

Salas, Jesus Manuel

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Luxembourg Income Study Working Paper Series

Working Paper No. 357

Poverty in Mexico in the 1990s

Jesus Salas

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Poverty in Mexico in the 1990's

AN EXIT PAPER

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By

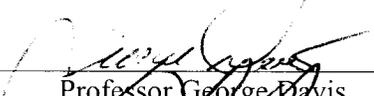
Jesus Manuel Salas
Miami University
Oxford, Ohio

On

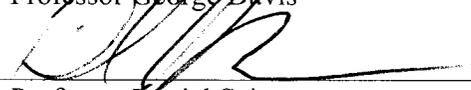
July 3rd, 2003

Supervisor: 

Professor Dennis Sullivan

Reader: 

Professor George Davis

Reader: 

Professor Daniel Seiver

Poverty in Mexico in the 1990's

By

Jesus Manuel Salas

Abstract

This paper explores poverty trends in Mexico during the 1990's using three different definitions of poverty. The paper then uses poverty convergence analysis to explore the pre-crisis (1992-1994), the crisis (1994-1996), and the recovery periods (1996-1998). Finally, the paper incorporates a regional analysis in order to examine these poverty effects in greater detail.

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I. Introduction:

Although poverty has been a subject of interest around the world, poverty data for Mexico were neither properly gathered nor effectively analyzed until recently. The income survey used in Mexico today was first taken in 1984, with a gap of 5 years before the second survey. Presidents often mentioned poverty reduction as one of their goals, but it was not until recently that an effort was made to define an official measure of poverty. The SEDESOL report (2002) is the statistical basis for government efforts to reduce poverty in Mexico. Although having one measure of poverty through the SEDESOL report is helpful to understand poverty, it is not enough. Changes in poverty can happen in many ways, and using different measures of poverty allows us to better identify the factors affecting poverty in Mexico. This paper will use three measures of poverty to try to understand the trends of poverty in Mexico during the 1990's.

This research will focus much of the analysis on the 1995 crisis because of the notable effects it had on the Mexican economy. The 7.5 per cent drop in per capita GDP was not the only factor making this crisis notable. Just one year before the crisis, a rebel movement developed in the south and the North American Free Trade Agreement started. Absolute poverty increased in Mexico during the crisis and decreased afterwards, as expected. Fields (1980) argues that “we would expect that countries with moderate to rapid rates of growth would succeed in upgrading the economic condition of significant numbers of their people – this is the so-called trickle-down theory” (Fields, 1980, pp. 170) and presents evidence for Mexico during the 1960's to support his claim. The rise in

absolute poverty during the crisis, and subsequent reduction in absolute poverty during the recovery, are consistent with this trickle-down model.

Presumably the crisis affected poverty through the income distribution, as well as through the level of per capita income. In order to isolate the effects of changes in the income distribution, I consider a relative measure of poverty, which incorporates a poverty line that changes as median real per capita income changes. The standard Kuznets “inverted u” (Poulson, 1994) suggests that inequality will be positively correlated with per capita income among low-income countries. Though a large decrease in real per capita income due to a macroeconomic crisis will presumably increase absolute poverty, it is plausible that declining inequality at the bottom of the distribution could cause relative poverty to fall (and to rise again during the recovery). Fields (Fields, 1980) finds evidence regarding the “inverted u” relationship for Mexico during the 1960’s and found mixed results depending on the measure of inequality used.

Mexico is the 14th largest country in the world by land area, and the 11th most populated. Distances between states can reach more than 1000 miles. Economically, Mexico is the 10th largest producer of the world. In a country that large and diverse, some regional economies may perform quite differently from the nation. Specifically, I address the poverty differences among the states and within the states. I first explore poverty convergence; that is, whether poverty is decreasing faster (or increasing more slowly) in poorer states. Standard convergence techniques first introduced by Barro and Sala-i-Martin (1995) were designed to measure per capita output convergence between regions.

For example, Barro and Sala-i-Martin (1995) found that per capita output growth rates were larger for the southern region than the eastern region of the United States between 1880 and 1990. For my research, I adapt the growth convergence techniques to measure poverty convergence in Mexico. Instead of analyzing the convergence of per capita output across states, I analyze poverty across states in Mexico to see whether state poverty rates converged during the 1990's.

However, as Barro and Sala-i-Martin (1995) noted, convergence results can be influenced by migration patterns in the country (or out of the country altogether). In the case of poverty, as people in poor states move to richer states, poverty rates are affected. In addition, as poverty rates change, people might decide to migrate to other states in the country. As a result, I analyze poverty convergence and migration across states. However, it is difficult to see how macroeconomic events affected the regional pattern of poverty without aggregating states into economically meaningful categories.

Having aggregated the states into 6 regions, absolute poverty calculations allow us to identify those regions with the largest percentage of poor people relative to a single, common poverty standard. In addition, relative poverty, using a poverty line keyed to national median real per capita income, can be used to observe trends in the income distribution. In order to explore the trends in the lower end of the distribution, I employ the regional relative poverty measure that Forster, Jesuit, and Smeeding (2002) recently introduced to study trends in poverty for eastern European countries. What makes

regional relative poverty unique is that it incorporates a poverty line that changes in each region as median real per capita income in that region changes.

A combination of the national, state, and regional analysis gives more comprehensive results on poverty that go beyond the obvious explanations for movements in poverty. In the end, this research shows how changes in the economy during the 1990's affected each region as well as the economy as a whole. I divide the remainder of the paper into 7 parts. In part II, I summarize macroeconomic conditions in Mexico during the 1990's. Part III will introduce methodologies available to measure poverty. Part IV will discuss the poverty results using two measures of poverty. Part V four discusses and presents poverty convergence and migration results for the 1990's. Part VI explores the relationship between migration and poverty in Mexico during the 1990's. Part VII establishes the regions for the regional poverty analysis in part VIII.

II. Macroeconomic Experience during the 1990's

Between 1989 and 2000, we can clearly identify three periods using macroeconomic data: The pre-crisis period (1989 – 1994), the crisis period (1994 – 1996) and the recovery period (1997 -present). Even though the data still show a very unstable economy, the trends show a government that intended to gain the confidence of investors by reducing inflation and becoming less dependent on oil exports.

As we can see from table 1, during the pre-crisis period, real GDP per capita grew very slowly. In fact, GDP per capita in 1994 was still below the 1982 levels. However, the government was able to reduce inflation dramatically, reaching single digit inflation by 1993. The public deficit behaves as expected with increases during periods of negative growth in GDP. In regards to trade, we see significant growth during the pre-crisis period. Of notable importance is the manufactured exports growth rate. In 1994, the manufactured exports growth rate (in part because of maquiladora growth) reached 20 per cent.

Table 1. Mexico: Selected macroeconomic indicators (1989 - 1994)						
	1989	1990	1991	1992	1993	1994
GDP per capita (1982 = 100)	90.8	93.4	93.7	94.4	93.1	94.7
Public budget as percent of GDP	-1.3	-2.1	-2.5	-4.5	-6.3	-5.8
Inflation rate (%)	19.7	29.9	18.8	11.9	8	7.1
% growth rate in dollar value of exports	15.2	15	5.6	7.6	12.3	17.3
Oil exports % growth rate	17.4	28.3	-19.2	1.7	17.7	3.1
Manufactured exports % growth rate	9.6	10.7	13	6.2	18.5	19.2
Total debt as % of GDP	46.9	43.8	43.8	34.6	33.2	35.2
Interest payments as % of GDP	4.7	3.1	2.9	2.3	2	2.2
Source: Damian, Tables 2.4 and 2.5						

As is often true of a third world country, another variable affecting the economy is the debt burden. This variable is especially important considering the Mexican debt default of 1982. However, as we can see from table 1, this burden went down during the 1989 – 1994 period.

Another trend during the pre-crisis period was increased social spending. Damian (2000) identified several advances in social spending during the pre-crisis period, such as increases in education and health spending. In fact, “towards the mid-1990s, particularly in 1994, public spending on health as a proportion of GDP surpassed the levels recorded

prior to the economic crisis of the 1980s” (Damian, 2000, pp. pp. 34). Finally, another change instituted by the government during the pre-crisis period was the decrease of the value added tax in 1991 from 15 to 10 per cent. Accompanying these changes came cuts such as the reduction of subsidies on food during the early 1990’s. However, by far the most controversial change in Mexico during the pre-crisis period was the wage control policy implemented as part of the adjustment policies to curb inflation. During the early 1990’s, the wage control policy included programs that limited minimum and contractual wage increases.

