

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

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Abstract

This paper asks how NAFTA affected income distribution within Mexico considering changes in internal migration. Trade liberalization should theoretically increase the income of low-skilled workers in low-skilled labor-abundant developing countries. Thus, by increasing the wages of poorer workers, one might expect that trade will decrease income disparity. However, anecdotal evidence indicates that NAFTA increased the gap between rich and poor in Mexico. Understanding the distributional effects of NAFTA on regional income is particularly important in countries with high levels of geographic inequality, such as Mexico. Because trade may affect wages differently across regions within the country, accurate trade welfare measures must incorporate intra-national migration. Using household level data before and after NAFTA, I find geographic, gender and educational inequalities in the distribution of Mexican income post NAFTA.

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

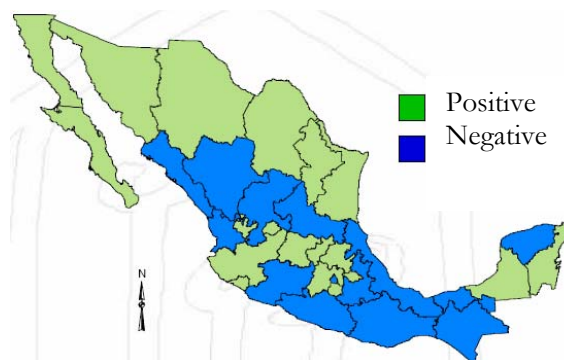
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1. Introduction

Globalization has had an economic, political and social impact in all countries. It has affected economies by opening 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). Globalization has benefited some countries and regions more than others, in some cases accentuating economic inequality, and inducing greater mobility of people (Anzaldo Gómez, et al., 2008).

Only a handful of studies shed light on the impact of trade liberalization on wage inequality in Mexico.² 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. Similarly, Hanson (2007) and Garduño-Rivera (2008) find that northern states, which have greater access to global markets through the United States than the southern states, benefit more from trade by obtaining higher prices because of lower transportation costs, which then translate into higher labor income. One disadvantage of these papers is that they do not take into account that some households respond to changes in labor demand by changing the type of labor they sell, or by relocating.³ Specifically, the distribution of benefits from NAFTA will presumably not only accrue on those 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 are likely most 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 income in the region receiving migrants, since 3.58 million Mexicans (4% of the population) migrated from one state to another between 1995 and 2000 (Vega, 2005). Most are migrant workers coming from the southern states of Guerrero, Oaxaca, Veracruz, Puebla and Hidalgo (SEDESOL, 2004). The recipient states are in the north; mainly Sinaloa, Sonora, Baja California, and Baja California Sur (see Figure 1). This research proposes to measure the effects of trade liberalization on income distribution while taking labor 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 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 of 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).

2. Motivation

Developing countries, such as Brazil, China, India and Mexico, have seen 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), as predicted by the Heckscher-Ohlin model of trade which 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 (Harrison, 2007). While increased trade may have benefited the Mexican economy, some initial evidence shows that the North American Free Trade Agreement may have worsened inequality in Mexico (Baylis, et al., 2010; Nicita, 2009).

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., 2010). The regional distribution of poverty is illustrated in Figure 2.

Figure 2: Poverty Headcount⁴ 2002



While neo-classical economic theory generates predictions about which industries and skills might benefit from trade, 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 (Krugman, 1991). This concentration generates increased labor demand in these regions and their sectors, which results in increasing wages in these markets.

⁴ the share of people living on less than \$2.00 per person per day (Walton, et al., 2004).

Distribution of gains across income levels and geographical regions are two of the most important aspects when considering the effects of globalization on workers. Trade theory predicts that in regional economics, employment concentrates in industry centers. However the correlation between trade liberalization and increased wage inequality was interpreted by many economists as proof against neoclassical trade theory: the Heckscher-Ohlin model in general and the Stolper-Samuelson theorem in particular. 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).

Arguably, geography may have also played 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 initially, 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 rural because of their higher reliance on skilled wages, whereas rural labor tend to work more in agriculture, and often consume most of what they produce (Nicita, 2009). This effect creates the inequality of regional distribution of wages. Therefore, it is necessary to understand the distributional effect of trade liberalization to measure its benefits on reducing wage inequality.

A small number of papers provide some evidence of an increase in wage inequality in Mexico after NAFTA. 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. He 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. As noted above, Hanson (2007) and Nicita (2009) also show that trade primarily benefited certain skills and regions in Mexico.

An increase in regional disparities may induce internal migration. Classic economic growth theory predicts that when a country is starting to grow, not all sectors and regions will grow at the same rate. Some sectors and regions take off first, abandoning traditional techniques and adopting more productive economic processes increasing efficiency (Rostow, 1960). The leading regions will require more labor to keep growing. But once the supply of labor available in this region is exhausted; this region will start requiring workers from neighboring regions in order to satiate its demand. This creates internal migration from regions less developed to those leading regions that took-off earlier.

While the effect of migration on wages in the United States is still debatable, there is a growing effect of migration on wages in Mexico. 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.

3. Research Methods and Data Sources

In brief, one lesson can be identified from Mexico's experience after NAFTA: 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. Failure to account for migration may result in an over-estimation of income in the region receiving migrants. In this paper, I identify the effect of trade on income inequality, taking in consideration labor migration. 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 2000. The main research question I ask is: Does internal migration tend to eliminate interregional wage differences after NAFTA? I consider both regional and skill-level income distribution within households in Mexico before and after NAFTA

I use the 1990 & 2000 micro-sample of the Population Census, collected by the National Institute of Statistics and Geography (INEGI), which provides household level data on ten percent of the Mexican population. These data allow me to create a cross-section across time data that spans the introduction of NAFTA.

Hypothesis

Combining the different NEG and the standard trade theory, I obtain the following testable hypotheses:

1. In response to trade openness, labor market adjusted its participation and characteristics.
2. Following Krugman and Livas-Elizondo (1996), due to transportation costs, more job opportunities in the North and higher wages; internal migration increased after NAFTA, especially from the south to the north of Mexico.
3. Following Esquivel, et al.(2003), over the past decades, trade openness has caused a substantial increase in regional income inequality in Mexico.
4. Following Nicita (2009) the effect of NAFTA has been almost exclusively transferred to skilled workers, especially in Mexican states close to the U.S. border, increasing the income disparity.

