Export markets and labor reallocation:

Evidence from the U.S.-Vietnam Bilateral Trade Agreement[1]

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Abstract

Labor mobility plays a key role in how international trade affects worker earnings and for understanding the distributional impacts of international trade. We study labor reallocation in response to new export opportunities in a poor country, where a majority of workers work in small, often household-owned businesses rather than in larger, more formal firms. We examine the effects of the 2001 U.S.-Vietnam Bilateral Trade Agreement (BTA) on the allocation of employment across industries and across employers in Vietnam. Changes in the structure of net employment across industries are related to the changes in export opportunities, especially in the sectors with a comparative advantage and among the formal firms. We find that following the BTA, Vietnam experienced a large decline in employment in small, household businesses, as workers reallocated toward larger firms. The probability of working in household businesses declined most in industries that faced the largest U.S. tariff cuts. These findings are consistent with models of trade with heterogeneous firms which predict that workers will reallocate from small, less productive firms to larger, more formal firms with new exporting opportunities.

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1. Introduction

Labor mobility plays a key role in how international trade affects worker earnings and for understanding the distributional impacts of international trade. Neoclassical trade theory emphasizes labor reallocation across sectors driven by trade based on comparative advantage and the reallocation of output and labor toward sectors with a comparative advantage. Models of trade with heterogeneous firms emphasize the consequences of trade that occur through the within-industry reallocation of labor across heterogeneous firms. These models (Melitz (2003), Bernard, Eaton, Jensen, and Kortum (2003)) suggest that new exporting opportunities will increase the profitability of exporting and expand output and employment in initially bigger, better performing firms, while contracting output and employment in initially smaller, less efficient firms.

In this paper, we examine how new export opportunities affect the allocation of labor across industries and across firms within an industry in a poor country. We examine this issue for the case of Vietnam and the new export market opportunities induced by the U.S.-Vietnam Bilateral Trade Agreement (henceforth, BTA) implemented in December 2001.

The existing literature on the effects of trade on labor reallocation is large. There is evidence that employment reallocates toward sectors experiencing relative demand increases after trade reforms in developed countries such as the United States and Canada as predicted by the comparative advantage models (Grossman (1986), Revenga (1992), Trefler (2004)). However, changes in the structure of employment across industries do not appear related to changes in industry protection in developing countries that implemented large tariff liberalizations during the 1980s and 1990s (see studies surveyed by Goldberg and Pavcnik (2007)). The evidence on how workers adjust to new exporting opportunities and these within-industry adjustments to trade is scarcer. While empirical studies confirm that better firms select to become exporters, that international trade reallocates market share from less to more productive firms within industries, and the aggregate productivity gains associated with this reallocation, the evidence on the reallocation of employment across firms in response to new

export opportunities is limited.[2] The models suggest that the increased exporting opportunities will increase the relative demand for labor and raise wages. Because trade increases the relative profitability of exporting for larger firms (but not smaller firms), the new export opportunities are expected to lead to reallocation of labor from smaller to larger firms within industries as workers lose jobs in smaller firms, and are eventually rehired by larger, more successful firms. Levinsohn (1999) shows that most labor reallocation occurred within industries rather than across industries in the case of Chile.[3] Menezes-Filho and Muendler (2011) is the study most closely related to ours. They find that workers are displaced from industries that face larger tariff cuts, and that larger tariff cuts are associated with transitions out of formal employment into unemployment or out of the labor force. Interestingly, using linked employee-employer data that covers the formal sector they find that more productive firms (i.e., exporters) do not expand employment subsequent to domestic unilateral import tariff liberalization in Brazil.

Our project makes several contributions to this literature on trade and labor reallocation. First, we use detailed nationally representative panel data on households and workers that are well suited to study worker reallocation in a poor country setting. Much of the existing evidence on labor reallocation in developing countries is based on the data sets from manufacturing censuses that usually cover firms with 10 or more employees or, more recently, is based on administrative data with linked employee-employer data. These datasets provide a good source of information for the formal manufacturing sector.[4] However, the use of the matched employee-employer data is not ideal for studying labor reallocation in a developing country context. In countries where linked employee-employer data is available, it is based on administrative records that match administrative data on workers to firm-level census information. The administrative data only cover workers that work for more formal, registered

[2] For evidence on the tariff induced market share reallocations see Pavcnik (2002), Fernandes (2007), Trefler (2004), Bernard, Jensen, and Schott (2007). New export opportunities also induce initially larger or more productive firms to upgrade quality (Verhoogen (2008), Iacovone and Javorcik (2008), upgrade technology (Bustos (2011), and, in some cases, improve productivity (Lileeva and Trefler (2010)). None of these papers directly examine how labor reallocates across firms within industries.

[3] He uses firm-level data from the Chilean manufacturing census.

[4] The firms included in formal manufacturing datasets account for a large share of aggregate output in manufacturing, so omission of smaller firms might not be problematic when studying the effects of trade on output reallocation within industries.

firms. While the omission of employment in less formal businesses is not a concern in developed countries, the coverage of self-employment and employment in household businesses is important in poor economies, where a large share of the workforce is self-employed or works in small household businesses that are not covered by the usual firm-level datasets or administrative data. For example, in Vietnam, 88 percent of all workers and 68 percent of workers in manufacturing are either self-employed or work in a household business that would not be captured in the abovementioned surveys. Vietnam is not unique in the importance of small businesses for employment. Such businesses account for a large share of employment in poor countries such as India (see Nataraj (2011), Hsieh and Klenow (2011)) and the majority of individuals in poor countries rely on employment in small, often household-run businesses as the main source of income (Banerjee and Duflo (2007)).[5] As a result, a study that relied on commonly available administrative matched employee-employer data would exclude the vast majority of the labor force in a poor country. As explained in detail in section 3, an important advantage of the micro-survey data that we use is that it representative of economy-wide employment in all types of employers, including firms in less formal sectors such as self-employment and household businesses. A key contribution of our work is the exploration of economy wide reallocation of workers across employers, especially from household businesses to larger, more formal employers in response to increased foreign market access.[6]

Second, most of the existing work on trade and labor markets in less developed economies focuses on unilateral import tariff liberalizations.[7] We focus on a trade liberalization episode that is consistent with the type of trade liberalization emphasized in most heterogeneous firm models, namely expansion of new exporting opportunities.[8] The BTA reduced tariffs on Vietnamese exports to the U.S. on average by 23.4 percentage points and thus improved export opportunities to the U.S. for Vietnamese firms. The growth in exports to

[5] 80% of Indian manufacturing employment is in the informal sector (Nataraj (2011)).

[6] As a result, we view our study as complementary to the existing studies that usually focus on the formal manufacturing sector or compliance with labor market regulation in urban settings (see, for example, Menezes-Filho and Muendler (2011), Goldberg and Pavcnik (2003)).

[7] See studies surveyed in Goldberg and Pavcnik (2007).

[8] The nature of the reduction in trade costs is thus related to the international shocks studied by Verhoogen (2008), Trefler (2004), and Bustos (2011). Most of the existing work on labor reallocation focuses on the consequences of unilateral import tariff liberalization. See Menezes-Filho and Muendler (2011), Goldberg and Pavcnik (2003), Currie and Harrison (1997), among others.

the U.S. subsequent to the BTA represented a sudden and substantial shock to Vietnam's economy (McCaig (2011)). In particular, Vietnamese exports to the U.S. grew from 5.1 to 20.2 percent of Vietnam's total exports and grew from 2.8 to 13 percent of Vietnam's GDP between 2001 and 2004. The BTA-induced declines in US tariffs lead to increases in wages, especially for the less educated workers, in Vietnamese geographic areas that were more exposed to new exporting opportunities (McCaig (2011)). Given these changes in the Vietnamese economy, it is ex-ante possible that trade would lead to reallocation of labor as suggested in the abovementioned models. We will examine how these new export opportunities affect the allocation of labor across industries and across different types of firms within industries.[9] Another feature of the BTA is that the induced changes in tariffs were plausibly unrelated to the economic conditions in Vietnam during the early 2000s (McCaig (2011)).[10] In addition, the nature of the trade reform that is the focus of the current paper might be of particular interest from a policy perspective given recent attempts to further liberalize international trade for poor countries. Improving market access of exports from poor countries to rich countries is a key component of the current Doha WTO negotiation round and many recent bilateral and regional free trade agreements.

Third, we link the BTA-induced tariff cuts on Vietnamese exports to employment and employment type using the 2002 and 2004 Vietnam Household Living Standards Surveys (VHLSS). The two VHLSS surveys are repeated cross sections that also contain individual- and household-level panel datasets. We can thus track individuals over time as they move in and out of employment, across industries, and different types of employers. This enables us to study transitions across industries, across employers within industries, and transitions in and out of the labor force. It also enables us to control for unobserved heterogeneity related to selection on unobservables.[11]

[9] Most existing studies focus on the effect of trade on wages or sectoral employment shifts (see Goldberg and Pavcnik (2007) for a survey). Studies that focus on employment reallocation within industries (Menezes-Filho and Muendler (2011)) examine adjustments to a unilateral trade liberalization rather than expanded export opportunities.

[10] Please see section 3 of this paper for details.

[11] See also Menezes-Filho and Muendler (2011) and Frias, Kaplan, and Verhoogen (2009).

Our analysis so far yields several interesting findings. First, we find that increased export opportunities in an industry are associated with increases in net industry employment, which are more pronounced in industries with a comparative advantage and in the formal sector. Moreover, during the early 2000s Vietnam experienced a large decline in the share of workers that work in their own business or businesses run by other households and an increase in the share of workers employed in larger, more formal firms. Economy-wide, approximately half of this decline in employment in household businesses is driven by the relative contraction of industries that tend to organize production in small household firms, namely agriculture and aquaculture. The remaining half can be attributed to the reallocation of labor from household businesses to larger, more formal employers within industries. This within-industry component accounts for over 80 percent of the decline in the prevalence of household business employment outside of agriculture and aquaculture and is particularly pronounced in manufacturing. This suggests that within-industry reallocation of labor in response to trade reform plays an important role. Our further analysis suggests that the probability that a worker works for a household business declined most in industries that experienced the largest U.S. tariff cuts. This evidence suggests that the BTA contributed toward the within-industry reallocation of employment away from household businesses toward larger, more formal firms. This latter finding confirms the predictions of heterogeneous firm trade models, which suggest that new export opportunities should lead to a contraction of employment in smaller, more informal firms and an expansion of employment in larger, usually more "formal" firms.

Section 2 summarizes the existing literature and relevant theoretical work which provides us with a framework in which to analyze the impacts of changes in trade policy on the reallocation of labor across industries and across firms within industries. In section 3, we provide a detailed description of the BTA and in section 4 we describe the individual level data. Section 5 examines the effects of the BTA on reallocation of employment between industries. Section 6 decomposes aggregate changes in employer types into within- and between-industry components that are emphasized in the theory framework, and examines the effects of the BTA on reallocation of employment across employer types within industries in a regression

framework. Section 7 provides some discussion of labor market transitions in and out of employment and industry switching. Section 8 concludes.

