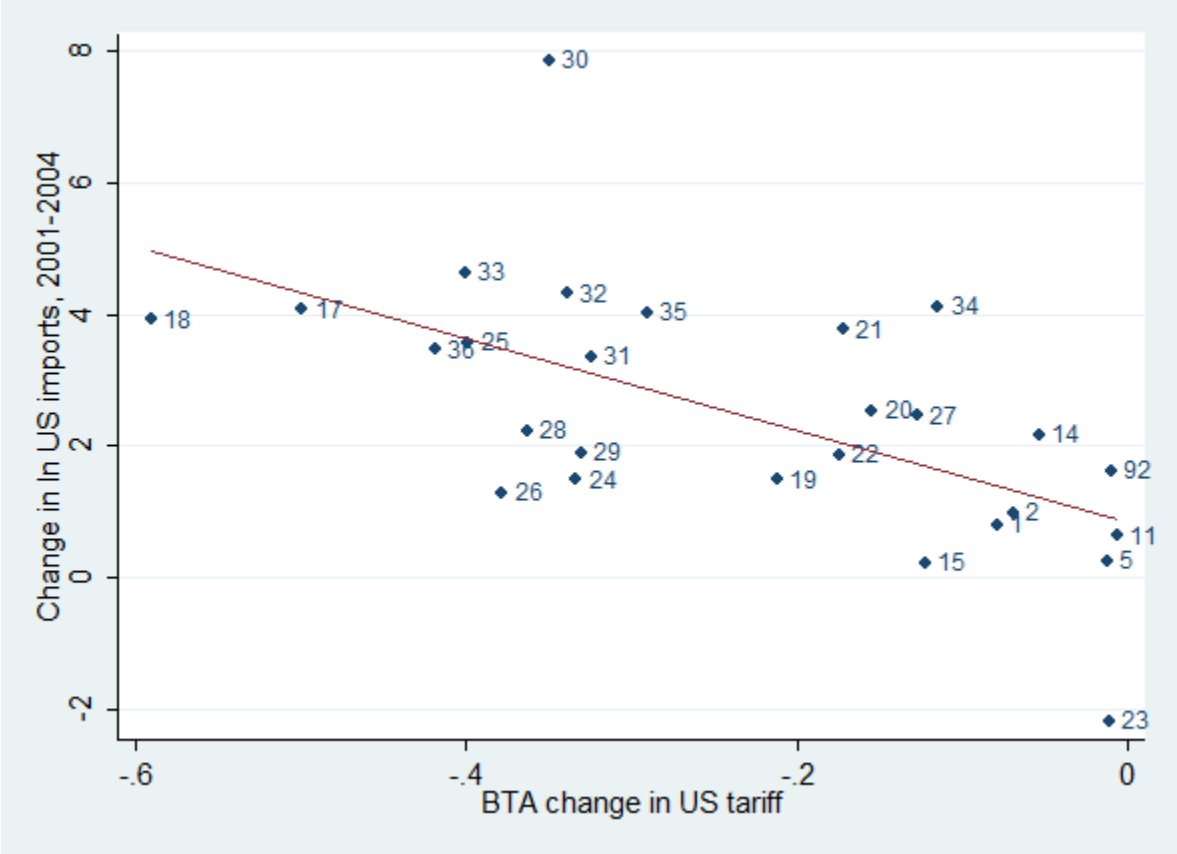
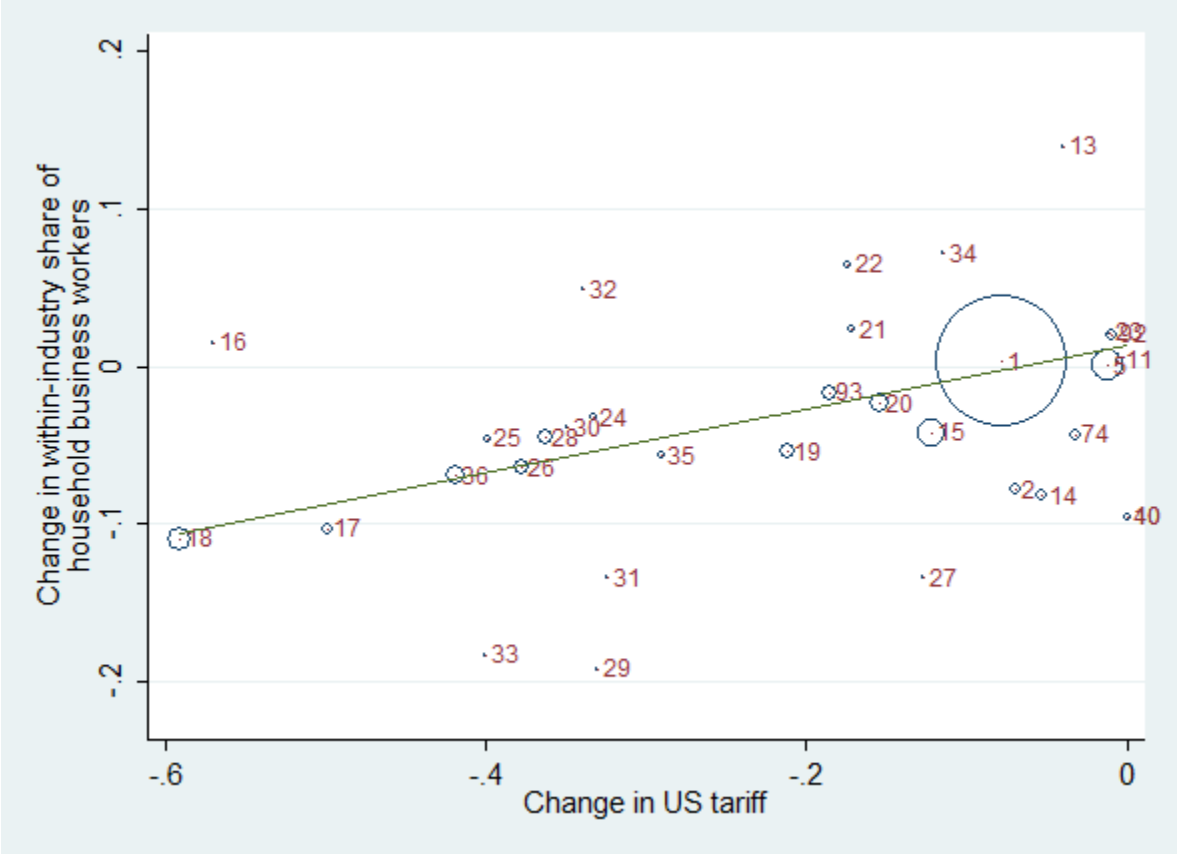


