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Globalization and its Impact on Migration in Agricultural Communities in Mexico

José Martínez

University of California, San Diego

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Abstract

In this paper, I examine several market liberalization measures taken in Mexico in the first half of the 90's and their impact on municipalities' migration incidence. Specifically, I look at events that affected generally small agricultural producers of basic crops, such as the removal of price supports and input subsidies, changes in laws governing the property rights of communal landowners and the reduction in tariffs on agricultural imports brought about by NAFTA, and their impact on migration to the U.S. I find that reliance on basic crop production is positively and significantly associated with municipality level U.S. migration incidence. I also find small effects of exposure to changes in property rights of communal landowners and negative but insignificant effects of exposure to globalization on migration to the U.S.

1 Introduction

In 1994, Mexico, Canada and the U.S. entered the North America Free-Trade Agreement, NAFTA. This agreement was aimed at reducing and eventually eliminating trade restrictions on most goods and services traded among these countries, including agricultural products. In many respects, Mexico's entry into a trade agreement with the U.S. and Canada represented an ideal case to test standard trade theory predictions, like the ones made by the Heckscher-Ohlin model. The typical version of the model would predict that Mexico's unskilled workers, its abundant factor, would benefit from open trade with U.S. and Canada. This would entail an improvement in their economic conditions and consequently a reduction in the economic incentives for international migration. Accordingly, the Mexican government, in line with the Washington consensus, claimed that globalization would lower migration incentives overall by improving economic conditions in Mexico through increases in FDI and international trade. This was summarized by the Mexican President's slogan used to promote NAFTA,

"Mexico wants to export goods, not people."

Analogously, the empirical literature has focused on the impact of FDI and increased international trade on economic conditions, especially for the communities that receive them. Feenstra and Hanson (1997) examine the impact of FDI on income inequality and find that FDI flows increase the relative wages of skilled workers. In a similar way, Hanson (2005) examines changes in the distribution of labor income across regions in Mexico during the 1990s and finds that high exposure to globalization, based on FDI and the contribution of international trade to GDP, shifts the income distribution to the right, relative to low-exposure communities.

In terms of migration, empirical studies have typically found that FDI and international trade deter migration domestically and abroad¹. Aroca and Maloney (2005) find that a state's exposure to FDI deters out migration within Mexico, with its effects operating partly through the labor market. Similarly, Ritcher, et al (2005) uses retrospective panel data from a survey done in rural areas in Mexico to analyze the impact of globalization on international migration. Their main estimation uses a single variable to capture the impacts from globalization, specifically whether or not NAFTA was in place in a given year, and they find evidence that NAFTA deters migration to the U.S. from rural areas in Mexico².

The predictions that come out of the previous literature for reduced migration from increases in FDI or in participation in international trade seem to be at odds with the continuing trend in international migration in the 1990s. Figure 1 shows there is a strong positive correlation between FDI flows and the stock of Mexican-born in the U.S. in the 1990s.

Part of the explanation of this trend in migration is that the Mexican government failed to foresee that opening the borders to trade could have profound impacts on communities that rely heavily on the production of basic crops. This results from the fact that basic crops production in Mexico is for the most part unskilled labor intensive and therefore much less productive than in the U.S. In addition, basic crops production in the U.S. is highly subsidized, which allows for competitive prices internationally. But more importantly, NAFTA started operating soon after producers of basic crops in Mexico stopped receiving subsidies and price guarantees from the National Council for People's Subsistence (CONASUPO). For all these reasons, trade liberalization brought about by NAFTA and other liberalization measures left many Mexican producers of basic crops to compete with U.S. producers in an uneven field. This would likely affect negatively their economic conditions, and therefore increase the economic incentives for migration within Mexico and abroad.

That suggests that focusing on FDI and international trade to measure the impact of globalization on economic conditions and migration in Mexico in the 1990s presents an incomplete and distorted picture³. A more complete approach would take into account other factors, like the potential negative effects of NAFTA on basic crops prices through increased competition from the U.S. and the fact that other measures, besides NAFTA, were taken by the Mexican government in favor of trade and market liberalization in the 1990s.

¹ On the other hand, Boucher, et al., (2005) use a retrospective survey in rural communities in 8 out of the 32 states in Mexico to estimate a model that has the percentage of villagers in U.S. farms as the dependent variable. They found that a coefficient for NAFTA, measured as a dummy = 1 after 1994, is positive and statistically significant.

² However, these estimates are very small in magnitude, smaller than the effect macroeconomic variables and much smaller than the effect of migration networks.

³ For example, areas that focus on basic crops production are less likely to receive FDI or to benefit from increased international trade, but also more likely to be affected by the negative effects on producer prices from NAFTA. This would make it more likely for positive effects of NAFTA on economic conditions to be found when comparing communities with high and low exposure to FDI.

In this paper, I analyze the impact of several globalization and market oriented measures on migration incidence and find evidence that, contrary to what the Mexican government wished to accomplish, some of the globalization measures taken in the 90s had a positive and statistically significant effect on international migration in communities that relied heavily on basic crops production.

The rest of this paper is organized as follows: section 2 provides some background on the liberalization measures taken by the Mexican government that concluded with the signature of NAFTA, and on the role of CONASUPO in the production and distribution of basic crops in Mexico; section 3 reviews previous research on the effects of economic conditions on migration; section 4 presents the data used and the empirical strategy I employ; section 5 presents the main estimates and section V concludes.