4. Results

To explore the above hypotheses, as a first step, I analyze summary statistics and explain the change in regional characteristics over the period between 1990 and 2000. From this initial evidence, I find that poorer households in the South have not benefited from NAFTA as much as their Northern counterparts; and that women, migrants and higher educated people were more likely to find formal employment in this decade. I also find a small increase in internal migration. In particular, I observe strong forces of migration at the border after trade, accompanied by an increase in regional income disparity. Finally, I notice an increase in the premium for skilled workers, especially in Mexican states close to the U.S. border.

4.1. Labor Participation

Moving to our first hypothesis, NAFTA appears to lead to considerable labor market adjustments. I notice that the working-age population (people between the ages of 18 to 65) with zero income in my data decreases considerably between 1990 and 2000 (see Table 1). I attribute this change to the number of people that worked as housewives or in the informal sector during the 1990's but chose to join the formal sector by 2000. This difference is not picked up by Hanson (2007), as he only studies working-age men. He explains that female participation in the labor force is low and varies considerably across time. He further argues that female inclusion creates a sample selection problem since many of them report zero labor earnings but may work in family businesses or family farms. However, by excluding this information, he does not completely observe Mexican labor participation between 1990 to 2000, thus possibly failing to capture an important aspect of the effect of NAFTA, particularly on poorer, rural areas.

Table 1: Working Population with No-Income

Year	Working Age population	# of People with no Income	%
2000	10,099,182	414,979	4%
1990	8,118,242	2,113,722	26%

Table 2 shows the different characteristics of laborers who reported zero income. As previously noted, females made up the majority of this formally unemployed population in 1990. By 2000 this finding reversed itself, with the majority of people with zero income being male. This finding indicates that many of the workers who joined the labor force in the 1990s were women. The age variable in relation to unemployed workers also changes, moving from 35 in 1990 to 38 in 2000. That result means that mostly younger workers were absorbed into the labor market from 1990 to 2000. Years of education of the average person with zero income also decreases from 5.43 years in 1990 to 4.85 in 2000. Thus, in comparison to 1990, the 2000 mean education level of people reporting no income dropped by almost 1 full year. This result means that higher educated people were more likely to find formal employment over this time span. Finally, the number of people that migrated but could not find a job decreased, from 5% in 1990 to 2% in 2000. This tells us that a considerable higher number of migrants managed to find a job after NAFTA was implemented. Table 3 and Figure 3 show the different characteristics of migrant labor who reported zero income. In here we can observed that internal migrants that found job in the 1990s were in fact mainly young married women with low education level that did not speak Spanish but did speak at least one indigenous language.

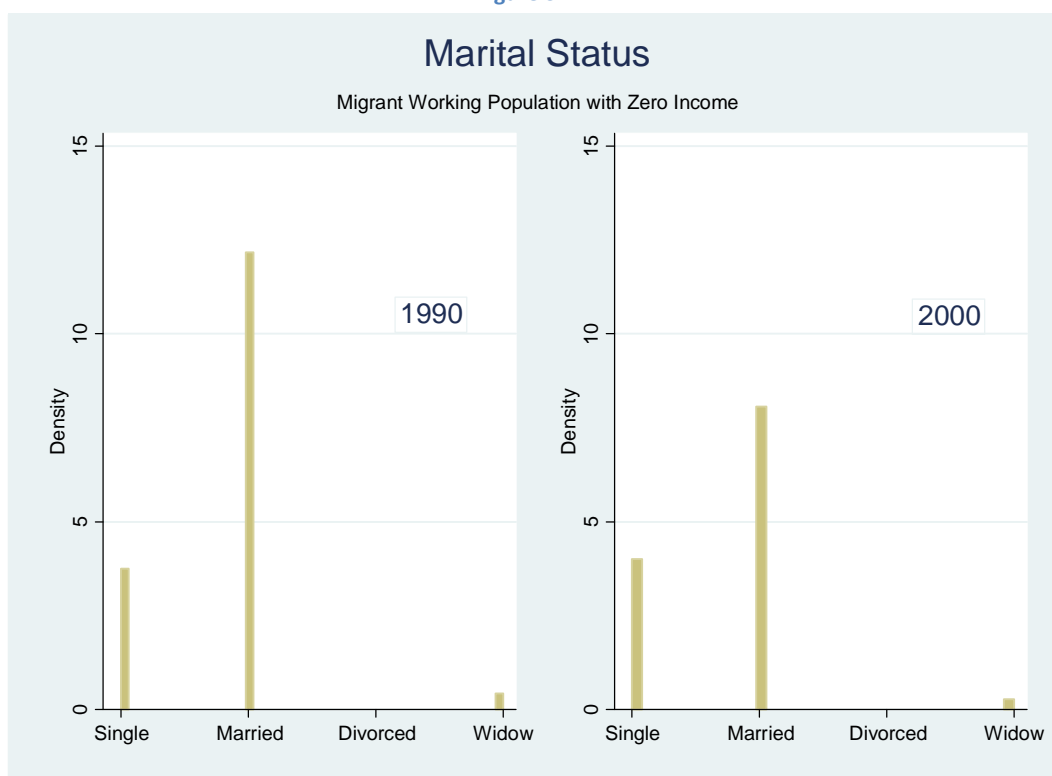
Table 2: Zero Labor Characteristics

1990						2000					
Variable	Obs	Mean	Std. Dev.	Min	Max	Variable	Obs	Mean	Std. Dev.	Min	Max
Male	2,113,722	0.23	0.42	0	1	Male	414,979	0.75	0.43	0	1
Age	2,113,722	35	13.55	18	65	Age	414,979	38	13.83	18	65
Education	2,094,809	5.43	4.20	0	24	Education	398,007	4.85	3.75	0	22
Migrant	2,098,992	0.05	0.21	0	1	Migrant	410,653	0.02	0.13	0	1

Table 3: Working Age Population with zero income and Migration

1990						2000					
Variable	Obs	Mean	Std. Dev.	Min	Max	Variable	Obs	Mean	Std. Dev.	Min	Max
Male	98,117	0.18	0.39	0	1	Male	6,898	0.60	0.49	0	1
Age	98,117	31	11.79	18	65	Age	6,898	34	12.01	18	65
Education	96,653	7.10	4.39	0	24	Education	6,737	7.51	4.42	0	22
Spanish ⁵	97,930	0.04	0.20	0	1	Spanish ⁵	1,093	0.97	0.17	0	1
Indigenous ⁶	96,595	0.05	0.21	0	1	Indigenous ⁶	6,888	0.16	0.37	0	1
Children	98,117	2	2.57	0	25	Children	2,749	2	2.41	0	16
Work Hrs ⁷	97,929	0.99	7.25	0	168	Work Hrs ⁷	6,643	41.51	22.78	0	168

Figure 3



⁵ Spanish= 0 if does not speak Spanish, 1 otherwise.

