



LUND UNIVERSITY

School of Economics and Management

Master in Economic Development and Growth

## On the Evolution of the Determinants of Household Poverty in Mexico: a Logistic Regression Analysis

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*Abstract:* Mexico, the second largest economy in Latin America, has almost eradicated extreme poverty according to the Millennium Development Goals; however, official statistics show that by national standards poverty levels are still quite high, reaching up to half its population. This paper looks into how the determinants of poverty in Mexico have evolved after the last major economic crisis the country experienced in the mid-90s. Using biennial survey data from 1996-2012, this paper aims to answer a two-fold question: (i) which household characteristics (demographic, socio-economic, and place of residence) are associated with a higher probability of poverty, and (ii) how much have these determinants changed over time? The results show that being a larger-than-average, a rural-located, or a female-headed household, having a household head that had no formal education or whose work lied in agriculture or other primary activities are all highly associated with poverty. The analysis of the dynamics shows that the effects of gender, education, non-agricultural occupations, and household size changed significantly during the studied period. The results imply that the effect of education is decreasing as the average educational level rises, while holding an industrial or services job is still an important factor to avoid poverty.

*Key words:* poverty, education, gender, occupation, determinants, Mexico.

**EKHM52**

Master thesis, second year (15 credits ECTS)

June 2015

Supervisor: Andrés Palacio, Ph.D.

Examiner: Prof. Jonas Ljungberg, Ph.D.

Word Count: 12177



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## 1. Introduction

Adam Smith (1776) once stated that “No society can surely be flourishing and happy, of which the greater part of the members are poor and miserable”. Poverty, as a social phenomenon, can be described most simply as a state of scarcity that can be felt in many aspects of an individual’s life. While traditionally spoken of as a lack of income, nowadays poverty is being redefined to include non-monetary aspects in which scarcity of resources also stresses the lives of those in poverty like lack of freedom or political rights, lack of opportunities, lack of access to valuable resources like education or healthcare, lack of safe environments, and social discrimination (United Nations, 2005). It is only logical that fighting to eradicate this phenomenon, and preventing people from ever experiencing it, is at the core of the Millennium Development Goals (MDG) agreed by at least 183 countries. According to these goals, that set the tone for the development agenda since 1990, the signing countries agreed to fight poverty and by 2015 reduce in 50% the number of people living under the international line of extreme poverty, set at 1.25 US dollars a day.

The results of this fight against poverty have been diverse. While countries like China have accounted for most of the world’s decrease in poverty headcounts, countries in Sub-Saharan Africa still have more than half the world’s extremely poor. Latin America is a region of great disparities; whereas the poverty rates are not as alarming as in other regions they are still not par to those in Europe or other developed regions. And although extreme poverty might be low, income inequality is one of the most worrying issues, being the region with largest disparities in the world.

Mexico, Latin America’s second-largest economy, is a perfect example of such characteristics. According to the World Bank (2015) It has completely succeeded by the MDG’s standards, having reduced its extreme poverty headcount ratio from 4.2% of the population in 1992, to 0.7% by 2010, meaning that it went from having 4.2 million people in extreme poverty in 1992 to having only 0.8 million in 2010. By contrast, if we use the (considerably higher) national poverty line we can see that Mexico’s headcount ratio has been somewhat constant over the last 20 years at around half its population (from 53.1% in 1992 to a peak in 1996 at 69%, from its lowest in 2006 at 42.9% to 52.3% in 2010) and that the number of people living in poverty in Mexico has actually increased in this period, going from 47.7 million in 1992 to 63.2 million in 2010. In inequality terms, the advances have been slow, for example in 1992 the richest 20 percent of the population massed 13.65 times the income of the poorest 20% (with a Gini Index of 51.1) and in 2010 this ratio was down to 10.77 (with a Gini Index of 47.2).

The main concern of this study, however, is not to define, nor measure poverty but to study the factors that act as determinants of such phenomenon and analyze their behavior through time. Are there any particular characteristics that make people more prone to be in a situation of poverty or that are highly correlated with it? Are they different today than 20 years ago? These questions are addressed through the employ of regression analysis and household surveys. Using biennial survey data from 1996-2012, a logistic regression model is constructed that explains the probability of poverty occurring in the household as a function of a set of socio-



demographic characteristics of the household head. The marginal effect of each correlate is then calculated and its evolution is plotted and analyzed throughout the period studied. The aim is to gain a clear enough picture of the evolution of the effects of the determinants of household poverty in Mexico during the period 1996-2012.

The rest of this paper is structured as follows: Section 2 presents the literature review on the topic of poverty and its determinants. A thorough description of the database employed to perform this analysis is presented in section 3. Section 4 describes the methodology used to estimate the models and perform the analysis. Section 5 presents the results. Section 6 concludes.

## 2. Literature Review

Poverty, as previously stated involves lack of resources that leads to a state of deprivation. The World Bank was the first to attempt at setting an international poverty line that allowed for global comparisons and policy-making. The \$1 USD dollar a day poverty line, later updated by Ravallion, Chen and Sangraula (2009) to be \$1.25 USD, provided the first unified methodology to define and measure global poverty, although it is a limited definition (only monetary) it is still widely used by academics and governments around the world. As a multi-faceted social phenomenon, poverty was first approached in the seminal works by Sen (1985, 1987) where its definition was greatly broadened into non-monetary realms, including for the first time, the role of deprivation on the individual's capacities to live a full and prosperous life.

The monetary definition of poverty, however limited, provides an easy-to-use methodology that allows measurement and analysis of poverty that can be easily understood and interpreted at the international level. For example, Sala-i-Martin (2002) estimated that between 1970 and 2000 worldwide poverty had decreased by as much as 50%, meaning there were between 250 and 500 million less poor people in the world by 2000. By contrast, Chen & Ravallion (2010) found that extreme poverty is more widespread than previously estimated, with up to 1.4 billion people living in such conditions by 2005 and find that, even when the efforts to eradicate it have been working, these have had different effects by regions, being Sub-Saharan Africa the most disadvantaged in these matters.

But moving away from the definitions and measurements, there is abundant literature that aims at trying to explain the income disparities that lead to or determine poverty at the micro-level. One of the most important factors, included in this study, is the importance of education as a poverty-avoiding element. Mincer (1974) first explored and estimated the net effect of education on determining income and wage, while already Becker (1964) and Schultz (1961) were praising the importance of such form of human capital as a key ingredient for growth and wealth. The role of education has also been confirmed through many empirical studies of poverty (Abuka, et.al., 2007, Bundervoet, 2006, Cortés, 1997, Coulombe & McKay, 1996, Garza-Rodríguez, 2002, and Okojie, 2002 to mention just a few)



Labor market discrimination has determined for a long time the existence of a difference in earnings between men and women for doing the same job. Pearce (1978) realized that this difference in income was also translated into poverty counts. Coining the term “feminization of poverty” she found that, for the US labor market, women are in general poorer than men, also that the incidence rate of poverty is growing more rapidly for women than for men, and that higher female poverty is linked to higher rates of women leading households.