Figure 3: Growth of Vietnamese exports to the US versus US tariff cuts by industry



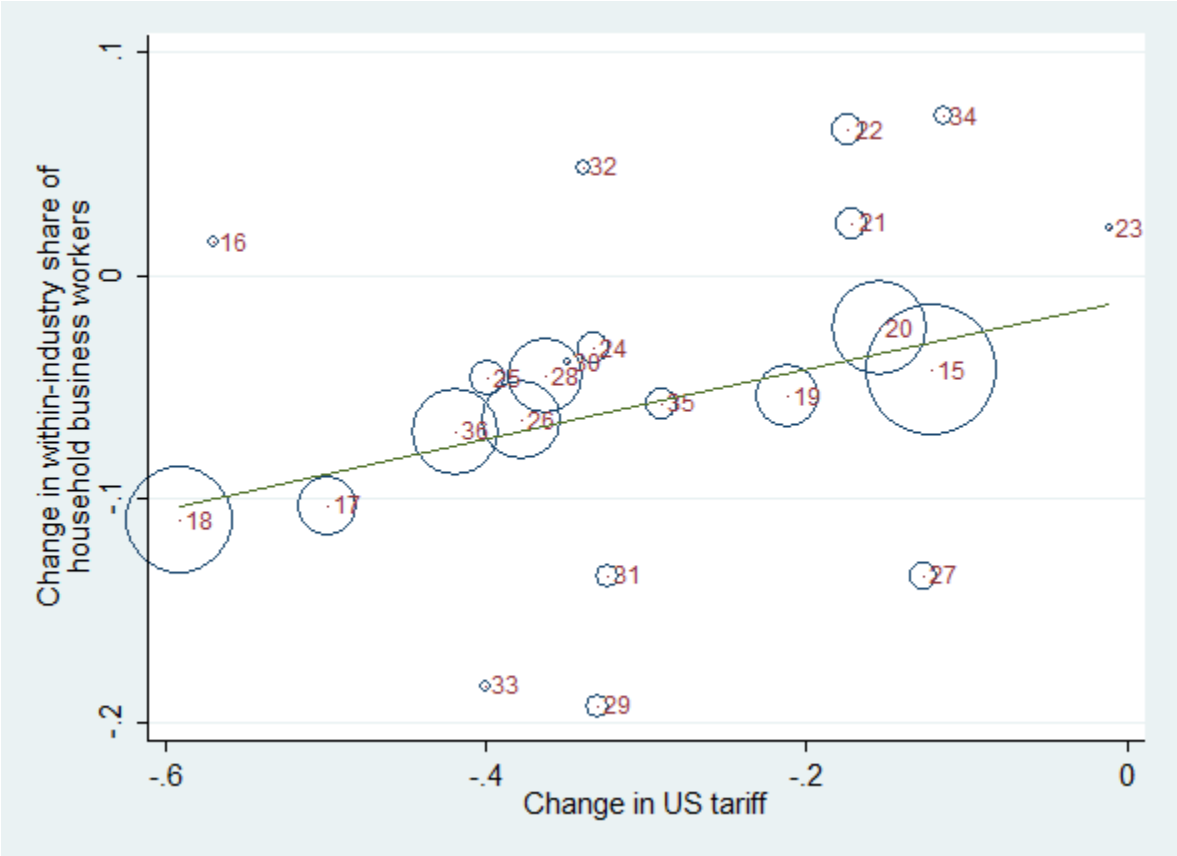
Notes: The industry codes correspond to ISIC revision 3.