2 Background

In 1982, Mexico suffered a financial crisis that lasted for several years and resulted in a 70% devaluation of the Peso, 100% inflation and a reduction in output and real wages. This crisis marked the end of the Import Substitution economic model in Mexico and the beginning of the market oriented era based on the liberalization of production and labor markets and the opening of the economy to international competition, all recommendations of the Washington Consensus. One important step in this direction was the signature of the General Agreement on Tariffs and Trade (GATT) in 1986, which reduced the maximum effective tariff from 80% to 20%, (Robertson, 2003). Nevertheless, Mexico received special treatment as a developing country that allowed it to protect most of the agricultural and animal products from foreign competition.

In 1988, Carlos Salinas de Gortari, a U.S. trained Economist, became president of Mexico. One defining characteristic of his presidency was his strong support for trade liberalization and market deregulation in general. He led the re-privatization of banks in 1991, the liberalization of financial markets and the sale of some state-owned enterprises. In particular, his presidency saw the reduction, elimination or privatization of entities designed to assist in the production, technical assistance and marketing of agricultural products, of which CONASUPO played an important role. He also signed in 1992 an amendment to Article 27 of the Constitution regarding the property rights of Ejidatarios⁴.

However, his most prominent step toward trade liberalization was the signing of NAFTA, which started operating in 1994. Contrary to GATT, Mexico did not receive much special treatment in the agricultural and animal products sectors under NAFTA. The Mexican government's argument for liberalization of the agricultural sector was based on comparative advantage in the production of fruits and vegetables that the Mexican climate favors. However, that meant that the basic crops production sector would observe increased competition from abroad, so producers in that sector would have to modernize and compete globally or move to other areas or sectors of production.

⁴ After the Mexican revolution, the government provided land for agricultural use to many groups of landless rural peasants as part of the Agrarian Reform. These groups are called ejidos and their individual members Ejidatarios. Each Ejidatario claimed a portion of the ejido as his/her own and was allowed to pass ownership only to kin. However, there were several restrictions on land use, for example, owners were prohibited from renting or selling their individual plots of land and they could not skip cultivation of their plots in two consecutive years.

All these liberalization measures were taking place at the same time that the government's intervention in agriculture was significantly reduced. Government intervention before 1990 was extensive and took several forms. It offered loans to private farmers and ejidatarios at below-market rates and provided agricultural producers with technical assistance and official insurance services at low prices. The government was also involved in price supports, input subsidies and in the distribution of basic crops to low income consumers at low prices. Additionally, it maintained high tariffs and quotas on all agricultural products in whose market CONASUPO intervened through producers' price supports.

CONASUPO, a major state-owned-enterprise up until 1990, was created in the mid-1960s to maintain the purchasing power of low income consumers and the income of small basic crops' producers through input subsidies and sell price guarantees, and to promote the domestic commerce and distribution of these goods. CONASUPO managed stores to sell basic products to the rural and urban poor at low prices and used to sell fertilizer and modified seeds to producers at low prices. It also provided technical support and exerted control in eleven basic crops, which at some point represented 30% of Mexico's gross domestic basic crops production (Yunez-Naude 2003)⁵, but its influence was severely diminished by reforms that were part of the market liberalization process that started after the 1982 financial crisis.

Starting in 1990, the influence of CONASUPO was severely limited due to changes in its operations and funding shortages. These changes were gradual and eventually led to the elimination of price guarantees to most basic crops in 1992, except for corn and beans which lasted until 1995. This led CONASUPO to become only a last resort buyer to basic crops producers⁶. In 1991, ASERCA was created to take CONASUPO's role in promoting the distribution of agricultural products. ANAGSA, the agriculture insurance contract program, disappeared in 1990 and was replaced by AGROASEMEX, but with more stringent rules that ruled most small producers ineligible. Credito a la Palabra (Word for Credit), Alianza Para el Campo (Alliance for the Countryside) and other programs were created to help with the financing of agricultural production and the transition to other crops, but not all producers qualified and the amount of loans was typically insufficient.

To try to help agricultural producers, The Program of Direct Support to Agriculture (PROCAMPO) was created, and in 1994, it started distributing monetary funds to agricultural producers of basic crops. This aid was meant to help producers of basic crops modernize or switch to more profitable crops in response to the opening of the agricultural sector to international competition. The Mexican government claimed that, because it was a direct subsidy, it would not create market or price distortions. However, given the insufficient amount of the transfer per eligible hectare and the lack of adequate financing, this aid became more of a subsidy for basic consumption.

⁵ CONASUPO exerted some control over the production of barley, beans, copra, corn, cotton, rice, sesame seed, sorghum, soybeans, sunflowers and wheat.

⁶ After 1992, the prices paid by CONASUPO for basic crops were often below market prices.

Overall, the changes in the agricultural sector brought about by the government move towards market liberalization affected negatively many producers of basic crops by reducing the aid and subsidies they previously received, by not adequately financing their modernization that would have allowed them to compete globally or to switch to more profitable crops and by the negative impact on prices received by producers of basic crops because of NAFTA.