Another important factor in poverty incidence is the location of the household. Where traditionally rural poverty has been more prevalent, the role of urbanization in creating big and growing slums cannot be ignored. Ravallion, Chen, & Sangraula (2007) find that in global terms, poverty incidence is three times higher in rural areas than in urban ones. In empirical studies for diverse countries, Bundervoet (2006), Garza-Rodríguez (2002), and Majeed & Malik (2014) have all found evidence that living in rural locations is highly linked with higher poverty incidence, while McKinley & Alarcón (1995) found that in Mexico poverty is more widely present among those living in rural areas, whether they work in the agriculture or as wage-earners in other occupations.

It wasn't until the early 1990s that the multivariate study of poverty determinants begun, most of the studies focusing in developing countries in Africa and Asia. Kyereme & Thorbecke (1991) studied the case of food poverty in Ghana; using data from the 1974-1975 Ghana Household Budget Survey they estimated a cross section model where the dependent variable was the household calorie gap and the explanatory variables included socioeconomic, demographic, and geographic characteristics of the households. Their findings point out that both income and education are negatively related to the household total calorie gap.

Coulombe & McKay (1996) analyzed the case of poverty in Mauritania. Using data from 1990's Household Survey, and modelling the probability of being poor through a multinomial logistic regression, they find that low educational levels, high levels of dependency, and living in rural areas are all positively correlated with a higher probability of poverty

Okojie (2002) conducted a study of poverty in Nigeria. Using household survey data 1985-1996, the author employed a logistic regression model to find that all educational levels are significantly associated with a decrease in the probability of being poor. The results also confirmed the gender income gap, with households with a female head being in greater risk of poverty.

In his study of poverty in Burundi, Bundervoet (2006) found that male-headed households are associated with a lower probability of suffering poverty than those headed by a woman. Using survey data from 1998-1999 and estimating the probability of poverty through a logistic regression model, the author found that education of the household head decreases the probability, and the gap in it between men and women. The results also pointed towards greater risk of poverty in rural areas.

Abuka, et.al. (2007) conducted a study of the determinants of poverty in Uganda. They use household survey data and model the probability of poverty through logistic regression analysis.



They find that higher education of the household head is not only associated with higher earnings and productivity of the head, but also of other members of the household. The results also suggest that living in a rural area and the size of the household were associated with increases in the probability of poverty occurring.

Ranathunga (2010) analyzed the poverty in Sri Lanka in order to find its determinants. Using 2006-2007 Household Income and Expenditure Surveys and diverse methodologies that included probit regressions, OLS regressions, and quantile regressions, the author estimated the impact of a set of explanatory variables on the probability of poverty. The results show that the largest impact was that of human capital, education being associated with a lower probability of poverty.

In their study of the determinants of household poverty in Pakistan, Majeed & Malik (2014) use logistic regression analysis to estimate the effect of certain household and household head characteristics on the probability of poverty occurring in the household. Their results suggest that education, especially at higher levels, is associated with a lower probability of being poor. Remittances play an important role also, being negatively correlated with the probability of being poor. They also find that the variables associated with a higher probability of poverty are: household size, age of the household head, male-headed households, and rural residence.

For the Mexican case, there have been three major studies about the determinants of poverty incidence at the household level. Cortés (1997), using the 1992 Household Income and Expenditure Survey, studies the determinants of being poor. Using logistic regression analysis, he finds that a higher probability is associated with a bigger dependency burden and rural locations, while a lower probability is correlated with years of education. These results are supported by Székely (1998), who using the data from the same survey, but from 1984, 1989, and 1992 found that the most important decrease in the probability of being poor came from education. The results also point towards a positive correlation between household size, rural areas, and occupational characteristics and the probability of poverty.

Finally, Garza-Rodríguez (2002) updates the previous results and, using the 1996 Household Income and Expenditure Survey, builds poverty profiles and models the probability of being poor through a logistic regression framework. He homogenizes the poverty line calculations from previous studies and proposes an extreme poverty line that serves as threshold for his calculations. The results suggest that the variables that are positively correlated with the probability of a household being poor are household size, rural residence, and rural or domestic occupations. The variables that are negatively associated with the probability of household poverty are the educational level of the household head, the age of the household head, and professional or middle-level occupations.

This study contributes to the current literature in three ways: it look at the determinants of poverty in the usual way, by running logistic regressions for each year with cross-sectional data, but uses the newest editions (1996-2012) of the Household Income and Expenditure Survey. The biennial repetition of the survey provides a nice opportunity to conduct this study of determinants across the better part of 17 years. It also introduces a longer time dimension than





those previously studied, allowing for better analysis of the dynamics of the determinants. Finally, where Cortés, Székely and Garza-Rodríguez all used different methodologies to define the poverty threshold, this study uses three poverty lines that were calculated in retrospective by the authority in poverty analysis in Mexico: the National Council for the Evaluation of Social Development Policies (CONEVAL) that came into being in the early years of the 2000's decade. This provides a more homogeneous methodology, with technically solid calculations that are defined as official thresholds for different kinds of poverty that range from extreme to mild.

To the best of the author's knowledge this is the first study that combines the use official poverty lines, different intensities of poverty, recent data, and a temporal dimension to the analysis of the determinants of household poverty in Mexico.

### **3. Database and Sample**

#### *3.1 Survey data*

The household data for this study was obtained from the Mexican National Household Income and Expenditure Survey (ENIGH). The ENIGH survey has been designed and sampled by the Mexican National Institute of Statistics and Geography (INEGI) since 1984 and applied on a biennial basis since 1992 during the last quarter of each year. Building on previous statistical projects and surveys, and being the first multidimensional effort to study the economic characteristic of households with one homogenous methodology, it captures numerous features of the household life, including consumption habits, household composition, income statistics and sources, use of free time, healthcare behavior, housing characteristics, etc.

The ENIGH survey is designed to yield a sample with representativity on a national level for all years up to 2012. For some years it also has some state-level representativity. However, for the purposes of this study only the national representativity feature was required and exploited. Therefore, ENIGH provides a cross-sectional database, with a new national representative sample generated and surveyed every two years.

For this study, information was used from ENIGH that referred to income of the household, socio-demographic characteristics of the household head that might affect the income-generating capacity, and relevant household characteristics. Further explanation will follow in the sample description.

#### *3.2 Poverty Lines.*

Since 2004, the National Council for the Evaluation of Social Development Policies (CONEVAL) has been in charge of conducting specialized studies and technical measures of poverty in Mexico. Even though the law in Mexico requires the measurement of poverty to be done in accordance with a multidimensional definition of the phenomenon, CONEVAL continues to measure and update older and/or single-dimension poverty lines. Included in this



group is the income-based definition of poverty, in which several thresholds are calculated, based on different levels of wellness, to measure the occurrence of poverty.

Thanks to the fact that CONEVAL has kept and updated poverty lines in use before its creation in 2004, it is now possible to use such lines to perform studies about poverty that include such previous years. The present study, covering the period 1996-2012, greatly benefits from this fact that homogenizes the source and the definition of poverty.

For the purpose of this study, poverty will be measured as an income-based phenomenon and three consecutive thresholds are used, which are named and defined by CONEVAL (2015) as follows:

- **Alimentary Poverty:** this is the deepest poverty level. It refers to an inability to acquire the basic food basket, even if the totality of the household's incomes were devoted to this purpose.
- **Capacities Poverty:** this is the intermediate level of poverty. It refers to the inability to acquire the basic food basket and pay for health and education expenses, even if the totality of the household's incomes were devoted to this purpose.
- **Patrimonial (or Asset) Poverty:** this is the upper level of poverty. It refers to the inability to acquire the basic food basket and pay for health, education, housing, transport, and clothing expenses, even if the totality of the household's incomes were devoted to this purpose.