Figure 4: Change in share of household business workers and U.S. tariff reductions



Notes: The bubble sizes represent the weight given to the industry in the plotted regression line. See text for explanation. The industry codes correspond to all traded industries in ISIC revision 3.

Figure 5: Change in share of household business workers and U.S. tariff reductions, manufacturing industries



Notes: The bubble sizes represent the weight given to the industry in the plotted regression line. See text for explanation. The industry codes correspond to ISIC revision 3.

Table 1: Summary of U.S. tariffs applied to imports from Vietnam

Industry	Number of industries	Mean pre-BTA tariff (Column 2)	Mean post-BTA tariff (MFN)	Mean change in tariff	Standard deviation of tariff change
Traded industries	34	0.234	0.024	-0.211	0.179
All industries	60	0.133	0.013	-0.119	0.170
Manufacturing	22	0.338	0.034	-0.303	0.153

Notes: The tariffs reported are simple averages across the indicated set of industries. Non-traded industries, which are included in "All industries" have been assigned a tariff of 0 both before and after the BTA.

Table 2: Share of employment in household businesses

	All	Excluding agriculture and fisheries	Manufacturing
Panel A: Share of employment in household businesses			
2002	0.847	0.672	0.657
2004	0.814	0.626	0.601
Panel B: Decomposing changes in household business employment			
Within industries	-0.017	-0.040	-0.059
Between industries	-0.016	-0.006	0.003
Total	-0.033	-0.046	-0.056

Notes: Authors' own estimates based on the 2002 and 2004 VHLSSs. Based on workers aged 20 to 64 inclusive. Survey sampling weights included.

Table 3: Employment in Household Businesses and Tariffs

	(1) Traded	(2) All	(3) Manufacturing
Tariff	0.210***	0.125***	0.164***
	(0.0140)	(0.0341)	(0.0204)
Age	0.00227	0.00176	0.0168***
	(0.00319)	(0.00227)	(0.00431)
Age squared	-1.69e-05	-1.13e-05	-0.000136***
	(3.16e-05)	(2.30e-05)	(4.57e-05)
Indicator for primary education	0.00363	0.00240	-0.00972
	(0.00384)	(0.00205)	(0.0209)
Indicator for lower secondary education	-0.00648	-0.00963	-0.0686**
	(0.00489)	(0.00835)	(0.0245)
Indicator for upper secondary education	-0.0802**	-0.106***	-0.223***
	(0.0388)	(0.0385)	(0.0412)
Indicator for female	0.00111	0.000770	-0.0167
	(0.00551)	(0.00613)	(0.0229)
Indicator for ethnic minority	0.00355	0.00257	0.0403
	(0.00328)	(0.00361)	(0.0267)
Rural indicator	0.0484**	0.0450***	0.0766***
	(0.0203)	(0.0114)	(0.0208)
Industry fixed effects?	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Number of industries	34	60	22
Observations	176,546	248,793	27,072
R-squared	0.415	0.591	0.293

Notes: Standard errors are clustered at industry level; ***, **, and * denotes significance at 1, 5, and 10 percent level, respectively. The sample is restricted to workers between the ages of 20 and 64 inclusive at the time of the survey. Column (1) includes all traded industries, column (2) includes all industries, and column (3) includes all traded manufacturing industries.