⁶ Indigenous: 0 if does not speak any indigenous language.

⁷ Work Hrs: Number of working hours per month.

4.2. Switching Migration Places

The process of economic integration occurring as a result of NAFTA has created a new migratory dynamic within Mexico. Under trade liberalization, the Mexican workforce is being called upon to play a crucial role in the industrial restructuring of the Northern region. Paradoxically, this transformation has created obstacles for development in Mexico, especially in its Southern regions.

Turning to my second hypothesis, I find that from 1990 to 2000, internal migration increased slightly after NAFTA. Although the percentage decreased from 4.9% to 4.2%, due to total population increased more than the total migration, the number of internal migrants increased from 3,477,237 to 3,584,957. The more substantial shift was in the locations to which people were migrating. The northern Border States had 710,249 migrants in 1990, 20% of the total migration, but in 2000, they increased to 811,815 migrants, or 23%. Whereas, the center states (D.F. & Mexico) saw an opposite effect: a decrease in receiving immigrants that went from 1,086,305 (31% of the total migration) in 1990, to 1,064,694 (30%). Only Mexico City's (also known as the Federal District, or D.F.) net migration went from -736,473 (-10% of the total migration) in 1990 to -403,818 (-5%) in 2000. This evidence conforms with the Krugman & Livas-Elizondo (1996) finding that increased trade can lead to dispersion of economic activity out of Mexico City and into the northern Border States, and subsequently increase migration to those regions where economic activities increased.

Figures 4 and 5 show the net migration in 1990 and 2000, respectively. The blue colors show states that are net receivers of migrants, whereas the red colors are net senders. The darker colors denote the states with higher percentages of migrants that left or arrived. The percentage is based on the total number of internal migrants that change residence 5 years before that year.

As observed, the D.F., Veracruz and the southern states (Guerrero, Oaxaca and Chiapas) are the main senders of workers. Veracruz increased its outmigration from 4% in 1990 to 6% in 2000. The main receivers are the states surrounding the D.F. (Mexico and Morelos), all the northern Border States, except from Coahuila, and the touristic state of Quintana Roo. This result confirms Krugman and Livas-Elizondo (1996) that Mexico City has lost relevance as a determinant of regional economic growth over time. Since NAFTA, many industries decided to relocate in the state of Mexico and the northern Border States. Hanson(1998a) argues there has been a cluster of economic activity created along the U.S. border, especially in the manufacturing sector, which has led to the decline of Mexico City's manufacturing belt since mid-1980s. The government has also encouraged this by providing tax incentives. As a result, many people are leaving Mexico City and reallocating to states that have increased significantly their economic growth during this decade. Thus, we can accept our second hypothesis that trade leads to more migration since the U.S. market appear to be increasing in importance, whereas the domestic market represented by Mexico City is perhaps less important after NAFTA.

Another reason for this increase of migration in regions with high economic growth is the concept of churning (i.e. young and fast-growing firms get involved in a process of hiring and separating workers, through new plants created, closed, and employment change). Normally this process begins with the labor market inside the region but after these same firms start attracting migrants from other regions. By this way regions involved in a high level of churning are mainly the ones receiving most of the internal migration (Hamalainen, et al., 2004; Harris, et al., 2005).

There is also regional churning of migrants in some of these states. These are regions showing large numbers of in and out-migration, which is the main channel of adjustment of labor markets (Duranton, 2007; Blanchard, et al., 1992). These states show with zero net migration, or close to zero, but inside the state there is a high migration churning. Some of these states are Puebla, Jalisco, Guanajuato, Michoacán, Oaxaca and Veracruz in 1990, and Puebla, Jalisco, Michoacán, and Sinaloa in 2000 (see Table 4 and 5 in Annex).