2. Existing literature and conceptual framework

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We consequently frame our empirical analysis to incorporate the insights of the recent literature on trade and heterogeneous firms. In particular, a reduction in industry tariffs on Vietnamese exports could influence the composition of employment between smaller, less formal firms and larger, more formal firms in Vietnam through two channels: between industry changes and within industry changes.

The BTA increased market access across several industries. Models of trade based on comparative advantage emphasize the influence of international trade for resource reallocation across industries through trade-induced changes in relative industry prices. In general equilibrium, the effects of trade policy on employment in smaller, less formal firms (such as household businesses) could potentially differ, as workers 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. If the expanding industries are industries where production is, in general, organized in larger, more formal establishments, then it is possible that trade liberalization would lead to an increase of employment in larger firms in the aggregate. Vice versa, if the workers move towards industries where production tends to be organized through self-employment or small household businesses (e.g., agriculture), one would observe an increase in employment in smaller firms, which, however, would be driven by labor re-allocation across industries rather than the mechanism outlined above. For example, suppose that production arrangements and employment in agriculture tends to be relatively more "informal" than employment in apparel. If trade liberalization increases the relative demand for apparel, the expansion of the apparel sector will increase the number of "formal" jobs in the economy. However, if trade liberalization increases the relative demand for agriculture, the number of "informal" jobs in the economy 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 industry tariffs 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 within in industry. More specifically, Melitz (2003) develops a model where firms differ in underlying performance and face a fixed cost of accessing export markets. In this setting, only some firms export and these tend to be initially more productive firms that are profitable enough to cover the fixed cost of exporting. The model generates several predictions for how increased access to an export market (due to a decline in a foreign tariff) affects firm survival, output, and employment. First, an increase in market access will lead to an increase in industry demand. However, only initially better firms benefit from this expansion because they are the ones profitable enough to cover the fixed cost of exporting. Thus, sales and employment in the initially better firms expand due to increased export demand. This expansion occurs by increased output and employment in existing exporters and entry of firms into the export market (i.e., new exporters). Second, the expansion of better firms due to new exporting opportunities increases industry-wide wages (Melitz (2003)) and the intensity of competition (Melitz and Ottaviano (2008)). Consequently, some less efficient firms that only serve the domestic market observe a contraction in output and employment. In fact, the most inefficient firms no longer earn sufficient profits to cover the fixed cost of production, so that increased export opportunities lead the least efficient firms to exit the industry.

These models create clear predictions that within an industry, trade will expand the employment in initially bigger, better performing firms and contract employment in initially inefficient firms. While the original formulation in Melitz (2003) does not allow for differences in employment conditions and wages across firms within an industry, several follow-up studies show that 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 (forthcoming)), and that increased market access increases wages paid in initially better-performing or exporting firms (Verhoogen (2008), Amiti and Davis (forthcoming)). To the extent that better performing firms offer better employment opportunities, higher wages, and pass some of the higher productivity to worker wages, the abovementioned models predict

that increased access to exporting opportunities should expand the availability of higher paying jobs.[13]

The above discussion of between- and within-industry channels through which increased export opportunities affect labor allocation between firms provides guidance for our empirical analysis in sections 5 and 6. In section 5 we examine how BTA-induced tariff cuts affected net reallocation of jobs across industries, emphasized in neoclassical trade models. In section 6 we examine changes in the allocation of labor across employers in Vietnam and decompose them into those stemming from between-industry and within-industry reallocation of labor to evaluate their relative importance for explaining the aggregate changes. We then examine how BTA-induced tariff cuts affected reallocation of jobs between household businesses and other, more formal employers within Vietnamese industries.

3. Description of the U.S.-Vietnam Bilateral Trade Agreement and Trade Data

The study will combine detailed information on changes in trade policy with micro-level data that span the period of trade reform. In this section we describe the U.S.-Vietnam Bilateral Trade Agreement and discuss the trade data.[14]

The BTA was implemented on December 10, 2001. Vietnam already applied MFN tariffs on U.S. imports, so the agreement did not significantly affect the structure of Vietnam's trade policy.[15] The main trade policy change in the agreement was for the U.S., which was to immediately provide Vietnam with the Normal Trade Relations (NTR) or Most Favored Nation (MFN) access to the U.S. market, as required by the World Trade Organization.

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. 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

[13] Existing literature (Marcouiller, Ruiz de Castilla, and Woodruff (1997), Goldberg and Pavcnik (2003), Pavcnik et al., (2004)), in fact, finds that workers working in the informal sector or establishments earn lower wages than observationally equivalent workers in the formal sector. They are also less likely to receive benefits. However, one should keep in mind that workers might select to work in the informal sector because they value flexibility in work arrangements available in this sector.

[14] This section draws heavily on McCaig (2011), which in turn relies heavily on the STAR-Vietnam report "An Assessment of the Economic Impact of the United States – Vietnam Bilateral Trade Agreement".

[15] The BTA required Vietnam to mainly implement various regulatory and legal changes and had approximately 10 years after the implementation of the BTA to make these changes.

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 ISIC nomenclature.

This data highlights the advantage of studying the relationship between increased export market access and employment reallocation in the context of BTA. The magnitude of the tariff cuts across industries is summarized in Table 1, which is taken from McCaig (2011). The table provides information on aggregate tariffs and industry-specific tariff declines. First, the BTA on average reduced tariffs by 23.4 percentage points. These are substantially bigger tariff cuts than those that have been the focus in previous work on the consequences of increased market access such as Bustos (2011) and Iacovone and Javorcik (2008). This improves our ability to separate the changes in tariffs from other confounding changes in the Vietnamese economy. A second useful feature of the BTA is that tariff cuts were not uniform across sectors. The BTA reduced tariffs on Vietnamese goods in agriculture, fishing, mining, and manufacturing. Manufacturing experienced the largest tariff cuts, with the average ad valorem equivalent tariff dropping from 33.0 to 3.4 percent. The average ad valorem tariff dropped from 8.5 to 1.6 percent in agriculture, hunting, and forestry. The tariff cuts in fishing and mining industries were much smaller, 1.1 and 2.6 percentage points respectively. This enables us to exploit differential changes in tariff rates across sectors to identify the effects of increased market access on outcomes of interest.

One concern with this approach is that the differences in the degree of industry tariff cuts across sectors reflect differing abilities of industry special interest groups in Vietnam and the U.S. to influence tariff formation. This is clearly not the case and a third advantage of the BTA is that the concern about the political economy of protection and the endogeneity of tariff changes are 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 instead of Column 2 tariff rates. The movement from one pre-existing tariff schedule to a second pre-existing tariff schedule implies that both U.S. and Vietnamese industries did not have an opportunity to influence the tariff cuts faced by

their industry. McCaig (2011) further shows that the Column 2 and MFN tariff schedules can be plausibly considered exogenous to Vietnam.[16]

The BTA has had a significant impact on the volume and structure of Vietnamese exports. During this period, Vietnam's aggregate exports were expanding world-wide, but the share of exports to the U.S. grew even more. From 2001 to 2002, Vietnamese exports to the U.S. grew by 128 percent followed by an additional 90 percent from 2002 to 2003. By 2004, the General Statistics Office (GSO) of Vietnam estimates exports to the U.S. accounted for 20.2 percent of Vietnam's total exports or about 13 percent of GDP.[17] By comparison, in 2000, exports to the U.S. represented only 5.1 percent of total exports or 2.8 percent of GDP. Hence, the growth in exports to the U.S. represents a sudden and substantial shock to Vietnam's economy.

At a more disaggregated level, exports soared in the 2-digit SITC categories of articles of apparel and clothing accessories. This commodity category showed an annual growth of 276.5 percent from 2001 to 2004. Table 2 presents information on the value, growth, and share of exports for Vietnam's top seven commodity exports to the U.S. according to 2004 value. With the exception of petroleum products, Vietnam's top seven exports to the U.S. are all commodities that intensively use less-educated labor. This suggests the potential for the increase in exports to influence the prevalence of employment in household businesses or self-employment as less-educated workers are more likely to work in household businesses than more educated workers.

4. Description of individual-level data

[16]He argues that "the countries subject to Column 2 rates are all former or current communist countries, suggesting that political concerns larger than industry lobbying dominate this category of the U.S. tariff schedule. Second, imports into the U.S. under Column 2 constitute a very small fraction of overall U.S. imports. Between 1996 and 2006, the share of total U.S. imports originating in countries subject to Column 2 rates never exceeded 0.09 percent. This implies that the returns to U.S. industries lobbying for protection are very low within the Column 2 section of the U.S. tariff schedule. Third, as suggested by the previous point, both prior and subsequent to the BTA, there has been little change in the prevailing Column 2 rates. Between 1997 and 2005, the correlation of Column 2 rates was 0.978. Clearly the Column 2 rates have been very stable and much more so than the MFN rates. These three arguments support the proposition that the Column 2 rates prevailing in 2001 were exogenous to Vietnam. The major argument for the exogeneity of the *ex-post* level of U.S. protection is that overall imports from Vietnam into the U.S. represent a very small fraction of total U.S. imports. By 2006, U.S. imports from Vietnam constituted only 0.46 percent of total U.S. imports. Hence, it is hard to believe that the U.S. would set its trade protection structure based on conditions in Vietnam." McCaig (2011, page 106-107)

[17] According to the GSO, exports of goods and services in 2004 were 65.74 percent of GDP.

4.1 Data Description

We use two waves of the Vietnam Household Living Standards Surveys (VHLSS) that were conducted by the General Statistics Office (GSO) of Vietnam in 2002 and 2004.[18] The survey included over 74,000 households in 2002 and over 45, 000 households in 2004. Each survey contained modules related to household demographics, education, health, employment, income generating activities, and expenditures. Each survey was designed to be nationally representative, as well as representative within rural and urban areas. We can thus examine labor reallocation nationwide, as opposed to urban areas only, as is common in the existing literature on countries such as Brazil and Colombia. About 20,000 households from 2002 were also resurveyed in 2004. This smaller panel component allows us to study transitions into and out of different types of employment, in and out of labor force, and to control for unobserved heterogeneity related to selection into these businesses and job types.

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. For employed individuals, the employment modules collect information on the industry of employment, the occupation of the individual, the type of employer the individual works for, the amount of time spent working in that job over the past 12 months, the value of wage or salary payments, and the value of non-wage/salary payments. We restrict the analysis to the main job of individuals aged 20 to 64 inclusive. Appendix Table A.1 provides descriptive statistics for the key variables in the analysis.