Table 4: Falsification test of the relation between tariffs and self-employment

	(1) Traded	(2) All	(3) Manufacturing
	Reform Period		
Tariff	0.212***	0.127***	0.201***
	(0.0409)	(0.0396)	(0.0510)
Industry fixed effects?	Yes	Yes	Yes
Province fixed effects?	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes
	Pre-reform Period (1993-1998)		
Tariff	0.0360	0.0142	-0.00480
	(0.0337)	(0.0350)	(0.102)
Industry fixed effects?	Yes	Yes	Yes
Province fixed effects?	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes

Notes: Standard errors are clustered at industry level; ***, **, and * denotes significance at 1, 5, and 10 percent level, respectively. The dependant variable is an indicator for whether an individual is self-employed. In the lower panel, the pre-BTA tariffs (Column 2 rates in 2001) are assigned to industries in 1993 and the post-BTA tariff (MFN rates in 2004) are assigned to industries in 1998. All regressions include the following worker characteristics: age, age squared, education level indicators, female indicator, ethnic minority indicator, and rural indicator.

Table 5: Employment in Household Business and Tariffs by Age, Gender, Education, and Location

Sample of workers	(1) Traded	(2) All	(3) Manufacturing
Panel A: Location			
Less than the median distance	0.227***	0.140***	0.191***
from a major seaport	(0.0215)	(0.0340)	(0.0273)
At least the median distance	0.149***	0.0670*	0.0609
from a major seaport	(0.0335)	(0.0381)	(0.0446)
Panel B: Age			
Age 20 to 29 in 2002	0.328***	0.220***	0.178***
	(0.0508)	(0.0425)	(0.0621)
Age 30 to 39 in 2002	0.139***	0.0780***	0.0852***
	(0.0196)	(0.0291)	(0.0224)
Age 40 to 49 in 2002	0.125***	0.0385	0.148***
	(0.0295)	(0.0414)	(0.0384)
Age 50 to 59 in 2002	0.113*	0.0381	0.165*
	(0.0648)	(0.0635)	(0.0867)
Age 60 to 64 in 2002	-0.0211	-0.0694	-0.136
	(0.109)	(0.0855)	(0.180)
Panel C: Gender			
Males	0.230***	0.101*	0.164**
	(0.0387)	(0.0528)	(0.0603)
Females	0.197***	0.147***	0.164***
	(0.0178)	(0.0219)	(0.0340)
Panel D: Education			
5 or fewer years of education	0.269***	0.177***	0.192***
	(0.0365)	(0.0462)	(0.0407)
6 to 9 years of education	0.177***	0.106**	0.145***
	(0.0177)	(0.0402)	(0.0307)
10 or more years of education	0.212***	0.123***	0.189***
	(0.0353)	(0.0364)	(0.0574)

Notes: Standard errors are clustered at industry level; ***, **, and * denotes significance at 1, 5, and 10 percent level, respectively. The table shows the estimated coefficient on industry tariffs from regressing an indicator for working in a household business for the indicate sample. All regressions include the usual controls for worker characteristics, and province, industry, and year fixed effects as in Table 3.

Table 6: Household business employment and tariffs, panel-level analysis

	Coefficient on industry tariff		
	Traded	All	Manufacturing
Tariff based on contemporary industry	0.152***	0.0748**	0.164***
	(0.0256)	(0.0319)	(0.0552)
Tariff based on initial industry	0.144***	0.0633**	0.180***
	(0.0196)	(0.0294)	(0.0493)
Tariff based on initial industry, with individual fixed effects	0.111***	0.0440*	0.0867**
	(0.0301)	(0.0240)	(0.0418)

Notes: Standard errors are clustered at industry level; ***, **, and * denotes significance at 1, 5, and 10 percent level, respectively. The sample is based on workers age 20 to 64 as of the 2002 VHLSS that reported working in the 2002 and 2004 VHLSSs. The groupings into traded, all, and manufacturing are based on the initial industry of employment reported in the 2002 VHLSS. All regressions that do not include individual fixed effects include individual covariates (age, age squared, education levels, gender, ethnic minority status, urban indicator, and province fixed effects). All regressions include industry and year fixed effects.