The Salinas de Gortari administration re-privatized banks in 1991 and opened banking markets to new domestic entrants in 1993. This deregulation, however, was not balanced with safety and soundness regulation. This, combined with a general lack of accounting/information standards and a weak legal system in the area of debt collection, set the stage for excessive loan volume (funded by short-term and/or dollar-denominated deposits) and credit risk-taking.

Despite this fragility in the banking system, the Mexican economy continued to perform quite well between 1989 and 1993. Real growth was generally strong, a disinflation trend was in place, and the government budget appeared to be sound. An estimated \$95 billion of foreign financial investment poured into Mexico between 1990 and 1993 (WorldBank, 2003). While not unambiguously positive, these standard economic performance statistics remained strong in December 1994 when the financial crisis began. Other domestic political and key country factors, then, helped drive Mexico

into crisis. The Chiapas rebellion, the Colosio assassination, and the nomination and election of Ernesto Zedillo, a relatively unknown political figure, as President, had a cumulative effect: risk perceptions of the international community increased and international reserves decreased. Further, a series of upward adjustments in United States interest rates beginning in February 1994 increased pressure on Mexican interest rates. Finally, financial market participants began to question the credibility of the fiscal and monetary policy authorities in the face of a crisis.

The results are well known. The pressure forced the government to change the exchange rate system from fixed to flexible. The peso depreciated more than 70 percent over the 1994-1995 period. The economy was in recession during 1995, and even now, banks continue to face significant problems even with a controversial government bailout¹.

Table 2 shows the corresponding data for the period of the crisis of 1995 and its aftermath. During the crisis period, the 7.5 per cent decrease in per capita income is the most notable change. The public deficit also increased during this time as the government attempted to accommodate the flight of capital. In addition, Mexico was not able to control inflation, as it immediately jumped to 52 per cent for 1995. Exports continued to have strong growth through this period, partly because of NAFTA taking effect on January of 1995. Specifically, NAFTA helped the development of the maquiladora industry, which accounts for the manufacturing exports along the United States border.

¹ For more detailed information on the 1994 crisis, including more data on the banking system situation and loans, see Gil-Diaz (1998).

We can see the effect with the 30 per cent growth rate in manufactured exports during this year.

	1995	1996	1997	1998	1999	2000
GDP per capita (1982 = 100)	88.2	91.0	95.5	98.9	101.3	106.6
Public budget as percent of GDP	-7.5	-0.6	-0.9	-1.9	-3.9	-1.0
Inflation rate (%)	52	27.7	15.7	18.6	12.3	9
% growth rate in dollar value of exports	30.2	18.2	10.8	9.7	16.1	22.0
Oil exports % growth rate	-2.1	9.21	5.7	1.6	-5.3	3.6
Manufactured exports % growth rate	30.6	20.7	15.0	6.4	16.1	22
Total debt as % of GDP *	61.2	49.5	38.3	40.0	36.0	26.9
Interest payments as % of GDP *	4.1	3.8	2.9	2.8	2.6	2.5

Source: Author's calculations from INEGI and Banco de Mexico. * World Bank (2000)

During 1995, total debt rose to 61 per cent of GDP (table 2) reminding Mexicans that they were still a third world country. However, many of the loans awarded to Mexico were short term causing a drop in the debt burden to 49.5 per cent of GDP in one year. To help pay for the loans, the Mexican government increased the value added tax back to 15 per cent, arguing that increasing other tax rates (such as the income tax) is normally not as effective in Mexico because of tax evasion.

For the recovery period, the figures are better. As we can see from table 2, soon after the crisis, GDP grew at much higher rates, thus allowing GDP per capita to reach and surpass the 1982 level by 1999. Similar to the pre-crisis period, the reduction of inflation and reduced dependence of Mexico on oil exports continue to be important goals of the nation during the recovery period, as we can see from the steady decline in inflation and the lower growth in oil exports. By the year 2000, the economy was again able to attain single digit inflation rates. In regards to manufacturing exports, growth rates

seem to go down, which may become an issue of concern in the future. In regards to the public debt burden, we continue to see a decrease, reaching levels as low as 26.9 per cent of GDP in 2000. This decrease in the burden can be attributed to two factors: the higher GDP growth rates and the repayment of short-term loans from the 1995 crisis. In absolute terms however, the Mexican debt today is still \$162 billion dollars (World Bank, 2003), making it one of the largest in Latin America.

In conclusion, the Mexican economy has been going through many changes during the 1990's. The pre-crisis period gave hope to Mexicans with the lower inflation rates and strong manufacturing exports growth. The crisis of 1995 became a reality check as capital fled the country, and the debt burden increased. NAFTA had begun a year before the crisis, somewhat alleviating the negative effect of the loss of capital and activating the border economy. The recovery period came with continued growth of exports, higher GDP growth rates, and policies that lowered inflation back to single digits. One may even wonder if the future will bring another crisis or a surprising continuation of strong macroeconomic conditions. Some recent good news came in 2000, when Moody's upgraded the Mexican debt to BBB+ (SHCP, 2003), and then again to Baa2 in 2002 (SHCP, 2003), allowing Mexico to borrow at lower rates than before.

III. Measuring Poverty in Mexico

Reducing poverty has always been a goal of the Mexican government, but only recently has a government made an effort to set an official measure of poverty. In March of 2000, President Vicente Fox invited the top poverty researchers in Mexico to develop the official measure. The final report (SEDESOL, 2002) suggests a methodology combining developments from earlier research. The SEDESOL report gives three measures of poverty, but does not address regional trends. In this section, I will describe the data set and methodology used by SEDESOL to measure poverty.

The Data Set:

The data set used for most of the poverty research for Mexico is the National Household Income and Expenditure Survey (ENIGH), which is managed by the National Statistics, Geography, and Computer Science Institute (INEGI). For my research, the surveys available through the Luxembourg Income Study (2003) are the ones for the years 1989, 1992, 1994, 1996, and 1998. Though the ENIGH survey is the standard dataset for poverty research, there are two major problems with the data set that potentially affect any analysis of the income distribution in Mexico:

1. Underreporting: When comparing the income reported in the survey to National Accounts, it is estimated that there is up to 60 per cent underreporting².

² See Damian (2000) pp. 58 for details on the underreporting.

2. Definition of rural population inconsistency: There was a change in the definition of rural populations in the year 1992, which makes the reported 1992 rural population smaller than that of 1989.

The implications of these problems for poverty analysis are considered in turn.

According to Damian (2000), the problem of underreporting comes from people being afraid of the survey somehow ending up in the national taxing agency (Secretaria de Hacienda y Credito Publico, SHCP), forcing them to pay more taxes. However, poor people actually do not pay income taxes, so there is no reason for them to underreport their already low incomes. For that reason, I do not believe this issue to affect poverty measurements. Although some researchers have developed correction methods to correct the underreporting, they require extensive knowledge and access to the National Accounts Records, which I lacked. As Damian notes (Damian, 2000, pp 58) the difficulty of including the very rich people of Mexico in the survey is what causes most of the underreporting. For this reason, the incidence of poverty should not be affected.

In regards to the definition of rural areas, the ENIGH survey in 1989 defined rural areas as housing units not fulfilling any of the following requirements: metropolitan areas or state capitals, or in localities of 2,500 or more inhabitants or in municipalities with a total population of 100,000 inhabitants or more. However, the ENIGH surveys for 1992, 1996, and 1998 define rural areas as housing units in localities with less than 2,500 inhabitants. Because municipalities encompass more than one locality, the 1989 survey

will count fewer rural households than the 1992 survey, *ceteris paribus*. Rural populations in 1989 are therefore not comparable to those in 1992. Had the 1989 survey counted rural households with the same standard as the 1992 survey, the rural population would have been greater.

This change in definition of rural households is important in the analysis of poverty because rural households are treated differently. For example, we will later discuss the definition of a basket of goods that is cheaper for rural communities. Because the 1989 survey counts more rural households than the 1992 survey, the poverty line for 1989 will be lower than that of 1992. This implies that poverty will be overestimated in the year 1989 compared to poverty in 1992. To avoid the problem, I decided to omit the results for 1989 because of the possible bias.

Finally, an issue with the ENIGH data set that may affect poverty analysis is the definition of income, because the survey measures net disposable income after taxes. The problem lies in that some countries (such as the United States) consider direct taxes as an expense, which therefore should not be considered as a deduction from computed income. However, this will not heavily affect our measure because very few of the poor people in Mexico pay income tax.