CONEVAL reports monthly estimates of each of these poverty lines in the year's current currency for every year in the sample. For this study, yearly averages of the three poverty lines were calculated and used as thresholds. The exact figures of these poverty lines, in pesos per capita, are available in Appendix 1. For the purposes of this study, in order to classify a household as poor, its total income should have been less than the poverty line multiplied by the total number of members of the household.

### *3.3 The Samples*

The working samples include information on the household head as follows: gender, age, the highest academic degree completed, and the type of occupation (divided by sectors). On the household, the samples include information on the household size and location. An income variable was also generated and used to determine whether the household suffers from any kind of poverty, according to the thresholds previously calculated.

All the details of the size, composition, and descriptive statistics of the samples are shown in Table 1.



**Table 1: Descriptive Statistics of the Database**

		1996	1998	2000	2002	2004	2006	2008	2010	2012
Size of Sample		12,978	10,146	9,393	16,008	21,425	20,207	22,888	21,252	7,065
Variable Name	Definition	Percentage of "1" in the sample								
poverty_A	1 if the household suffers from alimentary poverty. 0 otherwise	41.43%	35.96%	26.61%	23.65%	18.52%	18.67%	18.48%	20.10%	23.93%
poverty_B	1 if the household suffers from capabilities poverty. 0 otherwise	49.30%	43.68%	34.20%	30.41%	24.10%	24.75%	24.18%	26.62%	31.05%
poverty_C	1 if the household suffers from patrimonial poverty. 0 otherwise	68.93%	63.06%	53.89%	51.20%	42.57%	43.26%	42.71%	45.80%	51.21%
female	1 if the household head is female. 0 otherwise	13.92%	15.62%	17.30%	18.49%	21.29%	23.45%	17.34%	17.62%	18.47%
elementary	1 if the individual finished elementary education. 0 otherwise	25.04%	25.57%	23.93%	23.70%	38.33%	39.77%	36.40%	35.41%	36.88%
secondary	1 if the individual finished secondary education. 0 otherwise	16.24%	17.65%	18.20%	20.35%	20.07%	19.49%	23.63%	23.63%	25.08%
highschool	1 if the individual finished high school education. 0 otherwise	9.11%	9.38%	10.39%	10.78%	16.35%	15.62%	17.30%	17.56%	16.33%
college	1 if the individual finished college education. 0 otherwise	5.69%	5.96%	7.28%	6.06%	13.45%	12.25%	13.33%	13.57%	11.01%



graduate	1 if the individual finished some graduate education. 0 otherwise	0.76%	0.87%	1.03%	0.88%	1.92%	1.73%	1.94%	2.18%	1.81%
primary_sector	1 if the individual works in the primary sector. 0 otherwise	26.12%	25.08%	21.28%	19.79%	14.19%	16.90%	16.72%	18.74%	27.16%
secondary_sector	1 if the individual works in the secondary sector. 0 otherwise	21.58%	20.87%	23.80%	23.30%	23.21%	23.40%	27.92%	25.07%	24.53%
tertiary_sector	1 if the individual works in the tertiary sector. 0 otherwise	37.33%	38.88%	42.35%	44.45%	45.79%	43.01%	52.36%	53.77%	45.45%
small_city	1 if the individual lives in a city with less than 15000 inhabitants. 0 otherwise	32.20%	44.66%	45.10%	38.77%	29.81%	36.55%	34.96%	34.56%	53.16%
big_city	1 if the individual lives in a city with more than 15000 inhabitants. 0 otherwise	67.80%	55.34%	54.90%	61.23%	70.19%	63.45%	65.04%	65.44%	46.84%
Variable Name	Definition	Mean and [Standard deviation]								
age	age of the household head	44.09	44.91	45.69	46.15	46.12	46.50	44.47	44.63	45.44
		[15.00]	[15.15]	[15.21]	[15.10]	[15.16]	[15.48]	[13.14]	[13.14]	[14.01]
sizeHH	size of the household	4.57	4.33	4.16	4.18	4.02	3.98	4.14	4.02	3.87
		[2.27]	[2.18]	[2.09]	[2.05]	[1.97]	[2.03]	[1.94]	[1.93]	[1.91]

Source: Author's own elaboration, with data from ENIGH.



#### 4. Methodology

This study has two main objectives; the first is to estimate the determinants of poverty for every year in the sample while the second is to discuss the evolution of such determinants.

In order to address the first objective, multivariate regression analysis must be used in order to obtain estimates of the effects of each determinant on the probability of poverty occurring at the household level. Given the lack of panel-type data, the current study cannot properly address true causality but, as it is the general practice in the literature of the topic, it settles for recognizing and estimating significant correlations or associations between poverty and the set of determinants.

Since the dependent variable is a dichotomous one that reflects whether the household is poor (1) or not (0), then a model that takes into account this limited information is required. The model is specified as follows:

$$P(\text{poverty} = 1) = f(\text{gender, age, education, employment, size of household, location}) \quad (1)$$

In order to estimate this model, the logistic regression framework is followed, such that:

$$P(\text{poverty} = 1) = f(X\beta) \quad (2)$$

$$P(\text{poverty} = 0) = 1 - f(X\beta) \quad (3)$$

$$\log\left(\frac{P(\text{poverty}=1)}{1-P(\text{poverty}=1)}\right) = X\beta \quad (4)$$

$$\left(\frac{P(\text{poverty}=1)}{1-P(\text{poverty}=1)}\right) = e^{X\beta} \quad (5)$$

$$P(\text{poverty} = 1) = (1 - P(\text{poverty} = 1))e^{X\beta} \quad (6)$$

$$P(\text{poverty} = 1) = e^{X\beta} - e^{X\beta}(P(\text{poverty} = 1)) \quad (7)$$

$$P(\text{poverty} = 1) + e^{X\beta}(P(\text{poverty} = 1)) = e^{X\beta} \quad (8)$$

$$P(\text{poverty} = 1) = \frac{e^{X\beta}}{1+e^{X\beta}} \quad (9)$$

$$P(\text{poverty} = 1) = \Omega(X\beta) \quad (10)$$

Where  $\Omega$  represents the logistic cumulative distribution function.

Once the logistic regression has been estimated, the coefficients of the regression express, as shown in equation 10, the impact of a marginal change in any variable on the probability of poverty occurring, through its impact on the logistic cumulative distribution function. In order to obtain a clearer effect, marginal effects will also be calculated (for the continuous variables, the marginal effect is evaluated at the mean of the variable, while for the dichotomous variables, this effect measures the difference in effect between 0 and 1).



