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# TRADE, STRUCTURAL CHANGE AND LABOUR MARKET TRANSITIONS IN VIETNAM

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# Trade, structural change and labour market transitions in Vietnam *

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**Abstract**

We provide novel evidence on how structural change occurs at the individual level in a low-income country. The 2001 U.S-Vietnam Bilateral Trade Agreement led to a large increase in employment in formal manufacturing in Vietnam. We show individuals moved into the most exposed industries from all initial activities. Transitions from other manufacturing, agriculture, and school account for most transitions. There are significant differences in the likelihood of moving into these industries based on initial activity even after conditioning on gender or education. Transitions to these industries were more likely in the districts most exposed to the export demand shock.

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Keywords: structural change, exports, manufacturing, labour markets, Vietnam

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# 1 Introduction

Structural change, the movement of labour away from low-productivity toward high-productivity sectors, is a common feature of economic development. The potential aggregate productivity improvements from shifting the workforce out of agriculture may be quite large given the substantial labour productivity differences between agriculture and other sectors (Gollin *et al.*, 2014).[1] As developing countries have become more integrated with the global economy in recent decades, this has raised questions about the role of international trade in promoting or hindering structural change (McMillan *et al.*, 2014; Alessandria *et al.*, 2021).[2] Recent evidence from China suggests increased export opportunities within manufacturing reallocated resources out of agriculture into manufacturing (Erten and Leight, 2021). Yet, due to data constraints, limited evidence exists on which individuals make the transition to the newly created exporting jobs in manufacturing. Are these individuals coming directly from agriculture; from other sectors, such as informal services or manufacturing; or from outside of the workforce, such as directly from school? The nature of the individual transitions has important implications for the aggregate consequences of structural change and for understanding the dynamics of the labour market (Donovan *et al.*, 2023).

We examine individual-level labour market transitions in Vietnam in response to new export opportunities. The 2001 U.S.-Vietnam Bilateral Trade Agreement (BTA) led to a one-time immediate reduction in U.S. tariffs applied on imports from Vietnam, particularly within manufacturing. The U.S. tariff reductions are large, vary across industries, and are arguably exogenous to economic conditions in Vietnam (McCaig, 2011; McCaig and Pavcnik, 2018; McCaig *et al.*, 2022). They thus offer an ideal setting to examine the impacts of export-manufacturing driven structural change on labour markets in a low-income country, including transitions between informal and formal sectors as well as transitions into the workforce from school.

We begin our analysis using population censuses to document the rapid shift of the

[1] See McCaig and Pavcnik (2013) for evidence on sectoral labour productivity gaps in Vietnam.

[2] McMillan *et al.* (2014) find that structural change has been growth promoting in recent decades for countries mostly located in Asia whereas it has been growth inhibiting in many Latin American and African countries.

workforce out of agriculture and into manufacturing and services. We subsequently document that this structural change is largely due to changes within Vietnamese districts, not due to movements between districts.[3]

We next use individual panel data from the 2002 through 2018 Vietnam Household Living Standards Surveys, which are conducted every two years and feature household and individual panels. We focus on transitions into the manufacturing industries that were most exposed to the U.S. tariff reductions and jobs in formally registered businesses within these industries.[4] We first show that transitions into highly-exposed formal manufacturing (referred to as HEFM, henceforth) occur from all initial activities including individuals not working and individuals working in agriculture, manufacturing outside of HEFM, and services. These transitions are more common for women, younger individuals, and better educated individuals. Specifically, those who completed upper secondary are five times more likely to transition to HEFM than individuals who did not complete primary school. Second, we demonstrate that individuals already working in the formal manufacturing sector but not in the most exposed industries, are the most likely to transition to HEFM. Individuals in agriculture are the least likely to transition to HEFM. However, since agriculture is still a large sector of employment in our period, the aggregate contribution of transitions from agriculture to HEFM is still important, accounting for just less than a quarter of all transitions to HEFM.

Using a local labor markets approach, we subsequently show that the U.S. tariff reductions influenced transitions into HEFM. Individuals were more likely to transition into HEFM in districts more exposed to the U.S. tariff reductions. In particular, transitions from agriculture and from the formal manufacturing sector excluding the most exposed industries were the most responsive to the U.S. tariff reductions.

Our work contributes to the literature on trade and structural transformation, which is largely quantitative in nature and predicts changing trade costs can lead to the reallocation of labour across sectors (Uy *et al.*, 2013; Cravino and Sotelo, 2019; Alessandria *et al.*,

[3]Districts are the second level subnational administrative unit in Vietnam, below provinces.

[4]McCaig and Pavcnik (2018) demonstrate that the industries that were most exposed to the U.S. tariff reductions experienced a shift in the composition of their workforce away from informal microenterprises to formal registered firms. McCaig *et al.* (2022) show that industry employment within the formal manufacturing sector grew in response to the U.S. tariff reductions.

2021; Fajgelbaum and Redding, 2022). We confirm these aggregate predictions by providing novel evidence from individual-level labour market transitions in a low-income country setting. Importantly, we demonstrate the richness of the transitions to the expanding export sector as individuals transition from all sectors including directly from school. Within this literature, we are most closely related to Erten and Leight (2021) which provides empirical evidence of a shift of economic activity from agriculture to manufacturing in Chinese counties that were more exposed to the reduction in tariff uncertainty for exporting to the U.S. We compliment their approach by focusing on workers, not production, and providing individual-level evidence on how these transitions took place.[5] We are also closely related to McCaig and Pavcnik (2018), who focus on the margin of working for a formal versus an informal firm and find that industries that were more exposed to the U.S. tariff reductions experienced a reallocation of the workforce toward formal firms. We extend this analysis to examine the reallocation of the workforce across sectors, including formal and informal, over the long run, and focus on individual-level transitions across sectors.

Second, we contribute to the large literature on structural change and labour markets (Gollin *et al.*, 2014; McMillan *et al.*, 2014; Bustos *et al.*, 2020; Alviarez *et al.*, 2022; Donovan *et al.*, 2023). Recent work has highlighted the role of entry and exit of cohorts (Hobijn *et al.*, 2018; Porzio *et al.*, 2022). We too find that young workers are more likely to shift to expanding employment in manufacturing and that new entrants to the workforce play an important role. We further show that workers transition from all sectors of the economy, including both informal and formal, and that better educated workers are more likely to transition to new employment opportunities in formal manufacturing. Donovan *et al.* (2023) provide comprehensive evidence on labour market flows across a large number of developing countries and shows that the higher flows in developing countries are largely due to more frequent transitions between marginal jobs. We compliment their analysis by exploring a specific driver, new manufacturing export opportunities, of labour market transitions in a low-income country and by using individual panels with a longer time frame.[6]

[5]Note that we use the actual reduction in tariffs stemming from the shift of Vietnamese exports to the U.S. from the Column 2 to the MFN tariff schedule, as in McCaig (2011), McCaig and Pavcnik (2018), and McCaig *et al.* (2022), not the reduction in the uncertainty of moving from MFN to Column 2.

[6]Donovan *et al.* (2023) use labour force survey panels that follow workers across two successive quarters, in some cases three quarters. In contrast, we use annual labour market data in consecutive surveys that are

Third, our paper contributes to the literature on labour market adjustment to trade shocks in developing countries. This voluminous literature has covered a number of countries and trade shocks (see, for example, Topalova (2010) for India, Kovak (2013) and Dix-Carneiro and Kovak (2017, 2019) for Brazil, Erten *et al.* (2019) for South Africa, and Ben Yahmed and Bombarda (2020) for Mexico, among many others). Few of these papers feature panel data that tracks individuals over time, with Dix-Carneiro and Kovak (2019) being an important exception as their data allows them to track individuals within the formal sector. We are able to track individuals across all industries, both within the formal and informal sectors, and from outside of the workforce. Consequently, we provide the first evidence on individual transitions that cover all activities in a low-income country in response to trade policy changes. We show that transitions from out of the workforce, in particular from school, as well as from the informal sector are important contributors to labour market adjustment to new exporting opportunities.

We provide a detailed discussion of the BTA in Section 2. In Section 3, we describe the population census, household survey, and tariff data. We present our empirical methodology and results in Section 4. Section 5 concludes.

