Effect of Tariff Liberalization on Mexico's Income Distribution in the presence of Migration

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Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012

Abstract

This paper studies how the North American Free Trade Agreement (NAFTA) affected income distribution within Mexico given internal migration. In low-skilled labor-abundant developing countries, trade liberalization should theoretically increase the income of low-skilled workers, decreasing income disparity. However, anecdotal evidence indicates that NAFTA increased the gap between rich and poor in Mexico, and empirical evidence is mixed (Chiquiar, 2005; Nicita, 2009; Hanson, 2007). Because trade may affect wages differently across regions within the country, accurate measures of wage effects must incorporate intra-national migration. We specifically consider rural to urban migration and find that working age men with low incomes get a boost from the NAFTA in their wages while NAFTA has a negative effect for those with high incomes. There is a slight increase in migration in the years after NAFTA. We also find that, workers far away from the US-Mexico border earn significantly lower wages in comparison to their counterparts in the border. But this effect diminishes after NAFTA, when tariffs decrease. As a result, we find that in urban areas, trade liberalization has reduced income inequalities among working age men.

Keywords: Income Distribution, Regional Disparities, Trade Liberalization; Internal-Migration

1. Introduction

Globalization has opened markets to products and services often through international agreements that facilitate trade. While economists generally agree that trade can deliver benefits to an economy, the distribution of those benefits is in question (Anderson, et al., 2004). One of the critiques of globalization is that by benefiting some regions and workers more than others, globalization may accentuate economic inequality, and induce greater mobility of people (Anzaldo Gómez, et al., 2008).

A number of studies shed light on the impact of trade liberalization on wage inequality in Mexico.[1] Nicita (2009) shows that the benefits of trade have not spread to all households and have primarily gone to more skilled workers, especially in Mexican states close to the U.S. border. [2] Similarly, Hanson (2007) and Baylis, et al. (2012) find that Northern states, which have greater access to the US market than the Southern states, benefit more from trade by obtaining higher prices because of lower transportation costs, which translates into higher labor income. One disadvantage of these papers is that they do not take into account that households may respond to variations in labor demand by changing the type of labor they sell, or by relocating.[3] The distribution of benefits from NAFTA will presumably not only accrue to those already working in export industries and/or living in regions close to the U.S. border, but also to those who can more easily migrate into those regions and sectors. Conversely, those people who face higher barriers to migration may be penalized by the kind of structural shift in the economy brought about by trade. Failure to account for labor migration may result in an over-estimation of the growth income in the region receiving migrants, since 3.98 million Mexicans (4% of the total population in 2000) and five percent of working age men migrated from one state to another between 1995 and 2000 (Vega, 2005). (INEGI, 2008)[4]. Most of these migrants are workers coming from the Southern states of Guerrero, Oaxaca, Veracruz, Puebla and Hidalgo

[1] Some of them are Esquivel, et al. (2003); Airola (2008); Cragg, et al. (1996); Feenstra, et al. (1996); Feliciano (2001); Hanson (2003); Hanson, et al. (1995); Revenga (1997); Robertson (2007); Chiquiar (2005).

[2] Robertson (2007) finds that the expansion of assembly activities in Mexico has increased the demand for less-skilled workers, and Chiquiar (2005) finds that physical capital and infrastructure are the main reasons why Northern Mexican states reaped the benefits from trade liberalization more than the Southern states. While insightful, these papers do not explicitly analyze the distribution of gains across income levels and geographical regions.

[3] For example, Hanson (2007) assumes that "labor is sufficiently immobile across regions of Mexico for region-specific labor-demand to affect regional differentials in labor income" (pg. 419).

[4] Between 1985 and 1990 the interstate migration was 6% and for 2005 to 2010 was 4%.

(SEDESOL, 2004). The recipient states are in the North—mainly Sinaloa, Sonora, Baja California, and Baja California Sur (see Figure 1)—. By exclusively looking at growth within a region, one will overestimate the benefits going to the pre-existing residents and estimate a higher increase in income disparity in Mexico as a result of NAFTA. To correct this problem, this research proposes to measure the effects of trade liberalization on income distribution while taking labor migration into account.