Figure 2 presents some evidence that producer prices for basic crops have decreased since 1992 at the same time that prices for fruits, a product likely to benefit from NAFTA, have increased. Yunez-Naude and Barceinas-Paredes (2004) found econometric evidence that NAFTA led to the convergence of producers' fruit prices in Mexico to international prices. They also find consistent deterioration of prices for basic crops since NAFTA. However, this trend was present before NAFTA took effect⁷.

3 Economic Conditions and Migration

There is a vast literature on migration from Mexico to the U.S. in terms of its impact on both, the receiving and the sending country, and the characteristics and events that condition its incidence among communities in Mexico. Of the latter, the most common are studies on the effect of migration networks and economic conditions in Mexico and the U.S. on migration. After all, the neoclassical theory of migration, which has been used the most, depicts the migration decision as being dependent on all economic conditions in Mexico and abroad that affect potential earnings.

Massey and Espinosa (1997) use retrospective data from a survey done between 1987-1992 in 25 Mexican communities in historically high migration states and find that, aside from the presence of migration networks, macroeconomic variables like the real interest rate in Mexico and whether or not they live in an agrarian community are strong predictors for first trip migration to the U.S. of undocumented workers. This implies that individuals living in agrarian communities might be more likely to migrate abroad due to the lack of credit to make productive use of the land they own or due to low profitability in the production of basic crops. However, they also find that expected wage ratio between Mexico and the U.S. is not a strong predictor of migration. On the other hand, Hanson and Spilimbergo (1996) find that a reduction in real Mexican wages increases border apprehensions, which is a proxy for border crossing attempts.

In a similar way, Richter, et al (2005) use data from rural areas and find strong positive effects on migration from macroeconomic variables such as GDP growth in Mexico and the U.S. and Peso devaluations. This might imply that, in rural areas, low income individuals take advantage of good economic conditions to migrate abroad. It is also possible that Peso devaluations benefit potential migrants who receive remittances from abroad and therefore allow them to finance the trip northward.

All the fore mentioned events and others that took place in the 1990's had some economic impact on all communities in Mexico in some form or another, from the fall of

⁷ Agricultural data also shows that the number of hectares used in the production of corn and basic crops in general decreased in this period, at the same time that the yields per hectare increased. This might be due to small producers exiting the market. In the case of fruits, the average number of hectares used in the production of fruits increased as well as their yields per hectare.

CONASUPO, which affected mainly small producers of basic crops to the 1994 financial crisis, which affected most parts of the country. Such effects ranged from an increase in unemployment in some sectors to changes in the distribution and levels of income, and they likely affected the economic incentives for migration to the U.S. In this paper I incorporate measures that could potentially differentiate between communities with high and low concentration in basic crops production.

4 Empirical Strategy and Data

Empirical Strategy

The goal of this paper is to analyze how different globalization measures in the first part of the 1990s affected the migration incidence of municipalities in Mexico between 1992 and 1997. Among these measures, those that affected mainly communities that rely heavily on basic crops production are of most interest. That is, I try to investigate the impact of a uniform shock brought about by globalization measures and whose effects were mediated by the municipalities according to their exposure to basic crops shocks. To do so, I use a balanced sample of municipalities from 1992 and 1997 and employ the typical difference-in-differences estimation. The baseline specification takes the following form:

$$(1) \\ MigRate_{it} = \alpha + (\beta_1 * 1997_t + \delta_1) BasicCrops_i + (\beta_2 * 1997_t + \delta_2) NAFTA_t \\ + (\beta_3 * 1997_t + \delta_3) Ejido_i + \beta_4 * 1997_t + (\Omega * 1997_t + \Gamma) X_{it} + \varepsilon_{it}$$

The dependent variable is the migration rate in municipality i at time t . 1997 is the post-treatment dummy. To account for the impact of the removal of price supports, input subsidies and other shocks to basic crops producers, I include the variable *BasicCrops*. This variable is constructed by interacting the municipality's percentage of the labor force in agriculture and the percentage of agricultural land used in basic crops, so it takes on values between 0 and 1⁸. β_1 is the coefficient on the variable of interest, and it captures the impact of exposure to basic crops shocks on migration. Given that events like the fall of CONASUPO were likely to have a negative effect on producers of basic crops, I expect β_1 to be positive.

To control for the impact of NAFTA through investment flows and increased international trade on migration, I include the variable NAFTA. This variable is constructed following Hanson (2005) and it uses FDI as a percentage of the state's GDP and the share of the state's GDP in imports and maquiladora exports to rank states in terms of their exposure to globalization⁹. One key aspect to note here is that this is a typical measure of globalization used in the literature, which does not account for the impact on agriculture producer prices.

⁸ The ideal way to construct this variable would be to use the percentage of the labor force in basic crops production, and not just the percentage of labor force in agriculture. Unfortunately, that information is not available in the data that I use.

⁹ This data is only available at the state level. Source: INEGI/ Banco de Informacion Economica. Maquila exports is the only data available for exports at the state level.

Another important globalization measure taken by the Mexican government in the first part of the 1990s was the change to Article 27 of the Constitution regarding the property rights of Ejidatarios. This change in the law was signed in 1992 and basically gave Ejidatarios complete property rights on their individual plots of land. To account for the potential effect of this change on migration, I include the variable *Ejido*, which represents the percentage of agricultural land in the municipality that belongs to an ejido.