Addressing the second objective requires the combination of graphical analysis and statistical check-ups for significance. Specifically, for each of the determinants of poverty included in equation 1, the marginal effect for each year will be plotted as to observe the behavior of it across the 17 years of the sample. Subsequently, a procedure will be followed to observe if the differences between marginal effects across time are statistically significant or not. This procedure will be of the form:

$$P(\text{poverty}_{it} = 1|X_1) = f(\beta_0 + \beta_1 X_{1it} + \beta_2 d_{1it} + \beta_3 d_{1it} X_{1it} + \varepsilon_{it}) \quad (11)$$

Where  $i$  denotes the household,  $t$  denotes year ( $t=1,2$ ), and  $d_t$  is a dummy that takes the value of 1 if  $t=2$ . For simplicity, let's say we only have two observations, one at the beginning of the period ( $t=1$ ) and one at the end ( $t=2$ ). The estimated model for the beginning of the period will be:

$$P(\text{poverty}_{it} = 1|X_1, d_1 = 0) = \hat{\beta}_0 + \hat{\beta}_1 X_{1it} \quad (12)$$

And the estimated model for the end of the period will be:

$$P(\text{poverty}_{it} = 1|X_1, d_1 = 1) = (\hat{\beta}_0 + \hat{\beta}_2) + (\hat{\beta}_1 + \hat{\beta}_3) X_{1it} \quad (13)$$

So, in order to test if the effect of  $X_t$  is statistically different at the beginning ( $\hat{\beta}_1$ ) and at the end ( $\hat{\beta}_1 + \hat{\beta}_3$ ) of the period it is only necessary to test whether or not  $\hat{\beta}_3$  is statistically significantly different from zero. For the effects of this study, after the graphic analysis of each determinant, specific points of interest will be chosen to check for significant difference. In most cases, this will mean comparing the first and last available data points to confirm the existence or lack of difference in the effects.



## 5. Results

### 5.1 *The Determinants of Household Poverty in México: a year by year analysis.*

#### 5.1.1 The Determinants of Poverty: 1996

The marginal effects of the logistic regression for the determinants of poverty for 1996 are shown in table 2. Much in accordance with the findings of Garza-Rodríguez (2002), the results for this year show that the effects of household head gender and industrial occupation are not significant. The variables that are positively correlated with the probability of poverty, that is, those that increase the chances of a household being poor, are: size of the household (one more person than average in the household increases the probability of poverty around 5.96%-7.89%, *ceteris paribus*) and the reference categories of working in the agricultural sector, living in small cities or rural areas, and having no formal education.

The variables negatively correlated with the probability of being poor are all the education levels (compared with the reference category “no education”), living in a big city (as compared to the reference category “small city”), the age of the household head (older-than-average household heads are less prone to poverty than those younger-than-average) and working in the tertiary sector (as compared with the reference category “working in the primary sector”). As expected, the impact of education on the probability of being poor increases for higher academic degrees, in other words, the impact of secondary school is larger than that of elementary school, the effect of high school is larger than that of secondary school, and so on. Also noteworthy is the fact that effects are, as expected, larger as higher is the threshold of poverty. In this sense, for instance, being a larger than average household increases by 5.96% the chance that household would suffer alimentary poverty (extreme) but it increases its chances of suffering patrimonial poverty (mild or moderate poverty) by 7.89%, everything else being equal.

#### 5.1.2 The Determinants of Poverty: 1998

The marginal effects of the logistic regression for the determinants of poverty for 1998 are shown in table 3. The results are consistent with those found for the 1996 sample; this means that the variables that affect, both negatively and positively, the probability of poverty are the same. More specifically, being a larger-than-average household, having an illiterate household head, or having a household head who works in agriculture (primary sector) all increase the probabilities of such household suffering from poverty. On the other hand, having a more educated household head, or having employment on the secondary or tertiary sectors of the economy, as well as living in bigger cities all reduce the probability of poverty occurring.

For this year, the effect of the gender of the household head was positive and significant for the two lower levels of poverty. Having a woman as a household head increased the probability of alimentary poverty by 4.49%, while increasing the probability of suffering capabilities poverty by 3.99%.



**Table 2: Determinants of Poverty in Mexico: 1996**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	<i>0.3183</i>	<i>0.4230</i>	<i>0.6994</i>
female	-0.0022 [-0.13]	-0.0068 [-0.36]	-0.0059 [-0.33]
elementary	-0.1931 [-12.18]	-0.2512 [-13.15]	-0.2546 [-9.35]
secondary	-0.2875 [-21.86]	-0.3519 [-21.64]	-0.4094 [-14.57]
highschool	-0.3426 [-32.85]	-0.4314 [-35.60]	-0.5878 [-28.42]
college	-0.3657 [-47.66]	-0.4738 [-58.53]	-0.7037 [-63.75]
secondary_sector	-0.0204 [-1.21]	0.0031 [0.16]	-0.0088 [0.47]
tertiary_sector	-0.0577 [-3.80]	-0.0439 [-2.56]	-0.0362 [-2.22]
big_city	-0.2367 [-15.21]	-0.2470 [-15.57]	-0.1536 [-11.02]
age	-0.0052 [-10.57]	-0.0057 [-10.65]	-0.0053 [-10.79]
sizeHH	0.0596 [18.72]	0.0747 [20.23]	0.0789 [21.01]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city". For the 1996 sample, graduate school predicted failure perfectly, that is, there is no individual with graduate education who suffers poverty in the sample. The variable "graduate" was dropped from the regression.

Source: Author's own elaboration, with data from ENIGH.





**Table 3: Determinants of Poverty in Mexico: 1998**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	0.2336	0.3454	0.6205
female	0.0449 [2.62]	0.0399 [2.04]	0.0021 [0.11]
elementary	-0.1680 [-11.75]	-0.2139 [-11.44]	-0.2850 [-9.79]
secondary	-0.2104 [-15.72]	-0.2875 [-17.56]	-0.3938 [-14.05]
highschool	-0.2433 [-20.08]	-0.3472 [-27.34]	-0.5595 [-29.38]
college	-0.3072 [-41.41]	-0.4094 [-48.29]	-0.6673 [-68.80]
graduate	-	-	-0.6078 [-37.32]
secondary_sector	-0.0432 [-2.94]	-0.0490 [-2.58]	-0.0117 [-0.52]
tertiary_sector	-0.0445 [-3.13]	-0.0499 [-2.86]	-0.0246 [-1.30]
big_city	-0.2505 [-16.34]	-0.2776 [-17.33]	-0.2276 [-14.20]
age	-0.0038 [-8.67]	-0.0049 [-8.92]	-0.0051 [-8.99]
sizeHH	0.0501 [14.60]	0.0651 [15.57]	0.0791 [17.58]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city". For the 1998 sample, graduate school predicted failure perfectly, that is, there is no individual with graduate education who suffers (alimentary or capacities) poverty in the sample. The variable "graduate" was dropped from the regression in such cases.

Source: Author's own elaboration, with data from ENIGH.



### 5.1.3 The Determinants of Poverty: 2000

For the year 2000, the marginal effects for the logistic regression are shown in table 4. The sign of all the effects on the probability of poverty are the expected ones, positive for size of household, and negative for age, education, occupation, and size of city. The effect of the gender of the household head is once again not significant. In all poverty thresholds the largest effect of education is that of college, followed by the effect of high school education. In the Mexican context this can be seen as two points of importance: while the college effect is pretty much self-explanatory (allowing access to professional jobs), the end of the high school education (years 9-12) might be of particular importance because it allows the individual to work on more industrial or service-related jobs, avoiding the low-skilled ones and their associated lower income. The largest effect on occupation was that of the tertiary sector, reflecting the growing importance of this kind of employment, in an economy that is slowly redirecting itself away from manufacturing and more into services. Finally, the size of the household had a positive significant effect on the probability of suffering all three levels of poverty, meaning that larger-than-average households faced an increased probability of poverty in this year.