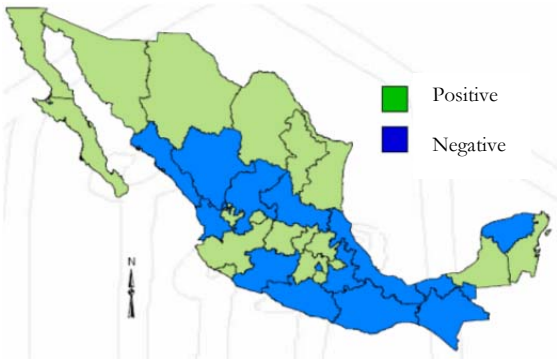
The results of this research can help identify those barriers facing individuals and regions that limit their ability to benefit from trade. Thus, this research can help detecting the areas of social investment and infrastructure investment[5] that may help smooth wage inequality. Further, by identifying those regions and individuals who have benefited and lost from trade, this information can be used to target compensation. Furthermore, using this estimation approach, regional governments can anticipate migration and wages in their region, and adjust local development plans accordingly.

To study the effect of NAFTA on migration we first predict the probability to migrate based on the potential growth in regional GVA associated with tariff reductions from NAFTA. Because migration and wage outcomes are jointly determined, and likely both related to unobservable individual characteristics, we instrument for migration using crop yield shocks, which have been shown to influence migration (Feng, et al., 2010) yet are unlikely to affect wages in the manufacturing, retail or service sectors in urban areas except through labor supply. By analyzing trade openness and distance to the border, we find that workers closer to the US-Mexico border get a higher wage than their counterparts far away. But this spread diminishes as tariffs reduce, after NAFTA. Also, there is a slight increase in migration in the years after NAFTA. Further, we find that men with low incomes get a boost from the NAFTA in their wages while NAFTA has a negative effect for those with high incomes. Thus, trade liberalization appears to have decreased income disparities.

[5] Following (Costa-i-Font, et al., 2005) we divide the public investment into social & infrastructure investments. The social investment goes to areas such as health education whereas the infrastructure goes to areas such as: transportation, and telecommunication.

This paper has the following potential contributions: First, to my knowledge, this is one of the first studies to consider the effect of income distribution while explicitly controlling for migration. Second, we correct for the potential endogeneity of internal migration and wages by using a two stage least squares (2SLS) instrumental variable estimation. Third, by comparing low vs. high income earners, we explore which workers gained and lost from trade. Fourth, we include the latest population census (2010) to observe if, after fifteen years of NAFTA, income disparity has increased in Mexico, or whether as the economy adapts to trade, inequalities decrease. These results will contribute to the literature by clarifying the effect that trade openness has on the distribution of gains across income levels and geographic regions, taking internal migration into account.

Figure 1: Net Migration by state, 1995-2000



Source: CONAPO, with information from INEGI's 2000 Population Census (Vega, 2005 p. 17).

2. Motivation

Developing countries, such as Brazil, China, India and Mexico, have experienced rapid economic growth. They have made significant policy adjustments to foster globalization, including lowering tariffs and other trade barriers, reducing barriers to foreign direct investment (FDI) and entering into complex trade agreements. The main motivation for these changes was the promise of growth, higher wages, and lower income inequality (Robertson, 2007; Harrison, 2007). While increased trade may have benefited the Mexican economy, some initial evidence shows that NAFTA may have worsened inequality in Mexico (Baylis, et al., 2012; Nicita, 2009).

Trade can affect income disparity across skills, sectors and regions. The Heckscher-Ohlin model of trade states that countries should benefit overall from trade, and in particular, low-skilled labor should reap higher wages in developing countries where such labor is abundant. If inputs are not completely mobile across sectors and regions, we would further expect factors employed in the export-oriented sectors to benefit more than those in import-competing industries. Further, we might expect those regions with lower transport costs to export markets to benefit more which, if labor is not freely mobile, may either improve or exacerbate wage inequality depending on whether those same regions were relatively high or low income before trade.

A number of papers provide evidence of an increase in wage inequality in Mexico after NAFTA[6]. For example, Nicita (2004) finds that the effect of trade liberalization has been almost exclusively transferred to skilled workers, and has increased the gap between the remuneration of skilled and unskilled jobs.[7] As noted above, Hanson (2007) and Nicita (2009) also show that trade primarily benefited certain skills and regions in Mexico.