To control for heterogeneity across municipalities in Mexico, the vector X_{it} includes municipality economic and demographic characteristics. It includes the municipality population in 1990, measures of historical rainfall, the percentage of land with irrigation system, the percentage of households with a member who speaks an indigenous language, etc. At the end, the identifying assumption for β_1 is that no other events took place in the period of analysis that affected differently communities depending on their exposure to basic crops shocks.

Data

I use municipality and state level data from the 1992 and 1997 National Survey of Demographic Dynamics (ENADID), the 1990 Population Census and the 1991 Censo Agricola-Ganadero (Agriculture-Livestock Census). The 1992 ENADID was the first nationally representative survey data on international migration. It contains data on dwelling and individual characteristics, education, employment, births, mortality and migration¹⁰.

Using the ENADID data, I construct the municipality migration rate as the number of households with at least one migrant to the U.S. in the last 5 years divided by the number of households surveyed in the municipality, but also as the percentage of individuals age 15-30, 30-45 and 45-60 with migration experience in the last 5 years. I include the migration rate among 15-30 year olds based on previous estimates that suggest migration is most prevalent for this age group, Martinez and Woodruff (2007). That means that, if exposure to basic crops production shocks is a determinant for migration, these effects would be particularly strong for this age cohort.

The 1990 population census provides data on the municipality population and the percentage of labor force in agriculture. The 1991 agricultural census provides data on land use, the types of crops cultivated and the number of hectares used on 9 of the 11 basic crops previously controlled by CONASUPO. It also contains information on percentage of private, communal and ejido land, as well as on the availability of irrigation systems.

¹⁰ Data from the ENADID survey is not representative at the municipality level, so the main specification restricts the sample of municipalities based on the number of households surveyed. I restrict the sample to municipalities that had at least 40 households surveyed in 1992 and 1997. To check the reliability of the migration estimates using this data, I compare the ENADID municipality migration rates from 1992 and 1997 to those from the 1995 and 2000 population census. The correlation between the 1992 ENADID estimates and the 1995 population census is 0.75 and 0.80 between the 1997 ENADID and the 2000 population census. For the migration rate based on individuals, the correlations are 0.72 and 0.85 respectively. The 1995 census data is also not representative at the municipality level.

Means

Table 3.1 presents some summary statistics. Compared to the 1995 population census, municipalities in the ENADID sample have higher migration incidence. Around 10 percent of the households in the municipality have at least one migrant and around 7 percent of individuals age 15-30 have migration experience. In terms of exposure to basic crops shocks, the average exposure is around 9 percent, compared to around 5 percent for the country as a whole.

Municipalities have medium levels of exposure to globalization. Again, this measure is based on the state's contribution to GDP from FDI, imports and maquiladora exports. In terms of ejido ownership, the average proportion of agricultural land that belongs to ejidos is 40 percent, compared to the country's average of less than 30 percent.

In summary, municipalities in my sample tend to have higher migration incidence, lower contributions of FDI, imports and maquiladora exports on GDP, higher concentrations of agricultural land in ejidos and larger agricultural areas compared to the country as a whole. Other family and household characteristics follow the same pattern; slightly higher family sizes and illiteracy rates, worse access to health services institutions and to water, slightly higher proportion of households with a member that speaks an indigenous language, etc.

5 Results

All the results in this section use robust standard errors by clustering at the state level. The sample is restricted to the set of municipalities with at least 40 households surveyed in 1992 and 1997¹¹. The first set of results uses the percentage of households with at least one migrant as the dependent variable and the second set uses the migration rate based on individuals age 15-30, 30-45 and 45-60. Column 1 presents the results from regressing the municipality migration rate only on the exposure to basic crops, the dummy for 1997 and their interaction, so it represents the typical unconditional difference-in-difference estimation. It suggests that in 1992 exposure to basic crops shocks was positively associated with migration rates, and that from 1992 to 1997 this relationship increased significantly. However, these results do not account for the likelihood of omitted variables that could be correlated with both, exposure to basic crops shocks and migration incidence and trends, so in column 2, I include family, household and community characteristics. I include family size, illiteracy rates, a measure of rain variability, percentage of households with a member that speaks an indigenous language, etc.

The estimates from column (2) show negative coefficients for the exposure to basic crops shocks, suggesting that in 1992 the time invariant component of the municipality's exposure to basic crops was negatively associated with migration rates. However, these estimates are not statistically significant in both sets of results. On the other hand, the coefficients for the variable of interest are positive and statistically significant in both sets of results. These estimates suggest that a one standard of deviation increase in the exposure to basic crops would lead to a 1.4 percent increase in the percentage of households with migrants and a .7 percent increase in the percentage of individuals age 15-30 with migration experience. However, these results do not take into account the

¹¹ More stringent restrictions, e.g. 60 households, lead to quantitatively similar results.

impact of changes to ownership laws of ejidos and the impact of NAFTA through FDI, imports and maquiladora exports.

Column (3) adds to the previous specification a variable for the percentage of agricultural land belonging to an ejido and the globalization variable NAFTA to try to account for their impact on migration rates, and this represents the main specification. The coefficients in the first row suggests that exposure to basic crops in 1992 was negatively associated with migration rates. This negative relationship might be due in part to the presence of poor indigenous communities in the sample used. In general, poor and indigenous communities in Mexico do not send many migrants abroad¹². The fact that the magnitude and statistical significance for the variable of interest do not change much when the NAFTA and Ejido variables are added to the specification is reassuring and suggests that exposure to basic crops is the best predictor in explaining the increase in migration rates from 1992 to 1997¹³.

