EXPORTING OUT OF POVERTY: PROVINCIAL POVERTY IN VIETNAM AND U.S. MARKET ACCESS*

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Job Market Paper

Can a small, poor country reduce poverty by gaining market access to a large, rich country? The 2001 U.S.-Vietnam Bilateral Trade Agreement provides an excellent opportunity to examine this question, as the cuts in U.S. tariffs are not subject to the usual political economy concerns. Between 2002 and 2004, provinces that were more exposed to the U.S. tariff cuts experienced greater decreases in poverty. An increase of one standard deviation in provincial exposure leads to a reduction in the poverty headcount ratio of approximately 10 percent. Furthermore, I explore three labor market channels from the trade agreement to poverty alleviation. Provinces that were more exposed to the tariff cuts experienced (1) increases in provincial wage premiums, particularly among rural workers and workers in agriculture, forestry, and fishing, (2) faster reallocation of workers from agriculture, forestry, and fishing into manufacturing, and (3) more rapid enterprise job growth.

JEL codes: F14, F16, I32, O11
Keywords: trade liberalization, poverty, Vietnam

* I am grateful to Loren Brandt, Daniel Trefler, and Azim Essaji for helpful advice and suggestions, to seminar participants at the University of Toronto, to conference participants at the Laurier Conference on Empirical International Trade, to the Centre for Analysis and Forecasting, Vietnam, and to the Center for Agricultural Policy, Vietnam. I gratefully acknowledge support from the Social Sciences and Humanities Research Council of Canada.

I. INTRODUCTION

Can a small, poor country reduce poverty by gaining market access to a large, rich country? International policy makers and civil society groups seem to think the answer is yes. For example, the most recent round of WTO negotiations focuses on development through trade. The agenda called for developed countries to reduce barriers to trade in agricultural goods, including reductions in subsidies, as developing countries are thought to have a comparative advantage in this sector. Similarly, activists campaign for the removal of agricultural subsidies in developed countries presuming that this will create new export opportunities for developing countries. But what do economists really know about the impact of increased market access on developing countries? The answer, unfortunately, is that little *ex post* empirical evidence exists to support or contradict this conclusion. The current paper seeks to contribute to this knowledge gap.

The paper uses the United States-Vietnam Bilateral Trade Agreement (BTA) to examine the impact of increased market access on poverty in Vietnam. A key attraction to studying the BTA between the U.S. and Vietnam is the simplicity and extensiveness of the changes in tariffs faced by Vietnamese exports to the U.S. As discussed in greater detail below, the U.S. committed to granting Vietnam the status of Normal Trade Relations (or Most Favored Nation status) upon entry into force of the agreement. This straightforward reclassification of Vietnamese exports implies that the tariff cuts offered by the U.S. are less susceptible to endogeneity concerns via political lobbying.

Since the BTA came into force in December 2001, Vietnamese exports to the U.S. have grown very rapidly. From 2001 to 2002, Vietnamese exports to the U.S. grew by 128 percent and by an additional 90 percent from 2002 to 2003 (see Table I). 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.[1] 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 II presents information on 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 low-skilled labor. This suggests the potential for the increase in exports to have positive impacts on alleviating poverty in Vietnam through increased demand for low-skilled labor.

Following the entry into force of the BTA, the incidence of poverty in Vietnam continued its dramatic decline. Between 2002 and 2004 the national poverty rate fell from to 28.9 to 19.5 percent.[2] While there is clearly a coincident trend in the fall in poverty and U.S. market access, it remains an empirical question whether there is a causal connection running from the cut in U.S. tariffs to the fall in poverty.

The paper measures the immediate short-run impacts of U.S. tariff cuts on provincial poverty in Vietnam. Following Topalova (2005), I construct provincial measures of exposure to the U.S. tariff cuts by weighting the tariff cuts by the pre-

[1] According to the GSO, exports of goods and services in 2004 were 65.74 percent of GDP.
[2] There is some concern over the magnitude of the decline, in particular that the national poverty rate in 2002 may be overestimated (see Glewwe (2005)). I will attempt to address this issue rigorously in the empirical section below.

existing share of employment by industry within each province. I find that provinces that were more heavily exposed to the tariff cuts (i.e., had a greater share of workers in industries with large tariff cuts) experienced more rapid decreases in poverty. The impact on provincial poverty rates between 2002 and 2004 is large. An increase of one standard deviation in provincial exposure leads to a reduction in the incidence of poverty by approximately 10 percent. The results are robust to alternative measures of poverty, alternative poverty lines, plausible measurement error in provincial poverty rates, and differential provincial poverty trends induced by variation in initial conditions. Regarding transmission mechanisms, I provide evidence that provincial wage premiums relatively increased, reallocation of workers from agriculture, forestry, and fishing to manufacturing was quicker, and employment in formal enterprises grew more quickly in more exposed provinces.

The paper proceeds by providing an overview of the literature on trade and poverty and a theoretical discussion of the impact of changes in foreign market access when sub-national units vary in their initial industrial structure. Next, the BTA is discussed in detail, followed by an overview of the data and empirical methodology used in the paper. Subsequently, regression results are reported and discussed, before concluding remarks are presented.

II. BACKGROUND

The trade and poverty literature provides little direct empirical evidence about the *ex post* economic impact of changes in trade policy on the poor (see reviews by Winters et al. (2002) and Goldberg and Pavcnik (2004)). Nonetheless, the associated literature is

very large and generally falls into one of two literature strands. The first strand relies on the relationship between growth and openness to trade combined with the relationship between growth and poverty alleviation.[3] The second strand relies on indirect evidence of the impact of changes in trade policy on poverty. This often takes the form of evidence linking labor market correlates of poverty, such as unemployment, employment in the informal sector, and unfavorable changes in wages for unskilled workers, with trade liberalization.[4]

Very recently, however, empirical evidence on trade liberalization and poverty has emerged. Topalova (2005) studies India's unilateral trade liberalization over the late 1980s and early 1990s, and the variation in regional impacts. She finds that rural Indian districts that were more exposed to the import tariff reductions experienced slower declines in poverty than districts that were less exposed. Porto (2003), Porto (2005), and Nicita (2004) predict the impact of changes in trade policy on households. The papers use *ex post* estimates of the impact of tariff changes on prices and predict the subsequent impact on household income or expenditures as suggested by initial household production and consumption patterns.

Most of the studies on trade and poverty use national trade reforms, such as own country tariff reductions or quota removals, as their source of variation in trade policy. Few papers look at the converse question – can countries use new trade opportunities as a mechanism for poverty reduction? Porto (2003) estimates the impact of possible domestic

[3] See Hallack and Levinsohn (2004) for a recent review of the trade and growth literature. Kraay (2006) provides evidence across a panel of developing countries that suggests that most of the long-run variation in changes in poverty can be explained by growth of average incomes. Besley and Burgess (2003) provide evidence of the elasticity of poverty with respect to income per capita.

[4] For recent empirical evidence of the impact of trade on labour markets in developing countries see Attanasio, Goldberg and Pavcnik (2004), Goldberg and Pavcnik (2003), Pavcnik, Blom, Goldberg, and Schady (2004), Galiani and Sanguinetti (2003), and Goldberg and Pavcnik (2005), among others.

and international trade reform for Argentina. He predicts that the elimination of agricultural subsidies and trade barriers on agricultural manufactures and industrial manufactures in industrialized countries would cause poverty to decline in Argentina. In a cross-country framework, Romalis (2003) studies the impact of developed country tariff cuts on exports from developing countries under the Generalized System of Preferences in the 1970s. He finds that developing countries that benefited more from the tariff cuts experienced more rapid growth, but he does not specifically address the poverty implications.

The empirical section of this paper directly focuses on the impact of new export opportunities induced by increased market access on poverty. The framework addresses whether all provinces in Vietnam derived similar benefits from the decreases in U.S. tariffs. Should one expect variation in impacts at the sub-national level? Traditional theories of international trade do not address this question. As such, I provide a brief adaptation of the Ricardo-Viner model, also known as the Specific Factors model, to illustrate why one might expect differences in the impact across provinces.[5] The Specific Factors model seems most appropriate as the empirical section focuses on the first two years immediately following the implementation of the BTA.

In this model labor is assumed to be completely mobile across industries, whereas capital is immobile in the short run. As a simple example, consider a two-province country that moves from international autarky to international free trade. For the current discussion, I abstract away from internal trade between the two provinces and I further assume that the country takes world prices as given. Let $X_i^p = f_i\left(L_i^p, K_i^p\right)$ denote the

[5] See Feenstra (2004) for a discussion of the Ricardo-Viner model of international trade.

production of good $i = 1, 2$ in province $p = A, B$, where it is assumed that each province uses the same technology to produce good *i*. Assume that prior to international trade, inter-province labor mobility has equalized the wage rate $w = w^A = w^B$. From the first-order condition with respect to labor demand, this implies that the labor-capital ratio within an industry must be equal across provinces.[6] Consider what happens in the short-run when the country opens up to trade. Suppose that this increases the relative price, *p*, of good 1, where the price of good 2 has been normalized to one. The percentage wage change can be expressed as:

$$\begin{aligned}\frac{dw}{w} &= \frac{f_{2LL}\left(L_2, K_2\right)}{f_{2LL}\left(L_2, K_2\right) + pf_{1LL}\left(L_1, K_1\right)}\frac{dp}{p} \\ &= \frac{\frac{1}{K_2} f_{2LL}\left(\frac{L_2}{K_2}, 1\right)}{\frac{1}{K_2} f_{2LL}\left(\frac{L_2}{K_2}, 1\right) + p\frac{1}{K_1} f_{1LL}\left(\frac{L_1}{K_1}, 1\right)}\frac{dp}{p} \\ &= \frac{f_{2LL}\left(\frac{L_2}{K_2}, 1\right)}{f_{2LL}\left(\frac{L_2}{K_2}, 1\right) + \left(\frac{K_2}{K_1}\right) pf_{1LL}\left(\frac{L_1}{K_1}, 1\right)}\frac{dp}{p}\end{aligned}$$

where I have suppressed the province superscripts. The second line comes from the assumption of constant returns to scale in the production functions (i.e., they are homogeneous of degree one). This implies the second partial derivatives are homogeneous of degree negative one (Varian (1992)). Since the ratio of labor to capital is constant across provinces within an industry, the percentage change in wages will differ across provinces according to the difference in capital stocks ratios assuming that labor is imperfectly mobile across provinces. Thus, the province with the higher share of its

[6] This is a result of f_{iL} being homogenous of degree 0 from assuming constant returns to scale in f_i.

capital invested in good 1, the rising price industry, would expect a greater percentage change in the nominal wage rate. This simple model helps to explain why some provinces might be expected to benefit more than others in the immediate short-run following entry into force of the BTA.