The ideal data to study labor reallocation would be a matched worker-employer (firm) dataset that covered *all* workers and linked workers to their employer characteristics. In countries where linked employee-employer data is available, it is based on administrative records that match administrative data on workers to firm-level census information. The administrative data only cover workers that work for more formal, registered firms. While the omission of employment in less formal businesses is not a concern in developed countries, the

[18] The BTA was implemented on 10 December 2001. The first wave of household survey data is from 2002. This survey had a recall period of 12 months and interviewed households throughout the year. As such, individuals that were 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. Thus, the 2002 VHLSS does not provide a perfect "before" dataset. As such, our results are likely to underestimate the full impact that the BTA has had on labor reallocation.

coverage of self-employment and employment in household businesses is important in a poor economy such as Vietnam, where a large share of the workforce is self-employed or works in small household businesses that are not covered in the usual firm-level datasets or administrative data (Benerjee and Duflo (2007)).[19] In Vietnam, 88 percent of all workers and 68 percent of workers in manufacturing are either self-employed or work in a household business.[20] As a result, a study that relied on commonly available administrative matched employee-employer data would exclude the vast majority of the labor force in a poor country.[21]

Given these data constraints, we instead rely on a nationally representative household survey that includes a labor market module. The employment modules of the VHLSS collected information representative of *all* workers, regardless of industry or type of employer. This allows us to look at employment and labor reallocation across industries and employers more broadly than is commonly possible in international trade research. While our data does not include detailed firm level characteristics, it enables us to identify broad types of firms/employers that a worker works for. In particular, we rely on the question that asks about the type of employer they work for. This question distinguished between self-employment (we can separate working on a household farm from a household business), working for another household's business, the state sector, the collective sector, the private sector, and the foreign sector. We use this information to construct our key dependent variable for whether an

[19]The usual data sources are either firm-level data sets or matched employee-employer data. Firm-level data usually cover formal firms in the manufacturing sectors above a certain size threshold (usually 10 or 20 workers). Matched employee-employer data are based on administrative records of employed individuals, so they cover employed individuals in formal firms and formal jobs.

[20]The informal sector accounts for about 50 to 60 percent of the labor force in urban areas of Brazil and Colombia, and 80% of employment in manufacturing in India.

[21] The informal sector is usually defined as the segment of the economy that is either not covered or does not comply with labor market regulations such as minimum wage or minimum working age laws, and is associated with lower pay and inferior working conditions. Studies thus often define informality based on criteria such as firm size (for example, firms with less than 10 employees are assigned to the informal sector), self-employment status (for example, in many countries self-employed are not subject to labor market regulation), or compliance with labor market regulation (for example, workers that do not receive benefits required by labor market regulation from their employers are considered informal), and hours of work (for example, part-time workers are assigned to the informal sector).

individual works for a household business. This variable is one if an individual works in his/her own household businesses or in another household business and zero otherwise.[22]

4.2 Heterogeneity across employers: household businesses vs. others

A natural question arises how employers that are household businesses differ from employers that are in the private, state, collective, or foreign sector. Especially important for our purposes is the difference between a household business and a private business. By definition, household businesses are not registered as an enterprise according to the Enterprise Law. In contrast, businesses in the private sector are officially registered under the Enterprise Law and include private limited companies, non-state joint-stock companies, partnerships, and private enterprises. The difference in registration status is predictive of important differences in firm characteristics. For example, household businesses are substantially smaller than firms that operate in the non-household business sector. The average household business in Vietnam had only two workers in 2002 (McCaig and Pavcnik (2011)). The average employment size for employers in the non-household business sector is 63.8.[23]

There are important predictive differences in earnings and non-wage compensation across household businesses and other employers, as noted in Tables 3a, 3b and 4. Table 3a regresses log hourly compensation on an indicator for whether a worker works for a household business, and various combinations of control variables that capture differences across workers in demographic characteristics (age, gender, and whether an individual belongs to an ethnic minority group), education (we include indicators for whether an individual has some primary, lower secondary, or upper secondary education), an urban indicator, year indicator, and industry and province fixed effects.[24] The coefficient on the household business indicator is -.50 in a specification that does not include any additional controls, suggesting substantially lower hourly earnings in household businesses. Part of the earning differential is due to differences in

[22] We also rely on an indicator for whether an individual works for his/her own business, i.e., is self-employed. This variable enables us to distinguish whether movements out of working for household businesses is due to movements from self-employment to working for larger firms or from working for someone else's household business to working for larger firms.

[23] The above information is based on author's calculations from the household business module of the 2002 VHLSS and the 2001 Registered Firm Enterprise Data.

[24] The sample includes individuals employed by a household business, but does not include the operators of the household business for whom net profits would also reflect returns to physical capital.

observable worker characteristics, as the coefficient drops to -.39 when we control for a year indicator and an urban indicator in column 2 and to -.28 when we additionally control for worker characteristics in column 3. In column 6, we also include industry and province fixed effects, in addition to the worker characteristics. The magnitude of the coefficient more than halves relative to the coefficient in column 1, suggesting that it is important to control for all these factors that independently affect earnings as well as selection into household business employment. Nonetheless, this specification suggests that workers working for a household business earn about 21 percent less than observationally equivalent workers working in the same industry and province.

While the above specifications control for observable worker characteristics, unobservable characteristics might also simultaneously affect worker earnings and the choice to work for a household business. To explore this, we limit our sample to individuals in the panel. Column 7 replicates the specification in column 6 on this panel sample and yields a nearly identical coefficient on the household business indicator. Column 8 explicitly controls for unobserved time-invariant worker heterogeneity with individual fixed effects. The coefficient on the household indicator, which is identified by the individuals that switch their employer, drops from -.21 in column 7 to -.07. This suggests that controlling for unobserved worker characteristics, workers that switch to work for a household businesses tend to earn 7 percent less than when they work for other, more formal employers.[25] The above analysis shows the importance of employer heterogeneity along the household business margin for earnings.

Further analysis reported in Table 3b suggests that in a cross-section, employer heterogeneity (i.e. work for household business or other businesses) alone accounts for 3% of the explained variation in log wages across workers.[26] This is a non-negligible contribution. For comparison, all included worker characteristics can jointly account for 11% of the explained

[25]Columns 9 and 10 only focus on workers that work in both periods. Coluns 11 and 12 estimate specifications in columns 7 and 8 only for workers that ultimately switch their employer affiliation to/from household business. The comparison of the coefficients on the household indicator suggest that while unobserved worker characteristics are clearly important for selection in/out of household businesses, they do not appear to affect the coefficient on the household business indicator among the switchers.

[26]We obtain this number by comparing the adjusted R2 from the regression that regresses log wages on household business indicator, worker characteristics, urban indicator, year indicator, industry and province fixed effects (column 1 of table 3b) to the R2 from the same regression that excludes household business indicator (column 2 of table 3b).

variation in log wages (column 3). Industry affiliation accounts for 15% (column 4), while geographic location accounts for 21 percent of the variation (column 5).

The analysis in Tables 3a and 3b clearly shows the differences in earnings for individuals working in household businesses. Individuals working for household businesses are also substantially less likely to receive benefits from their employer, as shown in Table 4. The table shows the share of individuals that reported receiving a positive payment for holidays social allowance, business trips, other forms of non-wage/salary payments, and any non-wage/salary payment in 2002 and 2004 for all workers working for household businesses (top panel) and workers working for other employers (bottom panel).[27] Individuals that work for household businesses are less likely to obtain non-wage benefits than individuals that work for other employers. This evidence on non-wage benefits thus confirms that working for a household business is associated with lower non-wage benefits. Overall, the above evidence is consistent with the predictions of recent heterogeneous trade models, which suggest that employer heterogeneity will be reflected in differences in earnings of individuals at different employers.

Before we move on to more formal analysis we need to discuss two caveats. One potential problem with the construction of a household business indicator is that it is possible that the individual might not know whether they work for a household business or a private business. While this is a concern, the survey provides detailed instructions to the enumerators about how to record the answers to questions. Moreover, if workers would not distinguish between working for a household or a private business, 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. However, the above discussion of observable differences across household businesses and other establishments shows that there are notable observed differences in wages and benefits received between workers that report working for household businesses and private businesses.[28] The above results are consistent with workers that work for household businesses receiving lower earnings and benefits, which

[27] For wage workers the VHLSS questionnaires asked about payments, either cash or in-kind, received for public holidays, social allowances (illness, maternity, workplace accidents), business trips, and other reasons.
[28] In unreported tabulations, we have also redone the analysis in table 4 for private businesses alone and continue to find large differences.

is what one would expect. Finally, 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.

Second, we use an indicator for whether a worker works for a household business to examine the reallocation of labor from household businesses toward larger, more formal firms. One disadvantage of our measure is that it only captures movements across employers from household businesses to private, state, collective, or foreign firms. The data does not enable us to detect any potential reallocation of workers within employer groups. This biases us against finding evidence in favor of within-industry reallocation.[29] Given that our data enables us to capture reallocations between household businesses and larger firms, which are usually not observed, we view our work as complementary to the existing firm level studies that focus on reallocations across larger firms. To partially address this issue of labor reallocation across firms within the non-household business sector, we will use in a robustness check a third definition of employer type that expands on our main definition. Jobs with benefits tend to be viewed as more formal and better jobs and tend to be offered by larger, more formal firms. Our third measure of employer heterogeneity distinguishes wage workers in the state, collective, private, or foreign sector (the formal enterprise sector) that did not report receiving any benefits from their employer.[30]

5. The BTA and labor reallocation across industries

As discussed in section 2, the effects of trade reform for household business employment depend in part on the mobility of labor across industries subsequent to trade reform. Classical trade theory predicts that, all else equal, industries that observed greater increases in export market access (i.e., bigger reductions in U.S. tariffs) should observe an increase in employment relative to industries with smaller or no tariff changes. We examine the relationship between market access and industry employment using the following framework:

[29] Earlier studies have provided evidence of substantial churning within the more formal sector (Levinsohn (1999), Menezes-Filho and Muendler (2011)).

[30] This dimension might be more closely related with the compliance of firms with the labor code. Starting in 1995, the Vietnam Social Insurance Agency covered employees of state-owned enterprises, employees of private enterprises with 10 or more employees, all foreign invested firms, government administrative employees, and party employees. The benefits were to include pension, sickness, maternity, and worker's compensation, with contributions coming from both the employer and employee as a percentage of the salary.

$$s_{jt} = \alpha + \beta tariff_{jt} + \lambda_j + \gamma_t + \varepsilon_{jt} \quad (1)$$

where s_{jt} is the share of total employment in industry j at time t and $tariff_{jt}$ is the U.S. tariff faced by industry j at time t. The main coefficient of interest is the coefficient on the U.S. tariffs.

The timing of the tariff cuts and the choice of study period used for identifying the impacts of the tariff cuts are important. We use the 2002 VHLSS as the baseline from which to measure changes in employment shares. This raises two concerns. First, some of the households were surveyed close to the end of the 2002. Hence, their employment data are reported for a period, 12 months, that is almost entirely after the entry into force of the BTA. Second, to the extent that firms and individuals changed behavior in anticipation of the BTA, this implies that some of the impacts were being felt prior to the date of implementation. Both observations suggest that by focusing on the period of 2002 to 2004 we may be underestimating the impact that that BTA has had as of 2004 on employment shares. Our estimates should thus be interpreted as the lower bound. Further to the timing of the BTA and the data we have available, we use the pre-BTA industry tariffs for t=2002 (i.e., Column 2 tariff rates in 2001) and the post-BTA tariffs (i.e., U.S. MFN tariffs) for t=2004.

The results are presented in Table 5a. Columns (1) through (3) focus on traded industries, all industries, and manufacturing industries, respectively.[31] Conventional theory predicts that net employment should expand in industries receiving the largest tariff cuts on exports, implying that the coefficient on tariffs should be negative. Focusing first on traded industries in column 1, there is a negative relationship between the change in industry tariff and the share of employment nationally, as predicted by theory. However, the relationship is not statistically significant. The inclusion of non-traded industries in specifications reported in column 2 further attenuates the coefficient toward zero. The lack of correlation between net changes in the structure of employment across industries and tariff changes is consistent with the findings of the earlier studies that focused on the industry reallocation in response to unilateral declines in import tariffs in many other less developed economies (Goldberg and Pavcnik (2007)).