Comparing the two sets of results, the magnitude of the first set of results is greater, but this has to do with the way the measures are constructed. Again, the second set of results use the migration rate among people of different age groups and include all the variables used in the third specification in the previous table. The first column presents the results when using the migration rate among individuals age 15-30. These results suggest that if a municipality increased its exposure to basic crops shock by one standard of deviation, its migration rate would have increased by .8 percentage points, a large increase considering that the average migration rate is 7 percent for this age group.

Comparing the results between different age groups, table 2.B shows that the impact of the agricultural shock on migration was positive at least for people age 15 – 60, and that this effect was greater for individuals age 15-30, These results support the findings in Martinez and Woodruff (2007) that claim this age cohort is overrepresented by migrants to the U.S., and therefore more responsive to changes to economic shocks.

In terms of the effects of NAFTA through FDI and international trade, I find that in 1992 exposure to globalization was negatively associated with migration, consistent with Aroca and Maloney (2005), but these results are small and statistically insignificant. The interacted term on the other hand is positive but also statistically insignificant, consistent with Boucher et al, (2005). In summary, I claim that prior to the reforms, municipalities with high FDI and international trade participation had no statistically different migration rates than other municipalities, but also no differential change in the migration rate in 1997. This might be due in part to the fact that the variable NAFTA accounts only for the impact of NAFTA through FDI and increased international trade at the state level and that there is a high level of heterogeneity among municipalities even in states with high participation in international trade.

I also find small and statistically insignificant impacts of exposure to changes in property laws of ejidos on migration. The magnitude of this coefficient might be explained in part

¹² However, the migration patterns are changing in Mexico making migration more prevalent across the entire country, The National Population Council (CONAPO).

¹³ Unfortunately, there are no other estimates in the literature to compare the magnitude of my estimates to.

by the potentially competing effects of changes in property rights of ejidatarios on migration rates; the improvement in the property rights could have assisted migration by allowing land owners to sell or rent their plots of land, but it could have also increased the level of investment by land owners due to clearer property rights, and therefore decreased migration¹⁴. Another potential explanation for the small magnitude observed could be the high correlation between basic crops production and ejido ownership. What this might entail is that the effect of exposure to basic crops production shocks might pick up a considerable part of the effect of the changes to Article 27 on migration. In results not shown, I rerun the specification in column 2 but I omit the variable for basic crops shocks and replace it by the Ejido variable, and I find that the coefficient for the percentage of land in ejidos increases substantially and it becomes statistically significant. Overall, the results suggest that changes to Ejido law had positive but statistically insignificant impact on changes in the migration incidence between 1992 and 1997. Considering also the coefficient for exposure to basic crops shocks, it suggests that the type of harvest matters more than type of ownership.

Other control variables have generally the expected signs. The coefficient for the percentage of households with at least one member who speaks an indigenous language is negative and statistically significant in both sets of results. The coefficients for the percentage of households with electricity and drainage system are negative, but they are both statistically insignificant. The coefficient for the average family size is positive but small and statistically insignificant. The coefficient on the percentage of agricultural land with irrigation system is also negative but statistically significant. This suggests that having a high percentage of the agricultural land with an irrigation system is associated with low migration. This can be explained in part if having irrigation system is a proxy for more productive agriculture.

As mentioned before, the typical specification in the literature that investigates the impacts of globalization on migration uses only measures of FDI and international trade and ignores other liberalization measures that might have had considerable impact on municipalities. This typical specification is presented in column (4). Some magnitudes change, but the conclusion is the same; I find no evidence that exposure to FDI and international trade had a differential impact on migration across municipalities in my sample.

Overall, the results from the main specification suggest that municipalities with high exposure to basic crops shocks experienced significantly higher changes in their migration incidence between 1992 and 1997 relative to municipalities with low exposure. I also claim that municipalities with higher exposure to changes in ownership laws of Ejidos and/or increase FDI and international trade did not experience statistically different changes in migration rates from 1992 to 1997 relative to low exposure municipalities.

An important question at this point would be, what does the coefficient on the variable of interest really capture? Based on the identifying assumption, it only captures the impact

¹⁴ The latter is similar to Pranab Bardhan's (Forthcoming) argument of the effect of property rights on long term investment.

of the elimination of price supports and input subsidies on migration, which came with the dismantling of CONASUPO. It also captures the impact of NAFTA through agricultural producers' prices and increased competition from the U.S. on migration, as well as any impact the changes in ownership laws of Ejidatarios might have had on producer prices.

Now that the results have shown that municipalities with higher exposure to basic crops shocks experienced higher migration incidence between 1992 and 1997 and given the high degree of heterogeneity among municipalities, it would be interesting to see whether or not the effect of exposure to basic crops shock is non-linear. I include the square term of exposure to basic crops shocks and run the same regressions as in table 3.2. The results show only the coefficients for the interacted terms.