### 5.1.4 The Determinants of Poverty: 2002

Table 5 shows the marginal effects for each variable after the logistic regression estimation for year 2002. While none of the expected signs changed, it is important to note that for this year the effect of having a female household head was again positive and significant for the two lower levels of poverty; in this way, having a woman as head of household increased the probability of the household suffering alimentary poverty by 3.03% and that of suffering capacities poverty by 3.14%. Avoiding agricultural occupations was also a big factor to avoid poverty, since both industrial and services occupations had negative and significant effects for all three levels of poverty, decreasing its probabilities between 7.09% and 16.78%. The rest of the determinants behaved as expected: negative effects for education and age, and positive for household size.

### 5.1.5 The Determinants of Poverty: 2004

For the year 2004, the marginal effects for the logistic regression are shown in table 4. Once more the signs and magnitudes of the marginal effects are in accordance with those previously obtained. The effect of household head gender was once more statistically insignificant. The variables negatively associated with the probability of poverty were: educational attainment, industrial or service occupations, age of the household head, and living in a big city. Interestingly, for this year the effect of graduate studies was estimated for two thresholds of poverty; up until this point it had been almost impossible to estimate this effect due to the fact that, except for one case in 1998, having graduate education perfectly predicted “failure” or absence of poverty. In this case, however, the effect is negative and significant, as was expected for both the capacities and the patrimonial poverty thresholds.



**Table 4: Determinants of Poverty in Mexico: 2000**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	<i>0.1428</i>	<i>0.2233</i>	<i>0.4965</i>
female	-0.0027 [-0.22]	0.0018 [0.10]	-0.0453 [-1.87]
elementary	-0.1006 [-8.13]	-0.1551 [-9.25]	-0.2441 [-8.53]
secondary	-0.1255 [-10.29]	-0.1893 [-11.82]	-0.3403 [-12.67]
highschool	-0.1699 [-17.90]	-0.2469 [-21.63]	-0.4452 [-21.81]
college	-0.1856 [-22.90]	-0.2874 [-30.76]	-0.5429 [-41.84]
secondary_sector	-0.0664 [-5.24]	-0.0629 [-3.42]	-0.0545 [-2.03]
tertiary_sector	-0.0785 [-6.38]	-0.0935 [-5.87]	-0.0685 [-2.98]
big_city	-0.1975 [-13.82]	-0.2358 [-14.43]	-0.2509 [-13.62]
age	-0.0027 [-7.22]	-0.0040 [-7.86]	-0.0058 [-8.41]
sizeHH	0.0319 [10.51]	0.0475 [10.83]	0.0719 [12.35]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city". For the 2000 sample, graduate school predicted failure perfectly, that is, there is no individual with graduate education who suffers poverty in the sample. The variable "graduate" was dropped from the regression.

Source: Author's own elaboration, with data from ENIGH.



**Table 5: Determinants of Poverty in Mexico: 2002**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	<i>0.1210</i>	<i>0.1865</i>	<i>0.4629</i>
female	0.0303 [2.75]	0.0314 [2.30]	0.0383 [1.90]
elementary	-0.0375 [-4.45]	-0.0463 [-3.90]	-0.0052 [-2.24]
secondary	-0.0575 [-6.23]	-0.0696 [-5.43]	-0.0178 [-3.72]
highschool	-0.1117 [-13.98]	-0.1524 [-13.07]	-0.2245 [-8.10]
college	-0.1494 [-26.45]	-0.2220 [-32.94]	-0.4400 [-26.57]
secondary_sector	-0.0709 [-8.52]	-0.0954 [-8.25]	-0.1299 [-5.70]
tertiary_sector	-0.0933 [-10.33]	-0.1282 [-11.05]	-0.1678 [-8.35]
big_city	-0.1884 [-16.54]	-0.2479 [-18.46]	-0.3028 [-18.38]
age	-0.0017 [-6.07]	-0.0021 [-5.80]	-0.0035 [-5.92]
sizeHH	0.0272 [14.58]	0.0443 [17.64]	0.0843 [19.99]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city". For the 2002 sample, graduate school predicted failure perfectly, that is, there is no individual with graduate education who suffers poverty in the sample. The variable "graduate" was dropped from the regression.

Source: Author's own elaboration, with data from ENIGH.



**Table 6: Determinants of Poverty in Mexico: 2004**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	<i>0.1133</i>	<i>0.1682</i>	<i>0.4200</i>
female	-0.0020 [-0.22]	-0.0020 [-0.17]	0.0244 [1.43]
elementary	-0.0755 [-7.41]	-0.1048 [-7.53]	-0.2186 [-9.24]
secondary	-0.1013 [-12.73]	-0.1409 [-12.46]	-0.2920 [-13.66]
highschool	-0.1390 [-22.03]	-0.1935 [-23.06]	-0.4224 [-29.76]
college	-0.1559 [-29.86]	-0.2225 [-32.45]	-0.4828 [-47.77]
graduate	-	-0.1783 [-33.26]	-0.4394 [-59.31]
secondary_sector	-0.0671 [-8.33]	-0.0801 [-7.38]	-0.1079 [-5.64]
tertiary_sector	-0.0720 [-8.38]	-0.0839 [-7.42]	-0.1231 [-6.70]
big_city	-0.1258 [-12.11]	-0.1581 [-12.00]	-0.2387 [-13.09]
age	-0.0021 [-7.31]	-0.0030 [-7.78]	-0.0052 [-9.15]
sizeHH	0.0229 [13.33]	0.0332 [14.12]	0.0734 [15.45]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city". For the 2004 sample, graduate school predicted failure perfectly, that is, there is no individual with graduate education who suffers alimentary poverty in the sample. The variable "graduate" was dropped from the regression in such case.

Source: Author's own elaboration, with data from ENIGH.



#### 5.1.6 The Determinants of Poverty: 2006

Table 7 presents the marginal effects calculated from the logistic regression of the determinants of poverty for 2006. The variables that are associated with an increase in the probability of poverty were: being a larger-than-average household, living in rural areas or small cities, having a household head who had no formal education, or who worked in the agricultural sector. The variables that are associated with a decrease in the probability of suffering poverty are: all education levels, age of the household head, working on the secondary or tertiary sectors, and living in urban areas. Notable, however, is the fact that the effect of having a woman as a household head was once more not significant. This once again implies that there is no statistical difference in the probability of suffering poverty between households headed by a man or a woman, in other words having a woman in charge of the household doesn't significantly affect the household's income, as compared to those households headed by a man.