Figure 4: Net Migration 1990

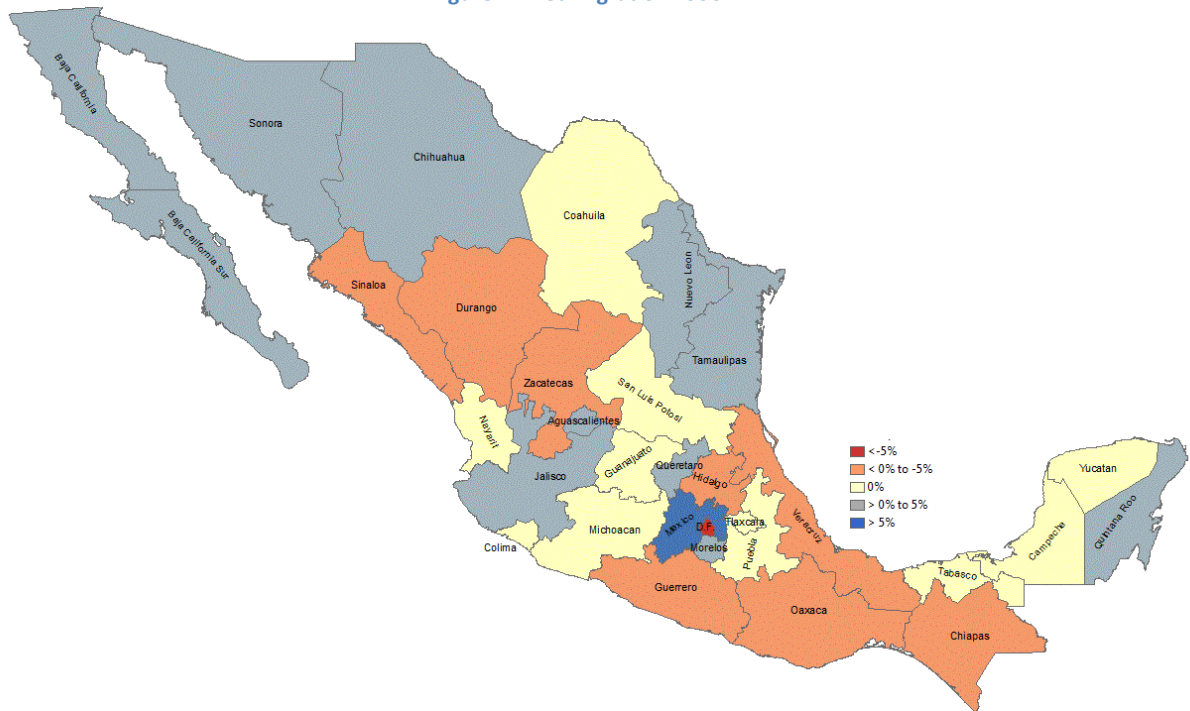
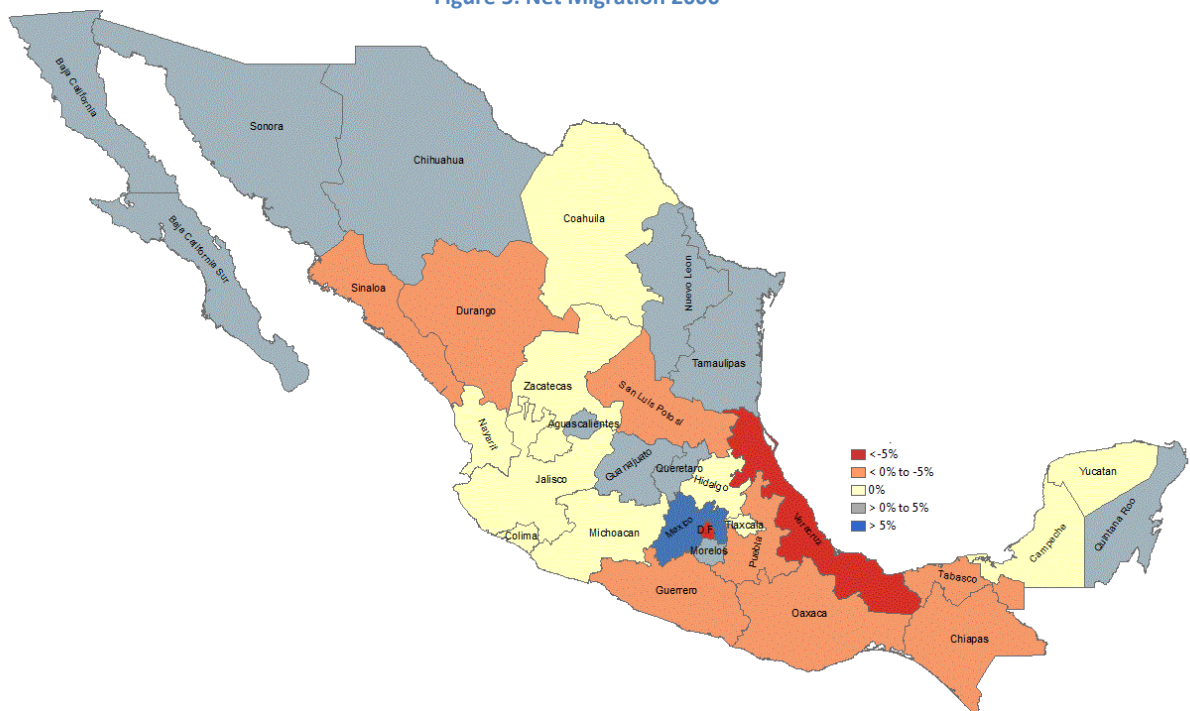


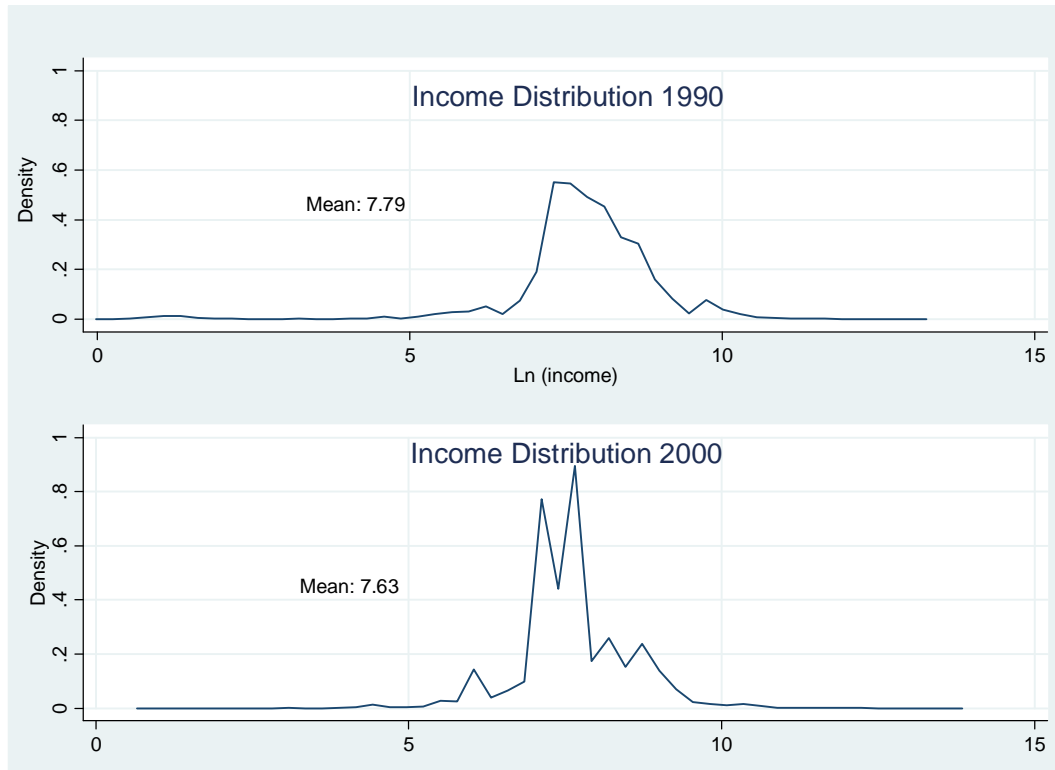
Figure 5: Net Migration 2000



4.3. Increase in Income disparity

In contrast to the Stolper-Samuelson Theorem, which implies that trade liberalization would lead to a reduction in the wage gap in Mexico, results suggest that trade liberalization has slightly increase the wage gap between 1990 to 2000. Figure 6 shows how the income distribution suffers a negative excess kurtosis transformation from 1990 to 2000. This result concurs with other studies (Esquivel, et al., 2003) which mention that over the past decades, there has been an increase in wage inequality in Mexico.