[31] In specifications that include all industries, non-traded industries are assigned a tariff of 0 in both periods. Because the empirical specification always includes industry fixed effects, this treatment implies that non-traded industries face a zero change in tariffs.

Vietnam might not have a comparative advantage in some of the industries subject to tariff cuts, so one might expect a stronger net employment expansion in industries where Vietnam has comparative advantage. We augment the specification in equation 1 by including an interaction of industry tariff with the share of that industry's exports in total Vietnamese exports prior to the BTA.[32] The results are reported in columns 4-6 of Table 5a. The coefficient on the tariff*comparative advantage interaction is always negative and statistically significant in most specifications. Declines in tariffs are associated with proportionally larger increases in net employment in industries in which Vietnam has revealed comparative advantage.

In addition, the conceptual framework in section 2 points to the importance of heterogeneity of employers and products within an industry. In particular, 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. One would then expect expansion of net industry employment only among the formal sector (see also Bernard, Redding, and Schott (2007)). As a result, we compute an industry's employment shares in total employment s_{jt} focusing on fomal sector alone, and repeat the above analysis. The results are reported in Table 5b. These results suggest somewhat more pronounced expansion in industry employment in industries that experienced larger tariff cuts, especially among the industries with comparative advantage. These results are further confirmed when we estimate equation (1) with industry employment shares obtained from the Enterprise Survey, which only includes formal firms (i.e. non-household businesses).[33] These results are presented in Table 5c. Consider first the coefficient on tariffs reported in traded sectors in column 1. The coefficient estimate in column 1 suggests that an industry that experienced the 24 percentage point decline in U.S. tariffs, observed a .38 percentage point increase in industry share of

[32]We use pre-reform data and focus on worldwide exports. We also include an interaction of the industry share in exports with 2004 dummy to allow for differential unobserved demand or supply shocks that might vary with industry's revealed comparative advantage. In unreported regressions we also relied on pre-reform exports to the US alone. That analysis yielded similar conclusions.

[33]To match the timeframe of this data closely to VHLSS, we rely on the information about the end of year employment in 2000 and 2003. We obtain this information for all firms and aggregate it up to compute employment shares at the industry level.

employment, which represents a 22% increase from the mean industry employment share.[34] These effects are more pronounced in industries with comparative advantage (see columns 4-9).

In sum, the analysis in this section suggests that declines in U.S. tariffs on Vietnam's exports were associated with increases in net industry employment, especially in industries with a comparative advantage and in the formal sector. We turn to examining the within industry reallocations across employers next.

6. BTA and labor reallocation across employers

6.1 Within and between industry changes in household business employment

The conceptual framework in Section 2 emphasizes that trade can influence the composition of employment through the reallocation of employment across employers within an industry. As discussed earlier, our data is well suited to examine the reallocation of labor along the margin not observed in conventional data sources used in trade literature: household businesses and other firms. Table 6 presents estimates of the share of individuals that work in household businesses in Vietnam in 2002 and 2004 and motivates the importance on this margin of adjustment. The left panel includes all industries, the middle panel excludes agriculture and fisheries, while the third panel only focuses on manufacturing industries.[35] The table also presents the figures for Vietnam as a whole, urban areas, and rural areas.

The major fact to emerge is that employment in household businesses is very high in Vietnam. Across all industries, 86 percent of workers are employed in household businesses in 2002. This prevalence of employment in household businesses is not merely driven by agriculture. The middle panel reports the share of employment in household businesses, excluding agriculture and aquaculture. The share of workers working for household businesses drops, but continues to be high at 68 percent in 2002. We see similarly high levels of working for household businesses of 66 percent within manufacturing. Thus, it is clear that even in manufacturing, where most of the existing work on labor reallocation with firm-level data is

[34]The magnitude of the effects in manufacturing (which on average experience a 30 percentage point decline in tariffs) is .49 percentage point increase.

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

done, the usual focus on employment in larger, more formal firms only captures a small share of employment. The share of workers in household businesses is higher in rural areas, in part, but not entirely, due to the high degree of self-employment in agriculture and aquaculture in rural areas.

The second key fact to emerge from Table 6 is that the prevalence of working in household businesses fell between 2002 and 2004. The decline in employment in household businesses occurred in urban and rural areas. Overall, the share of workers in household businesses fell by 3.3 percentage points (or 3.8 percent) nationally. The drop was particularly pronounced in manufacturing, where the share of workers employed in household businesses fell by 6.6 percentage points (or 10 percent). These descriptive statistics suggest that the reallocations to and from household businesses might play an important role in the labor market adjustment to export market opening.

The conceptual framework in Section 2 emphasizes that trade can influence the composition of employment through the reallocation of employment across employers within an industry and between industries that differ in their level of reliance on household businesses. The next step in our analysis thus examines whether the observed aggregate changes in the incidence of employment in household businesses stem from changes in the composition of industry employment (e.g., trade liberalization may have expanded the employment in industries that employ a proportionally larger share of workers 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 2002 and 2004, denoted by ΔH, into within and between industry shifts, respectively:

$$\Delta H_t = H_t - H_{t-1} = \sum_j \Delta h_{jt} E_{j.} + \sum_j \Delta E_{jt} h_j \,, \qquad (2)$$

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 $h_{j.} = .5(h_{jt} + h_{jt-1})$. This decomposition provides evidence on the relative importance of mobility of workers across employers *within* an industry (the first summation term) and mobility of

workers *across* industries (the second summation term) as sources of changes in employment in household businesses.[36] Table 7 presents the results of the decomposition between 2002 and 2004 for all industries, for all industries other than agriculture and aquaculture, and for manufacturing.

An important aspect of our analysis is that we can perform this decomposition with economy-wide employment, including agriculture.[37] Economy-wide, the between and within industry changes both contribute equally toward the decline in the aggregate share of employment in household businesses. The between industry changes account for 47 percent of the decrease in employment in household businesses. The between industry changes are mainly driven by agriculture. Figure 1 plots the change in share of industry employment in total employment between 2002 and 2004 against the initial share of household business employment in total industry employment. To the extent that expanding industries are less likely to organize their production in household businesses, trade would increase the incidence of employment in larger, more formal employers through this channel. Agriculture is the one outlier industry in Figure 1. The figure clearly shows that the share of employment in agriculture, the industry that relies on household businesses the most, is declining. This contributes toward the aggregate declines in employment in household businesses.

The remaining information in Table 7 highlights the importance of within-industry reallocation in other sectors of the economy. When we exclude agriculture and aquaculture, the reduction in employment in household businesses is driven more by within industry changes than between industry changes. The within industry channel accounts for 86 percent of the decline in employment in household businesses. The within industry channel plays an even larger role in manufacturing, where it can account for over 100% of the decline in the share of household business employment.

[36] 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.

[37] The bottom part of the table reports the decomposition for urban and rural areas. The within industry changes play a smaller role in rural than in urban areas. Nonetheless, separate decompositions for urban and rural areas confirm the general patterns observed in the nationwide sample.

Overall, the above analysis points to the importance of labor reallocation across firms from household businesses toward larger, more formal firms and this is especially the case in manufacturing. We should emphasize that while our data is well suited to examine the relative importance of reallocation of employment from the household businesses to larger firms, our data cannot capture the reallocation of employment within household businesses or across firms in the more formal sector. As a result, our analysis, by focusing solely on two types of employers (household businesses vs. other firms), likely underestimates the importance of the overall within industry reallocation component.

6.2 BTA and labor reallocation across employers within industry

Discussion of the decomposition in Table 7 clearly suggests that within industry reallocation of workers plays an important role in explaining the aggregate decline in employment in household businesses. In this section, we investigate whether these within-industry changes are related to the BTA-induced tariff cuts.

In particular, we examine the extent to which trade affects the probability of reallocation across employers within an industry. We use a linear probability model and regress an indicator H_{ijt} for whether a worker *i* employed in industry *j* at time *t* works for a household business on a vector of worker characteristics X_{ijt}, such as age, age squared, education indicators, gender, geographic location, and a set of industry indicators J_j indicating worker i's industry affiliation:

$$H_{ijt} = X_{ijt}\beta_D + tariff_{jt} * \beta + J_j + t_t + \varepsilon_{ijt} \qquad (3)$$

where $tariff_{jt}$ is the industry tariff in industry j at time t, J_j is a vector of industry fixed effects, and t is a vector of year indicators. We account for general forms of heteroskedasticity and serial correlation in the error term by computing robust (Huber-White) standard errors clustered by industry. 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 thus the reallocation of labor away from household businesses.

Note that controlling for individual worker demographic characteristics eliminates some of the potential estimation biases in the relationship between the reallocation of labor across household businesses and other firms and tariffs stemming from differences in worker

composition across industries and employers. Inclusion of these controls additionally reduces the potential estimation biases. For example, business cycle fluctuations might independently impact tariff formation and the incidence of household business employment. Year fixed effects controls for the fact that during the period of our study, Vietnam experienced rapid economic growth, which might have independently moved employment toward jobs in larger firms. Our key identification variation in tariffs is based on differential changes in tariffs facing Vietnamese exports in the U.S. across industries. The advantage of tariff variation across industries used in our analysis is that it can be plausibly considered exogenous to these developments (please see Section 3 for details). Thus, our estimates of the key coefficient on tariff are less prone to the usual concerns about the endogeneity of tariff changes.

Our main results are shown in Table 8. Column 1 estimates equation (3) for traded industries. We find that the industries that faced the largest reductions in U.S. tariffs experienced the largest decreases in the probability of employment in household businesses between 2002 and 2004. The magnitude of the coefficient in column 1 (.21) suggests that an industry that experienced the average reduction in tariffs, 23.4 percentage points, saw the probability of working in a household business fall by 4.9 percentage points relative to an industry facing no reduction in tariffs. In column 2 we estimate equation (3) for workers in all industries, including non-traded industries, to which we assign a tariff of 0. We continue to find a positive and statistically significant coefficient on tariffs. However, the magnitude of the coefficient (.125) is lower relative to the magnitude we obtained for traded industries in column 1. The estimated coefficient suggests that a 23.4 percentage point decline in tariffs would be associated with a 2.9 percentage point decline in the prevalence of household business work. This suggests that the inclusion of non-traded sectors dampens the magnitude of the effects we found when we focused on the traded sector alone. Lastly, in column 3 we estimate equation 3 for the manufacturing sector, in part to have a sample that is more comparable to the samples used in the majority of studies of labor reallocation in response to trade reform. Focusing on the manufacturing sector, we continue to find that a decline in a tariff on Vietnamese exports is associated with a greater decline in the probability of working in household businesses.

The above results are consistent with a model in which expanded export opportunities lead to labor reallocation from smaller to larger firms, as the latter become more profitable and expand as a result of new export opportunities. In Melitz (2003), the expansion of economic activity among larger firms in response to new exporting opportunities bids up wages. This leads to the contraction of smaller firms that do not export. In fact, McCaig (2011) finds that average provincial wages increased relatively more in provinces that were exposed to new export opportunities. These wage effects were particularly pronounced for average provincial wages of less educated workers. Our findings in Table 8 suggest that these developments lead to the reallocation of labor from household business to larger firms.