III. OVERVIEW OF THE U.S.-VIETNAM BILATERAL TRADE AGREEMENT

The BTA was signed on 13 July 2000 and came into force on 10 December 2001.[7] The commitments made by the United States and Vietnam are similar to those required by the World Trade Organization (WTO). As such, the principal change for the U.S. was to grant Vietnam Normal Trade Relations (NTR) or Most Favored Nation (MFN) access to the U.S. market immediately upon entry into force of the BTA. In contrast, the scope of the commitments for Vietnam is much larger. The bulk of Vietnam's commitments are scheduled for implementation within three to four years after entry into force, but some commitments are not required until up to ten years. The majority of Vietnam's commitments lie in the realm of legal and regulatory change as Vietnam already applied MFN tariffs to U.S. products well before the BTA. These commitments include accordance of national treatment to U.S. companies and nationals, customs system and procedures reform, liberalizing and streamlining trading rights, liberalizing trade in services, liberalizing and safeguarding foreign investment, among others. As for trade policy commitments, the BTA requires Vietnam to cut tariffs on only

[7] This section draws heavily on the STAR-Vietnam report "An Assessment of the Economic Impact of the United States – Vietnam Bilateral Trade Agreement."

around 250 tariff lines out of more than 6,000, typically by 25 to 50 percent, mostly in agriculture. The overall impact of these cuts on industry level tariffs has been very small. Industry level Vietnamese tariffs have been very stable over the period of 1999 to 2004. Furthermore, the BTA has an extensive list of quantitative import restrictions that must be eliminated, typically four to six years after entry into force. Almost all of these were eliminated well ahead of schedule as part of an IMF/World Bank Agreement. By the beginning of 2003, all import quotas except for those on sugar and petroleum products had been lifted. Quotas on sugar and petroleum products are required to be removed after ten and seven years from entry into force of the BTA.

IV. DATA

The primary poverty measure used in the empirical analysis is the poverty headcount ratio. It measures the share of the population that falls below the poverty line (i.e., the total number of individuals with expenditures below the poverty line divided by the total population). As with most studies of poverty in developing countries, this paper focuses on absolute deprivation. Thus, the poverty line used does not change over time as living standards improve or decline, instead it represents the same absolute level of expenditures adjusted for inflation.

The 2002 and 2004 Vietnam Household Living Standards Surveys (VHLSS) provide information on household expenditures, occupation, employment, and various other household and individual characteristics. Expenditure information is available for approximately 30,000 households in the 2002 VHLSS and 9,000 households in the 2004 VHLSS. The 2002 VHLSS was conducted between January 2002 and December 2002. In

contrast, the 2004 VHLSS interviewed households only from May 2004 through November 2004, with the majority of households being interviewed in June and September. For both surveys the recall period for expenditures and employment is the past twelve months. The GSO conducted both surveys with a largely consistent questionnaire. To construct estimates of provincial poverty, I use the official "general poverty line", which includes an estimate of the cost of a basket of food items required to consume 2100 calories per day and essential non-food items such as clothing and housing.[8] The general poverty line is 1,917 thousand VND in 2002 and 2,077 thousand VND in 2004. Glewwe (2005) has reviewed the consistency of the expenditure data and concludes that they are broadly consistent across the 2002 and 2004 VHLSS. Details of the expenditure variables and sample weights used can be found in the data appendix.

There is a substantial amount of variation in provincial poverty. Table III contains the poverty headcount ratio for each province in 2002 and 2004, as well as the proportional drop in poverty between 2002 and 2004. The latter is the primary dependent variable of the current study. The 2002 levels of poverty range from a high of 77 percent in Lai Chau to a low of 2 percent in Ho Chi Minh City. For the current study, it is not the level of poverty, but rather its rate of decline that is most interesting. Here too there is considerable variation. Two provinces experienced measured increases in the incidence of poverty, Khanh Hoa and Bac Lieu, while Ho Chi Minh City eliminated all remaining poverty between 2002 and 2004. The proportional drop in poverty between 2002 and 2004 is negatively correlated with the incidence of poverty in 2002. This suggests that existing trends in economic performance may be an important factor for explaining the

[8] See World Bank (1999).

decrease in poverty. In the empirical section I attempt to address this concern by controlling for differences in initial provincial characteristics.

For employment data, I use the 3 percent sample of the 1999 Population and Housing Census. In general, it reports industry of employment at the 3-digit ISIC level, but for some individuals it is only reported at the 2-digit level.[9] I restrict the sample to individuals 13 years of age and older, as individuals below age 13 were not asked about their employment status. Table IV displays the portion of the work force within each province involved in (1) agriculture, forestry and fishing, (2) mining and quarrying, (3) manufacturing, and (4) other industries. In almost all provinces, a large majority of workers are employed in agriculture, forestry, and fishing. The primary exceptions are the manufacturing centers Ho Chi Minh City, Ha Noi, Hai Phong, Da Nang, and Binh Duong. These provinces also feature lower levels of poverty in 2002. In the empirical section I attempt to control for differential poverty trends among provinces induced by different initial employment conditions.

Finally, I use U.S. tariffs from the U.S. International Trade Commission's online Tariff Information Center. Prior to the BTA Vietnam was subject to tariffs according to Column 2 of the U.S. tariff schedule. I take column 2 tariffs from 1998, as this is well before the BTA was signed. Upon entry into force of the BTA, Vietnam became subject to MFN tariff rates. I use MFN tariff rates from 2004. For both years, I compute the ad valorem equivalent of any specific tariffs. Details of the procedure can be found in the data appendix. I then match the tariff lines to industries by the concordance provided by

[9] To be exact, the industry codes used in the census do not match exactly with the ISIC nomenclature. There are a small number of industries for which the 3-digit industry assigned to the described industry does not match the ISIC code. I recode these observations according to ISIC nomenclature. This is the same for the 2002 and 2004 VHLSS. See the data appendix for further details.

the World Bank via the World Integrated Trade Solution database to construct industry-level tariffs according to 3-digit ISIC nomenclature.

Among traded industries, the simple mean of U.S. tariffs fell from 28.9 percent to 3.7 percent. The dispersion of tariffs also fell, from a standard deviation of 19.3 to 7.6 percent. Hence, the fall in tariffs is large, sudden, and varies across industries. Figure I shows the cut in industry tariffs versus the initial industry tariff. The cuts in industry tariffs form an almost uniform line. The major outlier is the manufacture of tobacco products.

Between 2002 and 2004 three Vietnamese provinces were split. To be consistent, I recode household observations from the 2004 VHLSS into the original 61 provinces, as in the 1999 census and the 2002 VHLSS.

V. EMPIRICAL METHODOLOGY

Following Topalova (2005), I exploit the sub-national variation in exposure to the trade agreement based on the structure of employment prior to the trade agreement. I construct provincial measures of the drop in U.S. protection as follows:

$$TariffDrop_p = \sum_i \omega_{ip} \Delta\tau_i \qquad (1)$$

where p indexes provinces, ω_{ip} is the share of workers in province p in industry i (i.e., $\sum_i \omega_{ip} = 1$), and $\Delta\tau_i$ is the tariff drop in industry i. Figure II shows a scatter plot of the proportional drop in poverty versus the drop in provincial tariffs. In general, provinces with a greater share of employment in manufacturing were more exposed to the tariff cuts, as cuts in U.S. tariffs were larger for manufactured goods than for agricultural

goods. The provinces of Ho Chi Minh City and Binh Duong are the two outliers in the top-right corner of the figure (Ho Chi Minh City is the largest outlier). These two provinces have the largest share of workers in manufacturing activities. In Figure II there appears to be a positive correlation between the proportional drop in poverty and exposure to the tariff cuts.[10] To establish the robustness of the results I employ the following baseline regression:

$$y_p = \alpha + \beta TariffDrop_p + \varepsilon_p \quad (2)$$

where y_p is the proportional drop in the poverty headcount ratio in province p.

In the above measure of exposure, all workers in non-traded industries are assigned a tariff cut of 0. As an alternative measure of exposure, I perform the same calculation, but only over individuals employed in traded industries:

$$TrTariffDrop_p = \sum_{i^{Tr}} \omega_{ip}^{Tr} \Delta\tau_i$$

where ω_{ip}^{Tr} is the share of workers in traded industries in province p employed in industry i, and the summation is only over traded industries. This measure of exposure is substituted for *TariffDrop* in the above regression framework to examine the robustness of my primary measure of exposure.

It is important to understand the source of variation being used to identify β. The regression measures the partial correlation between the proportional drop in poverty and exposure to U.S. tariff cuts. This implies that the framework cannot identify the average impact of increased U.S. market access on poverty across provinces. This will be part of

[10] In regressions not reported, when Ho Chi Minh City is removed from the sample, the estimate of the impact of the drop in tariffs falls slightly, but is still statistically significant at a 1 percent test level. When both Ho Chi Minh City and Binh Duong are removed, the estimated impact is statistically significant at the 10 percent level.

the estimated constant term. Hence, the total impact of the trade agreement, which is comprised of the relative impact, as measured by *TariffDrop*, and the average impact, cannot be determined. Rather than estimating the total impact of the BTA on provincial poverty, this framework asks whether all provinces derived similar benefits from the trade agreement. The degree to which provinces vary in their derived benefits highlights the important question of redistribution for policy makers.

A second point to address is the weighting of national tariffs at the provincial level to create a measure of provincial exposure to the tariff cuts. I use the industry of employment to aggregate exposure at the industry level into a provincial measure of exposure. This implicitly assumes that two workers in the same industry, one in the export-oriented manufacturing centre of Ho Chi Minh City and the other working in predominantly rural Son La, for instance, will experience the impact of cuts in tariffs on textile goods the same way. This assumption may or may not be realistic. Ideally, one would like to know whether the individual is involved in the production of goods predominantly for the domestic or for international markets. This may matter to the extent that in the short-run firms and individuals involved in export production may be better able to take advantage of new export opportunities. I do not test this assumption, but I do test whether the components of provincial tariff exposure originating in rural versus urban areas have different impacts on provincial poverty.

Third, weighting national tariffs by industry of employment is not the only plausible aggregation method. One could measure a province's exposure by weighting tariffs with the value of production within an industry by province or the value of exports and imports within an industry by province. Unfortunately I cannot check the robustness

of my results to these alternative aggregation procedures, as national account estimates at the provincial level in Vietnam are unreliable.

The timing of the tariff cuts and the choice of data used for identifying the impact of the tariff cuts is important. I use the 2002 VHLSS as my baseline from which to measure changes in poverty. This raises two concerns. First, some of the households were surveyed close to the end of the 2002. Hence, their expenditure and employment data are reported for a period that is almost entirely after the entry into force of the BTA. Second, to the extent that firms and individuals changed behavior prior to entry into force of the BTA in anticipation of its effect, I am unable to capture this effect in my estimates. Hence, my estimates possibly underestimate the impact of the BTA. Preferably, I would like to have reliable estimates of provincial poverty prior to the implementation of the tariff cuts. Unfortunately, the 1998 Vietnam Living Standards Survey (VLSS), unlike the 2002 and 2004 VHLSS, is not designed to be representative at the provincial level. In fact, there are no observations for two provinces. I partially address this concern by looking at the proportional changes in provincial poverty between 1999 and 2002 using a poverty map created by Minot and Baulch (2004).[11] To the extent that employment choices change in response to the BTA, using industry of employment from the 1999 census removes this effect. The census was conducted more than two years before entry into force of the BTA and well over a year before the agreement was signed. This helps

[11] The provincial poverty estimates are based on a poverty mapping exercise conducted by Minot and Baulch (2004) between the 1998 VLSS and the 1999 census. Though these estimates are consistent they are not unbiased. Moreover, personal experimentation shows that these estimates can change dramatically depending on which variables are included in the expenditure regressions and predictions.

to remove concerns over endogenous employment response contaminating my measure of provincial exposure.[12]

V.1 Endogeneity Concerns

In the above econometric framework, identification fails if *TariffDrop* is correlated with the error term. This could occur due to omitted variables, measurement error, or simultaneity bias.