Methodology of Poverty Measurement

The two most common concepts of poverty are the absolute and the relative measures of poverty. An absolute measure, such as the one currently used in the United States, defines a poverty line based on the cost of a basket of goods. Those that have inadequate income to buy the basket of goods are considered poor. There are many variants to this concept of poverty, but the idea of a line defined independently of the income distribution is the basis of absolute poverty.

On the other hand, if we define the poverty line relative to some element (for example, the median) of the income distribution, we have a relative poverty measure. There are also variants to this methodology, but the defining aspect of this method is that it uses distance from some social norm as a standard rather than a basket of goods. This methodology is used by the European Union and by many European countries.

The critical calculation for any absolute measure of poverty is the determination of a basket of goods a person must be able to buy to avoid being poor. Most lines begin by defining a basket of food items. However, even there we have controversies. In Mexico alone, five baskets of food items³ have been proposed. Some use nutritional content information to define biological needs, and others use surveys that ask people what food items they consider important. For example, the basket of goods defined by the National Bank in Mexico includes beer as a necessary food item (Martinez, 2001). After defining the items in the basket of goods, the researcher must now find the cost to the

³ See Martinez (2001) for detailed information on the baskets of good.

basket. Most researchers adjust the cost of the basket for rural areas, where the cost is lower. Suppose we have defined the cost of a basket of food items. We now must find a way to include such things as rent, clothing, and other important goods.

To address the problem of including necessities other than food, the original United States poverty line developed by Molly Orshansky⁴ employed an Engel coefficient, which represented the proportion of a poor person's income used to buy food items. Dividing the cost of a food-based basket of goods by this coefficient gives a line of poverty⁵. The Engel coefficient technique is used in the official measure of poverty for the United States and in some of the measures for Mexico. However, such researchers as Amartya Sen (2000) disagree with this proposal and suggest calculating the actual cost of the broader basket of goods including such items as housing and clothing. This method is sometimes referred to as the Unsatisfied Basic Needs method (UBN).

An example of a study of poverty in Mexico using absolute poverty is the SEDESOL study (SEDESOL, 2002), a report following the 2000 conference on poverty. The report defines three baskets of goods leading to three poverty lines. The first poverty line includes only a basket of food items defined by biological requirements. The second poverty line incorporates food, health expenses, and education by using an Engel coefficient. The last poverty line uses a smaller Engel coefficient to incorporate all of the

⁴ On 1965, Orshansky came up with the methodology currently used in the United States (United States Department of Health and Human Services, 2001).

⁵ One objection used against using the Engel coefficient has been the need for the coefficient to be readjusted for each survey because proportion of income spent on food changes. In the United States, this is not done, which makes one question the poverty line derived from its usage.

above plus rent, shoes, and public transportation expenses. The SEDESOL study does not adjust to National Accounts for the reasons explained earlier. In addition, it does not adjust for the rural definition problem because it did not intend to use the methodology to analyze poverty before 1992. Although the ENIGH data set is a household data set, SEDESOL divided household income by the size of the household to obtain per capita income. The report therefore ignores the economies of scale derived from families living in the same house. SEDESOL argues that they could not adjust for economies of scale because no equivalence scale is available for Mexico (SEDESOL, 2002, pp 60). Finally, SEDESOL adjusted for price changes using the Consumer Price Index published every month by the National Bank of Mexico < www.banxico.gob.mx >.

A relative measure of poverty does not use a basket of goods at all. Rather, the line is defined as a percentage of the median income (for example 50 per cent). Even though defining the correct percentage is even more subjective than determining a basket of goods, it is beneficial to consider both measures. It is possible for trends to be different with different measures (as we will see), allowing us to better understand what happened to poverty in Mexico across time.

A further refinement of the concept of relative poverty is to allow for each region in the country to have its own relative poverty line in order to see changes in the income distribution within the regions. This variant of relative poverty is referred to as “regional relative poverty.” Forster, Jesuit, and Smeeding (2002) provide an example of regional relative poverty when they analyze poverty within regions and across regions for eastern

European countries. In contrast to national relative poverty, regional relative poverty is determined by the relative compression of the lower end of the distribution in each region, which is affected by two forces: on the one hand, an increase in the median of the regional distribution would raise the poverty line, therefore increasing the poverty rate; on the other hand, a decrease in the income for the lower end of the distribution would also raise the poverty rate as people drop below unaltered poverty line. In the case of Mexico, the diversity of economic activities makes the regional relative analysis of poverty very illuminating.

IV. Poverty rates for Mexico

Absolute Poverty

To measure absolute poverty, I first attempt to approximate the SEDESOL report poverty line that includes food, health and education, using the ENIGH data set provided by the Luxembourg Income Study. Similar to the SEDESOL study. I do not adjust to National Accounts, nor do I adjust for the rural definition change. In addition, I also convert the income to a per capita basis by dividing the household income by the family size to better follow the methods of the SEDESOL report. The SEDESOL report sets the food basket cost at 485.71 pesos per person per month for the rural areas and 652.57 pesos per person per month for urban areas in 1992 (SEDESOL, 2002, pp. 38). The additional cost of health and education in 1992 are estimated in the report as 18.9 pesos per person per day for rural populations and 24.7 pesos per person per day for urban populations (SEDESOL, 2002, pp. 9).

I identify three periods: 1992 -1994 will be identified as the pre-crisis period; the 1994 – 1996 will be referred to as the crisis period; finally, the 1996 – 2000 period will be referred to as the recovery period. As we can see from table 3, I find somewhat different levels of poverty than SEDESOL, but similar trends. As we look at the numbers in more detail, we can see that the poverty rates are very influenced by changes in GDP (tables 1 and 2). Absolute poverty increased in periods of low GDP growth and decreased in periods of high GDP growth. In addition, note the high manufactured exports growth rates after NAFTA took effect in 1995 (table 2). Because of the consistent upward trends in GDP and exports, we are not surprised with the decrease in absolute poverty from 1996 to 1998 on to 2000.

Table 3. Different poverty rates for Mexico					
	Pre-Crisis		Crisis	Recovery	
Povert / Year	1992	1994	1996	1998	2000
SEDESOL	28.9%	29.4%	45.3%	40.7%	31.9%
Absolute Poverty (1)	39.9%	43.5%	58.2%	52.7%	N/A
Relative Poverty (1)	24.9%	25.9%	23.9%	25.5%	N/A
(1) Data for 2000 not available through Luxembourg Income Study					
key: N/A Not Available					
Source: SEDESOL report (SEDESOL, 2002) and author's calculations.					

Relative Poverty

To calculate relative poverty, I define the line to be at 60 per cent of the median per capita income, as income levels are already low to begin with. I adjust for rural populations by calculating the difference in costs of living from the basket of goods between rural and urban households and adding this amount to the income of those living in rural populations.

Relative poverty should not be as heavily affected by changes that affect the entire country, such as the 1995 crisis. The results from table 3 verify this intuition as national relative poverty actually decreased during the crisis period. In fact, changes in relative poverty come from changes in the income distribution, so the interpretation is that the crisis compressed the bottom end of the national income distribution.

In conclusion, the absolute poverty measure tells us that the purchasing power of the Mexicans was heavily affected by the crisis. On the other hand, we can see the purchasing power grow during the recovery period. On the other hand, the relative poverty measure tells us that the crisis led to a shift in the income distribution with the middle class showing a sharper decline than the low-income population. As middle class income decreases, the relative poverty line also decreases, therefore reducing the incidence of relative poverty.

V. Convergence

The standard convergence measures first introduced by Barro and Sala-i-Martin (1995) were designed to measure output growth convergence between regions. Convergence analysis is grounded in the economic growth theory of Solow (1956), which finds the equilibrium level of capital and labor for a stable path of economic growth. Barro and Sala-i-Martin (1995) assumed a Cobb-Douglas production function, free mobility of capital, and common technological knowledge to develop the convergence analysis used today. In their analysis, output convergence builds on the idea that

preferences, technology, and institutions tend to be similar in a country, suggesting that convergence of per capita income across states should be expected in the long run.

Whether the same conclusions can be made in regards to poverty remains a question. In order to evaluate this question, I adapt the growth convergence techniques by analyzing regional poverty rates instead of regional output growth rates. This section uses both absolute and relative measures of poverty to explore whether the relationships between the regions had an effect on poverty trends.