One concern with the above findings is that changes in industry tariffs could be correlated with initial industry characteristics, in particular initial industry propensity for employment in household businesses. The lack of a statistical relationship between 2002-2004 industry changes and the initial share of industry employment in household businesses in 2002 is clearly depicted in Figure 2. Table 9 further examines whether changes in industry tariffs are correlated with the share of industry employment in household businesses in 2002 for traded industries (column 1), all industries (column 2), and manufacturing (column 3). All coefficients on the tariff change are small in magnitude and statistically insignificant. As a result it is unlikely that our main results in Table 8 are simply capturing unobserved trends that vary with the initial share of employment in household businesses in an industry.

We further explore the reallocation of labor by using the other two dependent variables described previously in section 4. The analysis in Table 8 did not distinguish whether an individual was self-employed or was an employee of someone else's household business. We thus also use an indicator that equals one if an individual is self-employed in a household business and zero otherwise. This gives us information on whether the previously documented within industry reduction in the probability of working for a household business are due solely to employees of household businesses or can also be attributed to the owner/operators of said businesses. The top panel of Table 10 displays the results from estimating equation (3) where the dependent variable is the aforementioned indicator. We find positive and statistically significant effects that are very similar in magnitude to our main results described previously for

working in a household business: 0.212 for traded industries, 0.127 for all industries, and 0.201 for manufacturing industries. Hence, on the whole, self-employment in household businesses fell most in the industries that experienced the largest U.S. tariff cut suggesting that our main results are not driven solely by a reduction in the use of outside workers in household businesses. Interestingly, the larger coefficient on tariff in column 3 of Table 10 (as compared to column 3 of Table 8) in manufacturing suggests that some self-employed workers (perhaps those of less successful household businesses) find employment in household businesses run by other households (perhaps the more successful ones).

Second, we also examine how improved export opportunities affect the probability of working for a household business or in a formal enterprise, but without receiving benefits. The bottom panel of Table 10 presents the results. Again, the results are positive, statistically significant and very similar to the results reported in Table 10. However, the estimated coefficients are slightly lower across all three samples of industries, suggesting that the probability of working in the formal enterprise sector and not receiving benefits is not falling as quickly as the probability of working for a household business. This indicator gives us some information on whether the workers leaving household businesses are finding new work with firms in the formal enterprise sector that are likely to be smaller and less formal based on not paying benefits or whether they are finding jobs with firms that are likely to be larger, and more formal.

6.3 Panel-level analysis

We next check the robustness of our results using the individual panel to control for unobserved heterogeneity that may be simultaneously correlated with the probability of working for a household business and the industry in which the individual was working. We do so by estimating the following equation:

$$H_{ijt} = \alpha_i + tariff_{jt} * \beta + J_j + t_t + \varepsilon_{ijt} \qquad (4)$$

where the vector of individual characteristics has been replaced by an individual fixed effect. Note, however, that results from estimating equation (4) cannot be directly compared to the results presented in Table 8 for the following reasons: First, the individual panel is a subset of the repeated cross section observations. Second, to track the same individuals over time, we

must choose our sample based on initial age, not contemporary age. Third, individuals that enter or exit the workforce will not be part of the panel since we only have one observation for their work status. Lastly, in estimating equation 4 we use the initial industry of the individual for assigning tariffs, not the contemporary industry as was done for the repeated cross section regressions.

In Table 11 we present results that demonstrate the progression from estimating a repeated cross section model to a fixed effects model using traded industries. Column (1) reports the repeated cross section estimate from before for comparison purposes. In column (2), we restrict the sample to individuals that are part of the panel. The coefficient (0.230) increases slightly, suggesting that selection into the panel is not a major concern. In column (3) we change the age restriction from contemporary age to initial age (i.e., 20 to 64 as of 2002 instead of at the time of the survey). This reduces the coefficient (0.165) by slightly more than a quarter. This effect is due entirely to the exclusion of individuals that were not 20 years old as of 2002, but were as of 2004. Next, in column (4), the sample is restricted to individuals that worked in both years. Again the coefficient (0.143) is reduced, implying that entry and exit from the workforce are partially responsible for the overall effect previously documented. In column (5) we base the tariff on the initial industry of the worker. The change in the coefficient estimate is negligible. Finally, in column (6) we estimate an individual fixed effects regression on the same sample of workers as in columns (4) and (5). The coefficient (0.111) again falls slightly, suggesting that unobserved heterogeneity is correlated with the probability of working in a household business and the industry tariff reduction, but the results are still robust to this specification. Thus, our previous result based on repeated cross sections is robust to unobserved heterogeneity, but unobserved heterogeneity is only partially responsible for the decrease in the estimated coefficient relative to repeated cross sections. Conditioning our sample on initial age, which removes individuals age 18 or 19 in 2002, and on individuals that worked in both years, which removes entry and exit, also play a role. Overall, despite these changes in sample, which work against finding a positive relationship, the relationship is still strongly statistically significant even when controlling for unobserved heterogeneity. The magnitude of the coefficient in column (6) suggests that a 23.4 percentage point decline in

tariffs was associated with 2.6 percentage point decline in probability that a worker works for a household business.

Tables 12a and 12b repeat this analysis for workers in all industries and in manufacturing, respectively. While the magnitude of the coefficient on tariffs decreases with the inclusion of individual fixed effects, we continue to find that increased export opportunities are associated with a decline in the probability that a worker is employed in a household business. Overall, our results that control for unobserved individual heterogeneity continue to suggest that export opportunities lead to the reallocation of labor from household businesses to larger firms, albeit the effects are smaller in magnitude.

6.4 Robustness to underlying trends

Although we previously showed that the changes in U.S. tariffs are not related to initial industry conditions, such as the share of household business workers within an industry, it may still be the case that they are related to underlying trends. In this section we examine this possibility using data from the 1993 and 1998 Vietnam Living Standards Surveys (VLSSs).[38] In particular we perform a falsification test using the 1993 and 1998 data and directly control for the trend between 1993 and 1998 in regressions using the 2002 and 2004 data.

The employment module for the 1993 VLSS does not allow us to separately identify employment in a household business from employment in a private sector business. Thus, we use two indicators of employment status that are highly correlated with working in a household business. The first is an indicator for being self-employed (which we previously used in Table 10) and the second is an indicator for being self-employed or working in a household or private sector business.[39] In the falsification regressions the pre-BTA tariffs (Column 2 tariffs in 2001) have been assigned to the 1993 data and the post-BTA tariffs (MFN tariffs in 2004) have been assigned to the 1998 data. Thus, these regressions form a falsification test for whether the U.S. tariffs cuts are simply picking up a pre-existing underlying trend. If this is the case, then we

[38] 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.

[39] In the 1998 VLSS, where we do have sufficient information to disentangle working for a household business and working for a private sector business, among workers age 20 to 64, 83.0% of workers work for a household business either as the owner or as an employee. Only an additional 2.4% of workers work for a private sector business. Thus, combining working for a household business and working for a private sector business is unlikely to be a concern for our purposes.

would expect the coefficient on tariffs to be the same sign and of similar magnitude as in Table 8. If, on the other hand, the U.S. tariff cuts are not correlated within underlying trends, then we would expect the coefficient on tariffs to be close to 0. Table 13a reports results based on estimating equation (3) using the 1993 and 1998 data. Columns (1) through (3) use the indicator for being self-employed as the dependent variable while columns (4) through (6) use the indicator for self-employment or working in a household or private sector business as the dependent variable. For each dependent variable we report results for traded industries, all industries, and traded manufacturing industries.[40] The results are consistent with the U.S. tariff cuts being uncorrelated with pre-existing trends. For both indicators the point estimates are all very close to 0 and noticeably smaller than those reported in Table 8 for the period 2002 to 2004. For traded manufacturing, there is evidence that the pre-existing trend is negatively correlated with the U.S. tariff cuts, suggesting that our estimate for traded manufacturing industries in Table 8 may be an underestimate.

Next we return to the 2002-2004 data and directly control for the presence of underlying trends by introducing an additional term to the regression equation: an interaction between a 2004 dummy and the change in the share of household business workers within an industry between 1993 and 1998. Since we do not have a direct estimate of the share of household business workers in 1993, we instead use the two proxies from Table 13a, the share of individuals that were self-employed and the share of individuals that were self-employed or worked for a household or private business. If the pre-existing trend is not driving the results, then we should see a coefficient close to 0 on the interaction term and a similar coefficient on tariffs as in Table 8. This is indeed what we find, as shown in Table 13b. The pre-existing trends, using either indicator, have only a weak partial correlation with the probability of working for a

[40] 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.

household business and the coefficient on industry tariffs is relatively unchanged compared to the previous estimates in Table 8.[41]

Thus, we have shown that underlying trends do not explain the strong relationship between the U.S. tariff reductions and the decrease in the probability of working for a household business. No the.2254 .0012 Tc [(coef849reductions)Tj /TT1 1 Tf 4.3382 0 TD 0 Tc <0003>Tj

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We report the results in Table 14. The results show that "net entrants" were responsible for about one third of the aggregate decline in employment in household businesses. Entrants made up about 8.1 percent of the workforce in 2004 and would be exiters accounted for 5.7 percent of the workforce in 2002 and thus the workforce grew. However, more important is the differences in the likelihood of working in a non-household business as 22 percent of new entrants worked for a larger firm in 2004, while only 8 percent of exiters worked for a non-household firm in 2002. Additionally, the entrants are more likely to work for a non-household business than continuing workers in 2004, among which 15.4 percent worked in a non-household business in 2004. Finally, exiters were less likely than stayers to work in a non-household business in 2002 as 13.4 percent of stayers worked in a non-household business in 2002. Thus, exit and entry both contributed to the decline in the share of workers in household businesses as exiters were less likely to work in a non-household business than continuing workers who were in turn less likely than entrants. The overall contribution made by net entry is consistent with the decline in the estimated impact of tariff reductions on within-industry reallocation of labor away from household businesses when the sample is restricted to individuals that worked in both years in Table 11 in section 6.3.

The remaining two-thirds of the reduction in informality are due to continuing workers. Among these workers almost all of the reduction in the share of workers in household businesses was due to individuals that also switched industries. This result suggests that the within-industry reduction in the prevalence of working in a household business is rarely due to an individual leaving a household business to work for a larger firm in the *same* industry.[42] Instead, workers are simultaneously moving across employers (firm types) and industries, so that the gross movements across industries are much higher than the net movements.[43]

8. Conclusion

This paper examines how expanded export opportunities affect the reallocation of employment across and within industries in a poor country. An important contribution of our

[42] This is also consistent with McCaig and Pavcnik (2011) which shows little evidence of household businesses transitioning to officially registered, private businesses.