Figure 6: Income Distribution



Natural logarithm of individual income for working age population, presented in real thousand pesos from 2000

However this distribution does not show the income distribution across regions. For that reason I present the income distribution across the different municipalities in 1990 in Figure 7, and 2000 in Figure 8. These figures demonstrate how income has grown mainly in the U.S. border areas.

Figure 7: Income distribution 1990

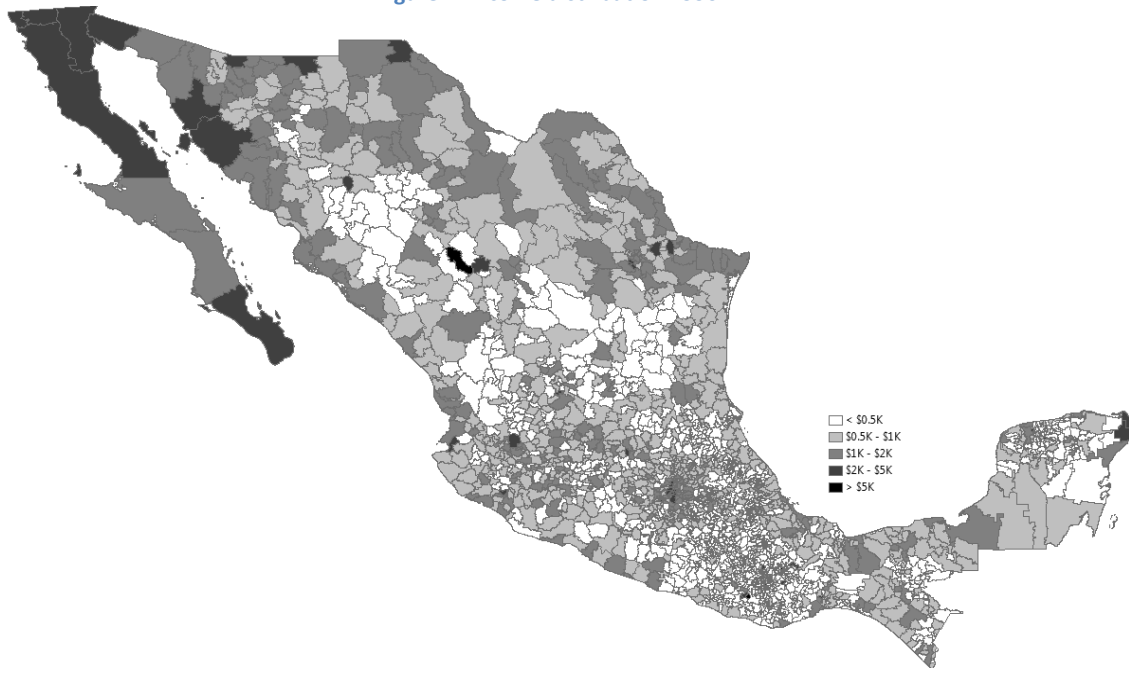
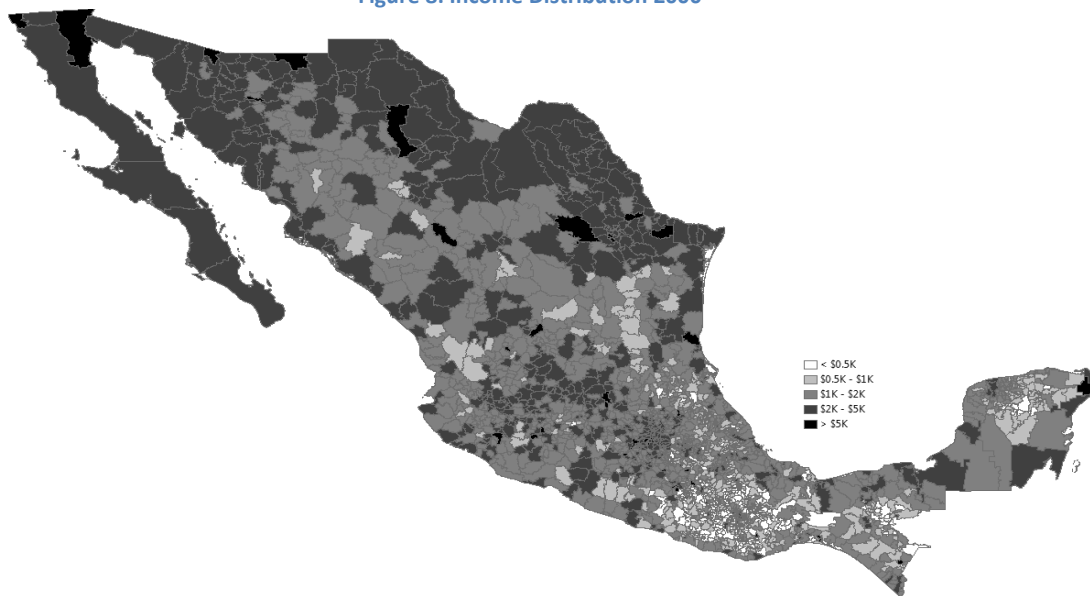