Literature Review

In general, σ (absolute) convergence “concerns cross-sectional dispersion... measured, for example, by the standard deviation of the logarithm of per capita income or product across a group of countries or regions” (Barro and Sala-i-Martin, 1995, pp. 383). On the other hand, β (conditioned) convergence applies “if a poor country tends to catch up with the rich one in terms of the level of per capita income or product” (Barro and Sala-i-Martin, 383). The common approach to calculate σ conversion is a simple one described in equation 1:

$$\sigma_t = \text{stdev} (\log(Y_{i,t})) \quad (1)$$

where “stdev” is used to represent the standard deviation, “i” for the regions, “Y” for real per capita income, and “t” for time. The convergence hypothesis suggests that σ_t will fall with t.

On the other hand, the method to obtain β involves the following equation (Barro and Sala-i-Martin, 1995, pp 384):

$$(1/T) \log(Y_{iT} / Y_{i,0}) = a - [(1 - e^{-\beta T}) / T] * \log(Y_{i,0}) + u_{i0,T} \quad (2)$$

where “i” is used for the regions, “Y” for real per capita income, “t” for time (t = 0 is the first year and t = T is final year in the analysis), and “u” for a random disturbance as a reflection of unexpected changes in production conditions or preferences.

A version of equation 2 suitable for estimation is given by:

$$(1 / T) \log (Y_{iT} / Y_{i0}) = \beta_0 + \beta_1 \log(Y_{i0}) + u_{i0,T} \quad (3)$$

The convergence hypothesis is that $\beta_1 < 0$.

An example of an application of the convergence tools explained above can be seen in the paper by Javier Sánchez-Reaza and Andrés Rodríguez-Pose (2002). In this paper, Sanchez and Rodriguez (2002) analyzed Mexico’s per capita income convergence rates after joining GATT and NAFTA in 1994. In the end, Sanchez and Rodriguez (2002) found convergence during the protectionist era of 1970-1985 and divergence during the trade liberalization periods of 1985-1998 (which includes the NAFTA period) for both the σ and β convergence measures.

For my research, an analysis of poverty convergence across time is very useful to measure whether states with higher poverty rates are improving across time relative to states with lower poverty. In the case of Mexico, convergence analysis is especially important to evaluate the response of poverty to the 1995 crisis. In addition, we can use

both absolute and relative measures of poverty. The only adjustment necessary for our analysis is to remove the logarithms from the regression because we already have percentage rates. Our σ convergence is simply the standard deviation of the state poverty rates. Finally, our new β will be calculated from the following regression:

$$(1 / T)[\text{Poverty}_{iT} - \text{Poverty}_{i0}] = \beta_0 + \beta_1 \text{Poverty}_{i0} \quad (4)$$

where as before, “t” represents time (t = 0 is the first year and t = T is final year in the analysis).

Results

Table 4 below shows the results for σ convergence while table 5 shows the results for β convergence for absolute and relative poverty. We need to evaluate trends for each measure of convergence in order to gather more information regarding the periods of analysis.

In regards to σ convergence, the levels decrease as we move from absolute to relative poverty rates (table 4). The result is explained by examining the range of the poverty rates for the different measures (full detail in Appendix 1). For absolute poverty, rates in 1996 range from 12 per cent in Baja California Norte to 90 per cent in Chiapas. In the case of national relative poverty, the rates range from 3 per cent in Baja California Norte to 54 per cent in Chiapas.

Periods / Convergence	Absolute	Relative
1992	0.171	0.147
1994	0.165	0.132
1996	0.176	0.129
1998	0.172	0.144

Source: Author's calculations.

For my analysis, both measures of poverty show that the pre-crisis is associated with σ convergence. However, the σ convergence calculations gives mixed results for the crisis and recovery periods with divergence followed by convergence using the absolute measure, but convergence followed by divergence with the relative measure of poverty.

In regards to β convergence, we use equation (4) in order to calculate the β_1 coefficient. The results in table 5 show that all the coefficients are negative, as convergence theory predicts, though the β coefficients for absolute poverty are significant only for the recovery period. On the other hand the β coefficients for relative poverty are significant for all periods except the recovery period.

Periods / Poverty	Absolute	Relative
1992 - 1998 (std. error)	-0.015 (0.147)	-0.023 (0.017)
Pre-Crisis (std. error)	-0.067 (.0587)	-0.129 (0.040)
Crisis (std. error)	-0.050 (0.059)	-0.142 (0.040)
Recovery (std. error)	-0.059 (0.016)	-0.004 (0.051)

Source: Author's calculations with robust standard errors

In conclusion, σ convergence measures provide no clear result. On the other hand, β convergence measures suggest that there is some convergence. Further analysis is needed to understand the results.

VI. Migration Patterns

An important question at this point is the effect of migration on poverty. On the one hand, we have people in poor states moving to richer states (or the United States) to find a better life. Another well-known phenomenon is the movement of non-poor people out of Mexico City into adjacent poorer areas to avoid the problems of the big city (e.g. pollution, crime, and traffic). In both cases, we might expect a decrease in poverty in the poor states and an increase in poverty in the richer states.

The line of causality between migration and regional poverty runs in both directions. On the one hand, poverty can lead someone to move to another state. On the other hand, migration can cause poverty to change as discussed above. Hence, we need to calculate both effects. In order to determine whether migration is a consequence of high poverty, I regress migration on poverty in the previous period:

$$\text{migration}_{t,T} = \beta_0 + \beta_1 \text{poverty}_t \quad (5)$$

where “t” and “T” represent the first and final time periods respectively. Theoretically, higher poverty rates should lead to higher net out migration. We should therefore see negative β_1 coefficients. On the other hand, to determine whether poverty is related to migration in the previous period, I run the following regression:

$$\text{poverty}_T = \beta_0 + \beta_1 \text{poverty}_t + \beta_2 \text{migration}_{t,T} \quad (6)$$

This time, we evaluate the effect poverty and migration in the first period have on poverty in the second period. In this equation, a negative α_2 would imply that net out migration increases poverty, while a positive α_2 would imply that net in migration increases poverty.

In order to calculate the regressions, it was first necessary to obtain migration rates per state. To do so, I first estimated the population per state by using the ENIGH data set through the Luxembourg Income Study (2003). I then obtained the number of births and deaths per state through SEMARNAT (2003) and used these to estimate how much of the population change was due to natural increase and how much due to changes in net migration. The net migration calculations are attached in Appendix 2.

As with convergence, we can use absolute and relative poverty to evaluate the trends. Tables 6 and 7 show the results for the regression coefficients for both equations and measures of poverty. As we can see from the results for equation 5, poverty changes due to the crisis and recovery did not have major effects on migration. In addition, the results for equation 6 suggest that poverty results are not just a consequence of migration.

However, it is difficult to determine the factors that drove changes in poverty for each of the 31 states with this information. Hence states must be aggregated for a more thorough regional analysis.

Table 6. Relationship between migration and absolute poverty.

Regression	migration (t, T) = $\beta_0 + \beta_1 \text{Poverty}(t)$			Poverty(T) = $\beta_0 + \beta_1 \text{Poverty}(t) + \beta_2 \text{Migration}(t, T)$		
	Pre-Crisis	Crisis	Recovery	1994	1996	1998
Constant	0.1221	0.0298	0.0694	0.1049	0.1725	0.0238
(std Error)	(0.0621)	(0.0803)	(0.0594)	(0.0312)	(0.062)	(0.0423)
β_1	-0.2648	-0.0955	-0.0632	0.8918	0.8995	0.8899
(std. Error)	(0.1359)	(0.1551)	(0.0847)	(0.0677)	(0.1191)	(0.0656)
B_2	-	-	-	0.1031	0.0050	0.1299
(std. Error)	-	-	-	(0.0925)	(0.1251)	(0.1227)
R-squared	0.11	0.01	0.01	0.80	0.69	0.82

Source: Author's Calculations with robust standard errors.

Table 7. Relationship between migration and relative poverty.

Regression	migration (t, T) = $\beta_0 + \beta_1 \text{Poverty}(t)$			Poverty(T) = $\beta_0 + \beta_1 \text{Poverty}(t) + \beta_2 \text{Migration}(t, T)$		
	Pre-Crisis	Crisis	Recovery	1994	1996	1998
Constant	0.1013	-0.0043	0.0576	0.0793	0.0477	0.012
(std Error)	(0.0493)	(0.0603)	(0.0377)	(0.0245)	(0.0267)	(0.0239)
β_1	-0.34342	-0.0412	-0.1086	0.7388	0.719	1.0082
(std. Error)	(0.1547)	(0.1914)	(0.1119)	(0.0826)	(0.0837)	(0.1106)
B_2	-	-	-	-0.0081	0.0919	0.1537
(std. Error)	-	-	-	(0.1194)	(0.1072)	(0.11)
R-squared	0.14	0.001	0.02	0.68	0.54	0.81

Source: Author's Calculations with robust standard errors.