## 2 U.S.-Vietnam Bilateral Trade Agreement

The U.S.-Vietnam Bilateral Trade Agreement (BTA) was signed on July 13$^{\text{th}}$, 2000 and implemented on December 10$^{\text{th}}$, 2001 (Manyin, 2001). The BTA immediately lowered tariffs on Vietnam's exports to the U.S. by switching the status of Vietnamese imports from the Column 2 to the Most Favoured Nation (MFN) tariff schedule, otherwise known as Normal Trade Relations (Manyin, 2001). We calculate the U.S. tariff reductions based on the MFN and Column 2 tariff schedules that existed at the time the BTA was implemented, given the immediate reductions in tariffs. The U.S. industry tariff reductions were large, with an average reduction of 23.4 percentage points, from 26% to 2.7% (Figure A1).[7] The tar-

two years apart.

[7]We use data on U.S. industry tariff reductions as calculated in McCaig (2011). The tariffs are calculated according to 3-digit ISIC revision 3 industry codes. They are a weighted average of 10-HTS ad valorem equivalent tariffs originally sourced from the U.S. International Trade Commission.

iff reductions were largest in manufacturing, 29.6 percentage points on average. The tariff reductions led to a dramatic increase in Vietnam's exports to the U.S., particularly in manufacturing where exports rose from 0.5 to 41.6 billion USD between 2000 and 2016 (McCaig *et al.*, 2022).

The U.S. tariff cuts resulting from the BTA are plausibly exogenous (McCaig, 2011; McCaig and Pavcnik, 2018; McCaig *et al.*, 2022). The immediate transition from Column 2 classification to MFN implies there was no influence by Vietnam or the U.S. on the size of industry tariff reductions (McCaig, 2011). McCaig and Pavcnik (2018) and McCaig *et al.* (2022) report that U.S. tariff cuts arising from the BTA were not correlated with initial industry characteristics or prior trends, further supporting the claim of exogeneity.[8] In contrast, the tariff commitments by Vietnam were minor, as Vietnam already offered the U.S. MFN tariffs, and concentrated in a small number of agricultural goods (Manyin, 2001). As such, we focus our analysis on the U.S. tariff reductions.

We study the effects of the U.S. tariff reductions on structural change and the underlying individual-level transitions over a long period. As such, it is possible that the U.S. tariff reductions might be correlated with other trade policy shocks during this period. The largest change in trade policy in Vietnam during our period of analysis is Vietnam's accession to the WTO in January 2007.[9]

Vietnam joined the World Trade Organization (WTO) on January 11$^{th}$, 2007. Joining the WTO did not lead to any broad-based changes in access to export markets as Vietnam already had at least MFN access to its major export markets (MFN for the U.S., MFN and GSP for the E.U. and Japan, and preferential access to China due to the ASEAN-China Free Trade Agreement). WTO negotiations with the E.U. led to the removal of import

[8] McCaig and Pavcnik (2018) find that the growth of Vietnamese exports to the U.S. prior to the BTA is not correlated with BTA tariff reductions. They find a similar pattern for exports to the EU, suggesting no pre-existing trends with another high-income economy. Additionally, they conclude there is little relationship between the BTA tariff reductions on a measure of unskilled labour intensity within an industry and the share of workers within the industry working in an informal business. McCaig *et al.* (2022) additionally report little to no correlation between the U.S. tariff reductions and initial industry characteristics (employment, capital per worker, wage per worker, and revenue per worker) within the formal manufacturing sector, with changes in industry employment in formal manufacturing prior to the BTA, or with subsequent changes in trade policy due to other trade agreements, including WTO accession.

[9] See McCaig *et al.* (2022) for discussion of additional changes in trade policy within Vietnam and its major export markets.

quotas applied to imports of textiles and clothing from Vietnam in 2005 and to the removal of similar quotas applied by the U.S. shortly after accession. Vietnam's tariff reductions required by WTO accession are not correlated with the U.S. tariff reductions (McCaig *et al.*, 2022). We nonetheless control for these tariff reductions in our local labor market analysis of the effects of the U.S. tariff reductions on individual-level transitions.

# 3 Data and Aggregate Structural Change

## 3.1 Data Description

**Population censuses:** We use the 1999, 2009, and 2019 Vietnam Population Censuses to examine aggregate structural change. We use a 33% sample of the 1999 census, a 15% sample of the 2009 census, and a 9% sample of the 2019 census.[10] All samples are representative at the district level. The censuses were collected as of April 1st of each year. They collected information on demographics, education, whether the individual was working or not, the industry of employment, and the ownership sector in which the individual worked.[11] We use information on sub-units within districts, urban wards and rural communes, to consistently define 610 districts using 1999 boundaries. Districts are second-tier sub-national administrative units, below provinces.

**Household surveys:** We use the Vietnam Household Living Standards Surveys (VHLSS) from 2002 to 2018. The VHLSSs are conducted every 2 years and provide information for the previous 12 months. The surveys are large (about 45,000 households in each survey), nationally representative and provide information on demographic characteristics, education, employment, etc. The surveyed households cover almost all districts within Vietnam. As with the censuses, we match the households to consistently defined districts over time. The number of districts varies from 602 in 2002 to 607 in 2018.

The employment module collects information on the individual's most time consuming

[10] We thank Bob Baulch and Nicholas Minot for providing the 33% sample of the 1999 population census with permission from the General Statistics Office of Vietnam, referred to as GSO, henceforth. The 2009 and 2019 population censuses were obtained directly from the GSO.

[11] The recall period for questions related to work was the past 12 months in the 1999 census and the last 7 days in the 2009 and 2019 censuses.

job during the past twelve months.[12] The employment module has remained very consistent across the VHLSSs.[13] We utilize data on whether the individual worked during the past year and, if so, the industry of work and data on hours and earnings.

Importantly, the VHLSSs include an individual panel. This allows us to track individuals as they transition into or out of the workforce as well as changing jobs. If individuals leave the household, the surveys collected information on why the individual left (e.g., for studies, household split, married, for work, died) and where the individual moved to if they left for work. However, the panels do not track individuals that have left the household. Approximately 20,000 households from each survey were interviewed in the subsequent survey. The exception is a break in the household panel between the 2008 and 2010 surveys. The household panel was constructed by randomly selecting urban wards or rural communes to be in the panel and then all households in the selected wards or communes were included.

Our analysis using the individual panels focuses on individuals ages 15 to 29 in the start year of the respective panel. We focus on this age range since these individuals transition between jobs more frequently than older individuals, but we report additional results for individuals ages 15 to 55 in the appendix.

**U.S. tariff data** We use data on Column 2 and MFN U.S. tariffs at the time of the BTA from McCaig (2011). The tariffs were aggregated from 10-digit HTS tariff products originally sourced from the U.S. International Trade Commission. McCaig (2011) computed ad valorem equivalent tariffs and aggregated the 10-digit HTS tariffs to 3-digit ISIC revision 3 industries using a concordance sourced from the World Integrated Trade Solution database.

## 3.2 Aggregate structural change

We begin by documenting aggregate structural change between 1999 and 2019. Table 1 reports the share of workers in agriculture, manufacturing, and services across the three censuses for workers ages 15 to 29. We focus on younger individuals as structural change

[12]The VHLSSs also collected detailed information on the individual's second most time consuming job, but we restrict our analysis to the most time consuming job.

[13]The few notable changes include a switch in industry codes from ones based on International Standard Industrial Classification revision 3 to revision 4 and a change in how the days and hours spent in the job were collected starting in 2010.

was more rapid for these individuals.[14] We additionally report the share of workers in manufacturing industries that were highly exposed to the U.S. tariff reductions (a manufacturing industry that experienced a tariff reduction greater than the median within manufacturing) and the share of workers in formal firms in highly-exposed manufacturing industries. There has been a dramatic shift out of agriculture and into manufacturing and services. The share of workers in agriculture fell by 41.5 percentage points over this 20-year period, while it increased by 20.0 and 21.8 percentage points in manufacturing and services respectively. This is consistent with McCaig and Pavcnik (2013), which focused on the 1990s and 2000s. The shift into manufacturing is in part due to industries that experienced the greatest exposure to the U.S. tariff reductions, which we call high-exposure manufacturing. The share of workers in these industries increased by 13.6 percentage points over 20 years. Additionally, the shift toward high-exposure industries within manufacturing was concentrated among firms in the formal manufacturing sector — firms registered as an enterprise with the national government.[15] We call these jobs high-exposure formal manufacturing (HEFM). The aggregate shift towards these jobs is consistent with the shift within manufacturing to formal sector jobs documented in McCaig and Pavcnik (2018) and the pattern of formal manufacturing sector employment growth in response to the BTA shown in McCaig *et al.* (2022).