[43] Note that in section 5 we found that the net labor movements across industries are correlated with the tariff reductions. In unreported analysis we show that the gross flows of workers across industries were substantially higher than the net flows. These results are available from authors on request.

work is the exploration of economy wide reallocation of workers from household businesses to more formal employers in response to increased foreign market access. Like most of the existing literature on the topic we find no association between changes in tariffs and changes in the net structure of employment across industries. However, we document a decline in employment in household businesses in Vietnam during the period that follows the U.S.-Vietnam Bilateral Trade Agreement, an agreement that reduced the U.S. tariffs on Vietnamese exports. We subsequently show that a large portion of this decline in employment in household businesses is driven by labor reallocation from household businesses to larger, more formal firms within industries that are particularly pronounced in industries that experienced relatively larger increases in exporting opportunities.

This is to our knowledge the first evidence on the importance of labor reallocation from household businesses to more formal firms in response to new export opportunities. Our results thus complement the existing evidence on the topic that focuses on such reallocations between larger firms. Our evidence suggests that once we incorporate household business, we find that expanded exporting opportunities reallocate labor from smaller to larger firms within industries.

Our results are also related to the recent literature on firm growth in developing countries. A recent study by Hsieh and Klenow (2011) emphasizes the prevalence of small, unproductive firms in poor economies such as India and in part Mexico. Our study provides evidence that structural reforms such as trade liberalization might induce a movement of labor from smaller firms usually operating in the informal sector to larger firms.

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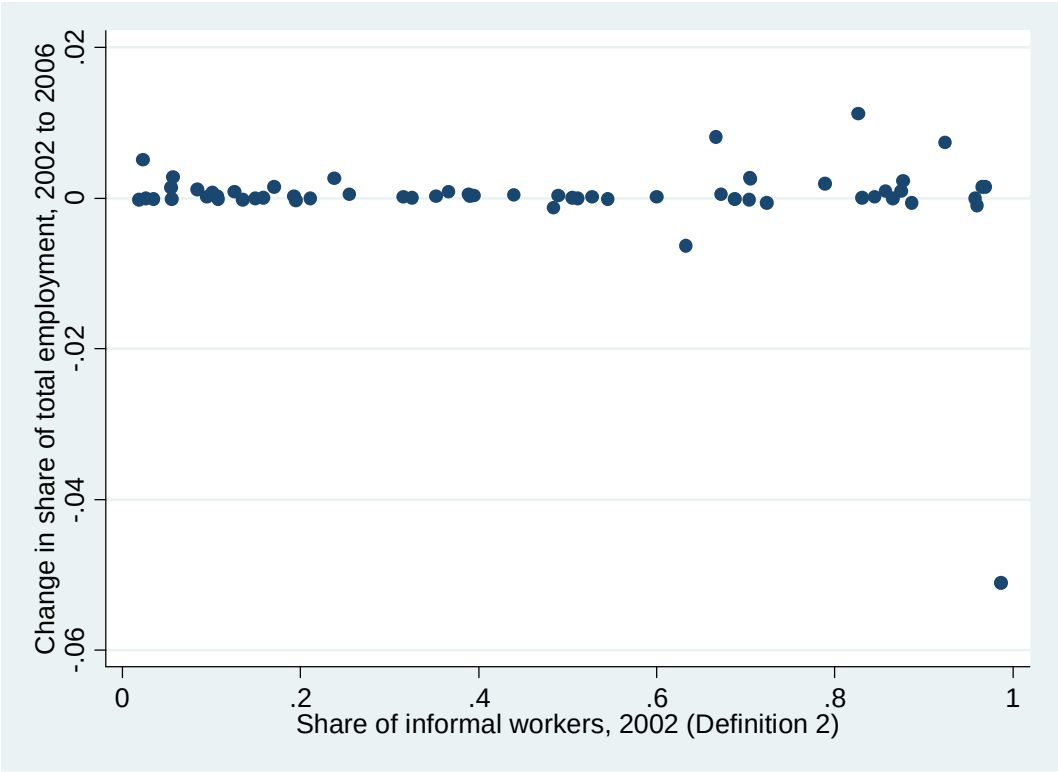
Figure 1: Change in the industry share of total employment (2002-2004) and the 2002 share of industry employment in household businesses



Notes:

1. The major outlier in the lower right corner is agriculture.
2. The correlation is -0.1524 for all industries, but 0.1466 when agriculture is excluded.

Figure 2: 2004-2002 Industry tariff cuts and

the 2002 share of employment in household businesses

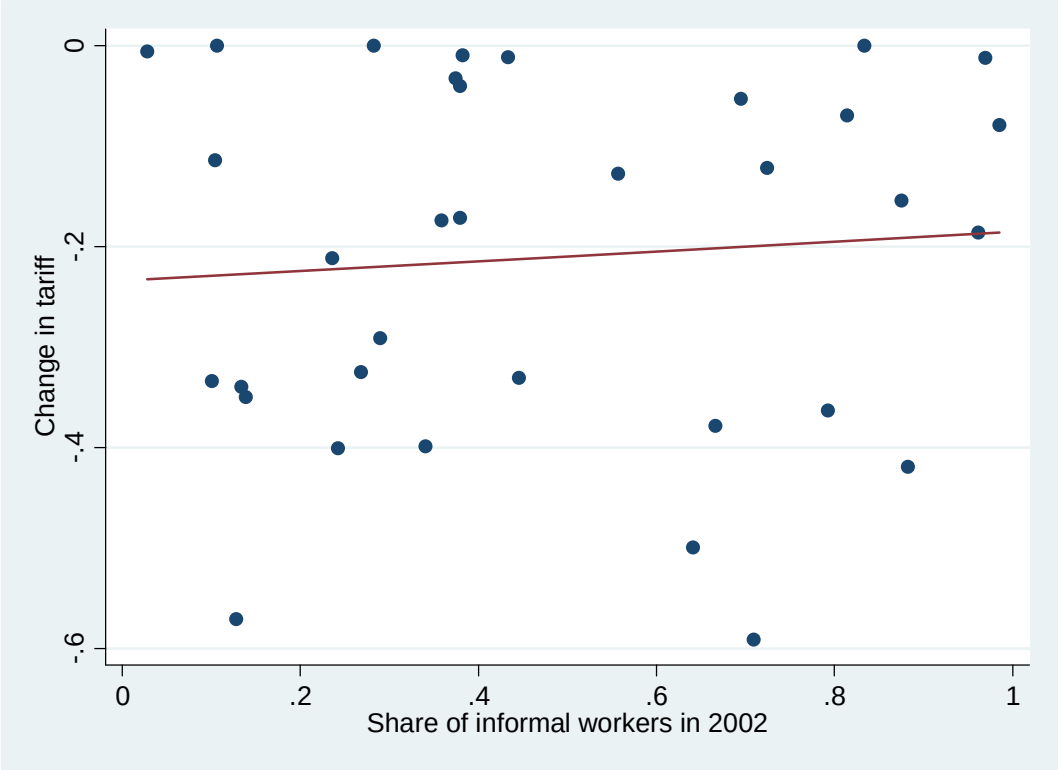


Table 1 - Summary of U.S. tariffs applied to imports from Vietnam

Industry	Number of industries	Mean pre-BTA tariff (Column 2)	Mean post-BTA tariff (MFN)	Mean tariff cut	Standard deviation of tariff cut
Agriculture, hunting & forestry	3	0.085	0.016	0.069	0.010
Fishing	1	0.013	0.002	0.011	
Mining	9	0.027	0.001	0.026	0.045
Manufacturing	57	0.330	0.034	0.296	0.148
Other	6	0.080	0.002	0.077	0.111
Total	76	0.260	0.027	0.234	0.171

Source: McCaig (2011).

Note: The tariffs reported are weighted average tariffs. For each commodity-line tariff, its weight is the share of imports within the sector based on 2001 U.S. imports.

Table 2 - Main commodity exports from Vietnam to the U.S.

SITC Code	SITC Description	2004 Value (million USD)	Annual Growth 2001 to 2004 (%)	Share of exports to U.S. in 2004 (%)
84	Articles of apparel and clothing accessories	2571	276.5	48.7
3	Fish	568	5.9	10.8
85	Footwear	475	53.2	9.0
82	Furniture	386	206.4	7.3
33	Petroleum	349	24.0	6.6
5	Vegetables and fruit	184	54.2	3.5
7	Coffee and tea	144	17.3	2.7

Source: McCaig (2011)

Table 3a: Regressions of ln real hourly compensation (wages/salary + additional payments)

Dependent variable: ln(real hourly compensation)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Indicator for working in a	-0.501***	-0.391***	-0.283***	-0.240***	-0.250***	-0.211***	-0.215***	-0.0704***	-0.212***	-0.0764***	-0.0588*	-0.0627**
household business	(0.00494)	(0.00504)	(0.00571)	(0.00655)	(0.00555)	(0.00630)	(0.0107)	(0.0171)	(0.0118)	(0.0180)	(0.0311)	(0.0307)
2004 indicator		0.124***	0.117***	0.106***	0.115***	0.103***	0.0541***	0.0523***	0.0318***	0.0634***	0.0851***	0.121***
		(0.00493)	(0.00475)	(0.00462)	(0.00454)	(0.00439)	(0.00712)	(0.00586)	(0.00754)	(0.00600)	(0.0301)	(0.0277)
Urban indicator		0.339***	0.268***	0.233***	0.166***	0.138***	0.155***		0.132***		0.0826**	
		(0.00516)	(0.00513)	(0.00520)	(0.00532)	(0.00529)	(0.00879)		(0.00915)		(0.0363)	
Age			0.0382***	0.0388***	0.0389***	0.0366***	0.0503***		0.0497***		0.0336***	
			(0.00158)	(0.00155)	(0.00151)	(0.00147)	(0.00258)		(0.00284)		(0.0104)	
Age squared			-0.000455***	-0.000451***	-0.000447***	-0.000407***	-0.000571***		-0.000541***		-0.000367***	
			(2.11e-05)	(2.06e-05)	(2.02e-05)	(1.96e-05)	(3.30e-05)		(3.66e-05)		(0.000140)	
Primary education			0.0466***	0.00858	0.0466***	0.0154	0.0364*		0.0467**		0.0212	
			(0.0122)	(0.0119)	(0.0118)	(0.0113)	(0.0194)		(0.0217)		(0.0854)	
Lower secondary			0.0473***	-0.0496***	0.134***	0.0607***	0.0906***		0.116***		0.0678	
education			(0.0120)	(0.0120)	(0.0120)	(0.0117)	(0.0199)		(0.0223)		(0.0850)	
Upper secondary			0.292***	0.152***	0.388***	0.270***	0.327***		0.340***		0.198**	
education			(0.0127)	(0.0128)	(0.0126)	(0.0125)	(0.0211)		(0.0234)		(0.0886)	
Female indicator			-0.200***	-0.180***	-0.208***	-0.174***	-0.181***		-0.177***		-0.244***	
			(0.00482)	(0.00519)	(0.00462)	(0.00493)	(0.00826)		(0.00885)		(0.0377)	
Ethnic minority indicator			-0.286***	-0.229***	-0.181***	-0.127***	-0.0770***		-0.0364**		0.0311	
			(0.00874)	(0.00862)	(0.00989)	(0.00957)	(0.0162)		(0.0184)		(0.0926)	
Constant	1.730***	1.498***	0.695***	0.751***	0.610***	0.444***	0.194***	1.493***	0.350***	1.599***	0.546***	1.326***
	(0.00349)	(0.00487)	(0.0306)	(0.0299)	(0.0294)	(0.0292)	(0.0533)	(0.0231)	(0.0587)	(0.0251)	(0.200)	(0.0699)
Industry FEs?	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FEs?	No	No	No	No	Yes	Yes	Yes	No	Yes	No	Yes	No
Individual FEs?	No	No	No	No	No	No	No	Yes	No	Yes	No	Yes
Observations	76,066	76,066	76,066	76,066	76,066	76,066	27,448	27,448	20,662	20,662	1,708	1,708
R-squared	0.119	0.172	0.234	0.284	0.302	0.357	0.367	0.844	0.361	0.774	0.291	0.700

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes:

1. The real wage is calculated by deflating the nominal wage to January prices of the contemporary survey using the monthly cpi deflators included in the hosuehold surveys. Next, these values are converted to January 2006 prices.
2. The sample is columns (1) through (6) is all wages earners between 20 and 64 years old inclusive in the 2002 and 2004 household surveys.
3. The sample in columns (7) and (8) is restricted to individuals that worked in 2002 and 2004.
4. The sample in columns (9) and (10) is restricted to individuals that worked for a wage in 2002 and 2004.
5. The sample in columns (11) and (12) is restricted to individuals that worked for a wage in 2002 and 2004, moved between the household business sector and the formal enterprise sector between 2002 and 2004, and were 20 to 64 years old inclusive as of 2002.
6. The estimates are from Part 34 of "Regressions.do".