New Economic Geography also generates predictions about which regions might reap the gains from trade. The economic effects of trade may increase the concentration of economic activity in certain regions more than others

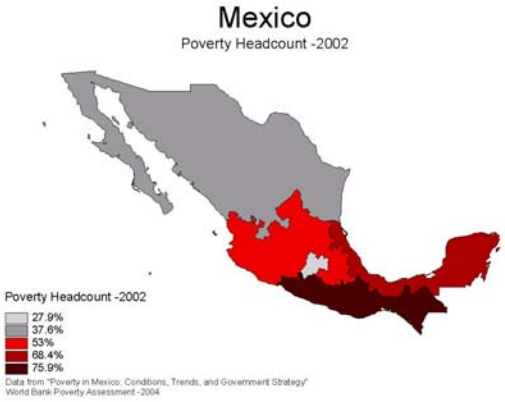
[6] For example, see Esquivel, et al., 2003; Airola, 2008; Cragg, et al., 1996; Feenstra, et al., 1996; Feliciano, 2001; Hanson, 2003; Hanson, et al., 1995; Revenga, 1997; Robertson, 2007; Chiquiar, 2005.

[7] Nicita (2004) finds that unskilled workers in the Southern and Northern agricultural regions have suffered because trade liberalization has produced a decline in the prices of agricultural products, which has contributed to the widening gap in the remunerations between skilled and unskilled individuals.

(Krugman, 1991). This concentration generates increased labor demand in these regions and their sectors, which results in increasing wages in these markets. Other effects of trade such as skill-biased technological change, modifications in industry-specific wage premiums, foreign investment, quality upgrading, skill scarcity, exchange rate and demographic changes have all been suggested as being more accurate explanations for the increase in wage inequality (Robertson, 2007; Ranjan, 2008).

Mexico's trade liberalization, via NAFTA, has caused important changes in regional economic growth, exacerbating the disparities between the North and South of Mexico which have existed since industrialization began in the 1930s (López Malo, 1960; Hanson, 2007; Baylis, et al., 2012). The regional distribution of poverty is illustrated in Figure 2. Here we observe the poverty headcount, which is the share of people living on less than $2.00 USD per person per day (Walton, et al., 2004). The darker colors denote states with higher share of people living on less than $2 dollars per person per day. States in the South, in dark red[8], have 76% of their people living on less than two dollars per person per day; whereas Northern states, in light gray[9], have only 28% of their population in this situation.

Figure 2: Poverty Headcount 2002



[8] Guerrero, Oaxaca, and Chiapas

[9] The Baja Californians (Norte and Sur), Sonora, Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, Sinaloa, Durango and Zacatecas.

Geography may also play a role in determining the distributions of the benefits of trade. In the case of Mexico, one might anticipate that, due to lower transportation costs, regions closest to the U.S. border, which also tend to be wealthier, might stand to gain from trade. Similarly, those regions with pre-existing export-industries, such as the Northern manufacturing centers, would likely benefit the most from trade (Rostow, 1960). Further, the urban labor market will benefit more than workers in rural regions because of their higher reliance on skilled wages, whereas rural labor tends to work more in agriculture, and often consumes most of what they produce (Nicita, 2009). Thus we may expect increasing inter-regional wage disparities which may induce migration.

There is a growing literature on the effect of migration on wages in Mexico, primarily focused on the effect of international labor movement. Mishra (2007) finds that "emigration has a strong and positive effect on Mexican wages due to changes in local labor supply" (pg. 180). Unger (2005) also finds a positive link between migration and local development, working through remittances. Aroca and Maloney (2005) find that trade and FDI slow migration, in the sense that increased linkages to global markets decrease the incentive to emigrate. However, if trade affects different regions within a country differently, it might induce internal migration, making benefits from trade available primarily to those households who can move (Garduño-Rivera, 2011).

3. Methodology

This paper estimates a model analyzing the impact of trade liberalization on wage inequality while controlling for labor migration. To account for an endogeneity problem between wages and migration, we estimate the wage equation using two-stage least squares (2SLS).

In the first stage, we predict the probability of migration. To capture trade openness, we include the measures of the GVA in period *t-1* (GVA_{it-1}), from the state where the person lived 5 years ago[10], multiplied by the change in tariffs ($\Delta\tau_t$). This interaction term captures the potential growth or contraction in regional GVA associated with a reduction in tariffs ($\Delta\tau_t * GVA_{it-1}$). We also include the measures of GVA for four different sectors (commerce, manufacturing, services and mining) in period *t-1* (GVA_{sit-1}), from the region where the person lived 5 years ago multiplied, to capture the effect of the economy on migration and wages. To predict migration, Sahota (1968) uses the geographical distance from capital of region *k* to capital of region *j*. We instead use distance from the capital of each region to the closest U.S. border-crossing point ($distF_i$), from the region where the person lived 5 years ago since economic opportunities provided by NAFTA will be greater closer to the U.S. border, due to the accessibility to markets (Hanson, 1996). We control for characteristics of the household, the source and destination municipalities. Following Feng, et al. (2010), we use negative changes in crop yields as an instrumental variable to predict people's migration responses. We calculate negative changes in crop yield (negative shocks) as yields below one standard deviation from the mean. These negative changes in crop yields work as a good instrument because it influences migration out-flows (Feng, et al., 2010), without being correlated with non-agricultural wages in urban areas. We create a pooled cross-section of individuals in all municipalities over 3 years (1990, 2000 and 2010). The complete migration function is:

[10] For the 1990's census, INEGI only asked the state were the person was living in 5 years ago but not the municipality.

Equation 1

$$P(M_{it} = 1 | \Delta\tau_t * GVA_{it-1}; GVA_{sit-1}; distF_i; distF_i * \Delta\tau_t * GVA_{it-1}; I_{it}; H_{it}; S_{it-1}; Y_{it})$$

where

M_i = 1 if individual *i* migrated within Mexico; 0 otherwise

$\Delta\tau_t$ = % change on Tariff from *t-1* to *t* for sending region

GVA_{it-1} = Total GVA in real 2003 Mexican pesos for sending region

GVA_{sit-1} = GVA in Manufacturing/Mining/Services/Commerce sector in real 2003 Mexican pesos for sending region

$distF_i$ = Road distance (in thousands of kilometers) from the capital of sending region *i* to the closest U.S. border crossing point

I_i = Vector of individual characteristics (i.e. education, age, and household head)

H_i = Vector of household characteristics in time *t* (i.e. electricity, # of people, water, and drainage)

S_{it-1} = Vector of sending state characteristics for individual *i,* in time *t-1*

Y_{it} = Sum of the number of negative changes in crop yields in the last 5 years in the sending region[11] for individual *i*, in time *t*

In a second stage, following Nicita (2009), we estimate a wage function based on individual data, as a function of trade-related, demographic and household characteristics and the instrumented probability of migration for individual *i*. Similar to Nicita, we include control variables such as age, years of education, gender of the worker, and status as household head. We run the regression for separate segments of income to analyze the effect that trade openness had on income distribution. We define the segment of low income earners by separating out those individuals earning one standard deviation lower than the mean wage or less for each year. In the same way, the

[11] Since there is no data for crop yield in 1990 and 2010, we use crop yield for 1991 and 2009, respectively.

high income segment is defined as those people earning more than one standard deviation greater than the mean wage for each year. The wage function is

Equation 2

$$ln(\omega_i) = f(\Delta\tau_t * GVA_{it-1}; GVA_{sit-1}; distF_i; distF_i * \Delta\tau_t * GVA_{it-1}; I_{it}; H_{it}; S_{it-1}; \widehat{P(M_i)})$$

where

ω_{it} = Observed wage of individual *i*

$\widehat{M_i}$ =instrumented probability to migrate

To capture trade openness, we include the measures of the GVA for four different sectors (commerce, manufacturing, services and mining) in period *t-1* (GVA_{sit-1}) multiplied by the change in tariffs in the respective sector ($\Delta\tau_{st}$). This interaction term captures the potential growth or contraction in regional GVA associated with a reduction in tariffs ($\Delta\tau_{st} * GVA_{sit-1}$).

We use data on individual level wages, individual and household characteristics, as well as regional level data in terms of economic growth, education, migration, and other characteristics, to determine regional income disparities throughout Mexico.

4. Data

We use the 1990, 2000 and 2010 micro-sample of the Population Census, collected by the National Institute of Statistics and Geography (INEGI), which provides household level data of the Mexican population. These data create a cross-section across time data that spans the introduction of NAFTA. The variables used are described below.

Migration (M_i): Migration data come from the 1990, 2000 and 2010 Population Censuses from a question that asks in what state (or municipality) the interviewee resided five years earlier. Though this approach might be standard, these data have the drawback of failing to count migrants who might have left and returned over the five-year period.

GVA sectors: To capture trade openness, we include the measurements of the GVA for four different sectors (commerce, manufacturing, services, and mining) in period *t-1* for the origin and destination areas. These data were obtained from the INEGI's economic censuses.