#### 5.1.7 The Determinants of Poverty: 2008

For the year 2008, the marginal effects resulting from the logistic regression estimation are shown in table 8. While the signs and magnitudes of the marginal effects behave as was expected and in accordance with most of what was found for the previous year, it is also noteworthy that for this year the effect of graduate education (negative and highly significant) was estimated for the three thresholds of poverty utilized in the study. This marks the first sample in which such exercise is possible, since before 2008 there was always at least one level of poverty for which graduate studies predicted perfectly the absence of poverty. In this case, having graduate education reduces the probability of alimentary poverty by 12.10%, the probability of capacities poverty by 18.28%, and the probability of suffering patrimonial poverty by 41.09%. On the other hand, the effect of having a woman-headed household was positive and significant only for the highest threshold of poverty, increasing the probability of patrimonial poverty occurring by 3.22%.

#### 5.1.8 The Determinants of Poverty: 2010

The marginal effects of the determinants of poverty included in the logistic regression for 2010 are shown in table 9. Once more, the variables show the expected effects, with gender, and size of the household positively affecting the probability of poverty, while education, age, non-agricultural occupations, and urban locations all decreasing the probability of a household suffering any of the three kinds of poverty used in this study. In this year, the effect of the gender of the household head was positive and significant for the two lower levels of poverty, increasing the probability of alimentary poverty by 2.96% and that of capacities poverty by 3.09%

#### 5.1.9 The Determinants of Poverty: 2012

For the last year in the studied period, the marginal effects of the determinants of poverty are reported in table 10. While lack of variance in the variable "graduate" excluded it from the analysis of alimentary and capacities poverty for this year (there were no observations that had



positive values for both graduate education and this sorts of poverty), the rest of the determinants reported marginal effects in the expected ranges. The negative and ever-increasing effect of educational degrees was significant for all poverty levels (except for graduate education at the lower levels of poverty, for which there were no observations). Once again, being a household whose head was a woman was highly associated with an increase in the probability of the household being poor (for this year however, the effect was significant for all three levels of poverty), while the size of the household showed a positive and significant effect on all probabilities of poverty. Non-agricultural occupations and urban locations showed negative and significant effects.

**Table 7: Determinants of Poverty in Mexico: 2006**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	0.0891	0.1481	0.3529
female	-0.0061 [-0.92]	-0.0127 [-1.37]	-0.0144 [-1.00]
elementary	-0.0766 [-10.14]	-0.1211 [-10.83]	-0.2031 [-9.39]
secondary	-0.0887 [-14.21]	-0.1336 [-14.82]	-0.2753 [-14.96]
highschool	-0.1073 [-17.56]	-0.1716 [-22.05]	-0.3558 [-25.33]
college	-0.1238 [-26.05]	-0.1962 [-32.60]	-0.4310 [-46.84]
graduate	-	-	-0.3782 [-58.34]
secondary_sector	-0.0550 [-9.46]	-0.0633 [-6.97]	-0.0676 [-3.82]
tertiary_sector	-0.0655 [-9.31]	-0.0861 [-9.02]	-0.1001 [-6.68]
big_city	-0.1220 [-12.06]	-0.1612 [-13.38]	-0.2232 [-14.25]
age	-0.0014 [-6.48]	-0.0023 [-7.48]	-0.0048 [-10.06]
sizeHH	0.0173 [11.93]	0.0287 [13.71]	0.0656 [19.15]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city". For the 2006 sample, graduate school predicted failure perfectly, that is, there is no individual with graduate education who suffers (alimentary or capacities) poverty in the sample. The variable "graduate" was dropped from the regression in such cases.

Source: Author's own elaboration, with data from ENIGH.



**Table 8: Determinants of Poverty in Mexico: 2008**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	<i>0.1117</i>	<i>0.1700</i>	<i>0.3990</i>
female	0.0111 [1.28]	0.0153 [1.39]	0.0322 [2.16]
elementary	-0.0647 [-7.79]	-0.1028 [-8.87]	-0.1795 [-8.40]
secondary	-0.0892 [-12.09]	-0.1375 [-13.88]	-0.2510 [-12.88]
highschool	-0.1219 [-19.27]	-0.1829 [-22.70]	-0.3586 [-24.47]
college	-0.1545 [-29.26]	-0.2249 [-34.29]	-0.4652 [-49.49]
graduate	-0.1210 [-29.54]	-0.1828 [-35.32]	-0.4109 [-60.38]
secondary_sector	-0.0975 [-17.04]	-0.1293 [-17.02]	-0.1723 [-11.10]
tertiary_sector	-0.1162 [-13.68]	-0.1452 [-13.76]	-0.1828 [-11.45]
big_city	-0.1217 [-14.18]	-0.1616 [-15.30]	-0.2102 [-15.85]
age	-0.0028 [-12.06]	-0.0040 [-13.25]	-0.0077 [-17.11]
sizeHH	0.0213 [14.84]	0.0332 [16.89]	0.0677 [20.01]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city".

Source: Author's own elaboration, with data from ENIGH.





**Table 9: Determinants of Poverty in Mexico: 2010**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	<i>0.0964</i>	<i>0.1571</i>	<i>0.3922</i>
female	0.0296 [3.54]	0.0309 [2.98]	0.0150 [1.01]
elementary	-0.0522 [-6.39]	-0.0709 [-5.77]	-0.1754 [-6.95]
secondary	-0.0797 [-10.74]	-0.1160 [-10.62]	-0.2598 [-11.15]
highschool	-0.1088 [-16.76]	-0.1646 [-18.93]	-0.3726 [-21.90]
college	-0.1402 [-27.00]	-0.2183 [-32.73]	-0.4688 [-44.43]
graduate	-0.1014 [-21.32]	-0.1671 [-31.21]	-0.4097 [-54.55]
secondary_sector	-0.0752 [-14.42]	-0.1014 [-13.43]	-0.1632 [-9.86]
tertiary_sector	-0.1227 [-15.03]	-0.1574 [-15.44]	-0.2234 [-13.25]
big_city	-0.0858 [-11.46]	-0.1002 [-11.18]	-0.1461 [-10.48]
age	-0.0032 [-13.56]	-0.0046 [-14.94]	-0.0089 [-18.18]
sizeHH	0.0206 [14.48]	0.0316 [16.36]	0.0732 [19.98]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city".

Source: Author's own elaboration, with data from ENIGH.



**Table 10: Determinants of Poverty in Mexico: 2012**

$Pr(poverty=1   X)$	Alimentary Poverty	Capacities Poverty	Patrimonial Poverty
	<i>0.1359</i>	<i>0.2070</i>	<i>0.4334</i>
female	0.0385 [2.41]	0.0709 [3.56]	0.0517 [2.11]
elementary	-0.0696 [4.66]	-0.1209 [-6.11]	-0.2057 [-6.19]
secondary	-0.1013 [-7.11]	-0.1540 [-8.22]	-0.2761 [-8.42]
highschool	-0.1524 [-13.29]	-0.2217 [-15.55]	-0.3973 [-16.43]
college	-0.1804 [-18.72]	-0.2647 [-23.51]	-0.4986 [-32.60]
graduate	-	-	-0.4594 [-44.19]
secondary_sector	-0.0946 [-9.65]	-0.1241 [-9.51]	-0.1376 [-5.68]
tertiary_sector	-0.1263 [-9.60]	-0.1584 [-9.76]	-0.1724 [-7.24]
big_city	-0.1133 [-8.7]	-0.1564 [-10.20]	-0.2145 [-11.19]
age	-0.0035 [-8.24]	-0.0050 [-9.35]	-0.0079 [-10.57]
sizeHH	0.0253 [8.66]	0.0407 [9.87]	0.0691 [10.34]

Marginal effects of the logistic regression are shown. For the continuous variable this is evaluated at the mean, for the dummy variables it reflects the effect of a discrete change from 0 to 1. Z-Statistics are shown in parenthesis. The omitted education category is "no\_school". The omitted job sector is "primary sector". The omitted size of city is "small city". For the 2012 sample, graduate school predicted failure perfectly, that is, there is no individual with graduate education who suffers (alimentary or capacities) poverty in the sample. The variable "graduate" was dropped from the regression in such cases.