Table 1: Aggregate structural change

| | | | | Change | | Share of change within districts | |
|---|---|---|---|---|---|---|---|
| Industry | 1999 | 2009 | 2019 | 1999 to 2009 | 1999 to 2019 | 1999 to 2009 | 1999 to 2019 |
| Agriculture | 0.693 | 0.496 | 0.278 | -0.197 | -0.415 | 0.845 | 0.919 |
| Manufacturing | 0.114 | 0.205 | 0.314 | 0.092 | 0.200 | 0.724 | 0.867 |
| Of which: | | | | | | | |
| High-exposure | 0.073 | 0.121 | 0.210 | 0.047 | 0.136 | 0.726 | 0.888 |
| High-exposure, formal | 0.022 | 0.077 | N.A. | 0.054 | N.A. | 0.763 | N.A. |
| Services | 0.187 | 0.292 | 0.405 | 0.105 | 0.218 | 0.949 | 0.966 |
| Number of observations | 4,972,170 | 2,808,275 | 1,129,614 | | | | |

*Note:* The table reports the share of workers by sector and year in the first three columns. The next two columns report the change between 1999 and 2009 and 2019 respectively. The final two columns report the share of the overall change due to changes within districts as per equation (1). The source data is the 1999, 2009, and 2019 population censuses. The sample is workers ages 15 to 29. All shares are weighted using sampling weights. N.A. denotes not available as there was no question related to working in a formal vs informal firm in the 2019 census.

[14] See Table A2 in appendix for the working age population 15 to 55.

[15] See McCaig and Pavcnik (2015, 2018) for further discussion on formal firms in Vietnam.

The regression analysis in later sections employs a local labor markets approach using districts as a local labor market. Hence, we examine to what extent structural change is due to changes within districts (e.g., the workforce transitioning out of agriculture within a district) and between districts (e.g., agriculture-intensive districts shrinking in population while districts that are less agriculture-intensive expand in population). To do so, we decompose the shift out of agriculture and into manufacturing and services into within- and between-district components using the following equation:

$$\Delta S_t = S_t - S_{t-1} = \sum_d \Delta s_{dt} e_d + \sum_d \Delta e_{dt} s_d \tag{1}$$

where $s_{dt}$ is the share of workers in district $d$ in year $t$ in the respective sector, $e_{dt}$ is district $d$'s share of national employment of the respective sector in year $t$, $e_d = 0.5(e_{dt} + e_{dt-1})$, and $s_d = 0.5(s_{dt} + s_{dt-1})$.

The last two columns of Table 1 displays the results of the decomposition. Changes *within* districts account for between 72% and 97% of the observed aggregate changes in sectoral shares. These aggregate trends motivate our focus on district-level variation in structural change in response to the U.S. tariff reductions.

## 3.3 Individual transitions to HEFM

In this subsection we use individual-level panel data to provide the first evidence of individual transitions that cover all activities (working and non-working) in a low-income country in response to changes in trade policy. This is a key contribution of our work. We are able to track individuals across two consecutive surveys (i.e., a two-year period). This is a shorter period than in Dix-Carneiro and Kovak (2019), but has the advantage of being able to track all individuals, those in the formal and informal sectors, as well as those who are not working.[16]

We focus on transitions into highly-exposed formal manufacturing (HEFM), the sector most directly affected by the U.S. tariff reductions. We pool observations over each two-

[16]The individual panels do not track individuals that left the household between the start and end surveys of the respective two-survey panel. Between 21 and 24% of individuals age 15 to 29 in the start survey have left the household by the end survey.

survey panel. In Table 2 we report the share of individuals by their activity in the initial survey, the share of individuals within each initial activity that are in the same activity in the respective end survey, the share of individuals within each initial activity that are in HEFM in the respective end survey, and the share of individuals that transitioned to HEFM by initial activity. We include individuals ages 15 to 29. We start at age 15 so that we can explore transitions from school to the workforce to see if direct entry into HEFM is an important transition path. Overall, 2.8% of young individuals transition to high-exposure formal manufacturing between surveys.[17]

Table 2: Share of individuals transitioning to high-exposure formal manufacturing

| Initial activity | Initial share | Share in same activity at the end of the panel | Share in HEFM in at the end of the panel | Share of total transitions into HEFM |
|---|---|---|---|---|
| In school | 0.295 | 0.596 | 0.024 | 0.250 |
| Neither work nor school | 0.071 | 0.316 | 0.040 | 0.099 |
| Agriculture | 0.356 | 0.763 | 0.018 | 0.230 |
| Mining | 0.004 | 0.495 | 0.023 | 0.003 |
| Manufacturing, formal | 0.030 | 0.688 | 0.131 | 0.137 |
| Manufacturing, informal | 0.052 | 0.492 | 0.059 | 0.108 |
| Services, formal | 0.073 | 0.764 | 0.025 | 0.064 |
| Services, informal | 0.118 | 0.630 | 0.026 | 0.109 |
| Total | 1.000 | 0.705 | 0.028 | 1.000 |
| Number of individuals | | 111,174 | | |

*Note:* The sample is individuals ages 15 to 29 in the start survey of the 2002-04 through 2016-18 VHLSS individual panels. The sample is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. HEFM denotes high-exposure, formal manufacturing where high-exposure is defined as a manufacturing industry receiving a U.S. tariff reduction above the median reduction within manufacturing. The columns represent the share of individuals in the indicated activity at the start of the panel, the share of individuals working in the same indicated activity at the end of the panel, the share of individuals that have transitioned to HEFM jobs at the end of the panel, and the share of total transitions into HEFM, respectively.

There is important variation in the tendency to move into high-exposure formal manufacturing depending on the individual's initial activity. 13.1% of individuals initially in formal manufacturing transition into HEFM compared to 5.9% from informal manufacturing. In comparison, the rate of transition out of not working is 4% for those not in school and 2.4%

[17]Table A3 shows the same table for individuals ages 15 to 55. The overall transition rate is 1.6% implying a transition rate of less than 1% for individuals ages 30 to 55. In Table A4 we show the transition rates into high-exposure formal manufacturing for each panel. The overall transition rate increased from 2.4% in 2002-04 to 4.0% by 2016-18.

for individuals in school. Individuals transitioning out of services is 2.5% and 2.6% (formal and informal, respectively), and it is only 1.8% for individuals initially in agriculture.[18] Despite the higher rate of transition out of manufacturing, both formal and informal, this transition still accounts for only 24.5% of transitions into HEFM. Transitions out of agriculture are responsible for approximately the same percentage of total transitions to HEFM, 23.0%, due to its larger initial size even though it has a lower transition rate. The most important initial activity to overall transitions to HEFM is from individuals in school. It accounts for 25% of all transitions in our dataset into HEFM. In Table A5 we show that young women are more likely to transition to HEFM, 3.4% versus 2.3%, and this difference is largely driven by a greater transition rate out of agriculture for women than for men. In Tables A6 and A7 we show better educated individuals are more likely to transition — 4.1% for individuals that have completed upper secondary education versus only 0.8% for individuals that did not complete primary.

# 4 Structural change and U.S. tariff reductions

In this section we investigate how the U.S. tariff reductions influenced transitions into high-exposure formal manufacturing.