Table 7: Industry Employment and Tariffs

Dependent variable: Share of industry employment in the indicated set of industries

	(1) Traded	(2) All	(3) Manufacturing
Panel A: Enterprise Sector (Enterprise Survey Data)			
Tariff	-0.0254**	-0.0105*	-0.0235
	(0.0114)	(0.00540)	(0.0174)
Observations	66	110	44
R-squared	0.986	0.992	0.993
Panel B: Overall Employment (VHLSS Data)			
Tariff	-0.00445	-0.000137	0.00410
	(0.00557)	(0.00256)	(0.0336)
Observations	68	120	44
R-squared	1.000	0.998	0.984

Notes: Standard errors are clustered at industry level; ***, **, and * denotes significance at 1, 5, and 10 percent level, respectively. The dependent variable is the share of workers and is calculated as the number of workers in industry j divided by the total number of workers in the respective group. The total number of workers includes workers in (i) traded industries for column (1), (ii) all industries for column (2), and (iii) traded manufacturing industries for column (3). The dependent variable is the share of workers in an industry and is calculated as the number of workers in industry j divided by the total number of workers in the respective grouping. The industry employment shares are based on workers between the ages of 20 and 64 inclusive. All regressions include industry and year fixed effects.

Appendix Table A.1: Growth of Vietnamese exports and BTA tariff chnages

	(1)	(2)	(3)	(4)
Industries	Traded	Manufacturing	Traded	Manufacturing
Destination market	US	US	EU13	EU13
Panel A: Change in ln exports 2001 to 2004				
BTA tariff change	-5.595***	-4.237*	0.375	0.153
	(1.446)	(2.059)	(0.658)	(1.040)
Observations	24	19	24	19
R-squared	0.279	0.116	0.009	0.001
Panel B: Change in ln exports 1997 to 2000				
BTA tariff change	-0.796	0.187	0.388	0.861
	(1.880)	(1.705)	(0.594)	(0.883)
Observations	24	19	24	19
R-squared	0.011	0.001	0.013	0.039

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. We use data on imports from Vietnam as reported by the U.S. and EU13 (EU15 excluding Belgium and Luxembourgh for which data was not consistently available) in UNComtrade. We exclude industries for which imports were 0 for any of the years.

Appendix Table A.2: Descriptive statistics

	All		Pre BTA Round		Post BTA Round	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Self-employed	0.686	0.464	0.701	0.458	0.672	0.469
Worked in a household business	0.830	0.375	0.847	0.360	0.814	0.389
Work in a household business or without benefits in a larger firm	0.850	0.357	0.862	0.345	0.838	0.368
Indicator for urban	0.239	0.427	0.240	0.427	0.238	0.426
Age	37.8	11.1	37.4	11.0	38.3	11.1
Indicator for female	0.505	0.500	0.507	0.500	0.503	0.500
Indicator for ethnic minority	0.123	0.328	0.121	0.326	0.124	0.329
Indicator for primary education	0.264	0.441	0.275	0.447	0.252	0.434
Indicator for lower secondary education	0.438	0.496	0.437	0.496	0.439	0.496
Indicator for upper secondary education	0.247	0.432	0.233	0.423	0.261	0.439
Indicator for agriculture, forestry and aquaculture	0.542	0.498	0.561	0.496	0.524	0.499
Indicator for manufacturing	0.123	0.329	0.118	0.322	0.128	0.334
Indicator for services	0.327	0.469	0.313	0.464	0.341	0.474
Indicator for state sector	0.118	0.322	0.115	0.319	0.120	0.325
Indicator for foreign sector	0.013	0.111	0.010	0.097	0.016	0.124
ln(hourly compensation)	1.368	0.726	1.234	0.791	1.494	0.634
Number of observations	248795		152388		96407	

Notes: The sample consists of all workers from the 2002 and 2004 VHLSS that worked and were 20 to 64 years of age inclusive at the time of the survey. The number of observations for wages are lower: 46,309 and 29,758 in pre-BTA and post-BTA survey round respectively.