The primary concern is omitted variable bias. Since the regression framework is expressed in differences, any time constant provincial characteristics that influence the level of poverty are controlled for. Hence, I only need to be concerned with time-varying omitted variables that may be correlated with the measures of protection. I attempt to control for this by including various provincial characteristics that might induce differential poverty reduction trends across provinces that may be correlated with the provincial cuts in tariffs.

Reverse causality is not likely to influence the results. After re-establishing economic relations in 1994, Vietnam was subject to the Column 2 tariff schedule of the U.S. Since this tariff schedule pre-dated the re-establishment of economic relations, the initial level of U.S. tariffs can confidently be taken as exogenous to Vietnamese provinces. The signing of the BTA moved Vietnam from Column 2 of the U.S. tariff schedule to MFN status. Again, this tariff schedule pre-dated the signing of the bilateral

[12] In regressions not reported, I have checked the robustness of my primary results using industry of employment from the 2004 VHLSS and find very similar results.

trade agreement and hence can also be taken to be exogenous to Vietnamese provinces and industries.

VI. EMPIRICAL RESULTS

The simplest regression model includes no controls and corresponds to a positive and statistically significant partial correlation between *TariffDrop* and the proportional drop in poverty. These results are shown in column (1) of Table V. Furthermore, the result is important in an economic sense. The last row of the upper half of Table V reports the estimated change in poverty associated with an increase in *TariffDrop* of one standard deviation. For the simplest regression model the estimated impact is a 12.2 percent decrease in poverty, which is sizeable in comparison to the 31.1 percent average decrease in provincial poverty between 2002 and 2004. Columns (2) and (3) in Table V successively add the natural logarithm of the level of poverty in 2002, to capture any convergence effects, and regional dummies to capture differential poverty trends that exist between Vietnam's eight regions. Note that the inclusion of regional dummies also removes any inter-regional differences in exposure to the trade agreement. Hence, the identification of the casual effect is based on intra-regional differences in exposure. In both cases the initial level of poverty is instrumented with its estimated value in 1999 and the share of ethnic minority households in the province.[13] The estimated impact of *TariffDrop* decreases in both models, but it stays positive and statistically significant at the 1 percent level. Furthermore, the partial correlation between the initial level of

[13] The 1999 provincial poverty estimates come from Minot and Baulch (2004) while the share of ethnic minority households comes from the 1999 census.

poverty and the subsequent percentage decrease is statistically insignificant. Given the small number of observations, a parsimonious regression model is preferred. I thus remove the initial level of poverty from the regression model, but retain the regional dummies. The regional dummies help to control for unobserved trends that may be correlated with the measure of provincial exposure. Column (4) of Table V displays the results. The partial correlation of *TariffDrop* changes little from the regression results presented in columns (2) and (3). In column (5) of Table V I present estimates of the impact when provincial exposure is measured over only workers in traded industries. The estimated coefficient on *TrTariffDrop* is positive and strongly statistically significant. Moreover, its economic impact is a similar magnitude to *TariffDrop*. A one standard deviation increase in *TrTariffDrop* leads to an 8.3 percent reduction in poverty. Since the former measure of provincial exposure explains a greater proportion of the variation in provincial poverty reduction, subsequent results are presented using *TariffDrop* as the measure of exposure.[14]

VI.1 Robustness of results

One concern with the measure of exposure is that it may be picking up trade related influences other than the BTA. For example, if U.S. import demand is shifting to the same industries that received the largest tariff cuts then I will be estimating this effect along with the impact of the tariff cuts. I examine this possibility by constructing a

[14] For the subsequent robustness results, similar results hold when *TrTariffDrop* is used instead of *TariffDrop*. These results are available from the author upon request.

measure of provincial exposure to changes in U.S. imports over the period of 1999 to 2004. Specifically, the variable is calculated according to:

$$ImpChanges_p = \ln\left(\sum_i \omega_{ip} Imports_{i,2004}\right) - \ln\left(\sum_i \omega_{ip} Imports_{i,1999}\right)$$

where ω_{ip} is the share of workers in province p in industry i, and $Imports_{i,t}$ is the value of U.S. imports in industry i in year t=1999, 2004. Hence, provinces with a greater share of workers in industries that experienced larger increases in U.S. import demand will be more exposed to this structural change. Table VI displays regressions results when $ImpChanges_p$ is included as a control variable. The regression results in column (1) do not include regional dummies and are thus comparable to the regression results in column (1) of Table V. The coefficient estimate marginally falls upon including $ImpChanges_p$, but the estimate is still statistically significant at the 1 percent level. A similar result holds when regional dummies are included, as reported in column (2) of Table VI.

Changes in Vietnam's trade policies, aside from the BTA, may also be a source of omitted variable bias. I explore this possibility by constructing a measure of provincial exposure to changes in Vietnam's import tariffs between 1999 and 2004. This is done in an analogous method as for changes in U.S. tariffs. Results are shown in columns (3) and (4) of Table VI. Similar to Topalova (2005), I find that Vietnamese provinces that were more exposed to Vietnam's tariff cuts experienced slower reductions in poverty, although the estimate is not statistically significant. Moreover, omitting exposure to Vietnam's tariff cuts seems to have induced a downward bias on the coefficient estimate of exposure to U.S. tariff cuts.

One final trade policy change that warrants attention is Vietnam's tariff commitments under the BTA. These are almost exclusively concentrated in crops and

food processing. As of 2004, Vietnam had not cut these tariff lines. In addition, the tariff cuts are small in magnitude as compared to those made by the U.S. However, firms and farmers may be changing their production patterns in anticipation of the impending tariff cuts. Columns (5) and (6) show regression results when provincial exposure to future Vietnamese tariff cuts, as proscribed by the BTA, are included. This exposure does not have a statistically significant impact, nor does it substantially change the coefficient estimate of exposure to U.S. tariffs.

As a first check that the coefficient estimate of *TariffDrop* is not biased by pre-existing trends I include the percentage decrease in poverty between 1998 and 2002 is as a regressor. The results, shown in column (1) of Table VII, indicate provinces that experienced larger proportional drops in poverty between 1998 and 2002 experienced slower rates of reduction between 2002 and 2004, conditional on exposure to the U.S. tariff cuts. More important though for the focus of the paper, the coefficient estimate on *TariffDrop* is very similar and remains statistically significant at the 1% level.

Furthermore, I check the robustness of the main results by including additional provincial indicators that may be spuriously correlated with the measure of U.S. tariff exposure. Specifically, I control for the share of the population that has completed primary schooling, the share of the population that has completed lower secondary school, the share of workers in agriculture, the share of workers in manufacturing and median per capita expenditures in 2002.[15] None of the additional controls have statistically significant explanatory power at the 5 percent test level, as shown in columns (2) through (4) of Table VII. In general, the tariff exposure measure remains positive and

[15] I have also run regressions controlling for government spending, government transfers, FDI stocks, and measures of the provincial business environment. None of these qualitatively influence the presented results.

strongly statistically significant, however, the statistical significance of *TariffDrop* disappears in column (3) where the share of workers in agriculture and the share of workers in manufacturing are added as controls. This is largely due to severe multicollinearity. The R^2 from a regression of *TariffDrop* on the other variables present in the regression reported in column (5) is over 0.9. The multicollinearity accounts for over 90 percent of the variance of the coefficient estimate on *TariffDrop*. In practice this makes it difficult to identify separate impacts. However, the estimate on *TariffDrop* has remained qualitatively similar and an F-test of the null hypothesis that both employment share variables may be excluded from the regression model leads to a p-value of 0.92, suggesting that they may safely be excluded from the econometric model. It is worth noting that provinces with a higher share of workers in 1999 in manufacturing did experience a more rapid decrease in poverty between 2002 and 2004.[16] However, this effect disappears once the drop in tariffs is included in the regression. Hence, those provinces that were more exposed to the trade agreement, based on their pre-existing structure of employment, experienced relatively larger proportional drops in poverty.

In addition, I check the robustness of my results to the poverty line used and alternative measures of poverty. I consider a 25 percent increase in the poverty line, as well as the normalized poverty gap and the normalized poverty severity at the original poverty line.[17] These results are presented in columns (1) through (3) of Table VIII and again are consistent with the primary results. One noteworthy result from columns (2) and (3) is that the impact of the trade agreement was particularly pro-poor in so far as

[16] These regression results are not reported, but are available from the author upon request.
[17] The normalized poverty gap is the average difference between actual expenditures and the poverty line for all poor individuals, expressed as a fraction of the poverty line, while the normalized poverty severity gap is the average squared differenced expressed as a fraction of the poverty line.

these results indicate a faster reduction in the poverty gap and the severity of poverty in comparison to the incidence of poverty.

In Appendix A I discuss the possible impacts of measurement error in the initial level of poverty in 2002. Results indicate that the above results are not driven by plausible measurement error.

VII. LABOR MARKET TRANSMISSION MECHANISMS

This section aims to confirm and to explain the above results. First, it seeks to confirm the above evidence on poverty reduction. Given the extent of the poverty reductions, intuitively, one would expect to find changes in the labor market that are consistent with this pattern. If contradictory results were found, then this would lead one to be suspicious of the previous results. Second, these same labor market channels help to explain how the tariff cuts led to reductions in poverty.

VII.1 Wages

One channel from tariff cuts to household welfare is the wage labor market. In the 2004 VHLSS, among individuals aged 15 to 64, 82 percent of individuals reported working in the past 12 months. Of these workers, 31 percent reported working for a wage in the past twelve months for their most time-consuming job. In the 2002 VHLSS, 83 percent of individuals between the ages of 15 and 64 reporting working in the past 12 months, while 29 percent of these workers reported working for wages for their most time-consuming job.[18] Thus, although labor force participation rates are high in both

[18] For both surveys, these are simple averages, unadjusted for sampling weights.

surveys, the wage labor market covers less than one third of workers. Clearly the wage labor market is but one channel through which the tariff cuts can impact the poor.

I examine how the drop in U.S. tariffs influenced provincial wage premiums.[19] The provincial wage premium is the variation in individual wages that cannot be explained by individual characteristics, such as age, gender, or industry affiliation. If labor is imperfectly mobile across provinces, one would expect to find a relationship between changes in provincial wage premiums and exposure to the tariff cuts.