% Change in Tariffs $(\Delta\tau)$: Trade openness was not the same across all sectors. Some sectors reduced tariffs faster than others, making these sectors grow faster than the others (Aguayo-Tellez, et al., 2010). Therefore, to identify the effect that NAFTA had on wages and internal migration through trade openness, we use the different tariffs available for the different sectors. These data were obtained from the United States International Trade Commission (USITC). We use the data available, with an annual frequency, of the U.S. tariffs on Mexican exports at the 1-digit Standard Industrial Classification (SIC) level for the light/heavy manufactured, mining and intermediate goods, which we matched to the manufacturing, mining and commerce sectors, respectively.

Transportation cost (distF): we consider that economic growth will be correlated with transportation cost to the U.S. border, which we proxy with the road distance (measured in thousands of kilometers) from the region of origin to the closest U.S. border crossing point. To create the border distance variable, d*istF*, we first obtain the name of the municipality or state capitals (INEGI, 2008). Second, we calculate the road distance from each of the municipality or states capitals to the different U.S. border crossing points, by entering the destination and origin

points in the webpage "Traza tu Ruta" provided by the Secretaría de Comunicaciones y Transportes (2008). Finally, we chose the shortest distance for each municipality or state capital from the different distances provided by each border crossing point. For municipality capitals that do not appear as origin points, we calculate the distance of the nearest available city or town and add the road distance from that point to the district capital of interest, which we calculate manually by using a map of Mexico.

Infrastructure (Infrastructure): Investment in infrastructure provided by the local governments plays an important role in the migration decision and wage since people tend to migrate from places with low levels of infrastructure and to places with high levels of infrastructure. Therefore, we include the percentage of households with water, electricity and sewage from the region where the person lived 5 years ago. This information was obtained from the INEGI's population censuses.

Population density (Pop.Density): Greenwood (1997) mentions that migration is directly related to the population size of the origin places. Thus, we control for the population size from the region where the person lived 5 years ago, since regions with larger concentrations of people will tend to have more out-migration. In this case we use the population density (population per squared kilometer) that districts and states report, including children and elderly, in every population census.

Individual Characteristics

Age: For this study we consider only males of working age (18 to 65 years), because we see a large increase in labor force participation of women from 1990 to 2000, which we would have difficulty controlling for; whereas 78% and 80% of men of working age were participating in the labor force in 1990 and 2000, respectively. Hanson (2007) and Nicita (2009) also work with the working-age male population due to the same problem. Hanson explains that female participation in the labor force is low and varies considerably across time. He further argues that including women creates a sample selection problem since many of them report zero labor earnings but may

work in family businesses or family farms[12]. The age effect is approximated by a quadratic function. Here we expect that the older the person, the less their probability to migrate but the higher their income.

Education: Education is the stock of productive skills and technical knowledge embodied in labor. Mexico has a competitive advantage in unskilled labor-intensive goods. Then the effect of the education variables will be: $\frac{\partial y}{\partial edu} > 0$. That means, more education will provide higher income.

Literacy: These data comes from the 1990, 2000 and 2010 Population Censuses from a question that asks whether the interviewee can read and write. Literacy is important because immigrants tend to have little formal education (Camarota, 2001).

[12] For a deeper analysis of the problems caused by including working age women population see also Borjas, et. al. (2008)

5. Hypotheses

The literature identifies that trade liberalization has increased economic growth, but affected the distribution of gains across income levels and geographic regions. However, these effects are confounded by a third important factor: migration. If all workers are completely mobile, then an increase in inequality among regions or sectors does not imply an increase in overall wage inequality and instead just reflects a change in the distribution of jobs. Failure to account for migration may result in an over-estimation of income in the region receiving migrants and therefore an overestimation of the inequality of income distribution. In this paper, we identify the effect of trade on income inequality, taking labor migration into consideration. Since migration will not be equally available to all households, understanding who can and who does migrate goes to understanding which households are more likely to benefit from or be hurt by trade.

The objective of this paper is to analyze how migration patterns and incomes change from 1990 to 2010. The main research question is: Did NAFTA increase wage inequality, taking internal migration into account? Combining the New Economic Geography (NEG) and the standard trade theory, we obtain the following testable hypotheses:

1. Over the past decades, trade openness has caused a substantial increase in income inequality in Mexico (Esquivel, et al., 2003). This effect will be observed by having a positive effect between trade openness and wage for the high income group and/or a negative effect of trade openness on the low income group.
2. The wage increases have been almost exclusively transferred to workers especially in Mexican states close to the U.S. border, increasing the income disparity (Nicita, 2009).This hypothesis can be tested by observing the sign on the coefficient on distance in the regression on worker wage.
3. People who migrate are able to obtain more remunerative and secure employment opportunities than those people who did not migrate (Morrison, et al., 2007; Finan, et al., 2005). This hypothesis can be tested by observing the coefficient on migration in the regression on wage.