## 4.1 Empirical methodology

We employ the local labour markets approach established in Topalova (2010) to measure exposure to U.S. tariff reductions at the district level. We define the change in district tariffs as:

$$\Delta\tau_d^{dir} = \sum_j \frac{L_{jd}}{L_d} \times \Delta\tau_j \tag{2}$$

where $\Delta\tau_j$ is the change in U.S. tariff for industry $j$ calculated as the difference between the Column 2 and MFN tariff at the time of the BTA, $L_{jd}$ is the number of workers in

[18]The low rate of transitions out of agriculture may be because transitioning from agriculture to highly-exposed formal manufacturing requires migrating for some individuals and migrants are poorly covered by the household surveys. Thus, our results should be interpreted as representing the non-migrant population.

industry $j$ in district $d$, and $L_d$ is the number of workers in traded industries in district $d$. We follow Kovak (2013) by using only workers in traded industries. The employment weights are calculated using the 1999 census and hence predate the BTA. We measure the U.S. tariff reduction in industry $j$ as the Column 2 tariff minus the MFN tariff. Hence, a larger positive value of $\Delta\tau_d^{dir}$ implies the district received a larger U.S. tariff reduction.

Figure 1 displays the variation in district U.S. tariff reductions. The districts that experienced the largest tariff reductions are largely concentrated in three regions: around Ho Chi Minh City in the south, in the north around Ha Noi and districts to the east, and along the central coast near Da Nang. The mean district U.S. tariff reduction is 7.9 percentage points with a standard deviation of 1.8 percentage points.[19]

Following Adao *et al.* (2023), we also measure indirect exposure to the U.S. tariff reductions in other districts:

$$\Delta\tau_d^{ind} = \sum_{f \neq d} \frac{D_{df}^{-\delta}}{\sum_{g \neq d} D_{dg}^{-\delta}} \Delta\tau_f \tag{3}$$

where $D_{df}$ is the distance between the centroids of districts $d$ and $f$. As in Adao *et al.* (2023) we set $\delta = 5$. Indirect exposure in district $d$ is greater the closer that district is to other districts with high exposure to the U.S. tariff reductions. This may be important for at least two reasons. First, workers may commute from their district of residence to nearby districts for work. Second, as new production facilities are established in response to the U.S. tariff reductions (McCaig *et al.*, 2022), this may entail the geographic expansion of manufacturing activities.

## 4.2 Individual transitions and U.S. district tariffs

The results in Table 2 show that individuals already in manufacturing, but not in HEFM, are the most likely to transition to HEFM, but that such transitions occur across all initial activities. We now examine whether the U.S. tariff reductions influenced the likelihood of transitioning to HEFM within districts and if it varied across initial activity. To do so we estimate the following regression:

[19] See Figure A1 for the industry-level U.S. tariff reductions.

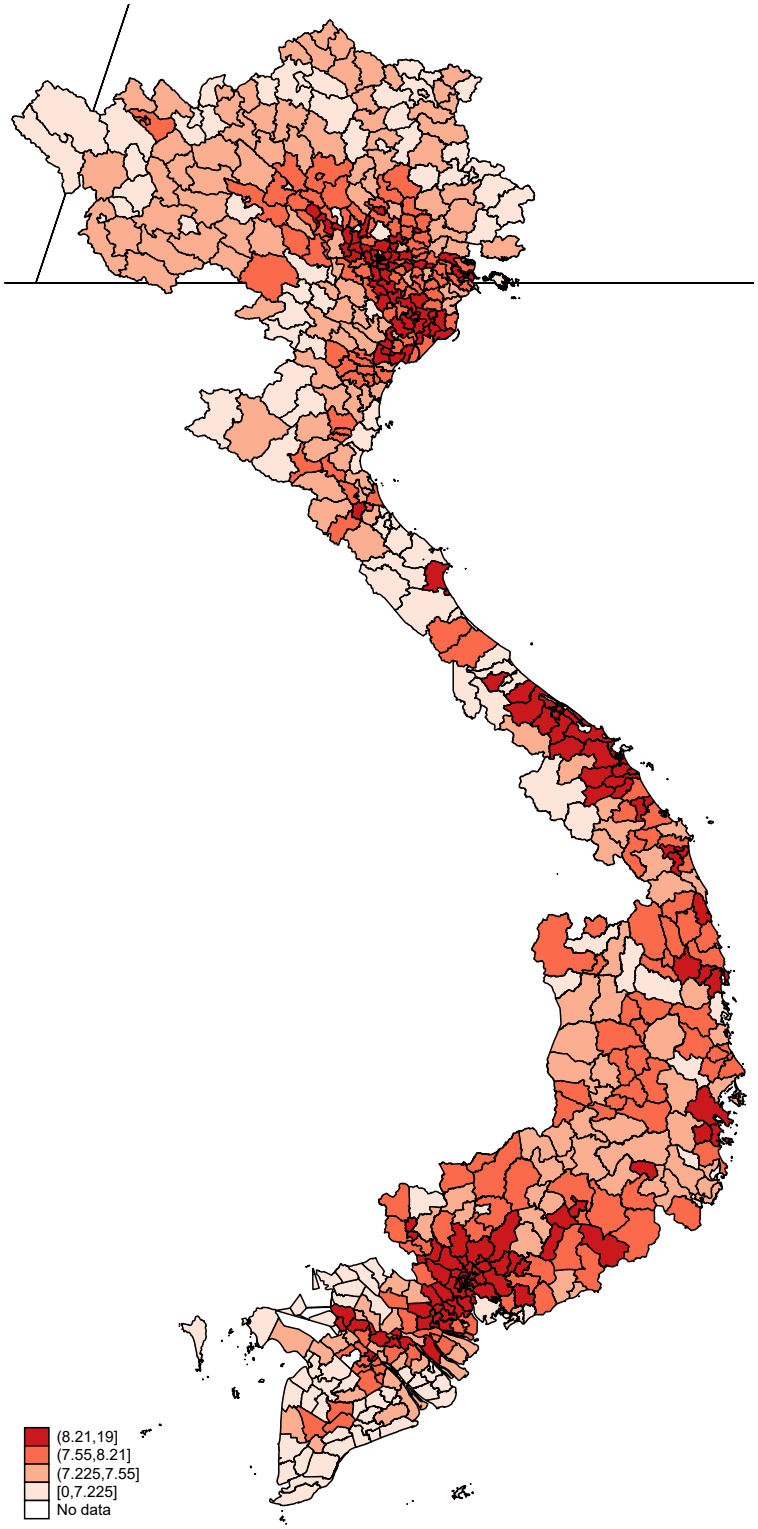


Figure 1: Reduction in district U.S. tariffs

$$y_{it} = \beta^{dir}\Delta\tau_d^{dir} + \beta^{ind}\Delta\tau_d^{ind} + \theta X_i + \lambda Z_d + \gamma_t + \epsilon_i \tag{4}$$

where $y_{it}$ is an indicator variable that takes the value 1 if individual $i$ in panel $t$ transitions into HEFM and 0 otherwise; $\Delta\tau_d^{dir}$ is the direct U.S. district tariff reduction; $\Delta\tau_d^{ind}$ is the indirect U.S. district tariff reduction; $X_i$ is a set of individual controls (age indicators, gender, an ethnic minority indicator, and indicators for completed primary, completed lower secondary, and completed upper secondary with less than completed primary as the excluded category); $Z_d$ is a vector of district controls (MFN tariff reductions due to WTO accession and the share of individuals within the district in 1999 by education category, by gender, and by urban status); and $\gamma_t$ is a survey fixed effect.[20]

The survey fixed effects in equation (4) control for differences over time in the rate of transitioning to HEFM (see Table A4). The individual controls, $X_i$, control for observable individual characteristics that are predictive of transitioning to HEFM. The district-level controls allow for transition rates to HEFM to vary based on differences in initial conditions within districts and subsequent exposure to domestic tariff reductions due to WTO accession. Hence, identification in our model comes from variation in HEFM transition rates and U.S. district tariff reductions within a panel after controlling for variation in initial conditions and individual characteristics.[21]

We pool over all individual panels and report the results in Table 3 starting with only direct exposure (Panel A). Across all individuals initially not in HEFM, the probability of transitioning to HEFM is higher in more exposed districts. A one standard deviation (1.8 percentage points) increase in district exposure to the U.S. tariff reductions is associated with a 0.5 ($0.0027 \times 1.8$) percentage point increase in the probability of transitioning to HEFM. Recall the overall rate of transitioning to HEFM is 2.8 percentage points (Table 2). Furthermore, there is important heterogeneity in terms of how responsive transitions

[20] The district MFN tariff reductions due to WTO accession are calculated as in equation (2) where the change in the industry MFN tariffs are calculated as the MFN tariff in 2006, prior to WTO accession, minus the MFN tariff in 2012.