The empirical analysis follows a two-stage procedure. In the first stage, the log of real hourly wages for worker *i* in industry *j* in province *p* at time *t* $\left(\ln\left(w_{ijpt}\right)\right)$ is regressed on a vector of individual characteristics $\left(H_{ijpt}\right)$, a set of industry dummies $\left(I_{ijt}\right)$, and a set of provincial dummies $\left(P_{ipt}\right)$:

$$\ln\left(w_{ijpt}\right) = \alpha + H_{ijpt}\beta_t + wp_{jt}I_{ijt} + wp_{pt}P_{ipt} + \varepsilon_{ijpt}\,.$$

The vector of individual characteristics includes a dummy for the individual's gender, a quadratic in age, dummies for the highest level of completed education, dummies for sector of ownership, and the number of months, days per month, and hours per day spent working. The coefficient of the provincial dummy represents the variation in wages that cannot be explained by individual characteristics or industry affiliation, but can be explained by province of residence. Following Krueger and Summers (1988), I normalize the sum of the employment-weighted provincial wage premiums to zero and I express the provincial wage premiums as deviations from zero. In the second stage, the change in the

[19] See for example Attanasio, Goldberg, and Pavcnik (2004).

provincial wage premium is regressed on the drop in tariffs by province and the provincial wage premium in 2002:

$$\Delta wp_p = \alpha + \beta TariffDrop_p + \gamma wp_{p,2002} + u_p .$$

Since the dependent variable is an estimate, I use weighted least squares. The weights are the inverse of the variance from the first stage regression, corrected according to Haisken-DeNew and Schmidt (1997). The results are reported in Table IX for all wage earners, urban wage earners, rural wage earners, agriculture, forestry, and fishery wage earners, and finally manufacturing wage earners. For all wage earners the drop in tariffs is positively associated with provincial wage premiums, but this result is not statistically significant. However, dividing the sample into rural and urban workers reveals a positive and statistically significant impact on provincial wage premiums among rural workers. Similarly, dividing the sample according to industry produces a positive and statistically significant association between the drop in tariffs and provincial wage premiums among workers involved in agriculture, forestry, and fishing. Although the association between the drop in tariffs and provincial wage premiums is only statistically significant among certain subsamples of wage earners, these subsamples are the most important in terms of poverty alleviation. Provinces with a larger rural population in 2002 have a higher incidence of poverty. Similarly, provinces with a higher share of workers involved in agriculture, forestry, and fishing also have a higher incidence of poverty. These relationships can be seen in Figures III and IV. Thus, the relationship between the drop in tariffs and provincial wage premiums of rural and agriculture, forestry, and fishery workers is consistent with the more rapid decrease in poverty identified above.

VII.2 Industry reallocation

An additional mechanism of adjustment is the reallocation of labor across industries. Specifically, in a province heavily exposed to cuts in U.S. tariffs on manufacturing products, one would expect employment in manufacturing industries to increase. To examine this channel, provincial shares of employment in (1) agriculture, forestry, and fishing, (2) manufacturing, and (3) non-traded industries are regressed on the measure of provincial exposure to the tariff cuts. I use estimate the following regressions equations:

$$\ln\left(aff_{p,2004}\right) - \ln\left(aff_{p,2002}\right) = \alpha_1 + \beta_1 TariffDrop_p + X_p\delta_1 + \varepsilon_{1p}$$
$$\ln\left(man_{p,2004}\right) - \ln\left(man_{p,2002}\right) = \alpha_2 + \beta_2 TariffDrop_p + X_p\delta_2 + \varepsilon_{2p}$$
$$\ln\left(ser_{p,2004}\right) - \ln\left(ser_{p,2002}\right) = \alpha_3 + \beta_3 TariffDrop_p + X_p\delta_3 + \varepsilon_{3p}$$

where $aff_{p,t}$ is the share of workers employed in agriculture, forestry, and fishing in province p at time t=2002,2004, $man_{p,t}$ is the share of workers employed in manufacturing in province p at time t=2002,2004, and $ser_{p,t}$ is the share of workers employed in non-traded industries in province p at time t=2002,2004. The vector X_p contains the initial shares of employment within each major industry.

Table X presents the results for all workers and Table XI presents the results for rural workers. After controlling for trends based on initial shares, provinces with a greater exposure to the drop in tariffs experienced a decrease in the share of employment in agriculture, forestry, and fishing, although the estimate is not statistically significant, and an increase in the share of manufacturing employment. For manufacturing employment, a one-standard deviation increase in *TariffDrop* is associated with a 13 percent increase in the share of manufacturing workers within a province. The results are stronger amongst

rural workers, where a one-standard deviation increase in *TariffDrop* is associated with a 2.8 percent decrease in employment in agriculture, forestry and fishing and a 16 percent increase in manufacturing employment. As noted above, given the lower incidence of poverty in provinces with a larger share of workers in manufacturing, the movement of workers out of agriculture, forestry, and fishing into manufacturing induced by the tariff cuts is consistent with the aggregate evidence on poverty rates presented above.

VII.3 Job creation

The last factor market impact that I investigate is the growth of jobs in enterprises. I use data collected annually by the GSO in nationally representative firm surveys. The survey excludes cooperatives involved in agriculture and forestry as well as household businesses and farms. Hence, the employment estimates essentially cover off-farm employment. Figure V displays a scatter plot of the percentage growth in jobs between 2000 and 2004 versus provincial exposure to the BTA while Figure VI displays a scatter plot of the incidence of poverty in 2002 versus the natural logarithm of the number of enterprise jobs in 2000. The data comes from GSO and is estimates of the number of employees in enterprises in each province as of December 31. The figures display a positive correlation between job growth and provincial exposure and a negative correlation between the incidence of poverty and employment in enterprises. The latter cross-sectional relationship suggests that enterprise job creation may be an important source of poverty alleviation. To explore the robustness of the positive correlation I employ the following regression model:

$$\ln\left(jobs_p^{04}\right) - \ln\left(jobs_p^{00}\right) = \alpha + \beta TariffDrop_p + \lambda \ln\left(jobs_p^{00}\right) + \mathbf{X}_p\boldsymbol{\gamma}' + \varepsilon_p$$

where $jobs_p^t$ is the number of employees in enterprises in province p at time $t = 2000, 2004$ and $\mathbf{X}_p$ is a vector of regional dummies. The results are shown in Table XII. I find strong evidence of convergence in enterprise employment. Provinces with lower levels of enterprise employment experienced more rapid job growth between 2000 and 2004, all else equal. Related to previous results, provincial exposure to the trade agreement is positively and significantly correlated with job growth, even after controlling for regional trends and convergence in employment levels. Furthermore, decomposing exposure into rural and urban components and by economic sector demonstrates that job growth was robustly linked to trade exposure in rural and urban areas as well as in both the agriculture, forestry, and fishing and manufacturing sectors.

These results are consistent with the above estimates of trade exposure on provincial poverty, but they do not conclusively link job growth to poverty reduction. Nonetheless, they are suggestive that one channel through which the trade agreement influenced poverty is via job creation. This may have a direct impact by providing jobs to individuals in poverty, thereby contributing positively to their earnings and helping to lift them out of poverty. It could also have an indirect effect on poor individuals through upward pressure on wages. Further research is needed to explore these possibilities.

VIII. DISCUSSION OF RESULTS

This study is unusual compared to most of the trade and development literature as it focuses on a very short time period. This obviously raises questions about the plausibility of the results. Can a trade agreement *really* influence poverty in only two

years? Previous sections of this paper presented additional labor market evidence that confirms the poverty results, while the current section provides a series of simple calculations to demonstrate the magnitude of the increase in export flows relative to the drop in poverty. The calculations are based on estimating the amount of money required to lift the individuals out of poverty and comparing this value to a prediction of the increase in value of exports under the BTA relative to a scenario without the BTA.

Consider the province of Lao Cai, located in northwest Vietnam. Lao Cai is a relatively isolated province with a low level of integration with the world economy. As a benchmark, I will assume that the overall impact of the BTA was zero in Lao Cai (recall that the overall impact is the sum of the relative and average impacts across provinces). Conditional on the coefficient estimate on *TariffDrop* presented in column (4) of Table V, this implies that the average impact of the BTA across provinces was an 8 percent drop in the incidence of poverty. Combining the average and relative effects suggests that approximately 1.6 million Vietnamese (about 2 percent of the population) were lifted out of poverty by the BTA in two years as shown in column (2) of Table XIII. Furthermore, if I assume that each individual lifted out of poverty was the average distance from the poverty line, then approximately 63.6 billion VND is required to reach these individuals on an annual basis to keep them out of poverty. With an admittedly very crude estimate of the amount of money required to lift the individuals out of poverty, this can now be compared to the amount of money flowing into Vietnam due to the rise in exports to the U.S. In 2003, annual exports from Vietnam to the U.S. totaled about 4.55 billion USD. Based on the three-year trend of growth in exports from 1998 to 2001, in the absence of the BTA exports from Vietnam to the U.S. would have been closer to 2.39 billion USD.

This suggests that only 0.6 percent of the estimated growth in export value is required to reach these individuals.

This exercise can easily be duplicated based on other assumptions about the average impact of the BTA across provinces. Table XIII demonstrates two alternative scenarios in columns (1) and (3). These scenarios assume an average impact across provinces of 3 and 13 percent respectively. In turn, these assumed average effects lead to drops in poverty of approximately 0.5 and 2.7 million people and would require that 0.18 and 1.06 percent of the predicted increase in export revenues reach these individuals. Under both additional scenarios, the flow of export revenues to the poor is a small fraction of overall export revenue growth.

IX. CONCLUDING REMARKS

In this paper, I estimate the poverty impacts of a large, developed country lowering import barriers to goods from a small, developing country. I examine the effect of the U.S.-Vietnam Bilateral Trade Agreement (BTA), which came into force in December 2001, on the incidence of poverty in Vietnam between 2002 and 2004 at the provincial level. The econometric framework establishes that provinces that were more exposed to the BTA (i.e., provinces that had a higher share of workers employed in industries that experienced larger tariff cuts) experienced greater proportional drops in poverty. I find a large and statistically significant impact. An increase in exposure to the BTA of one standard deviation is estimated to lead to approximately a 10 percent decrease in the incidence of poverty within a province. Between 2002 and 2004, the average proportional drop in provincial poverty is 31.1 percent. Hence, the estimated

impact is relatively large. Moreover, I show that this result is robust to a number of concerns. In particular, I control for possible trends in provincial poverty based on provincial characteristics, such as previous trends in poverty, initial levels of education, and initial shares of employment by industry. I also address concerns of potential measurement error and consider alternative measures of poverty.

I demonstrate labor market effects that are consistent with the estimated general equilibrium impacts. I show that provincial wage premiums increased in provinces more exposed to the trade agreement. This effect holds among rural workers, but not urban workers. Moreover, workers reallocated between sectors more quickly in provinces with greater exposure to the BTA. In particular, the share of manufacturing employment within a province expanded while the share of provincial employment in the agriculture, forestry and fishing sector contracted. The movement into manufacturing activities is consistent with moving out of poverty. Finally, more exposed provinces experienced greater rates of job creation.

The estimated impacts are consistent with predictions from the Specific Factors, or Ricardo-Viner, model of international trade. In the most frequent interpretation of this model, labor is assumed to be mobile across industries, but capital is immobile in the short-run. With the additional assumption of imperfect mobility of labor between provinces, the model predicts that provinces more exposed to an exogenous increase in prices will experience a greater percentage increase in nominal wages. I find exactly this effect when estimating changes in provincial wage premiums. Although the Ricardo-Viner does not make predictions specifically about poverty, the relative increase in wages

in consistent with my empirical finding of more rapid poverty alleviation in provinces more exposed to the tariff cuts.

The paper focuses exclusively on immediate, short-run impacts. While these impacts are important to understand and suggestive of positive impacts of international integration for the poor, the paper does not address the medium- to long-run potential for poverty alleviation via increased exporting opportunities.