6. Results

1st Stage—*Whole Working Age Male Population*

In the first stage we regress the probability of migration against drivers associated with trade. Table 1 reports the probit regression results from the first stage for the probability of migration. Column 1 shows the regression for the whole working age male population, where most variables are significant at the 1% level. To capture the effect of trade openness on the probability of migration, we use the interaction variables of the GVA with the change in tariff ($\Delta\tau_t * GVA_{t-1}$) and the distance from the border with the change in tariff and the GVA ($distF_i * \Delta\tau_t * GVA_{it-1}$). Table 2 shows the marginal effect of the change in tariff. We find that a one percent decrease in the change in in tariffs decreases the probability to migrate by 0.3%. All of the variables of the sectoral GVA are significant, but their signs are different. While an increase in commerce GVA reduced the probability of migration, an increase in manufacturing, mining and service GVA significantly increases it.

We find that literacy and years of education are significant for migration. But while literacy reduces migration, years of education increases it. We also find that marginal effect of distance to the border on migration is significant. We also find that distance to the border and the interaction of distance with GVA and changes in tariff have a positive significant effect on migration. Overall, the marginal effect of distance is that a thousand kilometers away from the border increases the probability to migrate by 11% (see Table 2).

We test for endogeneity of migration using the Durbin-Wu-Hausman test and get a χ^2 of 63.22 (p-value=0.00). Thus, we can reject the null hypothesis that migration is exogenous and conclude that it is endogenous. We also test for over identifying restrictions. In this test we get a χ^2 of 0.43 (p-value=0.51). Then, we do not reject the over identifying restrictions and can conclude that the over identifying restriction is valid.

2st Stage

Overall, the coefficients on the core variables are generally statistically significant and with the predicted signs (Table 3). The first column shows the result of the second stage regressions of the whole working age male population. Columns 2 and 3 show the result only for working age population for the low and high income, respectively. Table 4 shows the marginal effects of a change in tariffs and distance to the border. Next we explore each of these results.

Whole Working Age Male Population

To capture the effect of trade openness, we use the interaction variable of the GVA with the change in tariff $(\Delta\tau_t * GVA_{t-1})$. We find that this interaction variable is significant. Thus, a one percent decreases in the change in GVA induced by a change in tariffs decreases the wage overall, particularly it decreases the wage by 3% (see Table 4). The coefficient indicates that the larger the traded sector in that region, the lower the wage. Most of the variables of the sectoral GVA are significant, but their signs are different. While an increase in commerce and mining GVA increase the average wage, higher manufacturing and service GVA will actually reduce their average wage. While this result shows that trade openness decreases wages, it does not show the effect that trade openness has on income inequality. For that reason we split the data into high and low income individuals in the following section.

We find that literacy is negative and significant but years of education are positive and significant for average wages. Literacy, by itself, is not beneficial for the employees but the number of years of education does help to improve wages. We also find that distance to the border and the interaction of distance with GVA and changes in tariff have a negative significant effect on wages. Overall, the marginal effect of distance is that a thousand kilometers away from the border decreases the average wage by 4% (see Table 4). This marginal effect reduces after NAFTA since the interaction variables $distF_i * \Delta\tau_t * GVA_{it-1}$ reduces the overall effect as tariffs reduce with trade openness. This evidence rejects my second hypothesis that, following Nicita's (2009) findings, the effect of NAFTA has been almost exclusively transferred to workers especially in Mexican states close to the US-Mexico border, increasing regional income disparity.

Low Vs. High Income

When we divide the data between high and low income men, we find that the potential effect of NAFTA is negative for high income but positive for low income (see Table 4). While high income workers loose an 8% decrease on their wages for a 1% decrease in tariffs, low income workers gain a 2% increase. This result rejects the first hypothesis that trade openness has increased income inequality because it has benefited low but not high income people, thereby decreasing the income disparity.

Moving to the third hypothesis, we observe that high income workers who migrate do not do well with respect to their final wages whereas low income workers who migrate do improve their wages. Thus, we see two types of migrants, a low skilled worker migrating to occupy a better income jobs and high skilled migrant workers that get lower paid jobs. This evidence agrees with the third hypothesis, but only for low income people, because low income people who migrate end up in higher paying jobs than those who do not, on average over the whole country. This result supports Morrison et al. (2007) findings that poor households prevent and mitigate risk by migrating to locations with more remunerative and secure employment opportunities.