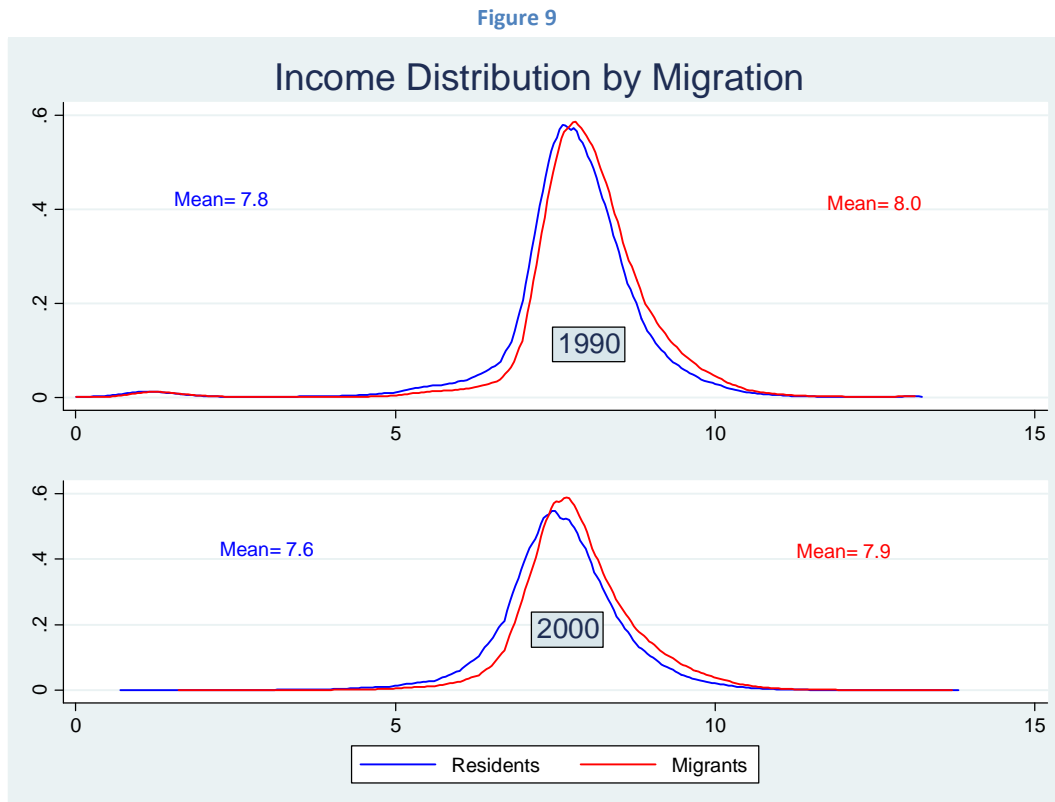
Figure 8: Income Distribution 2000



This evidence is consistent with Esquivel (2003) findings that NAFTA has caused an increase in regional income inequality in Mexico. Therefore we can accept our third hypothesis that trade leads to more regional income disparity. In particular we observe particular strong increases of income at the border after trade.

4.4. Increasing Premium on skilled workers

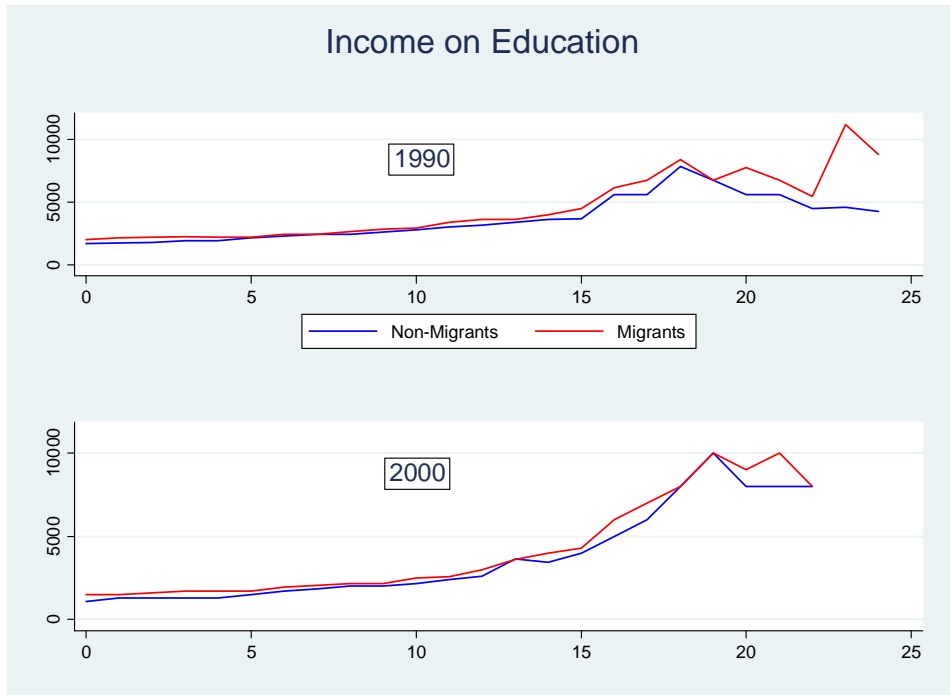
Finally, figure 9 shows the income distribution (in natural logarithms) of the people that migrate against the distribution of the people that did not migrate. As observed, the distribution of the people that migrate is slightly higher in both years. Also the means of the distributions are always higher for migrants than for non migrants. In 1990, the mean for the non-migrant distribution was \$4,622 pesos [$\ln(\text{income}) \approx 7.8$] whereas the migrants was \$5,706 pesos [$\ln(\text{income}) \approx 8.0$]. Whereas in 2000, the mean for the non-migrant distribution was \$3,307 pesos [$\ln(\text{income}) \approx 7.6$] whereas the migrants was \$4,329 pesos [$\ln(\text{income}) \approx 7.9$]. This indicates that on average, internal migrants gain more income than their counterparts who did not migrate in both years, 1990 and 2000.



Natural logarithm of individual income for working age population, presented in real thousand pesos from 2000

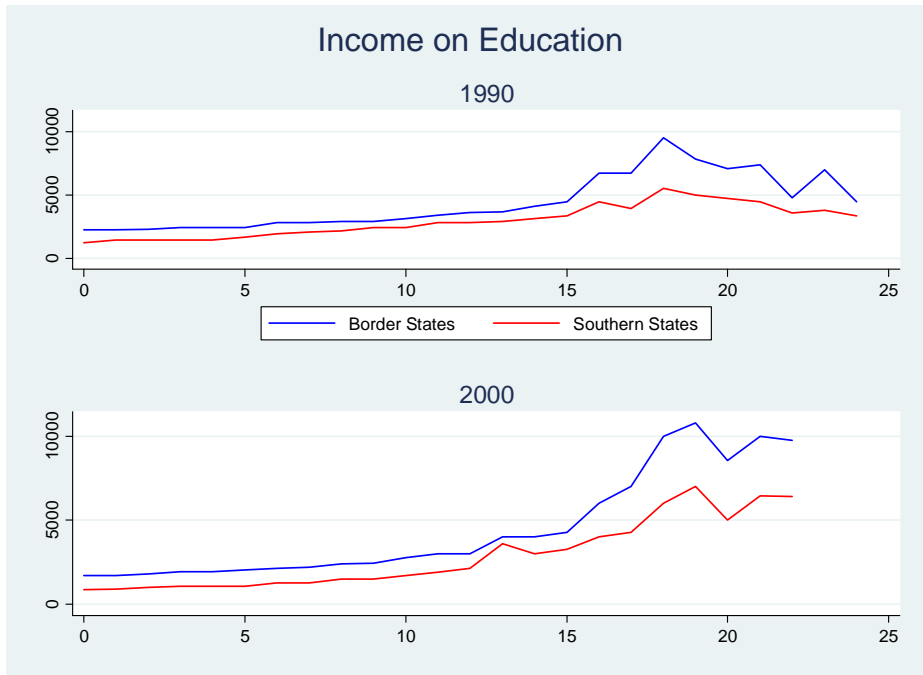
However this analysis does not take into consideration the skill level of the working population. For that reason I analyze the median income of the migrant and not migrant population at each level of education. The results are presented in Figure 10. In here we can observed that internal migrants gain more income than their counterparts, at every single level of education. This difference prevails in 2000, but increases as the worker gets more skilled.