APPENDIX A: MEASUREMENT ERROR

One concern that is always present when using household surveys is the consistency of the data. Based on a comparison of the mean per capita consumption in the VHLSS and the national accounts, Glewwe (2005) suggests that the 2002 VHLSS may have underestimated household per capita expenditures relative to the 2004 VHLSS. One possible explanation is problems with the commencement of the 2002 VHLSS, due to its large size and it being the GSO's first time implementing the survey on its own. However, Glewwe finds no evidence of an experience effect. A second plausible explanation is pressure to make the expenditure and income variables match in 2002. However, in both the 2002 and 2004 VHLSS nominal per capita expenditures are about 77 percent of nominal per capita income. This implies that there is no evidence of interviewers systematically doing something to lower consumption in the 2002 VHLSS. Overall, Glewwe concludes that the 2002 and 2004 VHLSS are broadly consistent, although it may be possible that the 2002 survey underestimated household expenditures relative to the 2004 survey. If this is true, then the poverty rates for 2002 may be overestimated.

To explore this issue, consider an example where all households report the same fraction, $\theta < 1$, of true expenditures in 2002. As an example, Figure A.1 shows an observed distribution of per capita expenditures where $\theta = 0.8$ and the true, unobserved distribution. It also shows two poverty lines at 1917 and 8000. From the figure, it is clear that the measurement error in the poverty headcount ratio will be most severe when the poverty line is close to the mode of the observed distribution. The difference between the observed and the true incidence of poverty will be greatest at the point of crossing between the observed and true distributions. In addition, as the poverty line moves past the mode of the distribution the difference between the observed and true poverty headcount ratio will diminish. Finally, if the observed poverty headcount ratio is 0 than the true poverty headcount ratio will also be 0 under the assumption that all households under reported their expenditures.

Let P_{pt} denote the true level of poverty in province *p* at time *t* and let $\tilde{P}_{pt}$ denote the observed level. Given the shape of the distribution, a natural approximation would be to model the measurement error as a quadratic function of the observed incidence of poverty:

$$P_{pt} \cong \tilde{P}_{pt} - \underbrace{\left(a\tilde{P}_{pt} + b\left(\tilde{P}_{pt}\right)^2 \right)}_{\text{measurement error}}$$

with the restrictions $a>0$, $b<0$ and $a+b>0$. Then the true proportional drop in poverty can be approximated as:

$$\frac{P_{p2002} - P_{p2004}}{P_{p2002}} \cong \ln\left(P_{p2002}\right) - \ln\left(P_{p2004}\right)$$
$$= \ln\left[\tilde{P}_{p2002} - \tilde{P}_{p2002}\left(a + b\tilde{P}_{p2002}\right)\right] - \ln\left(P_{p2004}\right)$$
$$= \ln\left(\tilde{P}_{p2002}\right) + \underbrace{\ln\left(1 - a - b\tilde{P}_{p2002}\right)}_{\text{measurement error}} - \ln\left(P_{p2004}\right).$$

This suggests including a non-liner function of the initial level of poverty on the right-hand side of the regression:

$$y_p = \alpha + \beta TariffDrop_p + f\left(\tilde{P}_{p2002}\right) + u_p .$$

If this measurement error is correlated with the drop in tariffs, then the previous estimates are biased.

I address possible measurement concerns in three ways. First, optimal first-differencing weights are used to remove the nonparametric component of the regression (Yatchew (2003)). Second, the measurement error is explicitly modeled as a quadratic function of the initial incidence of poverty. Third, the incidence of poverty in 2002 in each province is recalculated based on the assumption that each household under reports their expenditures by the same percentage. Specifically, I follow Glewwe (2005) and rescale household expenditures by the ratio 0.838/0.805, the respective ratios of mean expenditures in the 2004 and 2002 VHLSS to the national accounts estimates. The results are shown in columns (1) through (3), respectively, of Table A.1. The coefficient estimates are a similar magnitude as previous results and are statistically significant. This suggests that possible measurement error in the initial incidence of poverty is not driving the results.

APPENDIX B: DATA

Poverty Measures: I use the 2002 and the 2004 Vietnam Households Living Standards Surveys to estimate provincial poverty. From the 2002 VHLSS household expenditure file, **hhexpe02.dta**, I use the real per capita expenditure series **pcexp1rl**, which has been regionally and temporally deflated to national average January 2002 prices. I weight each household observation by household size and the household's associated sample weight. From the 2004 VHLSS household expenditure file, **hhexpe04.dta**, I use the real per capita expenditure series **pcexp1rl**, which has been regionally and temporally deflated to national average January 2004 prices. Again, I weight each household observation by household size and the associated sample weight. These expenditure series and weights reproduce the national and regional poverty estimates for 2002 reported in World Bank (2003). I obtained these datasets from the GSO.

Employment Shares: I use the 3 percent sample of the 1999 Vietnam Census, made available by IPUMS International[20], to construct estimates of employment by industry within each province. Individuals are considered employed if the variable **empstat** takes the value 1000. The variable **ind** records the industry affiliation for employed individuals. For the majority of industries, the code and description match with the 3-digit ISIC, revision 3 codes. However, there are a few industries for which the Vietnamese census code differs from the corresponding 3-digit ISIC code. I make the changes documented below.

[20] See http://www.ipums.org/international/index.html.

Old industry code	New industry code	Old industry code	New industry code
701	731	702	732
711	701	712	702
721	711	722	712
723	713	731	721
732	722	733	723
734	724	735	725
739	729	901	921
902	922	903	923
904	924	911	910
913	911	920	900

Finally, I assign individuals based on the province of official residence on the night of the census using **provvn** and weight individuals using **wtper**.

U.S. Tariffs: The 2001 U.S. tariff data from the U.S. International Trade Commission's (USITC) website. I convert specific tariffs to ad valorem equivalents by estimating the unit value of imports within each 8-digit HTS tariff line using total annual imports from all countries. I calculate the unit value of imports by dividing customs value of total imports by the total quantity by first unit for each 8-digit HTS tariff line that features a specific tariff component.

Concordance from HS to ISIC: The U.S. tariff data is reported according to the 8-digit Harmonized Tariff Schedule (HTS) of the United States. I match the 8-digit HTS codes to 6-digit Harmonized System (HS) codes by dropping the last two digits of the code. I convert the 6-digit HS codes to 3-digit ISIC codes with the concordance supplied by Jerzy Rozanski from the World Bank. These concordances are also available as part of the WITS software program. I calculate a weighted average of the ad valorem equivalent of all tariff lines within an industry using U.S. imports in each tariff line as the weights.

Hourly wages: For the 2004 VHLSS, nominal hourly wages are estimated by dividing the wage and salary received during the past 12 months for the most time consuming job (variable **m4ac10a** from file **m4a.dta**) by an estimate of annual hours. Annual hours are estimated by multiplying the number of months (**m4ac6**) by the number of days per month (**m4ac7**) and by the number of hours per day (**m4ac8**). I convert the nominal hourly wage series to national average January 2004 prices by regionally and temporally deflating using the series **rcpi** and **mcpi** available in **hhexpe04.dta**.

For the 2002 VHLSS, the wage and hours data comes from the file **muc3.dta**. I take annual wages from **m3c1a** and construct annual hours from months (**m3c9**), days per month (**m3c10**) and hours per day (**m3c11**). As for the 2004 wages, I convert the nominal hourly wage series to national average January 2002 prices by regionally (**rcpi**) and temporally (**mcpi**) deflating using deflators in the file **hhexpe02.dta**.

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Table I

Vietnamese exports to and imports from the U.S., 1997-2004

	1997	1998	1999	2000	2001	2002	2003	2004	2005
	Value (million USD)								
Exports	388	553	609	822	1053	2395	4555	5276	6630
Imports	278	274	291	368	461	580	1324	1163	1192
	Growth over previous year (%)								
Exports	22	43	10	35	28	128	90	16	26
Imports	-55	-1	6	27	25	26	128	-12	2

Source: USITC.

Imports are general imports and exports are FAS exports.

Table II

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: USITC.

Table III
Provincial Poverty Headcount Ratios

Province	Poverty Headcount Ratio		Number of households		Proportional Drop in Poverty
	2002	2004	2002	2004	
Red River Delta					
Ha Noi	0.052	0.036	740	240	0.310
Hai Phong	0.119	0.073	610	186	0.388
Vinh Phuc	0.390	0.165	480	144	0.575
Ha Tay	0.260	0.160	720	216	0.383
Bac Ninh	0.121	0.032	470	138	0.739
Hai Duong	0.231	0.100	660	192	0.568
Hung Yen	0.171	0.146	490	150	0.145
Ha Nam	0.317	0.268	440	138	0.155
Nam Dinh	0.291	0.173	680	204	0.407
Thai Binh	0.374	0.143	640	204	0.619
Ninh Binh	0.315	0.160	420	132	0.492
North East					
Ha Giang	0.692	0.591	300	96	0.146
Cao Bang	0.602	0.356	340	96	0.408
Lao Cai	0.600	0.539	340	90	0.102
Bac Kan	0.687	0.499	280	84	0.274
Lang Son	0.387	0.382	340	108	0.013
Tuyen Quang	0.393	0.274	340	111	0.304
Yen Bai	0.417	0.346	390	114	0.169
Thai Nguyen	0.224	0.217	480	144	0.028
Phu Tho	0.419	0.251	500	156	0.400
Bac Giang	0.327	0.203	600	174	0.378
Quang Ninh	0.064	0.058	460	144	0.099
North West					
Lai Chau	0.766	0.689	319	201	0.100
Son La	0.626	0.557	350	114	0.111
Hoa Binh	0.660	0.537	370	114	0.186
North Central Coast					
Thanh Hoa	0.484	0.365	850	258	0.247
Nghe An	0.434	0.304	780	234	0.300
Ha Tinh	0.497	0.366	520	162	0.264
Quang Binh	0.366	0.312	430	126	0.150
Quang Tri	0.418	0.331	330	102	0.209
Thua Thien-Hue	0.297	0.155	440	132	0.479

Table III (continued)
Provincial Poverty Headcount Ratios

Province	Poverty Headcount Ratio		Number of households		Proportional Drop in Poverty
	2002	2004	2002	2004	
South Central Coast					
Da Nang	0.043	0.025	320	114	0.415
Quang Nam	0.363	0.306	530	162	0.157
Quang Ngai	0.361	0.266	488	150	0.265
Binh Dinh	0.283	0.154	580	168	0.457
Phu Yen	0.210	0.199	380	120	0.055
Khanh Hoa	0.097	0.109	460	138	-0.122
Central Highlands					
Kon Tum	0.447	0.419	220	72	0.063
Gia Lai	0.638	0.462	460	132	0.276
Dac Lak	0.546	0.331	590	246	0.393
Lam Dong	0.360	0.178	420	132	0.504
South East					
Ho Chi Minh City	0.020	0.000	775	300	1.000
Ninh Thuan	0.450	0.323	290	90	0.283
Binh Phuoc	0.311	0.087	390	114	0.719
Tay Ninh	0.181	0.138	420	132	0.239
Binh Duong	0.086	0.024	350	114	0.714
Dong Nai	0.103	0.058	610	186	0.437
Binh Thuan	0.157	0.099	440	132	0.368
Ba Ria-Vung Tau	0.076	0.059	400	120	0.234
Mekong River Delta					
Long An	0.162	0.109	520	156	0.326
Dong Thap	0.314	0.107	560	168	0.659
An Giang	0.151	0.147	660	192	0.024
Tien Giang	0.166	0.103	570	174	0.380
Vinh Long	0.248	0.141	468	138	0.433
Ben Tre	0.161	0.136	500	156	0.156
Kien Giang	0.228	0.222	500	156	0.025
Can Tho	0.219	0.164	600	201	0.250
Tra Vinh	0.336	0.189	440	132	0.437
Soc Trang	0.375	0.235	430	138	0.373
Bac Lieu	0.213	0.258	380	114	-0.210
Ca Mau	0.320	0.160	670	138	0.498

Source: 2002 and 2004 Vietnam Household Living Standards Survey.