[21] There is no panel data available prior to the BTA to allow us to test for pre-existing trends that might be correlated with U.S. district tariff reductions. The 1992/93 and 1997/98 Vietnam Living Standards Surveys are much smaller in size and are not representative at the provincial level, let alone the district level. McCaig and Pavcnik (2018) and McCaig *et al.* (2022) find no evidence of pre-existing trends at the industry level for an extensive set of outcomes.

to HEFM are to the U.S. district tariff reductions based on the individual's initial activity. The probability of transitioning to HEFM in response to the U.S. district tariff reductions is most affected for individuals initially in agriculture (column 4) and formal manufacturing (column 5). Transitions from informal manufacturing are the least responsive to the U.S. district tariff reductions.

Table 3: US tariff reductions and transitions into high-exposure formal manufacturing

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | All | School | Not work Not Sch | Agri | Formal Manuf | Informal Manuf | Formal Serv | Informal Service |
| *Panel A: Direct exposure only* | | | | | | | | |
| Direct | 0.0027 | 0.0021 | 0.0025 | 0.0033 | 0.0099 | 0.0003 | 0.0024 | 0.0021 |
| | (0.0005) | (0.0005) | (0.0010) | (0.0010) | (0.0026) | (0.0015) | (0.0006) | (0.0004) |
| N | 111,173 | 32,832 | 7,881 | 39,605 | 3,308 | 5,744 | 8,167 | 13,163 |
| $R^2$ | 0.020 | 0.017 | 0.022 | 0.031 | 0.056 | 0.024 | 0.017 | 0.017 |
| *Panel B: Add indirect exposure* | | | | | | | | |
| Direct | 0.0005 | 0.0005 | 0.0002 | 0.0004 | 0.0077 | -0.0027 | 0.0020 | 0.0010 |
| | (0.0005) | (0.0006) | (0.0011) | (0.0011) | (0.0029) | (0.0017) | (0.0008) | (0.0006) |
| Indirect | 0.0020 | 0.0014 | 0.0023 | 0.0031 | 0.0022 | 0.0031 | 0.0003 | 0.0011 |
| | (0.0004) | (0.0003) | (0.0007) | (0.0008) | (0.0016) | (0.0012) | (0.0005) | (0.0004) |
| N | 111,157 | 32,831 | 7,876 | 39,605 | 3,308 | 5,744 | 8,161 | 13,159 |
| $R^2$ | 0.022 | 0.019 | 0.025 | 0.033 | 0.057 | 0.026 | 0.017 | 0.018 |

*Note:* Standard errors reported in parentheses are clustered by district. The sample is individuals ages 15 to 29 from the pooled individual panels: 2002-04, 2004-06, 2006-08, 2010-2012, 2012-2014, 2014-2016, and 2016-2018. The sample is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. The dependent variable is an indicator for working in HEFM at the end of the panel. The columns represent different samples of individuals based on their initial indicated activity. Controls included in the regression are district controls (WTO district tariff changes and the share of workers within the district in 1999 based on demographics such as gender, education, etc.), panel fixed effects, and individual characteristics (age, gender, and ethnic minority indicator) based on the initial survey of the respective panel.

In Panel B, we add the measure of indirect exposure and find evidence that the probability of transitioning to HEFM is strongly associated with exposure to the U.S. tariff reductions in other nearby districts.[22] The overall results in column (1) suggest that indirect exposure is much more important than direct exposure. This is true for individuals in all initial activities except for those in either formal manufacturing or formal services where direct exposure remains more important.[23]

Why is indirect exposure more important than direct exposure in this context? Figure A2 shows a scatterplot of the change in the share of individuals within a district working in

[22]In Appendix section A.1 we find a similar pattern using population census data.

[23]These results are consistent with analysis presented in Appendix section A.1 which provides evidence that the U.S. tariff reductions were associated with an increase in the share of individuals within districts working in HEFM using the population census data.

HEFM between 1999 and 2009 versus the share of individuals working in formal manufacturing in 1999. Many of the districts that experienced the largest increase in the share in HEFM had very little employment initially in formal manufacturing. In other words, these are newly industrializing districts.

Table A8 splits the sample by gender and education and reports the regression results for all initial non-HEFM activities. Although women are more likely than men overall to transition to HEFM (Table A5), we find that the probability of transitioning for men is more positively related to the U.S. district tariff reductions (columns 1 and 2 in Panel A), but the effects of indirect exposure are very similar by gender (columns 1 and 2 in Panel B). By education, we see very little difference across the categories, with the exception of the least educated individuals who are less likely than the other education categories to transition to HEFM in response to the U.S. tariff reductions.

Overall, the U.S. district tariff reductions influenced the pattern of transitions into HEFM, particularly through indirect exposure in other nearby districts. This suggests that new export opportunities influenced the overall patterns of structural change in Vietnam. Furthermore, it points to the importance of understanding the spatial expansion of industrialization in a low-income country.

## 4.3 Returns to switching to HEFM

We next examine wage differences associated with the transition to HEFM as structural change is presumed to be associated with earnings gains for workers.[24] The 2002 through 2008 surveys allow us to estimate hourly or daily wages whereas the 2010 through 2018 surveys only allow us to estimate daily wages. We estimate the following model:

$$\Delta lny_i = \beta HEFM_i + \gamma X_i + u_i \tag{5}$$

where $\Delta lny_i$ is the change in ln hourly earnings or ln daily earnings for individual $i$, $HEFM_i$ is an indicator for individual $i$ working in HEFM in the end survey, and $X_i$ is a vector of individual characteristics (indicator for gender, an ethnic minority indicator,

[24]This requires the individual to be working in paid employment in both the start and end surveys. Hence, anyone not working or self-employed in the initial survey will not be included in the analysis.

indicators for level of completed education (completed primary, completed lower secondary, completed upper secondary), and a complete set of age indicators). We focus on individuals not working in HEFM in the start survey. All regressions include district and panel fixed effects. The coefficient of interest is $\beta$ and it is identified by switchers within districts.

Table 4 shows results for the ln change in hourly wages using the 2004-06 and 2006-08 panels in column (1) and for the ln change in daily wages in columns (2) through (4) for the 2004-06 and 2006-08 panels; the 2010-12 through 2016-18 panels; and all panels respectively.[25] The results suggest very minor increases in either hourly or daily wages in the earlier panels, 2004-06 and 2006-08, in columns (1) and (2). In contrast, the increase in daily wages is much larger, around 9.3% in the later panels, 2010-12 through 2016-18, as shown in column (3). Further research is needed to better understand these wage dynamics among workers transitioning to HEFM.

Table 4: Wage changes from switching to high-exposure, formal manufacturing

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| HEFM | 0.029 | 0.026 | 0.093 | 0.072 |
| | (0.033) | (0.033) | (0.020) | (0.017) |
| Observations | 6,227 | 6,227 | 11,859 | 18,122 |
| R-squared | 0.14 | 0.14 | 0.10 | 0.08 |

*Note:* Standard errors reported in parentheses are clustered by district. The sample is individual panel observations where the individual does not work in HEFM in the start panel. The sample is restricted to individuals ages 15 to 29 and is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. The dependent variable is the change in ln hourly earnings in column (1) and the change in ln daily earnings for columns (2) through (4). Individual controls include an indicator for gender, an ethnic minority indicator, indicators for level of completed education (completed primary, completed lower secondary, completed upper secondary), and a complete set of age indicators. All regressions include district and panel fixed effects.