Table 3b: Regressions of ln real wage, exploring variation explained by various regressors, 2002 and 2004

Dependent variable: ln(real wage)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Adjusted R-squared	0.356	0.346	0.318	0.301	0.283	0.350	0.351
Indicator for working in a household business	Yes	No	Yes	Yes	Yes	Yes	Yes
2004 indicator	Yes	Yes	Yes	Yes	Yes	Yes	No
Urban indicator	Yes	Yes	Yes	Yes	Yes	No	Yes
Individual characteristics	Yes	Yes	No	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	No	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	No	Yes	Yes
Observations	76,066	76,066	76,066	76,066	76,066	76,066	76,066

Notes:

1. Nominal wages have been deflated based on the month of interview to January of the survey year then converted to January 2006 values.
2. Wages are based on total compensation (i.e., wages/salary plus benefits) divided by annual hours.
3. The sample is restricted to individuals age 20 to 64 inclusive.
4. Regressions programmed in Part 34 of "Regressions.do".

Table 4: Share of employees reporting non-wage/salary payments

	Repeated Cross Sections		2002-2004 panel	
Payment Type	**2002**	**2004**	**2002**	**2004**
All individuals that report working in the household business sector				
Holidays	0.185	0.193	0.178	0.176
Social subsidy (including maternity benefits)	0.002	0.002	0.003	0.003
Business trips	0.003	0.002	0.002	0.001
Other	0.154	0.198	0.154	0.186
Any benefit	0.269	0.309	0.267	0.293
All individuals that report working for other employers				
Holidays	0.849	0.821	0.846	0.832
Social subsidy (including maternity benefits)	0.036	0.038	0.038	0.032
Business trips	0.147	0.136	0.154	0.139
Other	0.597	0.589	0.603	0.593
Any benefit	0.901	0.870	0.902	0.873

Notes:

1. The shares are estimated using survey sample weights.
2. Based on individuals between the ages of 20 and 64 inclusive. For the individuals panels the sample is individuals aged 20 to 64 in 2002.

Table 5a: Industry employment shares and industry tariffs from VHLSS data, all sectors

	(1) Traded	(2) All	(3) Tr. Manuf.	(4) Traded	(5) All	(6) Tr. Manuf.
Industry tariff	-0.0053	-0.0001	0.0001	-0.00122	0.00265	0.00355
	(0.0055)	(0.0026)	(0.0048)	(0.00456)	(0.00226)	(0.00366)
Tariff * Share of exports to world in 2000				-0.110	-0.136*	-0.0833**
				(0.0692)	(0.0741)	(0.0361)
Share of exports to world in 2000 * 2004				-0.0258	-0.0332	0.00448
				(0.0358)	(0.0390)	(0.00992)
2004 indicator	-0.0019	0.0000	0.0005	-0.000900	0.000416	0.000708
	(0.0022)	(0.0008)	(0.0011)	(0.00135)	(0.000482)	(0.000786)
Constant	0.0220***	0.0167***	0.00529***	0.0218***	0.0169***	0.00501***
	(0.0019)	(0.0006)	(0.0015)	(0.00178)	(0.000789)	(0.000948)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	68	120	44	68	120	44
R-squared	0.999	0.998	0.979	0.999	0.999	0.988

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes:
1. The samples includes workers between the ages of 20 and 64.
2. For regressions including non-traded industries the industry tariff has been set to 0 in zero in both years for non-traded industries.

Table 5b: Industry employment shares and industry tariffs from VHLSS data, formal enterprise sector

	(1) Traded	(2) All	(3) Tr. Manuf.	(4) Traded	(5) All	(6) Tr. Manuf.
Industry tariff	-0.0065	-0.0030	-0.0058	0.00350	0.00509	0.00901
	(0.0084)	(0.0065)	(0.0129)	(0.00579)	(0.00464)	(0.00901)
Tariff * Share of exports to world in 2000				-0.281***	-0.292***	-0.358***
				(0.0882)	(0.0872)	(0.0812)
Share of exports to world in 2000 * 2004				-0.0230	-0.0260	-0.0418*
				(0.0239)	(0.0248)	(0.0213)
2004 indicator	-0.0016	-0.0004	-0.0012	-0.000474	6.83e-05	0.00138
	(0.0015)	(0.0008)	(0.0029)	(0.000982)	(0.000753)	(0.00193)
Constant	0.0131***	0.0171***	0.0139***	0.0128***	0.0172***	0.0127***
	(0.0018)	(0.0009)	(0.0039)	(0.00136)	(0.000769)	(0.00231)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	68	120	44	68	120	44
R-squared	0.956	0.992	0.962	0.967	0.994	0.980

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes:
1. The samples includes workers between the ages of 20 and 64.
2. For regressions including non-traded industries the industry tariff has been set to 0 in zero in both years for non-traded industries.

Table 5c: Industry employment shares and industry tariffs from Enterprise Survey data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				US exports in 2000			World exports in 2000		
	Traded	All	Tr. Manuf.	Traded	All	Tr. Manuf.	Traded	All	Tr. Manuf.
Tariff	-0.0157**	-0.0105*	-0.0129	-0.00292	-0.00243	0.00172	-0.00678	-0.00288	0.00178
	(0.00702)	(0.00540)	(0.00991)	(0.00468)	(0.00367)	(0.00597)	(0.00526)	(0.00382)	(0.00539)
Tariff * Share of exports in				-1.498***	-1.512***	-1.332***	-0.492***	-0.543***	-0.709***
2000				(0.309)	(0.301)	(0.259)	(0.127)	(0.126)	(0.0793)
Share of exports in 2000 *				-0.213***	-0.215***	-0.179***	-0.0389	-0.0538	-0.102**
2003 dummy				(0.0558)	(0.0537)	(0.0366)	(0.0501)	(0.0526)	(0.0397)
2003 dummy	-0.00323**	-0.00136	-0.00199	-0.000506	-0.000337	0.00153	-0.00220*	-0.000874	0.000848
	(0.00156)	(0.000865)	(0.00231)	(0.00113)	(0.000765)	(0.00161)	(0.00127)	(0.000792)	(0.00107)
Constant	0.0221***	0.0197***	0.0249***	0.0233***	0.0211***	0.0248***	0.0218***	0.0198***	0.0237***
	(0.00170)	(0.000852)	(0.00301)	(0.00129)	(0.000761)	(0.00200)	(0.00137)	(0.000773)	(0.00140)
Observations	66	110	44	66	110	44	66	110	44
R-squared	0.986	0.992	0.991	0.993	0.995	0.996	0.989	0.993	0.996

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes:

1. Uses end of year employment from 2000 and 2003.
2. All regressions include industry fixed effects.
3. Uses 2-digit industry codes.
4. Share of exports is based on Vietnames exports to the indicated region in 2000. All non-traded industries are assigned a value of 0.

Table 6: Share of employment in household businesses

	All industries		Excluding agriculture and fisheries		Manufacturing	
	2002	**2004**	**2002**	**2004**	**2002**	**2004**
			Repeated cross sections			
Nationally	0.857	0.824	0.683	0.633	0.660	0.594
Urban	0.655	0.609	0.595	0.546	0.527	0.470
Rural	0.916	0.885	0.753	0.693	0.745	0.659
			Individual panel			
Nationally	0.858	0.834	0.677	0.645	0.669	0.624
Urban	0.650	0.612	0.580	0.542	0.514	0.475
Rural	0.918	0.895	0.755	0.714	0.774	0.703

Notes:

1. The repeated cross section shares are based on workers age 15 to 64 inclusive as of the time of the survey. The panel shares are based on workers age 15 to 64 inclusive as 2002.

2. Survey sampling weights included.

Source: Author's own estimates based on the 2002 and 2004 VHLSSs.

Table 7: Decomposing changes in household business employment, 2002

		All industries	Excluding agriculture & aquaculture	Manufacturing
Nationally	Within	-0.018	-0.043	-0.068
	Between	-0.016	-0.007	0.002
	Total	-0.033	-0.050	-0.066
Urban	Within	-0.037	-0.045	-0.068
	Between	-0.009	-0.004	0.012
	Total	-0.046	-0.049	-0.056
Rural	Within	-0.015	-0.048	-0.076
	Between	-0.016	-0.011	-0.010
	Total	-0.030	-0.059	-0.086

Notes:
1. Based on workers aged 15 to 64 inclusive.
2. Survey sampling weights included.
Source: Authors' own estimates based on the 2002 and 2004 VHLSSs.

Table 8: Regression of indicator for working in a household business using the repeated cross sections

	(1) Traded	(2) All industries	(3) Manufacturing
Industry 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)
2004 indicator	0.0134**	-0.00508	-0.0149
	(0.00550)	(0.0101)	(0.00899)
Rural indicator	0.0484**	0.0450***	0.0766***
	(0.0203)	(0.0114)	(0.0208)
Constant	0.777***	0.798***	0.0543
	(0.112)	(0.0646)	(0.127)
Industry fixed effects?	Yes	Yes	Yes
Province 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

Robust standard errors in parentheses, clustered by industry.
*** p<0.01, ** p<0.05, * p<0.1

Notes:
1. The sample is restricted to workers between the ages of 20 and 64 inclusive at the time of the survey.
2. Column (1) includes all traded industries, column (2) includes all industries, and column (3) includes all traded manufacturing industries.