Source: Author's own elaboration, with data from ENIGH.



## 5.2 The Evolution of the Determinants of Household Poverty in México.<sup>1</sup>

### 5.2.1 Gender.

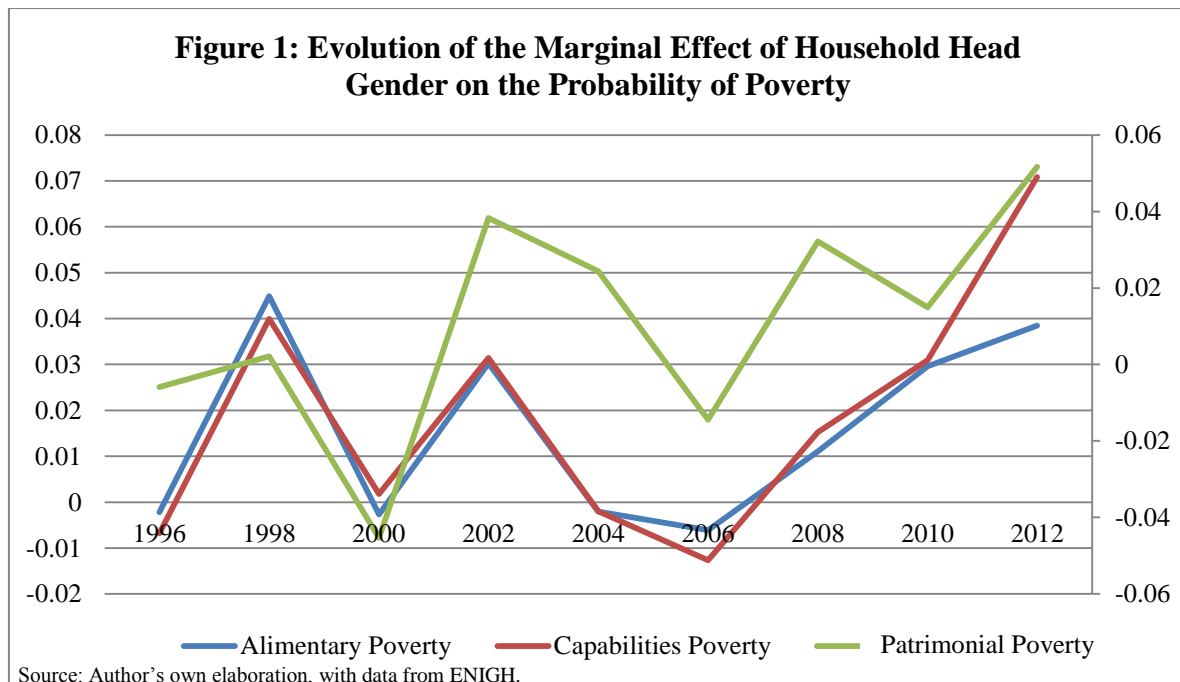
To start looking into the dynamics of the determinants of poverty in Mexico, we will first examine the behavior of the effect of the gender of the household head. As it is defined for this study, the variable “female” captured the effect on the probability of being poor of the fact that the household is headed by a woman (1) or a man (0). As previously stated, this variable exhibited some irregular behavior, with some results being negative and other positives, and switching in and out of statistical significance. But for all the significant results, the effect of having a woman as a household head was positive, that is, it was associated with a larger probability of being in one or more states of poverty.

**Table 11: Evolution of the Marginal Effect of Household Head Gender on the Probability of Poverty**

	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	<b>-0.0022</b>	0.0449	<b>-0.0027</b>	0.0303	<b>-0.0020</b>	<b>-0.0061</b>	<b>0.0111</b>	0.0296	0.0385
Capabilities Poverty	<b>-0.0068</b>	0.0399	<b>0.0018</b>	0.0314	<b>-0.0020</b>	<b>-0.0127</b>	<b>0.0153</b>	0.0309	0.0709
Patrimonial Poverty	<b>-0.0059</b>	<b>0.0021</b>	<b>-0.0453</b>	<b>0.0383</b>	<b>0.0244</b>	<b>-0.0144</b>	0.0322	<b>0.0150</b>	0.0517

Note: all figures, except those in bold are significant to the 95% confidence level.

Source: Author's own elaboration, with data from ENIGH.



<sup>1</sup> For all the graphic analyses, for trend identification, and simplicity purposes alimentary and capacities poverty was graphed in the main (left) axis, while patrimonial (asset) poverty was graphed on the secondary (right) axis. All the figures are of the author's own elaboration based on the analysis performed previously and with data from ENIGH



As is evident from Figure 1, the effect of having a female household head increased for 1998, oscillating up and down, as previously mentioned. However, at the end of the studied period, positive and significant results meant that the effect of the gender of the household head was definitely increasing, as compared to the one exhibited in 1996.

After testing for significance we find that the effect of a female-headed household on the probability of poverty did increase in the period, and the difference between the effect in 1996 and the effect in 2012 is statistically significantly different from zero<sup>2</sup>.

### 5.2.2 Age

According to all the year-by-year regressions, a one unit increase in the age of the household head (over the mean) will be associated with a decreased probability of the household being poor. This means that, holding everything else constant, having a household head whose age is one year above the mean (mid 40's) is associated with a decrease in the probability of poverty that ranges between the 0.14% and 0.89%. The results are in accordance with the widely accepted theory that age positively affects earnings through accumulated human capital in the form of labor-market experience (Mincer, 1974). It is yet to be explored, whether or not are there any indications of quadratic effects of age, as predicted by the same theory.

The evolution of the effect of this determinant is shown in table 12 and plotted in Figure 2. It is very interesting to note that, while the effect was always negative and significant, the dynamics of the effect is not<sup>3</sup>. This suggests that the effect of household head age on the probability of poverty is not significantly different in 2012 from what it was in 1996. Noteworthy is the fact that before the decrease in the marginal effects seen in 2012, the difference between the 1996 and 2006 effects was, indeed, significant, with the negative effect of age being smaller up until this point in time (with the exception of patrimonial poverty). In other words, the “poverty burden” of being a younger household head was less in 2006 than in 1996. But after six years, in 2012, no difference was statistically noticeable.