# 5 Conclusion

We study structural change induced by new export opportunities in a low-income country, Vietnam. The 2001 U.S-Vietnam Bilateral Trade Agreement led to a large increase in manufacturing exports from Vietnam to the U.S. and consequently a large increase in employment in the formal manufacturing sector. Using individual panel data that covers workers in all sectors, including both formal and informal firms, as well as individuals not in the work-

[25] We do not include the 2002-04 panel as the structure of questions related to employment earnings differ in 2002 relative to the other surveys.

force, we provide novel evidence on how structural change happens at the individual level. Individuals moved into the most exposed industries from all initial activities, including from school. While women and better educated individuals were more likely to transition to the most exposed industries, there remains significant differences in the likelihood of moving into these industries based on initial activity even when we condition on gender or education. Transitions were more likely to happen in the districts most exposed to the positive export demand shock. Our transition rates could be used to inform modeling of inter-sectoral labor movements in low-income countries.

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# A Supplementary Analysis

## A.1 Structural change and U.S. tariff reductions

We use the following regression equation to estimate the effects of district U.S. tariff cuts on labour market outcomes:

$$y_{idt} = \beta^{dir,09} D^{09} \Delta\tau_d^{dir} + \beta^{dir,19} D^{19} \Delta\tau_d^{dir} + \beta^{ind,09} D^{09} \Delta\tau_d^{ind} + \beta^{ind,19} D^{19} \Delta\tau_d^{ind} + \beta_3 X_{idt} + \beta_4 Z_{dt} + \mu_d + \theta_t + \epsilon_{idt} \quad (6)$$

where $y_{idt}$ is a labour market outcome for individual $i$ in district $d$ at time $t$; $\Delta\tau_d^{dir}$ is the direct district U.S. tariff reduction from the BTA; $\Delta\tau_d^{ind}$ is the indirect district U.S. tariff reduction from the BTA; $D^{09}$ and $D^{19}$ are indicators for 2009 and 2019, respectively; $X_{idt}$ are individual-level controls (gender, indicators for education category, age indicators, an urban indicator, and an ethnic minority indicator); $Z_{dt}$ is a vector of district controls (MFN tariff reductions due to WTO accession and the share of individuals within the district in 1999 by education category, by gender, and by urban status) interacted with indicators for 2009 and 2019 respectively; $\mu_d$ are district fixed effects; and $\theta_t$ are time fixed effects.

Equation (6) follows a similar framework to Dix-Carneiro and Kovak (2017, 2019) and Erten and Leight (2021). The key coefficients of interest are $\beta^{dir}$ and $\beta^{ind}$ for 2009 and 2019 each. They measure the cumulative effects relative to 1999. The inclusion of district and time fixed effects means that identification comes from district changes over time. Interacting initial district-level characteristics with year indicators helps address concerns regarding pre-existing trends that may be correlated with district tariff changes.

Table A1 presents our results from estimating equation (6) for individuals ages 15 to 29 for the following outcomes: working, working in agriculture, manufacturing, services, high-exposure manufacturing, and high-exposure, formal manufacturing.[26] Panel A presents results based on including direct exposure only and Panel B adds indirect exposure. We

[26] High-exposure manufacturing is industries that received a larger tariff cut than the median US tariff reduction within manufacturing.

focus our discussion on the results in Panel B as indirect exposure is consistently important for changing patterns of work, as in the main text for individual transitions. The results indicate that the direct US tariff reductions resulted in an increase in the incidence of working (column 1) in 2009, but this effect had dissipated by 2019 with little impact from indirect exposure. A one standard deviation (1.8 percentage points) increase in the direct district US tariff reductions is associated with a 0.6 percentage point increase in the likelihood of working in 2009 in Panel B. Across industries, we find an increase in the prevalence of working in agriculture in response to the direct U.S. district tariff reductions in both 2009 and 2019. The likelihood of working in manufacturing increased in response to indirect exposure, with a reduction in response to direct exposure, although the estimate is not statistically different from 0. Consistent with the evidence on individual transitions to high-exposure, formal manufacturing documented in Table 3, we find that the likelihood of working in HEFM in 2009 is not influenced by direct exposure to the U.S. district tariff reductions and is positively effected by indirect exposure.

Our results are consistent with recent work by McCaig *et al.* (2022) which shows an expansion in industry-level employment within formal manufacturing in Vietnam in response to the U.S. tariff reductions that grows quickly until about 2009 and then more slowly thereafter. Prolonged adjustment over time is also consistent with patterns of labour market adjustment to Brazil's major trade liberalization episode in the 1990s (Dix-Carneiro and Kovak, 2017, 2019) and structural change in China in response to reductions in export cost uncertainty (Erten and Leight, 2021).

Overall, these results show a mixed pattern of sectoral employment shifts in response to the U.S. district tariff reductions. This is consistent with our novel evidence on who transitions into expanding export sector as in Tables 2 and 3 we showed that individuals moving into high exposure, formal manufacturing jobs came from a range of previous activities, including agriculture, but at the same time not limited to agriculture.

Table A1: US tariff reductions and sectoral employment

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Worked | Agri | Manuf | Serv | High Exp Manuf | High Exp Formal Manuf |
| *Panel A: Direct exposure only* | | | | | | |
| *2009 interactions:* | | | | | | |
| Direct | 0.0023** | 0.0001 | 0.0024** | -0.0002 | 0.0010 | 0.0022** |
| | (0.0010) | (0.0010) | (0.0012) | (0.0010) | (0.0008) | (0.0009) |
| *2019 interactions:* | | | | | | |
| Direct | -0.0004 | 0.0039* | 0.0015 | -0.0060*** | 0.0006 | |
| | (0.0015) | (0.0020) | (0.0013) | (0.0014) | (0.0012) | |
| Observations | 12,908,923 | 12,908,923 | 12,908,923 | 12908923 | 12,908,923 | 11,193,647 |
| R-squared | 0.293 | 0.357 | 0.131 | 0.145 | 0.086 | 0.076 |
| *Panel B: Add indirect exposure* | | | | | | |
| *2009 interactions:* | | | | | | |
| Direct | 0.0036*** | 0.0068*** | -0.0011 | -0.0018* | -0.0020* | -0.0001 |
| | (0.0012) | (0.0015) | (0.0015) | (0.0011) | (0.0011) | (0.0012) |
| Indirect | -0.0012 | -0.0059*** | 0.0031*** | 0.0015*** | 0.0025*** | 0.0020*** |
| | (0.0008) | (0.0010) | (0.0009) | (0.0006) | (0.0007) | (0.0006) |
| *2019 interactions:* | | | | | | |
| Direct | -0.0017 | 0.0069*** | -0.0019 | -0.0069*** | -0.0028* | |
| | (0.0019) | (0.0025) | (0.0021) | (0.0019) | (0.0016) | |
| Indirect | 0.0012 | -0.0025** | 0.0029* | 0.0008 | 0.0029** | |
| | (0.0009) | (0.0013) | (0.0015) | (0.0011) | (0.0011) | |
| Observations | 12,907,995 | 12,907,995 | 12,907,995 | 12,907,995 | 12,907,995 | 11,193,266 |
| R-squared | 0.293 | 0.357 | 0.131 | 0.145 | 0.087 | 0.076 |

*Note:* Standard errors reported in parentheses are clustered by district. Significance * 10% ** 5% *** 1%. The sample is individuals ages 15 to 29 from the 1999, 2009 and 2019 population censuses. In columns 1 to 5, the dependent variable is an indicator for working in the indicated sector. District-level controls include MFN tariff reductions due to WTO accession and the share of individuals within the district in 1999 by education category, by gender, and by urban status. Each district-level control is interacted with indicators for 2009 and 2019 respectively. Individual-level controls are gender, indicators for education category, age indicators, an urban indicator, and an ethnic minority indicator. All regressions contain district fixed effects and year fixed effects.