Tables 3.A and 3.B show that the coefficient for the square term of exposure to basic crops shocks is negative and statistically significant. This suggests that the effect of exposure to basic crops shocks on migration between 1992 and 1997 is non-linear and presents an inverse-u shape¹⁵. It also shows that the coefficients for the ejido and NAFTA remain small and statistically insignificant.

Robustness

The maintained assumption in this paper is that the elimination of price supports and input subsidies had significant effect on migration rates between 1992 and 1997 and that these effects are captured by the variable for exposure to basic crops shocks. A concern for the validity of such claim would be that the main results presented are not truly capturing the impact of basic crops shocks on migration. That is, there is no secular trend in migration that is different between municipalities with different exposure to basic crops shocks. That would mean that what I am really capturing could be the effect of unobservables not considered in the analysis. If this is true, running a placebo test using another period would lead to similar results. If it doesn't, then that could serve as support to my results.

A period prior to 1992 would be ideal to compare to. However, as mentioned before, 1992 was first time representative data on migration was available, so that preclude us from looking at an earlier period¹⁶. In that case, the only available option is to look for a period beyond 1997. Given the current availability of data, the only alternative is to use the 1997 ENADID and the 2000 population census. However, it is possible that the impact of liberalization measures on agriculture might have extended beyond 1997, so this might bias the results towards finding positive effects of exposure to basic crops on migration.

¹⁵ Based on the results, the point of inflection for the relationship between exposure to basic crops shocks and migration rates would be around .4 and .3 for the first and second set of results, respectively. Only between 5 and 10 percent of the municipalities in the sample have an exposure level beyond the estimated inflection points.

¹⁶ There are other data sources that some authors have used to analyze other periods like the Mexican Migration Program (MMP). This data source contains retrospective information from family heads living in communities with high migration incidence.

The analysis is again restricted to municipalities with at least 40 households surveyed in the 1997 ENADID. I include the same controls as before and calculate the migration rates in both 1997 and 2000. The results are presented in table 4.

A couple of small changes to note are that the 2000 population is used instead of the 1990 population and that I now use the percentage of households receiving PROCAMPO or PROGRESA. The latter is a very important program developed by the Mexican government to try to better the living conditions of poor families living in rural areas through financial aid¹⁷.

Column (3) continues representing the main specification. None of the results are statistically significant, which supports my previous results in tables 2 and 3. However, there are some things to say about the signs and magnitudes of some coefficients. For example, the sign for the exposure to basic crops shocks is now negative and much smaller than before. This gives me more confidence that the variable of interest truly capture the impact of shocks to basic crops, like the dismantling of CONASUPO.

The coefficient for the exposure to NAFTA is now negative and the magnitude is higher than before, so it is now consistent with the existing literature. The coefficient for the exposure to changes to property rights of ejidatarios remains positive and statistically insignificant. The coefficient for the percentage of households receiving PROCAMPO or PROGRESA is negatively correlated with migration. This suggests that the Mexican programs using direct subsidies and conditional monetary transfers could be having their intended results. Overall, these findings suggest that the effects of the shock experienced by the agricultural sector in Mexico were for the most part absorbed in a few years following the shock.

6 Conclusions

In this paper, I examined the impact of several market liberalization measures taken by the Mexican government on the migration incidence of municipalities. Instead of focusing on FDI and the contribution of imports and exports to the state's GDP, I focused on several liberalization measures that might have had profound impact on municipalities that relied heavily in basic crops production. After controlling for several initial conditions and characteristics, including measures of rain variability, ejido ownership, exposure to NAFTA, the regression estimates show that exposure to basic crops production shocks is a strong predictor of changes in the incidence of migration to the U.S. between 1992 and 1997. My estimates suggest that a one standard of deviation increase in the exposure to basic crop shocks of municipalities would have increased the migration rate between 1992 and 1997 by 1.4 percent, which is considerable given an average municipality migration rate of 10 percent. By adding a square term, I also find evidence that the effect of exposure to basic crops shocks on migration is non-linear.

I also obtained measures of the impact of NAFTA on FDI and international trade and of changes to property rights of ejidatarios on migration. The coefficients for both measures are small and statistically insignificant, suggesting that communities with high exposure

¹⁷ PROGRESA aid is conditional on school attendance and attendance to regular health clinics and check-ups, which could have a negative (Stecklov et al, 2003) or positive (Angelucci, 2004) effect on international migration.

to globalization and changes to ejido property rights did not experience significantly different changes in their migration incidence between 1992 and 1997, relative to other municipalities.

Again, the sample of municipalities in this paper comes from the 1992 and 1997 ENADID survey, so it's possible that municipalities in the ENADID sample are not representative for the country as a whole. In other words, the results that I obtain might depend on the sample used. If this is true, and this might explain in part the discrepancy with some of the existing literature in terms of the impact of globalization on migration.

In summary, there is a vast literature that has tried to analyze the impact of NAFTA on the economic conditions and internal and international migration. This paper finds no similar effects. However, this paper finds that there were other more important events that significantly affected the migration incidence among municipalities, such as the fall of CONASUPO. Far from reducing migration abroad, this paper presents evidence that the market liberalization measures taken by the Mexican government represented strong incentives for U.S. migration for communities that relied heavily on basic crops production.