Table IV

Share of employment by by industry within Vietnam's provinces

Province	Agriculture, Forestry & Fishing	Mining & Quarrying	Manufact-uring	Other
Red River Delta				
Ha Noi	0.354	0.002	0.173	0.472
Hai Phong	0.579	0.012	0.120	0.288
Vinh Phuc	0.824	0.002	0.045	0.130
Ha Tay	0.813	0.000	0.071	0.116
Bac Ninh	0.813	0.001	0.053	0.133
Hai Duong	0.809	0.002	0.063	0.127
Hung Yen	0.862	0.000	0.052	0.085
Ha Nam	0.838	0.003	0.066	0.093
Nam Dinh	0.816	0.003	0.060	0.122
Thai Binh	0.854	0.001	0.051	0.095
Ninh Binh	0.817	0.003	0.045	0.135
North East				
Ha Giang	0.880	0.001	0.010	0.109
Cao Bang	0.860	0.004	0.017	0.119
Lao Cai	0.812	0.011	0.019	0.158
Bac Kan	0.850	0.017	0.013	0.119
Lang Son	0.843	0.002	0.014	0.141
Tuyen Quang	0.851	0.008	0.033	0.108
Yen Bai	0.792	0.002	0.056	0.150
Thai Nguyen	0.804	0.010	0.051	0.135
Phu Tho	0.807	0.002	0.054	0.138
Bac Giang	0.896	0.000	0.025	0.079
Quang Ninh	0.549	0.122	0.059	0.270
North West				
Lai Chau	0.884	0.000	0.012	0.104
Son La	0.873	0.003	0.025	0.099
Hoa Binh	0.854	0.004	0.017	0.126
North Central Coast				
Thanh Hoa	0.862	0.001	0.031	0.106
Nghe An	0.822	0.017	0.029	0.132
Ha Tinh	0.839	0.026	0.025	0.109
Quang Binh	0.822	0.001	0.034	0.143
Quang Tri	0.737	0.004	0.049	0.210
Thua Thien-Hue	0.506	0.011	0.156	0.327

Table IV (continued)
Share of employment by by industry within Vietnam's provinces

Province	Agriculture, Forestry & Fishing	Mining & Quarrying	Manufact-uring	Other
South Central Coast				
Da Nang	0.215	0.004	0.201	0.580
Quang Nam	0.741	0.013	0.071	0.174
Quang Ngai	0.735	0.002	0.081	0.182
Binh Dinh	0.773	0.009	0.062	0.155
Phu Yen	0.791	0.004	0.042	0.163
Khanh Hoa	0.506	0.006	0.129	0.359
Central Highlands				
Kon Tum	0.795	0.002	0.033	0.170
Gia Lai	0.819	0.001	0.030	0.150
Dac Lak	0.849	0.001	0.026	0.124
Lam Dong	0.765	0.001	0.055	0.179
South East				
Ho Chi Minh City	0.076	0.001	0.362	0.561
Ninh Thuan	0.671	0.008	0.079	0.242
Binh Phuoc	0.848	0.000	0.032	0.120
Tay Ninh	0.609	0.001	0.113	0.278
Binh Duong	0.359	0.006	0.312	0.323
Dong Nai	0.534	0.002	0.200	0.264
Binh Thuan	0.702	0.001	0.076	0.221
Ba Ria-Vung Tau	0.463	0.021	0.127	0.389
Mekong River Delta				
Long An	0.683	0.000	0.105	0.211
Dong Thap	0.687	0.000	0.102	0.211
An Giang	0.609	0.004	0.090	0.297
Tien Giang	0.746	0.000	0.075	0.179
Vinh Long	0.728	0.000	0.071	0.200
Ben Tre	0.717	0.001	0.064	0.218
Kien Giang	0.725	0.000	0.064	0.211
Can Tho	0.624	0.000	0.099	0.277
Tra Vinh	0.782	0.000	0.045	0.173
Soc Trang	0.817	0.000	0.042	0.142
Bac Lieu	0.760	0.006	0.044	0.190
Ca Mau	0.764	0.000	0.047	0.189

Source: 3 percent sample of 1999 Population and Housing Census.

Table V

Primary regression results

	(1)	(2)	(3)	(4)	(5)
Estimation method	OLS	IV	IV	OLS	OLS
TariffDrop	8.874	6.998	7.409	7.347	
	(7.49)**	(3.09)**	(3.85)**	(4.50)**	
TrTariffDrop					2.314
					(3.27)**
ln(*initial poverty*)		-0.059	0.003		
		(-1.19)	(0.06)		
Constant	0.311	0.231	0.402	0.398	0.432
	(13.04)**	(3.77)**	(4.32)**	(6.13)**	(6.73)**
Regional dummies	no	no	yes	yes	yes
Observations	61	61	61	61	61
(Centred) R^2	0.30	0.24	0.40	0.40	0.35
P-value(Hansen's J-statistic)		0.609	0.990		
P-value(Wu-Hausman test)		0.009	0.118		
P-value(Durbin-Wu-Hausman test)		0.008	0.087		
Standard deviation of *TariffDrop*	0.0137	0.0137	0.0137	0.0137	
Standard deviation of *TrTariffDrop*					0.0357
Economic impact	0.122	0.096	0.102	0.101	0.083
First stage results					
Endogenous variable		ln(*P2002*)	ln(*P2002*)		
ln(Poverty 1999)		0.958	1.140		
		(6.04)**	(5.84)**		
Ethnic Minority Share		0.500	0.616		
		(2.18)*	(1.72)		
Regional dummies		no	yes		
Partial F		32.73	25.01		
Partial R^2		0.53	0.50		

Robust t statistics, for OLS estimation, and z statisitics, for IV estimation, in parentheses.

* significant at 5%; ** significant at 1%

Table IV

Regressions controlling for other trade influences

	(1)	(2)	(3)	(4)	(5)	(6)
TariffDrop (US BTA)	9.32	7.83	10.55	9.06	10.38	8.74
	(6.16)**	(5.19)**	(5.33)**	(5.02)**	(4.91)**	(4.46)**
ImpChanges	-0.498	-0.709				
	(-0.57)	(-0.59)				
TariffDrop (Vietnam 99-04)			-9.92	-11.90		
			(-1.40)	(-1.54)		
TariffDrop (Vietnam BTA)					9.80	10.93
					(1.17)	(1.20)
North East		-0.136		-0.123		-0.128
		(-1.68)		(-1.59)		(-1.64)
North West		-0.218		-0.218		-0.220
		(-2.82)**		(-2.83)**		(-2.83)**
North Central Coast		-0.102		-0.080		-0.079
		(-1.47)		(-1.21)		(-1.19)
South Central Coast		-0.210		-0.163		-0.171
		(-1.94)		(-1.66)		(-1.70)
Central Highlands		-0.069		-0.059		-0.063
		(-0.65)		(-0.58)		(-0.61)
South East		-0.003		0.040		0.029
		(-0.03)		(0.41)		(0.30)
Mekong River Delta		-0.074		-0.028		-0.042
		(-0.81)		(-0.32)		(-0.51)
Constant		0.396		0.372		0.378
		(6.11)**		(6.03)**		(6.10)**
Observations	61	61	61	61	61	61
R^2		0.40		0.42		0.41
Standard deviation of *TariffDrop*	0.0137	0.0137	0.0137	0.0137	0.0137	0.0137
Economic impact	0.128	0.107	0.145	0.124	0.142	0.120

Table VII

Regressions controlling for time trends in initial conditions

	(1)	(2)	(3)	(4)
Estimation method	OLS	OLS	OLS	OLS
TariffDrop	8.469	7.833	8.867	8.036
	(4.49)**	(3.79)**	(1.19)	(3.73)**
Proportional drop in poverty: 1998 to 2002	-0.243	-0.238	-0.271	-0.274
	(-2.37)*	(-2.02)*	(-1.88)	(-1.90)
Share completed primary		0.248		
		(0.84)		
Share completed lower secondary		0.582		
		(0.67)		
Share of workers in agriculture			-0.165	
			(-0.27)	
Share of workers in manufacturing			-0.328	
			(-0.12)	
ln(Median expenditures 2002)				0.054
				(0.39)
Constant	0.068	0.268	0.628	0.057
	(6.93)**	(1.79)	(0.99)	(0.05)
Regional dummies	yes	yes	yes	yes
Observations	61	61	61	61
R^2	0.47	0.48	0.47	0.47
Standard deviation of *TariffDrop*	0.0137	0.0137	0.0137	0.0137
Economic impact	0.116	0.107	0.122	0.110

Robust t statistics in parentheses.

* significant at 5%; ** significant at 1%

Table VIII

Regressions with alternative measures of poverty

	(1)	(2)	(3)
Dependent variable	Proportional drop in headcount ratio	Proportional drop in poverty gap ratio	Proportional drop in poverty severity ratio
Poverty line (percentage of overall poverty line)	125	100	100
TariffDrop	6.915	10.502	14.050
	(3.00)**	(3.00)**	(2.38)*
Regional dummies	yes	yes	yes
Observations	61	61	61
R-squared	0.40	0.30	0.25

Robust t statistics in parentheses.

* significant at 5%; ** significant at 1%

Table IX

Impact of *TariffDrop* on provincial wage premiums

	All wage earners (1)	All urban wage earners (2)	All rural wage earners (3)	All agricultural, forestry, and fishing wage earners (4)	All manufacturing wage earners (5)
TariffDrop	0.266	0.698	1.508	4.233	1.168
	(0.62)	(1.03)	(3.09)**	(4.31)**	(2.09)*
Provincial Wage Premium 2002	-0.335	-0.436	-0.394	-0.872	-0.482
	(6.44)**	(5.49)**	(7.32)**	(11.22)**	(7.42)**
Number of individuals 2002	18578	6887	11686	4169	4306
Number of individuals 2004	31808	11784	20025	4104	7937

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

Table X

Impact of *TariffDrop* on share of provincial employment by major industry

	Percentage change in agriculture, forestry and fishing employment (1)	Percentage change in agriculture, forestry and fishing employment (2)	Percentage change in manufacturing employment (3)	Percentage change in manufacturing employment (4)	Percentage change in non-traded employment (5)	Percentage change in non-traded employment (6)
TariffDrop	-2.681	-2.548	7.192	8.645	-0.775	-1.872
	(-2.62)*	(-2.66)*	(2.21)*	(2.75)**	(-0.72)	(-1.41)
ln(*aff2002*)	0.128	0.144	0.137	0.084	-0.137	-0.153
	(2.53)*	(4.48)**	(0.89)	(0.69)	(-1.77)	(-1.94)
ln(*man2002*)	-0.011	0.020	-0.317	-0.450	0.099	0.080
	(-1.68)	(1.22)	(-2.45)*	(-3.55)**	(2.44)*	(1.79)
ln(*ser2002*)	0.116	0.128	0.328	0.227	-0.420	-0.434
	(2.53)*	(3.94)**	(1.17)	(0.95)	(-2.95)**	(-3.31)**
Regional dummies	no	yes	no	yes	no	yes
Observations	61	61	61	61	61	61
R-squared	0.45	0.64	0.32	0.46	0.32	0.51

Robust t statisitics in parentheses.