## A.2 Additional figures and tables

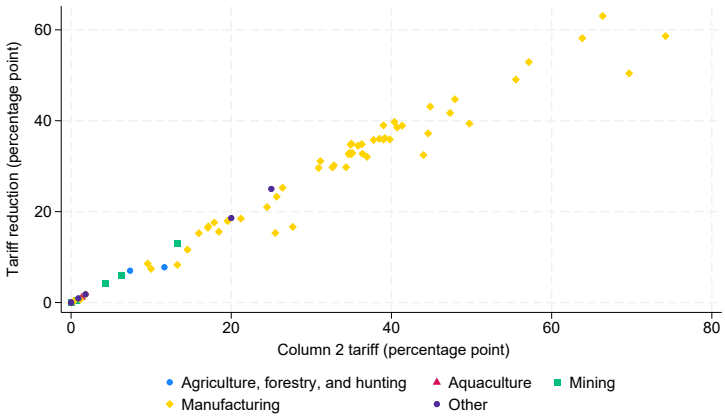


Figure A1: Reduction in U.S. industry tariffs relative to initial U.S. industry tariff

*Note:* Industries are based on 3-digit ISIC revision 3 classification. The horizontal axis plots the Column 2 tariff in 2001. The vertical axis plots the reduction in the tariff calculated as the Column 2 tariff minus the MFN tariff. Source: McCaig (2011).

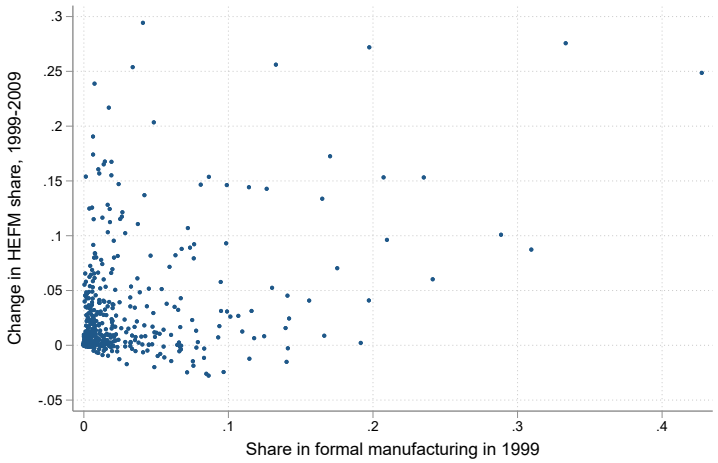


Figure A2: Change in share of population working in HEFM versus intitial share working in formal manufacturing

Table A2: Aggregate structural change, workers ages 15 to 55

| Industry | 1999 | 2009 | 2019 | Change | | Share of change within districts | |
|---|---|---|---|---|---|---|---|
| | | | | 1999 to 2009 | 1999 to 2019 | 1999 to 2009 | 1999 to 2019 |
| Agriculture | 0.678 | 0.518 | 0.317 | -0.160 | -0.360 | 0.865 | 0.916 |
| Manufacturing | 0.090 | 0.146 | 0.226 | 0.056 | 0.136 | 0.757 | 0.862 |
| Of which: | | | | | | | |
| High-exposure | 0.057 | 0.084 | 0.145 | 0.027 | 0.088 | 0.721 | 0.879 |
| High-exposure, formal | 0.019 | 0.046 | N.A. | 0.027 | N.A. | 0.762 | N.A. |
| Services | 0.225 | 0.330 | 0.453 | 0.105 | 0.228 | 0.921 | 0.948 |
| Number of observations | 11,124,599 | 7,202,067 | 3,821,291 | | | | |

*Note:* The table reports the share of workers by sector and year in the first three columns. The next two columns report the change bewteen 1999 and 2009 and 2019 respectively. The final two columns report the share of the overall change due to changes within sectors as per equation (1). The source data is the 1999, 2009, and 2019 population censuses. The sample is workers ages 15 to 55. All shares are weighted using sampling weights. N.A. denotes not available as there was no question related to working in a formal vs informal firm in the 2019 census.

Table A3: Share of individuals transitioning to high-exposure formal manufacturing, ages 15 to 55

| Initial activity | Initial share | Share in same activity at the end of the panel | Share in HEFM in at the end of the panel | Share of total transitions into HEFM |
|---|---|---|---|---|
| In school | 0.110 | 0.596 | 0.024 | 0.168 |
| Neither work nor school | 0.058 | 0.465 | 0.022 | 0.080 |
| Agriculture | 0.445 | 0.825 | 0.008 | 0.238 |
| Mining | 0.006 | 0.592 | 0.022 | 0.008 |
| Manufacturing, formal | 0.024 | 0.687 | 0.105 | 0.157 |
| Manufacturing, informal | 0.064 | 0.557 | 0.033 | 0.133 |
| Services, formal | 0.105 | 0.801 | 0.013 | 0.090 |
| Services, informal | 0.189 | 0.729 | 0.011 | 0.126 |
| Total | 1.000 | 0.770 | 0.016 | 1.000 |
| Number of individuals | | 299,713 | | |

*Note:* The sample is for individuals ages 15 to 55 based on the 2002-04 through 2016-18 VHLSS individual panels. The sample is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. For each indicated sample, the columns represent the share of individuals in the indicated activity at the start of the panel, the share of individuals working in the same indicated activity at the end of the panel, the share of individuals that have transitioned to HEFM jobs at the end of the panel, and the share of total transitions into HEFM, respectively.

Table A4: Share of individuals transitioning to high-exposure formal manufacturing by panel

| Initial activity | 2002-04 | 2004-06 | 2006-08 | 2010-2012 | 2012-14 | 2014-16 | 2016-18 |
|---|---|---|---|---|---|---|---|
| In school | 0.022 | 0.018 | 0.022 | 0.022 | 0.027 | 0.027 | 0.034 |
| Neither work nor school | 0.037 | 0.035 | 0.038 | 0.033 | 0.038 | 0.047 | 0.059 |
| Agriculture | 0.016 | 0.017 | 0.017 | 0.018 | 0.020 | 0.019 | 0.027 |
| Mining | 0.023 | 0.029 | 0.031 | 0.016 | 0.019 | 0.024 | 0.000 |
| Manufacturing, formal | 0.128 | 0.099 | 0.145 | 0.118 | 0.108 | 0.149 | 0.161 |
| Manufacturing, informal | 0.058 | 0.057 | 0.048 | 0.049 | 0.068 | 0.082 | 0.076 |
| Services, formal | 0.018 | 0.023 | 0.020 | 0.023 | 0.031 | 0.026 | 0.028 |
| Services, informal | 0.018 | 0.020 | 0.023 | 0.032 | 0.024 | 0.030 | 0.039 |
| Total | 0.024 | 0.024 | 0.026 | 0.028 | 0.030 | 0.033 | 0.040 |
| Number of individuals | 19,358 | 18,542 | 17,859 | 16,299 | 14,346 | 13,223 | 11,547 |

*Note:* The samples are based on the 2002-04 through 2016-18 VHLSS individual panels and include individuals ages 15 to 29 in the start survey of the respective panel. The sample is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. The columns represent the share of individuals in the indicated activity that have transitioned to HEFM jobs at the end of the panel. For each column, the total represents the share of individuals summed across all activities.

Table A5: Share of individuals transitioning to high-exposure formal manufacturing, by gender

| Initial activity | Initial share | Share in same activity at the end of the panel | Share in HEFM in at the end of the panel | Share of total transitions into HEFM |
|---|---|---|---|---|
| **Panel A: Females** | | | | |
| In school | 0.305 | 0.618 | 0.028 | 0.245 |
| Neither work nor school | 0.090 | 0.350 | 0.044 | 0.115 |
| Agriculture | 0.350 | 0.774 | 0.026 | 0.262 |
| Mining | 0.002 | 0.424 | 0.035 | 0.002 |
| Manufacturing, formal | 0.035 | 0.731 | 0.137 | 0.142 |
| Manufacturing, informal | 0.053 | 0.479 | 0.069 | 0.107 |
| Services, formal | 0.071 | 0.841 | 0.021 | 0.044 |
| Services, informal | 0.095 | 0.626 | 0.031 | 0.084 |
| Total | 1.000 | 0.714 | 0.034 | 1.000 |
| Number of individuals | | 51,507 | | |
| **Panel B: Males** | | | | |
| In school | 0.287 | 0.576 | 0.021 | 0.257 |
| Neither work nor school | 0.054 | 0.267 | 0.034 | 0.080 |
| Agriculture | 0.362 | 0.753 | 0.012 | 0.191 |
| Mining | 0.006 | 0.510 | 0.021 | 0.006 |
| Manufacturing, formal | 0.025 | 0.635 | 0.122 | 0.130 |
| Manufacturing, informal | 0.051 | 0.503 | 0.050 | 0.109 |
| Services, formal | 0.076 | 0.702 | 0.027 | 0.088 |
| Services, informal | 0.139 | 0.633 | 0.023 | 0.139 |
| Total | 1.000 | 0.697 | 0.023 | 1.000 |
| Number of individuals | | 59,667 | | |

*Note:* The sample is individuals ages 15 to 29 in the start survey of the 2002-04 through 2016-18 VHLSS individual panels. The sample is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. The columns represent the share of individuals in the indicated activity at the start of the panel, the share of individuals working in the same indicated activity at the end of the panel, the share of individuals that have transitioned to HEFM jobs at the end of the panel, and the share of total transitions into HEFM, respectively. HEFM denotes high-exposure, formal manufacturing.