7. Conclusions

This paper explores the factors that influence Mexico's regional income differentials and the effect of NAFTA, taking internal migration into account. We use data on individual level wages, individual and household characteristics, as well as regional level data in terms of economic growth, education, migration, and other characteristics, to determine regional income disparities throughout each Mexican region. Thus, this study sheds light on the effect of trade openness on individual and wage inequalities.

This research provides initial evidence of the effect of trade liberalization on income inequality, suggesting that trade liberalization has reduced income inequalities, leading to a smaller regional polarization. Men with lower income benefited more from NAFTA than those with higher income, indicating a decrease in income disparity. The potential effect of NAFTA on migration is also stronger with low income people than with high income people, because low income workers are more sensitive to migrate, especially those that worked in traded sectors in the same region where the worker lived 5 years ago. Also, large traded sectors induced migration, particularly for the poor, and offered a higher wage overall, which results in an increase in income inequality because it has only benefited workers in traded sectors but not in non-traded sectors.

The effects of trade liberalization, such as regional transportation benefits, have slightly increased migration towards the US-Mexico border. This evidence conforms with Krugman & Livas-Elizondo (1996) finding that trade leads to more migration because the U.S. market appears to be increasing in importance.

While workers close to the U.S. market have a higher wage, workers far away from the United States are receiving a lower income. This spread reduces over time as tariff decreases. However, north-south disparities are only one part of the story. We find that large manufacturing sectors seem to be associated with a smaller wage. This implies that because trade benefits manufacturing, it decreases income disparity.

Potential policy implications of this study are that investment in manufacturing can be used as means to ease regional wage inequality. This evidence also suggests that policies that facilitate internal migration will be good for economic growth and will reduce income inequality. However it is important to mention, that those policies should

have a broad access to make sure it reaches all the household and regions. In this way, it will avoid increasing inequality among households and regions.

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ANNEX

Table 1: 1st stage—2SLS across time: P(Migrate). Significance levels: *** 0.001, ** 0.01, * 0.05

	(1) *All*	(2) *Low Income*	(3) *High Income*
$\Delta\tau_t * GVA_{it-1}$	-2.19e-11	2.53e-10**	-2.21e-10*
	(-1.79)	(3.13)	(-2.47)
$GVA_{commerce t-1}$	-1.44e-09***	6.98e-11	-2.66e-09***
	(-13.86)	(0.09)	(-5.10)
$GVA_{manufac\ t-1}$	1.11e-09***	1.10e-09**	1.62e-09***
	(21.04)	(2.98)	(7.06)
$GVA_{minning\ t-1}$	5.06e-11***	7.76e-11	1.25e-10
	(6.21)	(1.43)	(1.90)
$GVA_{service\ t-1}$	3.69e-10***	2.42e-10*	3.00e-10**
	(22.20)	(2.06)	(3.24)
Literacy	-0.0127***	-0.00480	-0.0229***
	(-14.67)	(-1.40)	(-3.83)
Education	0.00209***	0.00157***	0.00442***
	(49.04)	(5.74)	(22.32)
$distF_i$	0.111***	-0.0443	0.0581**
	(18.92)	(-1.03)	(2.75)
$distF_i * \Delta\tau_t * GVA_{it-1}$	3.12e-11*	-3.07e-10***	-8.28e-11
	(2.38)	(-3.45)	(-1.11)
Y_{it}	-0.000824**	0.00316	0.00223
	(-2.64)	(1.83)	(1.37)
Age	-0.000755***	0.00157***	-0.000469
	(-8.17)	(3.63)	(-0.74)
Age^2	-0.00000149	-0.0000250***	-0.0000174*
	(-1.34)	(-4.78)	(-2.38)
Married	-0.000954*	0.00192	-0.00370
	(-2.24)	(0.75)	(-1.30)
Indigenous Lang.	0.0164***	0.00480	-0.00147
	(18.23)	(1.39)	(-0.24)
$Infrastructure_{t-1}$	-0.0675***	-0.00631	-0.0240***
	(-61.86)	(-0.89)	(-4.38)
$Pop.Density_{t-1}$	0.0000916***	0.0000677***	0.0000606***
	(54.19)	(6.18)	(8.67)
Working Hours	0.000320***	0.0000288	0.000262***
	(31.04)	(0.73)	(4.71)
Owner	-0.000850	0.0145	-0.0203***
	(-0.89)	(1.57)	(-8.52)
Labor force participation rate	-2.491***	-0.565*	-1.795***
	(-61.83)	(-2.29)	(-9.60)
x2000	0.0924***	-0.0281	0.0484***
	(38.47)	(-1.83)	(4.15)
x2010	0.175***	-0.0164	0.0635***
	(49.26)	(-0.70)	(3.48)
Constant	1.190***	0.320*	0.934***
	(56.68)	(2.51)	(9.92)
N	3,798,578	107,301	148,688
R-sq	0.226	0.173	0.195
Adjusted R-sq	0.270	0.211	0.264