Figure 10



I also analyze the median income of the migrant population at each level of education in the Southern vs. Northern-Border states⁸. The results are presented in Figure 11. In here we can observed that internal migrants in Border States gain more income than their counterparts in the South, at every single level of education. This difference prevails in 2000, but increases as the worker gets more skilled. This evidence agrees with our fourth hypothesis that, following Nicita's (2009) findings, the effect of NAFTA has been almost exclusively transferred to skilled workers, especially in Mexican states close to the U.S. border, increasing the income disparity.

Figure 11: Income in Education



⁸ The Border States are integrated by Baja California Norte, Baja California Sur, Sonora, Chihuahua, Nuevo Leon and Tamaulipas; whereas the Southern states are Guerrero, Puebla, Veracruz, Oaxaca, Tabasco and Chiapas.

5. Conclusions

This study helps strengthen the understanding of the factors that influence Mexico's regional income differentials and the effect that NAFTA has had on them. It takes into consideration internal migration when determining that NAFTA has exacerbated interregional income differences. I 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 regional wage inequalities.

This research provides initial evidence of the effect of trade liberalization on income inequality, suggesting that poorer households and households living in the South of Mexico might not have equally benefited from the effects of trade liberalization in comparison to their counterparts in the North. I found that labor-force participation changed from 1990 to 2000. Many of the workers who joined the labor force were women and most of them were younger workers. Higher educated people were more likely to find formal employment over this time span. Finally, a considerable higher number of migrants managed to find a job after NAFTA.

The effects of trade liberalization, such as regional transportation benefits, more job opportunities and higher wages, has slightly increased migration towards the North. This evidence conforms with the Krugman & Livas-Elizondo (1996) finding that trade leads to more migration since the U.S. market appears to be increasing in importance, whereas the domestic market represented by Mexico City is perhaps less important after NAFTA.

In contrast to the Stolper-Samuelson Theorem, trade liberalization has not reduced regional income inequalities, but rather led to a greater regional polarization. While Mexican municipalities close to the U.S. market have profited from integration by increasing their incomes, regions further away from the United States have become more disconnected from Mexico's integration into world markets.

However, north-south disparities are only one part of the story. Contrary to what the standard trade theory might predict, we find that the effect of NAFTA has been almost exclusively transferred to skilled workers, especially in Mexican states close to the U.S. border, increasing the income disparity between regions with higher skilled workers and those without. Thus, it appears as if NAFTA did have some redistributive effect.

6. Next Steps

The next steps for this research are to develop and estimate a model analyzing the impact of trade liberalization on income inequality while controlling for labor migration. In this model, I will follow closely the methodology used in Sahota (1968) and Nicita (2009). In the next paragraphs, I describe the main steps involved in calculating the effect of NAFTA on wages and explain the differences between my model and those of Sahota and Nicita. To account for an endogeneity problem between wages and migration, I estimate the wage equation using two-stage least squares (2SLS).

Following Sahota (1968), in the first stage, I predict the probability of migration, using the number of migrants from the same region k that migrate to the same region j in the past as an instrument. To predict migration, Sahota uses the geographical distance of capital of region k to capital of region j . I instead use the road distance between sending and recipient municipalities and add another variable that measures the distance from the capital of each region to the closest U.S. border-crossing point, since economic opportunities provided by NAFTA will be greater closer to the U.S. border. I control for characteristics of the household, the source and destination municipality. I also control for the fact that migration source and destination are likely influenced by the characteristics of the neighboring municipalities. I propose to create a cross-section across time data of individuals in all municipalities over 4 years (1990, 1995, 2000, and 2005). In this way, I will be able to test if probability of migration has increased after NAFTA, by including a dummy variable for the NAFTA years. The complete migration function is:

Equation 1

$$P(M_i = 1 | I_i; H_i; Zm_{it-1}; Zs_{it-1}; \sum M_{t-1}; Ps_{t-1})$$

where

M_i = 1 if individual i migrated; 0 otherwise

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

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

Zm_{it-1} = Vector of recipient municipality characteristics for individual i , in time $t-1$

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

$\sum M_{t-1}$ = Absolute number of migrants from sending state to recipient municipality in time $t-1$

Ps_{it-1} = $\sum m_{s_{t-1}} / TPops_{t-1}$

$\sum m_{s_{t-1}}$ is the total number of migrants from sending to state recipient municipality in time $t-1$, and $TPops_{t-1}$ is the total population of the sending state in time $t-1$.

In a second stage, following Nicita (2009), I will 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, I will need to include control variables such as age, years of education, gender of the worker, and status as household head; and run the estimation for all individuals between 25 and 65 years of age reporting salaried wages. The wage function is:

Equation 2

$$\ln(\omega_i) = f(I_i; H_i; Zm_i; Zs_i; NAFTA_t; \hat{M}_i)$$

where

ω_{it} = Observed wage of individual i

$NAFTA_t$ = dummy variable for NAFTA years (1995, 2000 & 2005)

\hat{M}_i = instrumented probability to migrate

I will also interact the NAFTA variable with the various individual, household, distance and migration variables to determine which characteristics determined whether an individual benefited or lost from the trade agreement.

I feel the resulting work will have the following potential contributions: First, I correct for the potential endogeneity of internal migration and wages by using a two stage least squares (2SLS) instrumental variable estimation. Second, I analyze the effect of trade on income, considering the distribution across household characteristics and regions. Third, by using quantile regressions, I explore which households gained and lost from trade.