Table A6: Share of individuals transitioning to high-exposure formal manufacturing by education

| Initial activity | Initial share | Share in same activity at the end of the panel | Share in HEFM in at the end of the panel | Share of total transitions into HEFM |
|---|---|---|---|---|
| | **Panel A: Did not complete primary** | | | |
| In school | 0.007 | 0.196 | 0.022 | 0.022 |
| Neither work nor school | 0.110 | 0.635 | 0.015 | 0.215 |
| Agriculture | 0.699 | 0.894 | 0.003 | 0.312 |
| Mining | 0.004 | 0.321 | 0.019 | 0.011 |
| Manufacturing, formal | 0.016 | 0.590 | 0.031 | 0.065 |
| Manufacturing, informal | 0.041 | 0.440 | 0.030 | 0.161 |
| Services, formal | 0.010 | 0.280 | 0.024 | 0.032 |
| Services, informal | 0.112 | 0.638 | 0.012 | 0.183 |
| Total | 1.000 | 0.811 | 0.008 | 1.000 |
| Number of individuals | 12,318 | | | |
| | **Panel B: Completed Primary** | | | |
| In school | 0.105 | 0.469 | 0.013 | 0.068 |
| Neither work nor school | 0.073 | 0.358 | 0.034 | 0.121 |
| Agriculture | 0.528 | 0.802 | 0.012 | 0.317 |
| Mining | 0.005 | 0.434 | 0.023 | 0.006 |
| Manufacturing, formal | 0.030 | 0.639 | 0.102 | 0.148 |
| Manufacturing, informal | 0.075 | 0.515 | 0.047 | 0.169 |
| Services, formal | 0.021 | 0.335 | 0.034 | 0.035 |
| Services, informal | 0.163 | 0.665 | 0.017 | 0.136 |
| Total | 1.000 | 0.700 | 0.021 | 1.000 |
| Number of individuals | 25,032 | | | |

*Note:* The sample is individuals ages 15 to 29 in the start survey of the 2002-04 through 2016-18 VHLSS individual panels. The sample is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. Education samples are based on reported education in the start survey of the respective individual panel. Panel A are individuals that did not complete primary education which is defined as completed grade 4 or less. Panel B are individuals that completed primary education which is defined as completed grades 5 to 8, inclusive. For each indicated sample, the columns represent the share of individuals in the indicated activity at the start of the panel, the share of individuals working in the same indicated activity at the end of the panel, the share of individuals that have transitioned to HEFM jobs at the end of the panel, and the share of total transitions into HEFM, respectively. HEFM denotes high-exposure, formal manufacturing.

Table A7: Share of individuals transitioning to high-exposure formal manufacturing by education

| Initial activity | Initial share | Share in same activity at the end of the panel | Share in HEFM in at the end of the panel | Share of total transitions into HEFM |
|---|---|---|---|---|
| | **Panel C: Completed Lower Secondary** | | | |
| In school | 0.433 | 0.645 | 0.019 | 0.278 |
| Neither work nor school | 0.042 | 0.285 | 0.048 | 0.069 |
| Agriculture | 0.315 | 0.708 | 0.024 | 0.260 |
| Mining | 0.003 | 0.473 | 0.015 | 0.002 |
| Manufacturing, formal | 0.024 | 0.710 | 0.152 | 0.123 |
| Manufacturing, informal | 0.056 | 0.499 | 0.067 | 0.127 |
| Services, formal | 0.023 | 0.468 | 0.044 | 0.034 |
| Services, informal | 0.104 | 0.631 | 0.030 | 0.107 |
| Total | 1.000 | 0.702 | 0.029 | 1.000 |
| Number of individuals | 41,134 | | | |
| | **Panel D: Completed Upper Secondary** | | | |
| In school | 0.375 | 0.556 | 0.034 | 0.311 |
| Neither work nor school | 0.091 | 0.162 | 0.050 | 0.110 |
| Agriculture | 0.148 | 0.569 | 0.046 | 0.165 |
| Mining | 0.005 | 0.620 | 0.032 | 0.004 |
| Manufacturing, formal | 0.042 | 0.712 | 0.145 | 0.150 |
| Manufacturing, informal | 0.033 | 0.462 | 0.077 | 0.062 |
| Services, formal | 0.201 | 0.850 | 0.021 | 0.103 |
| Services, informal | 0.105 | 0.583 | 0.037 | 0.094 |
| Total | 1.000 | 0.672 | 0.041 | 1.000 |
| Number of individuals | 32,689 | | | |

*Note:* The sample is individuals ages 15 to 29 in the start survey of the 2002-04 through 2016-18 VHLSS individual panels. The sample is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. Education samples are based on reported education in the start survey of the respective individual panel. Panel C are individuals that completed lower secondary education which is defined as completed grades 9 to 11, inclusive. Panel D are individuals that completed upper secondary education which is defined by completed grades 12 or more. For each indicated sample, the columns represent the share of individuals in the indicated activity at the start of the panel, the share of individuals working in the same indicated activity at the end of the panel, the share of individuals that have transitioned to HEFM jobs at the end of the panel, and the share of total transitions into HEFM, respectively. HEFM denotes high-exposure, formal manufacturing.

Table A8: US tariff reductions and transitions into high-exposure formal manufacturing, by gender and education

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Male | Female | Not Primary | Primary | Lower Secondary | Upper Secondary |
| *Panel A: Direct exposure only* | | | | | | |
| Direct | 0.0031*** | 0.0023*** | 0.0019*** | 0.0037*** | 0.0030*** | 0.0030*** |
| | (0.0005) | (0.0006) | (0.0007) | (0.0007) | (0.0006) | (0.0006) |
| N | 59,667 | 51,506 | 12,318 | 25,032 | 41,134 | 32,689 |
| $R^2$ | 0.017 | 0.023 | 0.014 | 0.021 | 0.022 | 0.020 |
| *Panel B: Add indirect exposure* | | | | | | |
| Direct | 0.0010* | -0.0001 | 0.0008 | 0.0014* | 0.0007 | 0.0009 |
| | (0.0005) | (0.0007) | (0.0009) | (0.0007) | (0.0008) | (0.0007) |
| Indirect | 0.0019*** | 0.0022*** | 0.0010* | 0.0023*** | 0.0023*** | 0.0018*** |
| | (0.0004) | (0.0004) | (0.0006) | (0.0005) | (0.0005) | (0.0005) |
| N | 59,664 | 51,493 | 12,317 | 25,032 | 41,128 | 32,680 |
| $R^2$ | 0.019 | 0.025 | 0.015 | 0.024 | 0.025 | 0.021 |

*Note:* Standard errors reported in parentheses are clustered by district. Significance * 10% ** 5% *** 1%. The sample is individuals ages 15 to 29 from the pooled individual panels: 2002-04, 2004-06, 2006-08, 2010-2012, 2012-2014, 2014-2016, and 2016-2018. The sample is restricted to individuals for whom the gender and year of birth are consistent across the start and end surveys of the panel. The dependent variable is an indicator for working in HEFM at the end of the panel. The columns represent different samples of individuals based on their initial indicated activity. Controls included in the regression are district controls (WTO district tariff changes and the share of workers within the district in 1999 based on demographics such as gender, education, etc.), panel fixed effects, and individual characteristics (age, gender, and ethnic minority indicator) based on the initial survey of the respective panel.