VII. Regional Analysis

In the past, most regional analysis has been based on geographic variables. For example, in their regional poverty analysis, Lustig and Szekely (1997) used a straightforward, but purely geographical (northeast, northwest, etc.), definition for regions in Mexico. Other researchers, such as Sanchez-Reaza and Rodríguez-Pose (2002) use economic activities, but only explicitly define three regions (oil states, tourism states, and border states with maquiladoras). For my analysis, I determine the most important economic variables for Mexico by reference to historical context.

Ever since the beginnings of the pre-colonial era agriculture has been an important component of the Mexican economy. Today, agriculture in Mexico still accounts for about seven per cent of GDP⁶ while employing more than 25 per cent of the population⁷. There are seven states with strong agricultural output in relation to the rest of the country (Baja California Sur, Durango, Michoacan, Nayarit, Oaxaca, Sinaloa, and Zacatecas). Throughout history, even before the Spaniards arrived, Mexico City has been the most powerful city, today housing more than 20 per cent of the population. Hence, Mexico City is treated as a separate region. The industrial revolution came and American investors arrived in Mexico to extract oil in 1900⁸. Until recently, oil had always been a very important component of the economy.

⁶ GDP in the food sector (INEGI, 2003). 5.5 per cent of only account for agriculture. If you include food, drinks, and tobacco, the number jumps to 10.6 per cent.

⁷ Own calculations using the National Household Income and Expenditure Survey (ENIGH) through the Luxembourg Income Project.

⁸ PEMEX history of the Oil Industry at www.pemex.com.

In a conference this year at the Netherlands, the president noted the following: "... oil exports, in comparison to total exports are less than 10 per cent, when 25 years ago they used to be 80 to 85 per cent. The same can be said in relation to proportion of GDP, which is now less than 10 per cent, when 25 years ago it used to be a very important part of GDP." (Presidencia, 2003). Today, most of the oil in Mexico is extracted and refined in four states (Campeche, Chiapas, Tabasco, and Veracruz). Soon after World War II, the first non-military president in Mexico (Miguel Aleman Valdez, 1946) noticed the beaches in Mexico, and developed the first resort in the Pacific town of Acapulco, starting the development of the now very important tourism industry in 1948. The most important tourism resorts are located in 5 states of Mexico (Colima, Guerrero, Jalisco, Quintana Roo, and Yucatan). By this time, the United States was already the number one economic power, and the states bordering the United States began developing a trade economy. However, because of protectionist government policies, the border area did not become important until Mexico's entrance to the General Agreement on Tariffs and Trade in 1985. There are 6 states that border the United States (Baja California Norte, Chihuahua, Coahuila, Nuevo Leon, Sonora, and Tamaulipas). Finally, the most recent trend in Mexico has been the movement of the manufacturing industries away from the already overcrowded border-states. As Sanchez-Reaza and Rodriguez-Pose (2002) note, states such as Queretaro and Tlaxcala, began attracting capital with benefits such as tax breaks. Most of the movement away from the border developed in 8 smaller states (Aguascalientes, Guanajuato, Morelos, Puebla, Queretaro, San Luis Potosi, and Tlaxcala). The results are reorganized in table 8.

Region	States encompassing region
Agriculture	Baja California Sur, Durango, Michoacan, Nayarit, Oaxaca, Sinaloa, and Zacatecas.
Border	Baja California Norte, Chihuahua, Coahuila, Nuevo Leon, Sonora, and Tamaulipas.
Mexico City	Mexico City, the suburbs of Mexico City, and those living in the state of Mexico
Manufacturing	Aguascalientes, Guanajuato, Hidalgo, Morelos, Puebla, Queretaro, San Luis Potosi, and Tlaxcala.
Oil States	Campeche, Chiapas, Tabasco, and Veracruz.
Tourism	Colima, Guerrero, Jalisco, Quintana Roo, and Yucatan.

VIII. Regional Poverty Results⁹

The absolute poverty results by region are summarized in table 9. The first results we notice are the lower poverty rates in Mexico City and the states bordering the United States. This is not surprising, as we know that higher concentrations of capital are traded in these areas. The states that consistently show the highest poverty rates include the Agricultural and Oil states. As we can see from table 10, this may have to do with the fact that agricultural and oil-producing states are very rural. Even though we adjusted the basket of goods for the rural areas, we still obtain a higher poverty rate in these states. People that are familiar with the Zapatista revolutionary movement in the southern state of Chiapas are never surprised when they see the high poverty rates in these regions. Even though Chiapas is an oil producing state, most of the income derived from the oil industry goes to the federal government.

⁹ With the regions defined, I tested the possibility of different intercepts for the beta convergence regressions reported in table 5, but no statistically significant results emerged. These results are presented in Appendix 3.

Table 9. Absolute Poverty Rates in Mexico by region				
Period	Pre-Crisis		Crisis	Recovery
Region / Year	1992	1994	1996	1998
Agriculture states	54.41%	53.50%	65.25%	59.15%
US bordering states	22.68%	26.07%	38.80%	33.36%
Mexico City	24.30%	28.88%	49.11%	44.83%
Manufacturing states	53.61%	57.01%	68.57%	65.09%
Oil states	50.81%	59.51%	74.06%	66.12%
Tourism states	38.53%	42.03%	60.72%	50.38%
Source: Author's Calculation				

Table 10. Rural Population in Mexico by region				
Period	Pre-Crisis		Crisis	Recovery
Region / Year	1992	1994	1996	1998
Agriculture	41.45%	41.65%	42.01%	41.59%
Border	13.95%	12.25%	13.65%	15.25%
Mexico City	7.77%	8.11%	10.88%	10.02%
Manufacturing	35.38%	38.00%	38.15%	33.60%
Oil States	48.98%	47.81%	46.69%	47.10%
Tourism states	25.42%	23.21%	23.84%	24.06%
Source: Author's Calculation				

As table 9 shows, absolute poverty increased during the pre-crisis period in almost every region, suggesting that the small increase in real GDP during the period was not enough to decrease poverty.

Moving on to the crisis period, the biggest increases in absolute poverty occurred in Mexico City and the oil states. It is well known that Mexico has been trying to eliminate corruption in the national petroleum agency (PEMEX) in order to eventually sell the refining complexes. One of the biggest problems in PEMEX is the great number of people hired to reduce unemployment in Mexico. The story of the supervisor of the supervisor to the employee that twists a handle twice a day is frequently told amongst Mexicans. As PEMEX has become more efficient, many people have lost their jobs,

making the situation worse for the general population in these areas. Since 1990, PEMEX has stopped growing. As a result, it is not surprising that poverty increased in the oil producing states. In regards to Mexico City, a different story may explain the high increase in poverty. The 1995 crisis is thought to have affected urban areas such as Mexico City (see table 10) very heavily.

During the recovery period, we see the biggest drops in poverty in agricultural, tourism and the oil producing states. However, poverty rates were so high to begin with in these areas, that the absolute decreases are not as surprising. After these regions, Mexico City and states bordering the United States are the ones with the biggest decreases. As before, this is not surprising because of the development of the NAFTA and the high concentrations of capital in these areas.

National relative poverty rates are shown in table 11. Even though the story is different, we still find similarities in levels between relative and absolute poverty. For example, Mexico City and the states bordering the United States are the regions with the lowest poverty rates. In addition, the Oil and Agricultural states are among the regions with the highest relative poverty. The same regions are relatively more or less prosperous, whether compared to a basket of necessities or to the national median.

Period	Pre-Crisis		Crisis	Recovery
Region / Year	1992	1994	1996	1998
Country	24.88%	25.89%	23.89%	25.50%
Agriculture	32.68%	35.49%	31.33%	31.90%
Border	12.44%	13.12%	12.14%	10.11%
Mexico City	12.00%	12.41%	15.05%	19.85%
Manufacturing	37.03%	35.55%	29.58%	39.29%
Oil States	33.45%	38.02%	36.85%	36.64%
Tourism	25.63%	26.69%	25.73%	24.50%
Source: Author's Calculation				

In regards to the pre-crisis period table 11 shows small increases in relative poverty for most of the regions, with manufacturing being the exception. However, most interesting with the national relative measure is the decrease of poverty during the crisis period in most of the regions. In fact, the only notable increase in poverty happened in Mexico City. This can be explained by changes in the income distribution. The 1995 crisis affected the middle class the most. As their income dropped, more people were classified as poor under national relative poverty. Hence, the regions most likely to have an increase in relative poverty from the crisis are those in which the middle class is dominant.