* significant at 5%; ** significant at 1%

Table XI

Impact of *TariffDrop* on share of provincial rural employment by major industry

	Percentage change in agriculture, forestry and fishing employment (1)	Percentage change in agriculture, forestry and fishing employment (2)	Percentage change in manufacturing employment (3)	Percentage change in manufacturing employment (4)	Percentage change in non-traded employment (5)	Percentage change in non-traded employment (6)
TariffDrop	-2.739	-3.023	9.191	10.361	0.657	0.422
	(-2.04)*	(-2.10)*	(2.75)**	(3.38)**	(0.46)	(0.24)
ln(*aff2002*)	0.235	0.233	0.151	0.097	-0.047	0.011
	(3.59)*	(3.61)**	(0.56)	(0.43)	(-0.49)	(0.11)
ln(*man2002*)	0.007	0.023	-0.525	-0.620	0.071	0.016
	(0.66)	(1.92)	(-4.80)**	(-5.57)**	(2.50)*	(0.42)
ln(*ser2002*)	0.066	0.067	0.587	0.494	-0.283	-0.185
	(3.21)*	(2.21)*	(2.27)*	(2.10)*	(-3.88)**	(-1.68)**
Regional dummies	no	yes	no	yes	no	yes
Observations	61	61	61	61	61	61
R-squared	0.50	0.60	0.51	0.62	0.33	0.47

Robust t statisitics in parentheses.

* significant at 5%; ** significant at 1%

Table XII

Enterprise job growth

	(1)
TariffDrop	7.486
	(2.70)**
ln(Jobs 00)	-0.094
	(-2.61)*
Regional dummies	yes
Observations	61
R-squared	0.28

Robust t statistics in parentheses.

* significant at 5%; ** significant at 1%

Table XIII

Estimates of the number of people lifted out of poverty and the associated share of export revenue growth

	Scenario		
	(1)	(2)	(3)
Assumed proportional drop in poverty due to the BTA that is common across provinces (%)	3	8	13
Estimate of the number of individuals lifted out of poverty due to the BTA (000s)	504	1,638	2,772
Estimate of the amount of USD required to lift these individuals out of poverty (000s USD)	4,195	13,627	23,059
Predicted value of Vietnamese exports to US in 2003 based on previous trend (000s USD)	2,394,746	2,394,746	2,394,746
Actual value of Vietnamese exports to US in 2003 (000s USD)	4,554,859	4,554,859	4,554,859
Fraction of BTA-induced growth in exports required to lift these individuals out of poverty (%)	0.19	0.63	1.07

Table A.1
Regressions addressing measurement error

	(1)	(2)	(3)
Estimation method	First-Diff.	NLS	OLS
Dependent variable	y_{0402}	y_{0402}	y_{0402}
TariffDrop	11.152	11.050	9.139
	(3.12)**	(4.80)**	(3.93)**
North East	-0.136	-0.187	-0.095
	(-1.28)	(-2.07)*	(-1.13)
North West	-0.243	-0.390	-0.146
	(-2.14)*	(-3.16)**	(-1.92)
North Central Coast	-0.117	-0.165	-0.083
	(-1.65)	(-2.20)*	(-1.15)
South Central Coast	-0.070	-0.243	-0.253
	(-0.54)	(-1.99)	(-2.01)*
Central Highlands	-0.077	-0.157	-0.026
	(-0.68)	(-1.13)	(-0.22)
South East	0.094	-0.058	-0.071
	(1.03)	(-0.50)	(-0.57)
Mekong River Delta	-0.039	-0.093	-0.114
	(-0.41)	(-0.93)	(-1.08)
Constant			-0.419
			(-2.01)*
Observations	61	61	61
R-squared		0.42	0.35
Standard deviation of *TariffDrop*	0.0137	0.0137	0.0137
Economic impact	0.153	0.151	0.125

Robust t statistics in parentheses.
* significant at 5%; ** significant at 1%

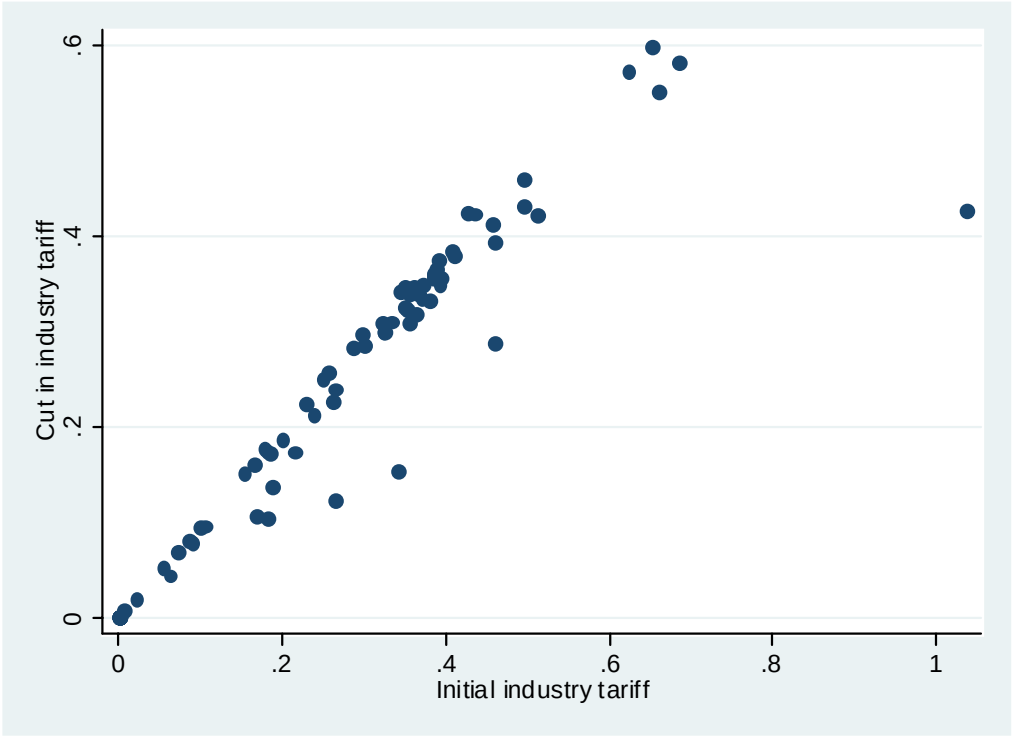

Figure I – Graph of cuts in industry tariffs versus initial industry tariffs

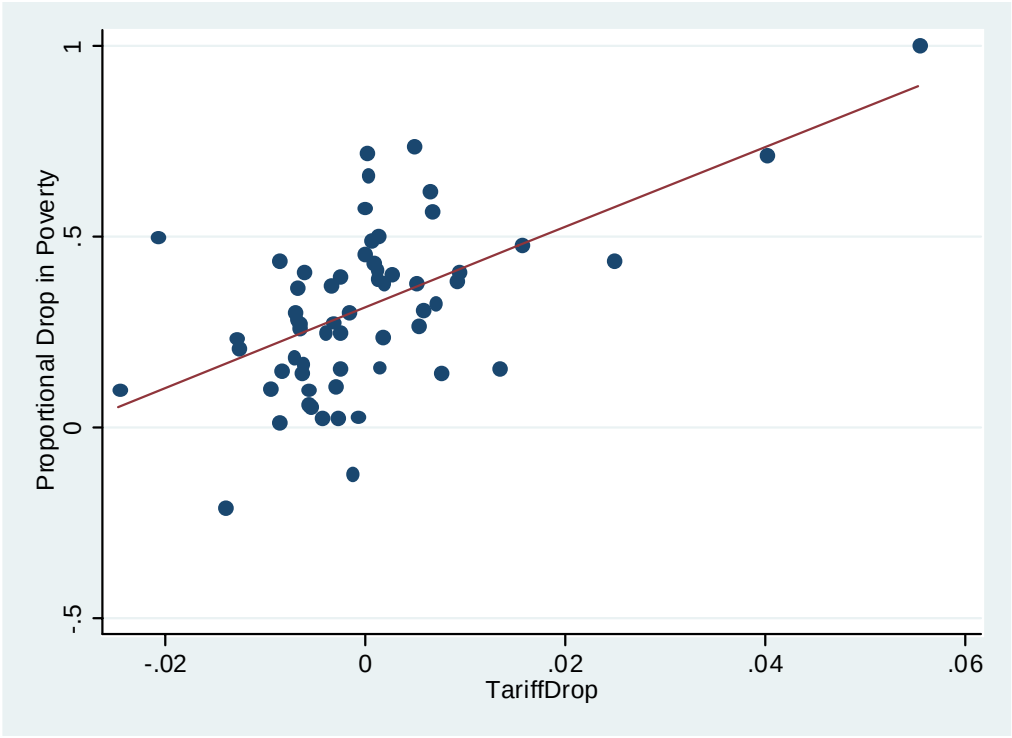

Figure II – Graph of the proportional drop in provincial poverty rates, between 2002 and 2004, versus the drop in provincial tariffs

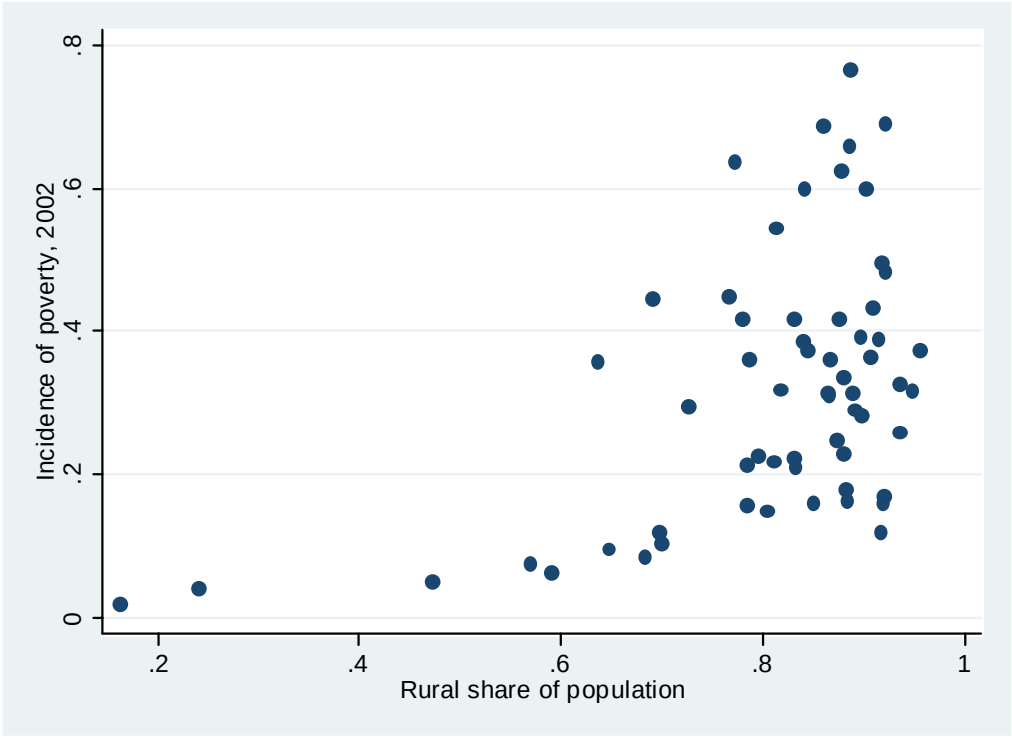

Figure III – Relationship between provincial poverty in 2002 and rural share of population