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8. Annex

Table 4: Internal Migration 1990

State	Total	Residents	Receiving		Sending		Net-Migration	
			#	As % of Migration	#	As % of Migration	#	As % of Migration
México	8,563,538	7,715,847	787,020	23%	271,421	8%	515,599	15%
Baja California	1,425,801	1,178,743	220,848	6%	40,309	1%	180,539	5%
Chihuahua	2,118,557	1,978,526	118,343	3%	40,146	1%	78,197	2%
Quintana Roo	412,868	314,471	92,895	3%	18,969	1%	73,926	2%
Morelos	1,048,065	950,127	91,322	3%	39,613	1%	51,709	1%
Nuevo León	2,750,624	2,616,715	114,049	3%	66,247	2%	47,802	1%
Jalisco	4,584,728	4,359,271	178,259	5%	138,366	4%	39,893	1%
Tamaulipas	1,974,755	1,843,870	115,424	3%	75,599	2%	39,825	1%
Querétaro	898,199	823,330	67,976	2%	29,264	1%	38,712	1%
Aguascalientes	619,401	570,895	44,012	1%	17,452	1%	26,560	1%
Sonora	1,596,063	1,508,975	72,307	2%	53,840	2%	18,467	1%
Baja California Sur	275,985	243,260	29,539	1%	11,735	0%	17,804	1%
Colima	371,876	337,232	31,123	1%	18,356	1%	12,767	0%
Tlaxcala	662,426	623,570	35,906	1%	25,028	1%	10,878	0%
Campeche	456,452	418,566	34,500	1%	24,697	1%	9,803	0%
Guanajuato	3,396,283	3,266,666	98,926	3%	94,976	3%	3,950	0%
Total	70,562,202	66,501,519	3,477,237	100%	3,477,237	100%	0	0%
Nayarit	711,691	669,150	35,934	1%	38,769	1%	-2,835	0%
Tabasco	1,288,222	1,230,380	47,965	1%	54,412	2%	-6,447	0%
Yucatán	1,188,433	1,143,643	38,395	1%	47,384	1%	-8,989	0%
Coahuila	1,730,829	1,650,636	69,278	2%	80,748	2%	-11,470	0%
Puebla	3,565,924	3,416,498	126,056	4%	139,132	4%	-13,076	0%
San Luis Potosí	1,723,605	1,642,499	64,531	2%	77,650	2%	-13,119	0%
Michoacán	3,037,340	2,896,080	106,146	3%	121,134	3%	-14,988	0%
Hidalgo	1,628,542	1,548,781	67,114	2%	85,909	2%	-18,795	-1%
Sinaloa	1,923,515	1,825,563	83,139	2%	105,330	3%	-22,191	-1%
Chiapas	2,710,283	2,638,242	43,947	1%	69,824	2%	-25,877	-1%
Zacatecas	1,100,898	1,051,465	36,731	1%	68,784	2%	-32,053	-1%
Durango	1,169,332	1,117,969	41,301	1%	82,359	2%	-41,058	-1%
Oaxaca	2,602,479	2,511,418	74,083	2%	138,780	4%	-64,697	-2%
Veracruz	5,424,172	5,228,654	163,924	5%	236,281	7%	-72,357	-2%
Guerrero	2,228,077	2,159,919	46,959	1%	120,236	3%	-73,277	-2%
Distrito Federal	7,373,239	7,020,558	299,285	9%	1,035,758	30%	-736,473	-21%
USA					126,486	4%		

The blue colors show the top 5 states receivers of migrants, whereas the red colors are the top 5 states senders.

Table 5: Internal Migration 2000

State	Total	Residents	Receiving		Sending		Net-Migration	
			#	As % of Migration	#	As % of Migration	#	As % of Migration
México	11,097,516	10,353,640	688,200	19%	438,970	12%	249,230	7%
Baja California	2,010,869	1,740,820	229,547	6%	64,966	2%	164,581	5%
Tamaulipas	2,427,309	2,242,226	164,697	5%	69,164	2%	95,533	3%
Chihuahua	2,621,057	2,450,504	138,616	4%	49,694	1%	88,922	2%
Quintana Roo	755,442	625,774	123,574	3%	35,872	1%	87,702	2%
Nuevo León	3,392,025	3,239,025	128,902	4%	66,925	2%	61,977	2%
Querétaro	1,224,088	1,137,537	78,652	2%	32,422	1%	46,230	1%
Morelos	1,334,892	1,239,182	83,614	2%	48,982	1%	34,632	1%
Baja California Sur	374,215	330,561	40,339	1%	15,888	0%	24,451	1%
Sonora	1,956,617	1,862,929	77,072	2%	55,486	2%	21,586	1%
Guanajuato	4,049,950	3,922,657	94,420	3%	75,176	2%	19,244	1%
Tlaxcala	846,877	803,801	39,436	1%	26,573	1%	12,863	0%
Jalisco	5,541,480	5,322,614	155,237	4%	142,660	4%	12,577	0%
Colima	457,777	421,069	30,741	1%	20,853	1%	9,888	0%
Hidalgo	1,973,968	1,876,884	86,888	2%	78,527	2%	8,361	0%
Campeche	606,699	570,757	33,873	1%	28,524	1%	5,349	0%
Coahuila	2,018,053	1,929,877	72,981	2%	68,591	2%	4,390	0%
Yucatán	1,472,683	1,422,300	44,554	1%	43,575	1%	979	0%
Total	84,794,454	80,565,026	3,584,957	100%	3,584,957	100%	0	0%
Nayarit	815,263	768,930	36,772	1%	41,057	1%	-4,285	0%
Zacatecas	1,188,724	1,139,015	33,121	1%	45,706	1%	-12,585	0%
Michoacán	3,479,357	3,341,540	94,038	3%	107,161	3%	-13,123	0%
Puebla	4,337,362	4,179,456	131,109	4%	150,373	4%	-19,264	-1%
San Luis Potosí	2,010,539	1,945,855	50,898	1%	73,711	2%	-22,813	-1%
Sinaloa	2,241,298	2,130,225	96,899	3%	122,258	3%	-25,359	-1%
Durango	1,264,011	1,212,364	38,362	1%	65,057	2%	-26,695	-1%
Tabasco	1,664,366	1,614,643	43,815	1%	73,612	2%	-29,797	-1%
Chiapas	3,288,963	3,222,193	45,240	1%	89,244	2%	-44,004	-1%
Oaxaca	3,019,103	2,923,845	76,764	2%	139,705	4%	-62,941	-2%
Guerrero	2,646,132	2,572,010	52,632	1%	139,616	4%	-86,984	-2%
Veracruz	6,118,108	5,941,172	155,031	4%	374,545	10%	-219,514	-6%
Distrito Federal	7,738,307	7,309,269	376,494	11%	780,312	22%	-403,818	-11%
USA					293,373	8%		

The blue colors show the top 5 states receivers of migrants, whereas the red colors are the top 5 states senders.