The crisis was associated with a major decrease in relative poverty in the agricultural and the manufacturing regions. The reason for the decrease in poverty in these regions may have been the currency devaluation. As the peso lost value, Mexico reduced imports and increased exports of both agricultural and manufactured goods. While the median income decreased in the country, these regions actually gained from the currency

devaluation, relative to other regions. Hence, these regions might actually benefit from a currency crisis, as their incomes rise relative to the national median.

The recovery period shows relatively small changes with the biggest mover again being Mexico City. As before, the growth in median income raises the poverty line, therefore increasing poverty. Theoretically, rising incomes could make up for the increasing poverty line, but that was not the case for Mexico City. One region that benefited from the recovery period was the border region. As we will confirm with the regional relative poverty measure, poverty decreases in the border region as the middle class becomes larger. In turn, the middle class becomes larger in this region as the economy becomes more connected to the United States. The effects of NAFTA are becoming evident in the decreasing poverty rates.

We now explore the trends on the lower end of the distribution, which will be measured by the regional relative measure of poverty. As explained earlier, regional relative poverty incorporates a poverty line for each region. As with national relative poverty, the poverty line for regional relative poverty will be defined as a percentage of the median income.

To measure regional relative poverty, I also chose to use 60 per cent of the median per capita income in the region for consistency. As with national relative poverty, I increased rural households' income to adjust for the cheaper cost of living. This time, there is a different line of poverty for each region. The trends for regional relative poverty

rate will be very sensitive to the relative compression of the lower end of the distribution within each region. Hence there are two ways in which regional relative poverty can increase: either a decompression at the upper end of the lower half of the distribution causes an increase in the poverty line, or a decompression at the lower end causes more people to fall below the relative poverty line. A study of the 50th and 20th percentile across time is often helpful to see the trends.

Period/Region	Pre-Crisis	Crisis	Recovery
Agricultural	-17.65%	-17.31%	10.64%
Border States	-11.77%	-24.92%	18.45%
Mexico City	-11.70%	-31.27%	1.22%
Manufacturing	-9.89%	-14.45%	5.80%
Oil states	-11.02%	-24.10%	8.66%
Tourism States	-15.07%	-22.24%	14.22%

Source: Author's Calculations

Period	Pre-Crisis	Crisis	Recovery
Agricultural	-7.65%	-18.49%	8.04%
Border States	-14.66%	-19.98%	15.12%
Mexico City	-10.51%	-32.68%	10.05%
Manufacturing	-12.36%	-18.20%	9.06%
Oil states	-15.08%	-26.17%	15.35%
Tourism States	-9.28%	-29.76%	18.90%

Source: Author's Calculations

As we can see from table 12, real disposable income at the 20th percentile of all regions moved in the same direction across time. However, the magnitudes are different.

During the pre-crisis period, the regions with a bigger decrease were the agricultural and tourism states. During the crisis, the loser was Mexico City by a great margin over the other regions. Finally, during the recovery, the region most benefited was the border states.

Table 13 shows the trends for the 50th percentile of the distribution of real disposable income in each region. Even though the direction of change is consistent across regions, some differences in magnitudes are important to notice. During the pre-crisis period, the regions most affected were the oil and border states. During the crisis period, Mexico City was again the region with the biggest drop, closely followed by the oil region. Finally the biggest winners during the recovery period were the oil, tourism, and border states.

When we move to explore the regional relative poverty rates in table 14, we can see how the percentiles help us explain the movements in the poverty rates.

Period	Pre-Crisis		Crisis	Recovery
Region / Year	1992	1994	1996	1998
Country	24.88%	25.89%	23.89%	25.50%
Agriculture	21.40%	25.13%	24.35%	23.29%
Border	25.00%	24.40%	25.79%	25.20%
Mexico City	22.30%	22.88%	22.55%	25.82%
Manufacturing	24.46%	23.31%	21.37%	21.75%
Oil States	23.45%	19.60%	18.24%	21.10%
Tourism	16.68%	16.80%	21.13%	19.49%
Source: Author's Calculation				

Regional relative poverty rates do not differ very much. That is, the degree of compression of the income distribution is similar across regions. In general, the Border states and Mexico City have the highest regional relative poverty rates. With regards to Mexico City, the lower end of the distribution is large relative to a prosperous middle class.

The pre-crisis period shows trends similar to the trends in the national relative poverty. The regions that saw a decrease in poverty were the border, oil, and manufacturing states. Something peculiar with these states is that they saw a larger decrease in the 50th percentile of the distribution than in the 20th percentile of the distribution, as we can see from tables 13 and 14. This implies that the lower end of the distribution became compressed. As this happens, the relative poverty line falls to the point that regional relative poverty decreases.

Similar movements can explain the trends during the crisis. Although Mexico City was the most affected, both the middle and the bottom of the distribution shifted. Therefore, regional relative poverty was fairly stable during the crisis period. For the border states, economic conditions are causing the region to behave uniquely. As NAFTA opens trade in this region, the border states in Mexico and the United States become more connected. In regards to poverty, this implies that the Mexican border states start behaving like a developed country, with increasing regional relative poverty during crisis periods and decreasing poverty during recovery periods.

During the recovery period, most regions saw an increase in regional relative poverty as the lower end of the distribution decompressed. However, the border states behave differently with a decrease in poverty. Similarly to the crisis period, the answer may lie in the convergence of the border states to the United States economy. The tourism states also saw a decrease in poverty during this time, which can be explained by the changes in the lower end of the distribution. Notice that the 20th percentile of the tourism states increased much more than the 50th percentile during the recovery. This implies that the poverty line grew slower than the lower end of the distribution, therefore reducing poverty.

IX. Conclusions

The regional analysis in Mexico is a useful addition to the analysis of poverty during the 1990's. In regards to absolute poverty, for example, the values for the regions ranged from 19.9 per cent in Mexico City to 47.20 per cent in the agricultural states. However, much more interesting was the fact that trends were also different across regions.

In regards to the periods, we notice that the pre-crisis affected poverty negatively. Absolute and national relative poverty increased for all regions during this period. However, the regional relative poverty calculations show mixed results for the different regions. In fact, manufacturing, border, and oil states saw a decrease in regional relative

poverty suggesting that the lower end of the distribution became relatively better off during the pre-crisis period in these regions.

During the crisis period, absolute poverty increased dramatically in every region. In addition, my results for relative poverty trends support the idea that the middle class was most heavily affected by the crisis. National relative poverty rates decreased in almost all regions, except for Mexico City, where the middle class is most prominent. On the other hand, another interesting trend becomes evident during this period as NAFTA takes effect. The only region with a notable increase in regional relative poverty rates was the border region, which suggests that the border region is becoming much more like a developed economy with increasing inequality during crisis periods and decreasing inequality in recovery periods.

During the recovery period, absolute poverty decreased in every region. However, the national relative measure gives mixed results: the middle class did not completely recover during this time in Mexico. On the other hand, the border region has benefited during this period. In regards to regional relative poverty, most regions saw an increase in regional relative poverty during the recovery, except for the border region, the region most affected by NAFTA.

In conclusion, the crisis deeply affected both poverty and the regional pattern of poverty in Mexico. Specifically, the crisis seriously affected the middle class, as indicated by the notable increase in national relative poverty rates in Mexico City.

Although the recovery period decreased absolute poverty, we also saw increased inequality during the recovery period as evidenced by increasing national and relative poverty rates. The government should be aware of these trends as the economy of Mexico completes its recovery from the 1995 crisis.