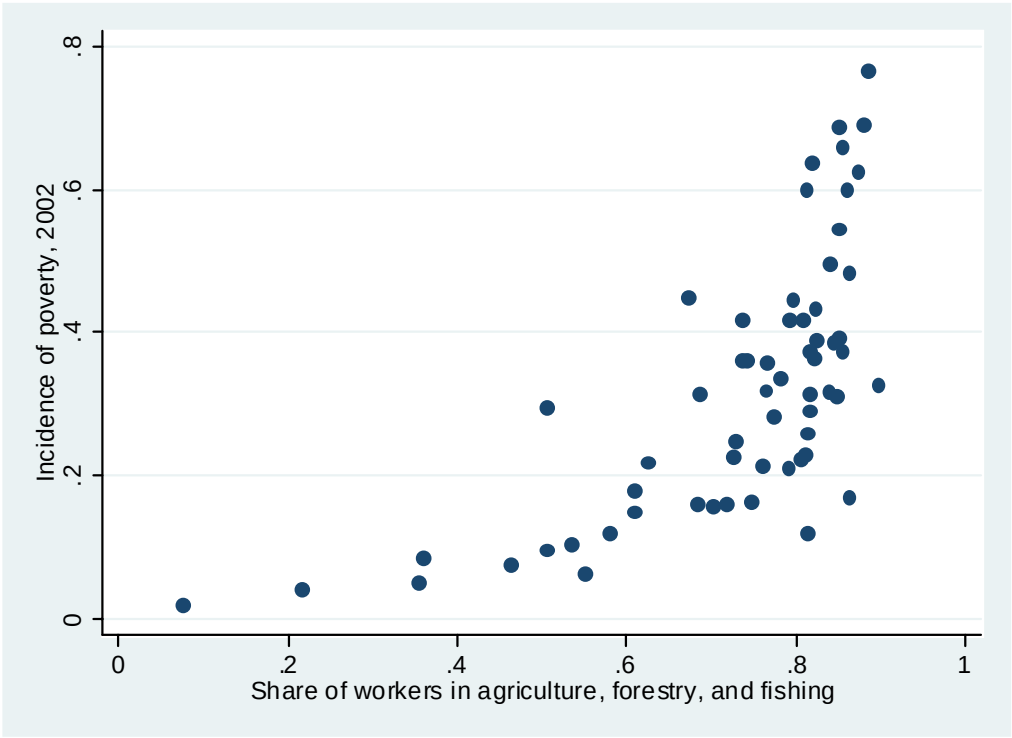

Figure IV – Relationship between provincial poverty in 2002 and share of workers in agriculture, forestry, and fishing

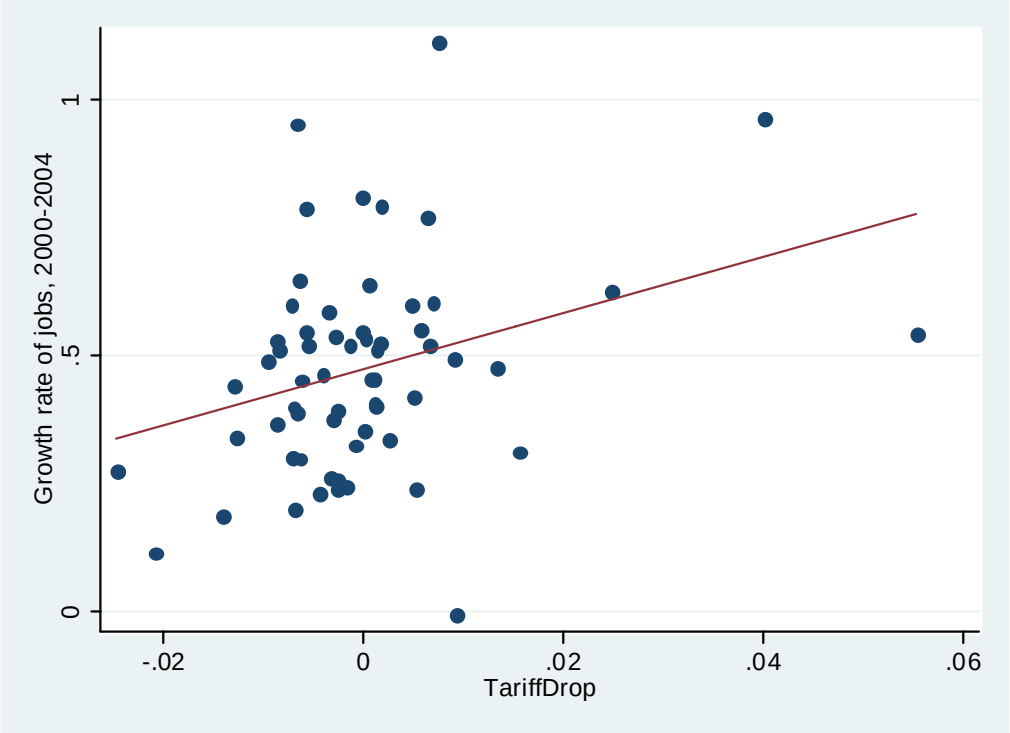

Figure V – Relationship between growth in jobs between 2000 and 2004 and provincial exposure to U.S.-Vietnam Bilateral Trade Agreement

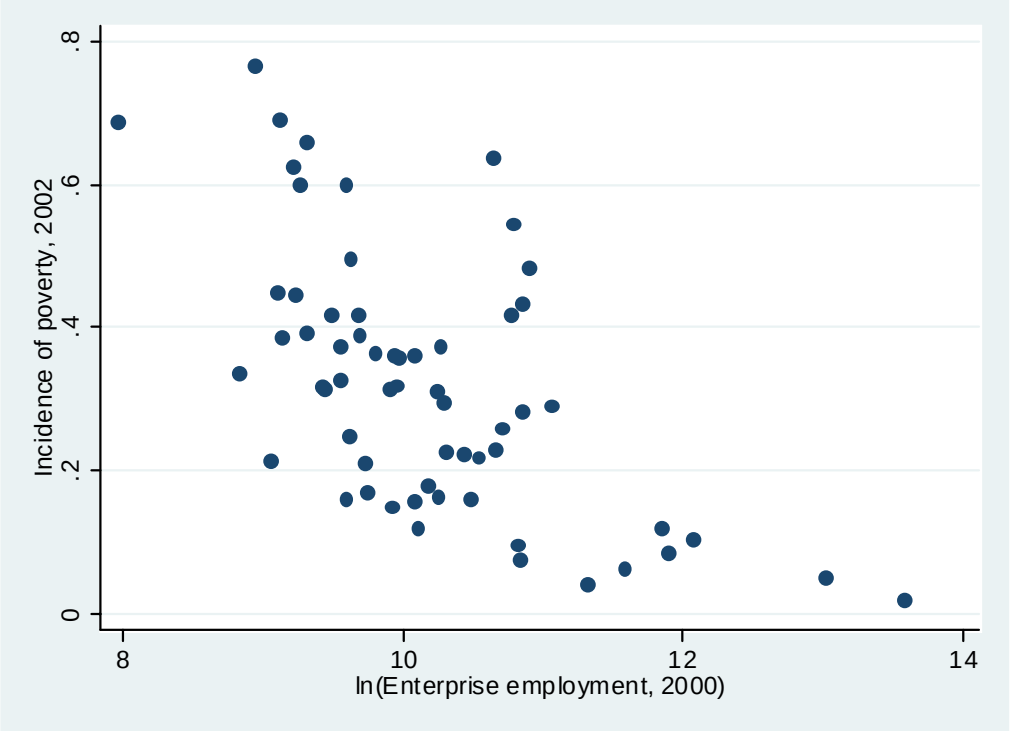

Figure VI – Relationship between provincial poverty and enterprise employment

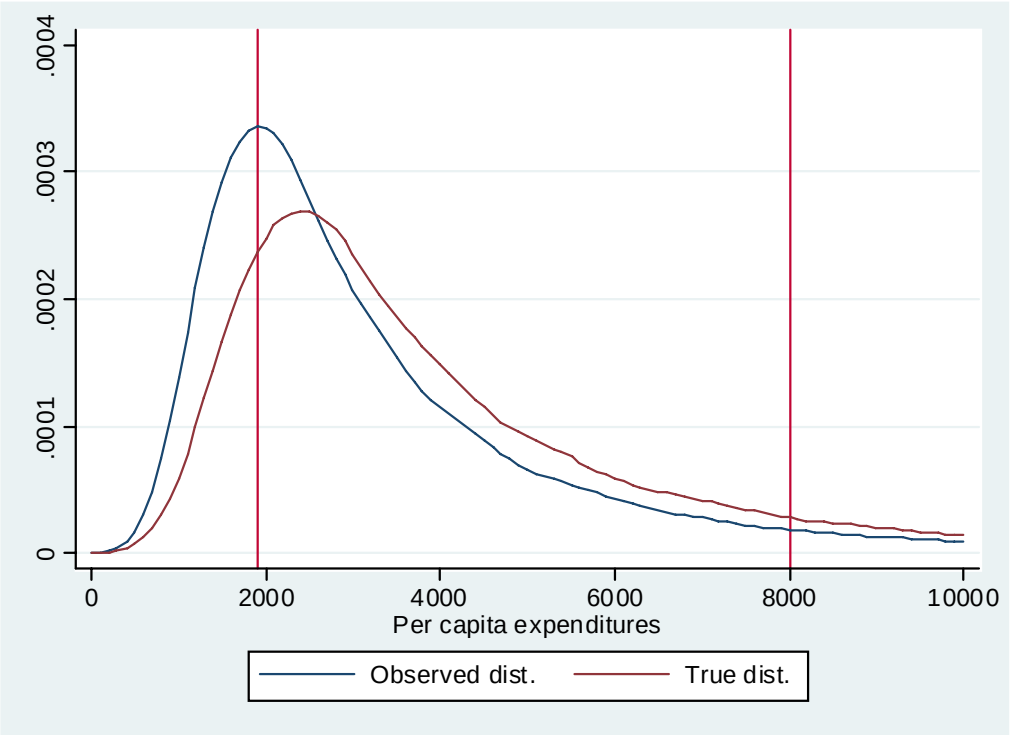

Figure A.1 – Difference between an under-reported distribution of per capita expenditures and the true distribution