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Tables and Figures

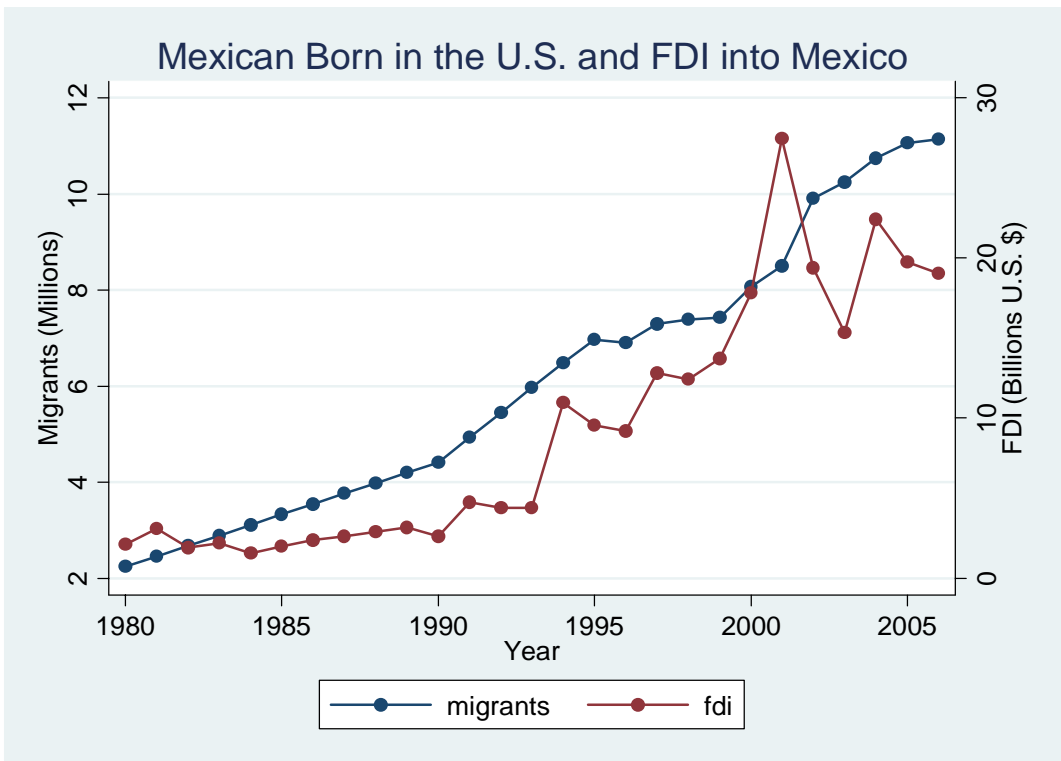


Figure 1. Stock of Mexican migrants in the U.S. and FDI

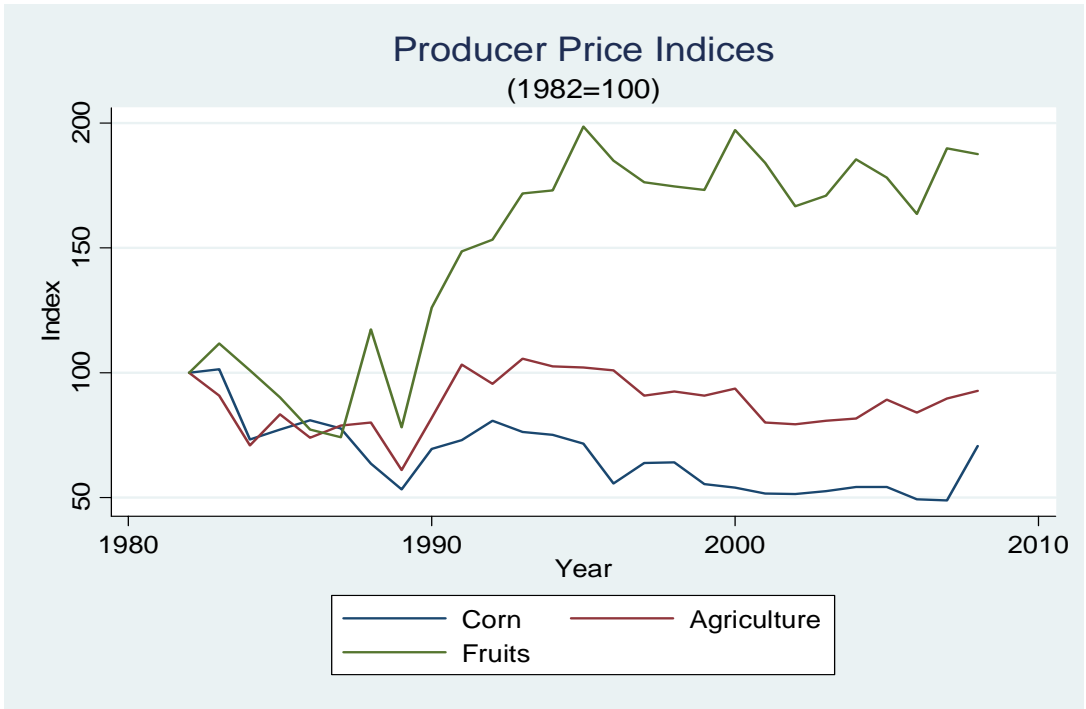


Figure 2. Agricultural producer price indices in Mexico

Table 1. Means

Summary Statistics	
Municipalities	744
% Households with migrants	9.72 (12.08)
% of Individuals age 15-30 with Migration experience	6.90 (9.65)
Basic Crops Exposure (0,1)	0.09 (0.10)
NAFTA (1=not exposed, 6=very exposed)	3.66 (1.46)
% of Agricultural land owned by Ejidos	39.55 (26.36)
Family size	5.61 (2.48)
Number of children ever born	4.04 (0.92)
% of Adults that know how to read and write	73.44 (10.53)
% of Working adults that are Self-employed	10.84 (6.31)
% of individuals with access to Health services institution	35.57 (21.97)
% of Households with hard floors	77.21 (21.05)
% of Households with water	58.61 (34.07)
% of Households with electricity	88.20 (16.63)
% of Households with person speaks indigenous language	6.49 (13.61)
Standard of dev. in parenthesis	

Table 2.A Regression results

Dependent Variable: % of households with migrants				
	(1)	(2)	(3)	(4)
Basic Crops	12.88 (8.51)	-3.82 (7.94)	-2.95 (7.51)	
Basic Crops * 1997	9.19 **(4.32)	13.59 *** (5.07)	13.72 *** (5.22)	
Ejido			-0.02 (0.02)	
Ejido * 1997			0.01 (0.02)	
NAFTA			-0.43 (0.77)	-0.90 (0.85)
NAFTA * 1997			0.29 (0.54)	0.28 (0.57)
Standard errors in parenthesis.				

Table 2.B. Regression results

Dependent Variable: % of individuals with migration experience			
	(1) Age 15-30	(2) Age 30-45	(3) Age 45-60
Basic Crops	-1.01 (4.41)	-2.34 (5.47)	-1.86 (4.90)
Basic Crops * 1997	8.33 **(3.66)	6.56 *(3.94)	3.21 (3.35)
Ejido	-0.01 (0.01)	-0.01 (0.02)	-0.01 (0.02)
Ejido * 1997	-0.00 (0.01)	-0.01 (0.02)	-0.01 (0.01)
NAFTA	-0.10 (0.31)	-0.53 (0.59)	-0.38 (0.49)
NAFTA * 1997	0.14 (0.28)	0.34 (0.38)	0.27 (0.34)

Standard errors in parenthesis.

Table 3.A. Regression results 2

Dependent Variable: % of households with migrants			
	(1)	(2)	(3)
Basic Crops * 1997	15.62 (11.54)	29.01 **(11.32)	29.59 **(12.17)