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Appendix 1. State Poverty Rates

Poverty	Absolute		National Relative	
	1992	1994	1992	1994
Aguascalientes	0.3777	0.4179	0.2355	0.2102
Baja California Norte	0.0947	0.2006	0.0442	0.0703
Baja California Sur	0.1405	0.3041	0.0508	0.2082
Campeche	0.5114	0.5476	0.346	0.2525
Coahuila	0.372	0.4311	0.2489	0.1969
Colima	0.2387	0.3454	0.1209	0.1674
Chiapas	0.6824	0.5696	0.4972	0.3282
Chihuahua	0.2278	0.3192	0.1157	0.1656
Distrito Federal	0.1908	0.1882	0.0813	0.0743
Durango	0.4849	0.4868	0.2585	0.2588
Guanajuato	0.4866	0.5448	0.2599	0.2598
Guerrero	0.6415	0.7039	0.5684	0.4772
Hidalgo	0.569	0.6356	0.3723	0.388
Jalisco	0.2768	0.3425	0.1218	0.2087
Estado de Mexico	0.2883	0.3908	0.1498	0.16
Michoacan	0.5348	0.6287	0.2209	0.3778
Morelos	0.415	0.4712	0.242	0.2027
Nayarit	0.423	0.6553	0.2868	0.3484
Nuevo Leon	0.2236	0.2389	0.1216	0.0735
Oaxaca	0.8018	0.7552	0.5605	0.5756
Puebla	0.6669	0.6967	0.5679	0.4792
Queretaro	0.4183	0.548	0.2548	0.2729
Quintana Roo	0.3196	0.3447	0.1713	0.2036
San Luis Potosi	0.4757	0.65	0.3025	0.4967
Sinaloa	0.3524	0.3173	0.2083	0.1475
Sonora	0.1886	0.1947	0.0885	0.1002
Tabasco	0.5033	0.6609	0.3579	0.4457
Tamaulipas	0.2707	0.3344	0.1205	0.2129
Tlaxcala	0.6258	0.5724	0.3976	0.2935
Veracruz	0.4099	0.6181	0.2331	0.3906
Yucatan	0.4502	0.4646	0.2649	0.2203
Zacatecas	0.5257	0.5838	0.3686	0.356

Source: Author's Calculations

Table 16. State Poverty Rates for 1996 and 1998				
Poverty	Absolute		National Relative	
Year	1996	1998	1996	1998
Aguascalientes	0.5819	0.5376	0.181	0.1727
Baja California Norte	0.1192	0.1728	0.029	0.0224
Baja California Sur	0.2789	0.2296	0.0898	0.0847
Campeche	0.6903	0.7125	0.3162	0.4249
Coahuila	0.5817	0.4376	0.1682	0.1072
Colima	0.4202	0.5189	0.1253	0.2381
Chiapas	0.9003	0.8715	0.5407	0.6176
Chihuahua	0.4197	0.267	0.0749	0.0778
Distrito Federal	0.3563	0.3104	0.0836	0.0797
Durango	0.6134	0.5065	0.2061	0.2004
Guanajuato	0.6812	0.6183	0.2463	0.2689
Guerrero	0.7907	0.7334	0.3498	0.4268
Hidalgo	0.7087	0.7573	0.352	0.3654
Jalisco	0.5861	0.4301	0.1946	0.1387
Estado de Mexico	0.6224	0.56	0.1995	0.2782
Michoacan	0.7704	0.6246	0.369	0.2466
Morelos	0.6219	0.5655	0.2005	0.2073
Nayarit	0.5253	0.6061	0.1406	0.2314
Nuevo Leon	0.4207	0.3699	0.133	0.1185
Oaxaca	0.7745	0.8051	0.4663	0.5655
Puebla	0.8062	0.7189	0.376	0.3998
Queretaro	0.6636	0.6127	0.1994	0.2928
Quintana Roo	0.4289	0.52	0.1216	0.1851
San Luis Potosi	0.7386	0.7841	0.3241	0.4284
Sinaloa	0.5031	0.4511	0.0883	0.1878
Sonora	0.4526	0.4412	0.1713	0.119
Tabasco	0.7004	0.6886	0.2855	0.3092
Tamaulipas	0.4275	0.492	0.1513	0.1518
Tlaxcala	0.7245	0.7379	0.3323	0.3666
Veracruz	0.7151	0.5553	0.3039	0.2413
Yucatan	0.7277	0.6209	0.4566	0.3292
Zacatecas	0.8062	0.6861	0.4056	0.4033

Source: Author's Calculations

Appendix 2: Migration Data

State	1992	1994	1996	1998
Aguascalientes	682,129	821,621	804,813	948,136
Baja California	1,698,208	1,994,220	2,144,531	2,332,030
Baja California Sur	343,747	321,899	332,119	399,004
Campeche	471,303	538,119	652,508	708,405
Coahuila	1,902,877	2,278,603	2,252,615	2,245,150
Colima	390,160	463,625	417,062	509,944
Chiapas	3,681,884	2,815,455	3,468,588	3,753,883
Chihuahua	2,333,905	2,580,216	2,907,503	2,942,596
Distrito Federal	8,307,174	8,391,959	9,527,104	8,591,695
Durango	1,238,352	1,415,647	1,340,596	1,456,103
Guanajuato	4,390,952	4,729,747	5,057,877	4,718,460
Guerrero	2,804,119	2,825,241	2,845,365	3,125,986
Hidalgo	1,716,831	1,695,827	2,182,590	2,190,625
Jalisco	5,771,166	7,540,716	6,298,228	6,228,763
México	10,762,442	13,765,798	9,984,768	12,798,125
Michoacán	3,162,909	4,017,312	3,723,784	3,895,080
Morelos	1,208,301	1,173,319	1,378,537	1,654,468
Nayarit	860,761	916,515	770,278	915,209
Nuevo León	3,325,482	3,777,541	3,702,016	3,638,374
Oaxaca	3,240,144	2,854,771	3,356,128	3,443,409
Puebla	4,829,023	4,590,820	4,570,063	4,956,712
Querétaro	1,007,161	1,027,234	1,126,409	1,346,989
Quintana Roo	693,266	608,320	816,420	826,786
San Luis Potosí	1,938,924	1,873,306	2,223,789	2,270,628
Sinaloa	2,206,745	2,577,457	2,208,060	2,551,123
Sonora	1,709,703	1,867,140	2,399,501	2,237,210
Tabasco	1,827,306	2,189,198	1,920,921	1,936,096
Tamaulipas	2,402,457	1,943,135	2,157,595	2,667,689
Tlaxcala	786,532	837,067	852,075	964,137
Veracruz	6,387,988	6,976,526	6,245,360	6,985,469
Yucatán	1,457,195	1,500,322	1,498,548	1,743,393
Zacatecas	1,284,735	1,488,744	1,375,156	1,350,730

Source: Author's Calculations

State	1991	1993	1995	1997
Aguascalientes	24,561	25,777	25,870	24,717
Baja California	50,807	54,291	55,702	56,831
Baja California Sur	9,348	9,542	9,735	9,780
Campeche	17,735	19,237	17,534	19,140
Coahuila	61,526	59,322	57,147	56,907
Colima	12,613	12,630	12,858	12,316
Chiapas	202,182	173,922	143,290	131,882
Chihuahua	69,855	73,537	72,275	77,309
Distrito Federal	222,105	220,978	196,252	181,803
Durango	48,170	49,936	49,703	48,023
Guanajuato	133,770	142,052	139,199	138,450
Guerrero	94,410	111,843	144,271	122,069
Hidalgo	73,349	66,531	68,528	71,753
Jalisco	172,562	176,934	169,970	164,066
México	320,462	384,224	316,785	327,782
Michoacán	135,757	141,216	134,998	127,726
Morelos	39,209	37,714	34,124	38,153
Nayarit	27,412	26,597	27,546	25,809
Nuevo León	81,557	84,711	85,766	86,893
Oaxaca	103,307	105,766	113,702	117,195
Puebla	142,107	151,535	141,249	156,943
Querétaro	39,575	43,023	41,620	38,223
Quintana Roo	20,237	21,412	19,733	21,599
San Luis Potosí	63,147	70,698	68,930	65,443
Sinaloa	69,275	72,674	74,116	79,253
Sonora	54,316	53,174	55,786	55,840
Tabasco	56,115	55,120	57,131	58,650
Tamaulipas	66,677	62,334	75,272	66,972
Tlaxcala	26,804	30,212	27,959	26,746
Veracruz	234,600	218,535	230,081	213,098
Yucatán	40,014	41,632	40,329	37,903
Zacatecas	41,014	40,851	40,311	38,131

Source: SEMARNAT (2003)