Table 2 Marginal Effect of Change in Tariffs and Distance for P(Migrate).

Marginal Effect	Migration		
	All	Low	High
$\Delta\tau_t$	0.3%	-0.5%	-2.2%
$distF_i$	11%	1%	6%

Table 3: 2nd stage 2SLS across time: Ln(Wage). Significance levels: *** 0.001, ** 0.01, * 0.05

	(1) *All*	(2) *Low Income*	(3) *High Income*
$\Delta\tau_t * GVA_{it-1}$	1.20e-09***	-2.56e-09***	7.80e-10***
	(18.20)	(-17.08)	(6.14)
$GVA_{commerce t-1}$	3.85e-09***	3.02e-09***	8.03e-09***
	(11.90)	(5.27)	(11.91)
$GVA_{manufac\ t-1}$	-1.05e-09***	-2.10e-09***	-7.56e-10**
	(-8.30)	(-9.38)	(-2.75)
$GVA_{minning\ t-1}$	2.61e-10***	-2.13e-10**	5.90e-10***
	(8.03)	(-2.65)	(5.06)
$GVA_{service\ t-1}$	-2.77e-10***	-7.73e-10***	1.37e-09***
	(-3.64)	(-5.48)	(8.82)
Literacy	-0.0973***	0.0426***	-0.168***
	(-14.67)	(5.78)	(-4.77)
Education	0.0706***	-0.00294***	-0.0327***
	(238.66)	(-5.49)	(-47.93)
$distF_i$	-0.0585***	0.143***	-0.0375*
	(-5.99)	(6.48)	(-2.13)
$distF_i * \Delta\tau_t * GVA_{it-1}$	-9.14e-10***	2.11e-09***	5.44e-11
	(-15.23)	(13.94)	(0.49)
$\widehat{M}_i$	0.0138	0.0991**	-0.0777**
	(1.08)	(2.83)	(-2.69)
Age	0.0726***	0.0116***	-0.0391***
	(103.04)	(12.91)	(-20.99)
Age^2	-0.000819***	-0.000169***	0.000445***
	(-88.00)	(-15.05)	(20.26)
Married	0.204***	0.100***	-0.130***
	(79.01)	(20.40)	(-18.69)
Indigenous Lang.	-0.149***	-0.0190***	0.00697
	(-27.94)	(-3.90)	(0.35)
$\text{Infrastructure}_{t-1}$	-0.0194***	0.0743***	-0.104***
	(-7.80)	(16.96)	(-16.75)
Pop.Density_{t-1}	-0.0000335***	-0.0000167	-0.000121***
	(-8.54)	(-1.83)	(-14.35)
Working Hours	0.00741***	0.000273***	-0.00236***
	(97.61)	(3.91)	(-16.24)
Owner	0.539***	-0.0473***	-0.0584***
	(74.92)	(-3.98)	(-8.55)
Labor force participation rate	0.729***	-2.773***	1.439***
	(7.86)	(-18.09)	(6.69)
x2000	-0.513***	-0.832***	-1.534***
	(-94.76)	(-75.48)	(-104.16)
x2010	0.254***	-0.753***	-1.118***
	(31.56)	(-56.87)	(-60.88)
Constant	5.079***	1.641***	12.83***
	(104.08)	(20.52)	(107.03)
N	3,798,578	107,301	148,688
R-sq	0.148	0.369	0.444
adj. R-sq	0.148	0.369	0.443

Table 4 Marginal Effect of Change in Tariffs and Distance for Ln(Wage).

Marginal Effect	Wage		
	All	Low	High
$\Delta\tau_t$	3%	-2%	8%
$distF_i$	-4%	11%	-4%