Table 9: Change in industry tariff on the 2002 share of household business employment within an industry

	(1) Traded	(2) All	(3) Manufacturing
2002 Share of employment in household businesses	0.0491	0.00455	0.0433
	(0.106)	(0.0683)	(0.134)
Constant	-0.234***	-0.121***	-0.309***
	(0.0596)	(0.0386)	(0.0688)
Observations	34	60	23
R-squared	0.007	0.000	0.005

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Estimated coefficients on industry tariffs from regressions of alternative indicators of employment status

	(1)	(2)	(3)
Employment Status Indicator	Traded	All industries	Manufacturing
Self-employment	0.212***	0.127***	0.201***
	(0.0409)	(0.0396)	(0.0510)
Work in household business or in a formal	0.148***	0.105***	0.131***
sector firm without receiving benefits	(0.00995)	(0.0214)	(0.0166)

Robust standard errors in parentheses, clustered by industry.
*** p<0.01, ** p<0.05, * p<0.1

Notes:
1. The sample is restricted to workers between the ages of 20 and 64 inclusive at the time of the survey.
2. Column (1) includes all traded industries, column (2) includes all industries, and column (3) includes all traded manufacturing industries.
3. All regressions include individual covariates (age, age squared, education levels, gender, and ethnic minority status), a 2004 indicator, urban indicator, and industry and province fixed effects.

Table 11: Regressions of an indicator for working in a household business, transitioning from repeated cross sections to the individual panel: traded industries

	(1)	(2)	(3)	(4)	(5)	(6)
Contemporary industry tariff	0.210***	0.230***	0.165***	0.143***		
	(0.0140)	(0.0227)	(0.0276)	(0.0282)		
Initial industry tariff					0.144***	0.111***
					(0.0196)	(0.0301)
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	No
Individual fixed effects?	No	No	No	No	No	Yes
Observations	176,546	61,115	59,501	56,901	57,686	57,686
R-squared	0.415	0.427	0.424	0.424	0.445	0.868

Robust standard errors in parentheses, clustered by industry. *** p<0.01, ** p<0.05, * p<0.1

Notes:
1. Column (1) is based on all workers age 20 to 64 at the time of survey; column (2) restricts the sample to individuals interviewed in 2002 and 2004; column (3) is based on panel individuals between the ages of 20 and 64 as of 2002; column (4) restricts the sample to individuals that worked in both years; columns (5) and (6) use the same sample as column (4).
2. All regressions that do not include individual fixed effects include individual covariates (age, age squared, education levels, gender, and ethnic minority status).
3. All regressions include a 2004 indicator and an urban indicator.

Table 12a: Regressions of an indicator for working in a household business, transitioning from repeated cross sections to the individual panel: all industries

	(1)	(2)	(3)	(4)	(5)	(6)
Contemporary industry tariff	0.125***	0.143***	0.0893***	0.0748**		
	(0.0341)	(0.0388)	(0.0328)	(0.0319)		
Initial industry tariff					0.0633**	0.0440*
					(0.0294)	(0.0240)
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects?	Yes	Yes	Yes	Yes	Yes	No
Individual fixed effects?	No	No	No	No	No	Yes
Observations	248,793	85,899	83,780	79,880	79,880	79,880
R-squared	0.591	0.610	0.619	0.625	0.625	0.911

Robust standard errors in parentheses, clustered by industry. *** p<0.01, ** p<0.05, * p<0.1

Notes:
1. Column (1) is based on all workers age 20 to 64 at the time of survey; column (2) restricts the sample to individuals interviewed in 2002 and 2004; column (3) is based on panel individuals between the ages of 20 and 64 as of 2002; column (4) restricts the sample to individuals that worked in both years; columns (5) and (6) use the same sample as column (4).
2. All regressions that do not include individual fixed effects include individual covariates (age, age squared, education levels, gender, and ethnic minority status).
3. All regressions include a 2004 indicator and an urban indicator.

Table 12b: Regressions of an indicator for working in a household business, transitioning from repeated cross sections to the individual panel: traded manufacturing industries

	(1)	(2)	(3)	(4)	(5)	(6)
Contemporary industry tariff	0.164***	0.193***	0.153***	0.153***		
	(0.0204)	(0.0325)	(0.0393)	(0.0424)		
Initial industry tariff					0.180***	0.0867**
					(0.0493)	(0.0418)
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects?	Yes	Yes	Yes	Yes	Yes	No
Individual fixed effects?	No	No	No	No	No	Yes
Observations	27,072	8,930	8,408	7,966	7,584	7,584
R-squared	0.293	0.320	0.323	0.322	0.357	0.886

Robust standard errors in parentheses, clustered by industry. *** p<0.01, ** p<0.05, * p<0.1

Notes:
1. Column (1) is based on all workers age 20 to 64 at the time of survey working in traded manufacturing industries. Column (2) restricts the sample to panel individuals. Column (3) is based on panel individuals age 20 to 64 as of 2002. Column (4) restricts the sample from column (3) to individuals that worked in both years. Column (5) changes the sample to individuals that worked in a traded manufacturing industry as of 2002. Column (6) uses the same sample as column (5).
2. All regressions that do not include individual fixed effects include individual covariates (age, age squared, education levels, gender, and ethnic minority status).
3. All regressions include a 2004 indicator and an urban indicator.

Table 13a: Falsification test of the relation between tariffs and working in a household business using the 1993 and 1998 repeated cross sections

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Indicator for being self-employed			Indicator for being self-employed or working for a household or private business		
	Traded industries	All industries	Traded manufacturing	Traded industries	All industries	Traded manufacturing
Industry tariff	0.0360	0.0142	-0.00480	0.00132	0.0150	-0.208
	(0.0337)	(0.0350)	(0.102)	(0.0817)	(0.0781)	(0.144)
1998 indicator	0.00380	-0.00280	-0.00871	-0.0243***	-0.0215**	-0.119*
	(0.00357)	(0.00493)	(0.0397)	(0.00770)	(0.00855)	(0.0574)
Industry FEs?	Yes	Yes	Yes	Yes	Yes	Yes
Province FEs?	Yes	Yes	Yes	Yes	Yes	Yes
# of industries	28	54	17	28	54	17
Observations	17,568	22,687	2,366	17,568	22,687	2,366
R-squared	0.344	0.505	0.234	0.254	0.515	0.224

Robust standard errors in parentheses, clustered by industry. *** p<0.01, ** p<0.05, * p<0.1

Notes:

1. The sample is restricted to individuals age 20 to 64 inclusive.
2. 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.
3. The sample includes individuals from 1993 that work in an industry that requires aggregating two industries from 1998 to match it. Industries 31 and 32, 34 and 35, and 30 and 33 were merged together. For each newly merged industry, a simple average tariff was calculated for both the pre- and post-BTA tariff.
4. The sample assumes that individuals in either industry 123 or 124 in 1993 are in aquaculture.
5. Individuals in industries 17 and 18 have been merged together and an average tariff has been applied.
6. Individuals in industries 20 and 36 have been merged together and an average tariff has been applied.

Table 13b: Robustness of 2002-2004 regressions of the probability of working for a household business to alternative industry groupings and pre-existing trends

	(1) Traded industries	(2) All industries	(3) Traded manufacturing	(4) Traded industries	(5) All industries	(6) Traded manufacturing
Industry tariff	0.198***	0.110***	0.121***	0.197***	0.110***	0.134***
	(0.0143)	(0.0380)	(0.0160)	(0.0159)	(0.0372)	(0.0287)
Change in the share of informal 1 workers between	-0.0175	0.00956	0.0429			
1993 and 1998 interacted with 2004 time dummy	(0.0751)	(0.0897)	(0.0655)			
Change in the share of informal 4 workers between				-0.0271	-0.00951	0.0499
1993 and 1998 interacted with 2004 time dummy				(0.0792)	(0.0810)	(0.0739)
2004 indicator	0.0129**	-0.00557	-0.0225***	0.0120*	-0.00579	-0.0165
	(0.00567)	(0.0101)	(0.00733)	(0.00624)	(0.00999)	(0.0136)
Industry FEs?	Yes	Yes	Yes	Yes	Yes	Yes
Province FEs?	Yes	Yes	Yes	Yes	Yes	Yes
Number of industries	29	55	17	29	55	17
Observations	175,602	245,509	26,935	175,602	245,509	26,935
R-squared	0.404	0.591	0.285	0.404	0.591	0.285

Robust standard errors in parentheses clustered by industry. *** p<0.01, ** p<0.05, * p<0.1

Notes:

1. The province codes are based on 1993 provincial boundaries.
2. The following 2-digit ISIC revision 3 industries have been merged: 17 (textiles) and 18 (waering apparel; dressing and dyeing of fur), 20 (wood and products of wood and cork, except furniture; articles of straw and plaiting materials) and 36 (furniture and manufacturing n.e.c.), 31 (electrical machinery and apparatus n.e.c.) and 32 (radio, television, and communication equipment and apparatus), 34 (motor vehicles, trailers, and semi-trailers) and 35 (other transport equipment), and 30 (office, accounting, and computing machinery) and 33 (medical, precision and optical instruments, watches and clocks).
3. The sample is restricted to individuals age 20 to 64 inclusive.
4. Informal 1 is defined as self-employment.
5. Informal 4 is defined as self-employment, working in a household business, or working in a private firm.
6. The estimates are produced in Part 26 of "Regressions.do".
7. All regressions include the following worker characteristics: age, age squared, education level indicators, female indicator, ethnic minority indicator, and rural indicator.

Table 14: Decomposition of changes in the share of workers i household businesses using the 2002-2004 panel

	Nationally	Urban	Rural
	All industries		
Net Entrants	-0.010	-0.014	-0.008
Stayers	-0.020	-0.028	-0.021
same industry	-0.003	-0.008	-0.003
changed industry	-0.018	-0.020	-0.018
Total	-0.030	-0.042	-0.029
	Manufacturing		
Net Entrants	-0.047	-0.029	-0.075
Stayers	-0.019	-0.019	-0.023
same industry	-0.006	-0.005	-0.009
changed industry	-0.013	-0.014	-0.013
Total	-0.066	-0.048	-0.098

Notes:
1. Based on workers aged 15 to 64 as of 2002.
2. Contemporary sampling weights included.
3. The groups of workers are: (1) individuals in the same industry, individuals that changed industries, (3) entrants to the indicated wo and exiters from the indicated workforce.
4. Urban and rural status is based on urban-rural classification in 2

Appendix Table A.1: Descriptive statistics

	2002 & 2004		2002		2004	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Worked in a household business	0.686	0.464	0.701	0.458	0.672	0.469
Self-employed	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:
1. The sample is all observations from 2002 and 2004 that worked and were 20 to 64 years of age inclusive at the time of the survey.
2. The number of observations for wages are lower: 46,309 and 29,758 in 2002 and 2004 respectively.

Appendix Table A.2: Summary statistics of employees in enterprises

	Shares		Number	
Enterprise employees in:	**2000**	**2003**	**2000**	**2003**
Agriculture, forestry, and aquaculture	0.076	0.049	267,304	252,132
Mining	0.043	0.031	152,327	162,512
Manufacturing	0.452	0.494	1,598,485	2,557,296
Services	0.430	0.426	1,519,766	2,202,820
State	0.585	0.422	2,070,885	2,184,985
Collective	0.052	0.031	182,320	160,949
Private	0.248	0.380	876,941	1,968,567
Foreign	0.115	0.166	407,736	860,259
Total	1.000	1.000	3,537,882	5,174,760

Notes:

1. See Part 6 of "Enterprise analysis.do" for matching of ownership codes to broad categories.
2. The industry of the firm is based on the first industry of operation listed by the firm.
3. The employment numbers are based on the end of the year reports.