Table 18. Deaths by state for Mexico				
State	1991	1993	1995	1997
Aguascalientes	3,485	3,474	3,491	3,782
Baja California	8,876	8,836	9,822	10,541
Baja California Sur	1,312	1,426	1,463	1,630
Campeche	2,304	2,279	2,529	2,563
Coahuila	9,289	9,463	9,594	10,312
Colima	2,325	2,251	2,338	2,403
Chiapas	14,968	15,359	15,281	15,512
Chihuahua	13,722	13,534	14,422	15,508
Distrito Federal	45,203	45,301	46,609	46,884
Durango	5,614	5,664	5,740	6,121
Guanajuato	21,750	20,789	21,482	21,492
Guerrero	8,946	9,563	10,710	11,173
Hidalgo	9,362	9,559	9,907	9,781
Jalisco	29,009	30,369	30,189	30,722
México	48,668	49,110	50,167	51,525
Michoacán	17,607	17,869	18,515	18,656
Morelos	6,060	6,390	6,654	6,704
Nayarit	3,812	3,920	4,083	4,103
Nuevo León	13,926	13,961	14,554	15,603
Oaxaca	18,542	19,023	18,253	18,425
Puebla	25,927	26,222	26,713	26,458
Querétaro	5,326	5,221	5,716	5,698
Quintana Roo	1,631	1,827	1,875	2,053
San Luis Potosí	9,481	9,937	10,184	10,289
Sinaloa	8,632	9,095	9,876	9,969
Sonora	9,164	9,609	10,130	10,797
Tabasco	6,647	6,737	7,183	7,196
Tamaulipas	10,491	10,803	10,798	11,450
Tlaxcala	4,249	4,180	4,464	4,651
Veracruz	29,611	28,878	30,556	31,705
Yucatán	7,478	7,740	8,139	7,988
Zacatecas	6,056	5,861	6,438	6,511

Source: SEMARNAT (2003)

Table 19. Migration results by state			
State/Period	Pre-Crisis	Crisis	Recovery
Aguascalientes	94886	-61566	101453
Baja California	205102	58551	94919
Baja California Sur	-38080	-6324	50585
Campeche	32900	84379	22743
Coahuila	276008	-121094	-100655
Colima	52707	-67603	73056
Chiapas	-1183555	397115	52555
Chihuahua	126305	211581	-88509
Distrito Federal	-266569	835859	-1205247
Durango	88751	-162977	31703
Guanajuato	96269	92696	-573333
Guerrero	-183438	-246998	58829
Hidalgo	-134948	369521	-115909
Jalisco	1476420	-1522050	-336153
México	2333128	-4314266	2260843
Michoacán	607709	-526494	-46844
Morelos	-97630	150278	213033
Nayarit	10400	-193163	101519
Nuevo León	310559	-217949	-206222
Oaxaca	-558859	310459	-110259
Puebla	-488829	-249829	125679
Querétaro	-55531	27367	155530
Quintana Roo	-124116	172384	-28726
San Luis Potosí	-187140	232991	-63469
Sinaloa	243554	-497877	204495
Sonora	70307	441049	-252377
Tabasco	265126	-368173	-87733
Tamaulipas	-562384	85512	399050
Tlaxcala	-1529	-31982	67872
Veracruz	209224	-1130216	377323
Yucatán	-24657	-66154	185015
Zacatecas	134029	-181334	-87666
Source: Author's Calculations (Initial population + 2 x births – 2 x deaths – Final population)			

Table 20. Migration results for Mexico as percentage of population.			
State/Year	1992-1994	1994-1996	1996-1998
Aguascalientes	0.139103	-0.074932	0.126058
Baja California Norte	0.120776	0.029360	0.044261
Baja California Sur	-0.110779	-0.019646	0.152310
Campeche	0.069806	0.156804	0.034855
Coahuila	0.145048	-0.053144	-0.044684
Colima	0.135091	-0.145814	0.175168
Chiapas	-0.321454	0.141048	0.015152
Chihuahua	0.054117	0.082001	-0.030442
Distrito Federal	-0.032089	0.099602	-0.126507
Durango	0.071669	-0.115125	0.023648
Guanajuato	0.021924	0.019599	-0.113354
Guerrero	-0.065417	-0.087425	0.020675
Hidalgo	-0.078603	0.217900	-0.053106
Jalisco	0.255827	-0.201844	-0.053373
Estado de Mexico	0.216784	-0.313405	0.226429
Michoacan	0.192136	-0.131056	-0.012580
Morelos	-0.080799	0.128079	0.154536
Nayarit	0.012082	-0.210758	0.131795
Nuevo Leon	0.093388	-0.057696	-0.055705
Oaxaca	-0.172480	0.108751	-0.032853
Puebla	-0.101227	-0.054419	0.027500
Queretaro	-0.055136	0.026641	0.138076
Quintana Roo	-0.179031	0.283377	-0.035185
San Luis Potosi	-0.096517	0.124374	-0.028541
Sinaloa	0.110368	-0.193166	0.092613
Sonora	0.041122	0.236216	-0.105179
Tabasco	0.145091	-0.168177	-0.045672
Tamaulipas	-0.234087	0.044007	0.184951
Tlaxcala	-0.001944	-0.038207	0.079655
Veracruz	0.032753	-0.162003	0.060417
Yucatan	-0.016921	-0.044093	0.123463
Zacatecas	0.104324	-0.121803	-0.063750
Source: Author's calculations using SEMARNAT and Luxembourg Income Study data.			

Appendix 3: Test for different Beta convergence regressions intercepts

Table 21. β convergence for poverty rates for 1992-1998 and pre-crisis.			
Periods / Poverty		Absolute	Relative
1992 - 1998	Constant	0.0392	0.015
	(std. error)	(0.0116)	(0.01)
	Beta Coefficient	-0.0277	-0.039
	(std. error)	(0.0133)	(0.0205)
	Agricultural	-0.0193	-0.005
	(std. error)	(0.0124)	(0.0105)
	F-TESTS		
	Absolute		
	F-test = 2.57		
	Prob >F = 0.05		
Relative	Border	-0.0105	-0.014
	(std. error)	(0.0128)	(0.0104)
	Manufacturing	0.0017	-0.0049
	(std. error)	(0.0123)	(0.0113)
	Oil States	0.0054	0.0055
	(std. error)	(0.123)	(0.0128)
	Tourism	0.0013	-0.0029
	(std. error)	(0.0128)	0.0109
	F-test = 1.28		
	Prob >F = 0.30		
Pre-Crisis	Constant	0.0581	0.0225
	(std. error)	(0.0285)	(0.010)
	Beta Coefficient	-0.1383	-0.1882
	(std. error)	(0.0448)	(0.0456)
	Agricultural	0.0398	0.0527
	(std. error)	(0.0349)	(0.0193)
	F-TESTS		
	Absolute		
	F-test = 1.24		
	Prob >F = 0.32		
Relative	Border	0.002	0.0073
	(std. error)	(0.0279)	(0.0134)
	Manufacturing	0.043	0.0377
	(std. error)	(0.031)	(0.0216)
	Oil States	0.0508	0.0428
	(std. error)	(0.0385)	(0.0325)
Tourism	0.0226	0.0274	
(std. error)	(0.0581)	(0.0124)	

Source: Author's calculations.

Table 22. β convergence for poverty rates for crisis and recovery.

Crisis F-TESTS Absolute F-test = 0.67 Prob >F = 0.65 Relative F-test = 0.56 Prob >F = 0.73	Constant (std. error)	0.1197 (0.0281)	0.0331 (0.0138)
	Beta Coefficient (std. error)	-0.0684 (0.0742)	-0.1783 (0.0559)
	Agricultural (std. error)	-0.0446 (0.0348)	-0.0114 (0.0243)
	Border (std. error)	-0.0415 (0.0304)	-0.0163 (0.0169)
	Manufacturing (std. error)	-0.019 (0.0277)	0.00 (0.0181)
	Oil States (std. error)	-0.0024 (0.0420)	0.0337 (0.0386)
	Tourism (std. error)	-0.0143 (0.0311)	0.0095 (0.0348)
Recovery F-TESTS Absolute F-test = 1.10 Prob >F = 0.38 Relative F-test = 0.67 Prob >F = 0.65	Constant (std. error)	0.0284 (0.0241)	0.0275 (0.0219)
	Beta Coefficient (std. error)	-0.1133 (0.0460)	-0.0626 (0.0717)
	Agricultural (std. error)	0.01486 (0.0191)	-0.0007 (0.0244)
	Border (std. error)	-0.0027 (0.0195)	-0.0308 (0.0201)
	Manufacturing (std. error)	0.0377 (0.0164)	0.0078 (0.0233)
	Oil States (std. error)	0.0345 (0.0259)	0.0134 (0.0323)
	Tourism (std. error)	0.0255 (0.0240)	-0.0049 (0.0279)
Source: Author's calculations.			