Basic Crops Square *1997	-15.61 (23.98)	-36.55 *(19.89)	-38.67 *(21.74)
Ejido * 1997			0.01 (0.02)
NAFTA * 1997			0.38 (0.51)

Standard errors in parenthesis.

Table 3.B. Regression results 2

Dependent Variable: % of individuals with migration experience			
	(1) Age 15-30	(2) Age 30-45	(3) Age 45-60
Basic Crops * 1997	18.76 ***(7.34)	15.73 **(7.49)	12.99 (7.49)
Basic Crops Square *1997	-25.70 **(12.28)	-23.38 *(13.53)	-14.88 (12.82)
Ejido * 1997	0.01 (0.01)	0.01 (0.02)	0.01 (0.01)
NAFTA * 1997	0.17 (0.26)	0.42 (0.35)	0.33 (0.32)
Standard errors in parenthesis.			

Table 4. Regression results 3

1997-2000 Data				
Dependent Variable: % of households with migrants				
	(1)	(2)	(3)	(4)
Basic Crops * 2000	-7.16 (5.67)	-3.93 (6.99)	-4.12 (6.96)	
Ejido * 2000			0.01 (0.01)	
NAFTA * 2000			-0.46 (0.35)	-0.50 (0.34)
PROGRESA/PROCAMPO * 2000		-1.22 (1.20)	-1.75 (1.31)	
Dependent Variable: % of individuals age 15-30 with migration experience				
	(1)	(2)	(3)	(4)
Basic Crops * 2000	-3.54 (2.54)	-0.07 (4.03)	-0.39 (3.73)	
Ejido * 2000			0.01 (0.01)	
NAFTA * 2000			-0.19 (0.24)	-0.23 (0.23)
PROGRESA/PROCAMPO * 2000		-0.71 (0.70)	-1.05 (0.81)	

Appendix

I present in this section the results as in table 3.2, but restricting the sample of municipalities to those with at least 60 households surveyed, instead of 40. As shown in table 3.1A, the results do not vary considerably under this specification, and neither when the sample of municipalities is restricted to those with at least 20 households surveyed. Restricting the number of municipalities for those with more than 100, for example, reduces considerably the sample size.

Table 3.1A. Regression results 2A.

Dependent Variable: % of households with migrants			
	(1)	(2)	(3)
Basic Crops * 1997	9.49 **(4.41)	15.37 *** (5.18)	14.76 *** (5.29)
Ejido * 1997			0.01 (0.02)
NAFTA * 1997			0.30 (0.55)
Dependent Variable: % of individuals age 15-30 with migration experience			
	(1)	(2)	(3)
Basic Crops * 1997	6.08 *(3.47)	7.32 *(3.77)	6.88 *(3.73)
Ejido * 1997			0.00 (0.01)
NAFTA * 1997			0.27 (0.41)