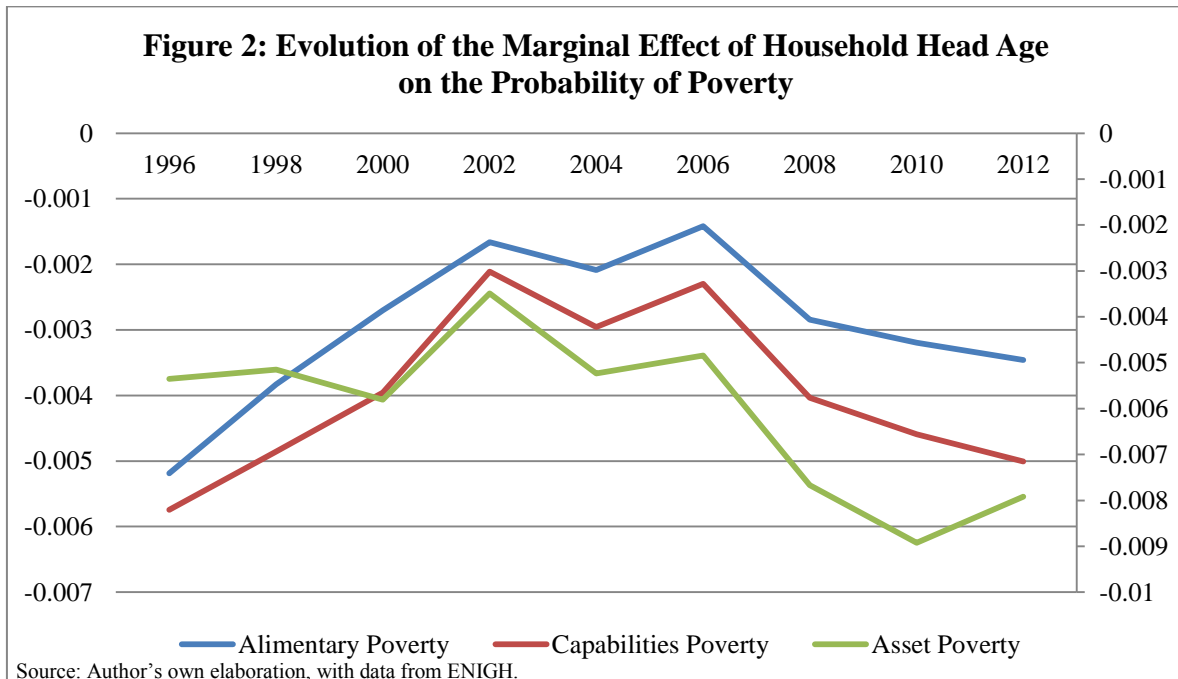
**Table 12: Evolution of the Marginal Effect of Household Head Age on the Probability of Poverty**

	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	-0.0052	-0.0038	-0.0027	-0.0017	-0.0021	-0.0014	-0.0028	-0.0032	-0.0035
Capabilities Poverty	-0.0057	-0.0049	-0.0040	-0.0021	-0.0030	-0.0023	-0.0040	-0.0046	-0.0050
Patrimonial Poverty	-0.0053	-0.0051	-0.0058	-0.0035	-0.0052	-0.0048	-0.0077	-0.0089	-0.0079

Note: all figures, except those in bold are significant to the 95% confidence level.

<sup>2</sup> The P-values for the Wald tests were 0.033 (alimentary poverty), 0.002 (capacities poverty) and 0.000 (patrimonial poverty)

<sup>3</sup> The P-values for the Wald test were 0.176 (alimentary poverty), 0.072 (capacities poverty) and 0.078 (patrimonial poverty)



### 5.2.3 Education

The year-by-year analysis of the determinants of poverty showed that the educational levels were all associated with a lower probability of household poverty. Excluding graduate studies, which had special circumstances already described, all other educational levels, specially referring to those considered as compulsory education (up to 2010 this included elementary and secondary education, and after this year it also included high school education after a constitutional reform) showed a negative, increasing, and significant effect on the probability of poverty occurring. In other words, the effect is always present, it is always negative (decreases probability of poverty) and is larger in magnitude for higher educational levels. For more than half of the period studied, graduate education was a perfect predictor of “no poverty”.

The dynamics of this effect are shown in table 13 and plotted individually in Figures 3-6. Generally speaking, the evolution of the effects of elementary school, secondary school, high school and college are all highly significant (P-values are all 0.00)<sup>4</sup>. This means that the marginal effect of having any of these educational degrees on the probability of poverty is significantly different at the beginning and at the end of the period.

What is interesting to note, from the graphic analysis is that, contrary to what one would anticipate, the slope of the effect of education is positive, in other words, it is approaching zero with time. While it was obvious to expect an increase in the importance of such degrees, the data suggests otherwise. The effect of having an academic degree on the probability of poverty was larger in magnitude for 1996 than it was in 2012.

<sup>4</sup> The exception being elementary school. In this case the change in the effect was only significant for the models of alimentary poverty (0.038) and capacities poverty (0.049), while it was not significant for the model of patrimonial poverty (0.18)



**Table 13: Evolution of the Marginal Effect of Household Head Educational Attainment on the Probability of Poverty**

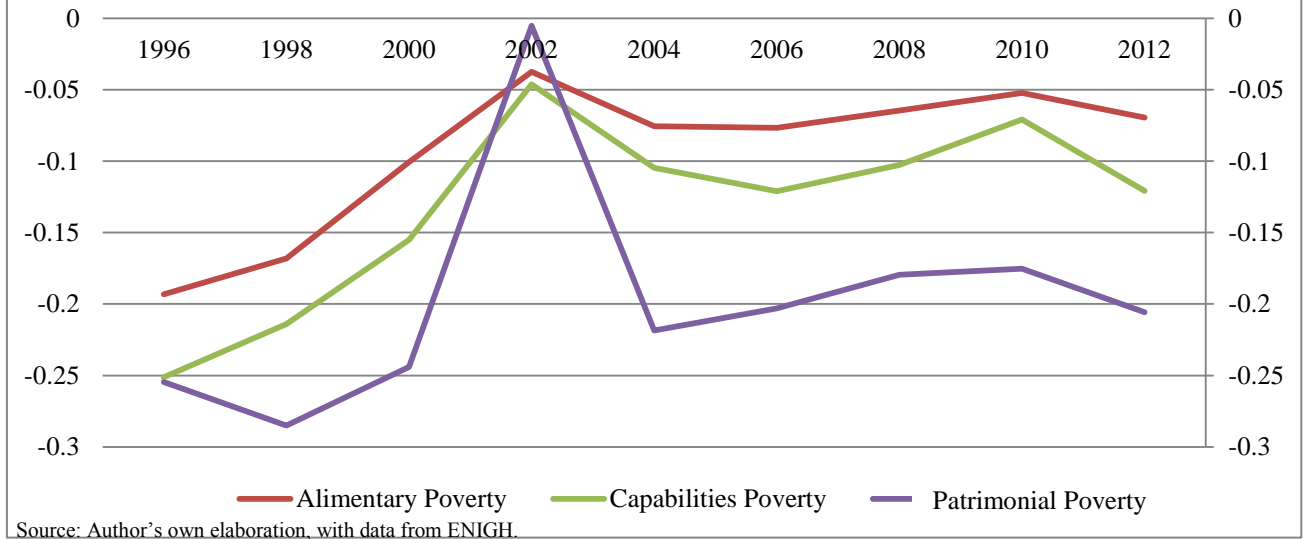
Elementary School	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	-0.1931	-0.1680	-0.1006	-0.0375	-0.0755	-0.0766	-0.0647	-0.0522	-0.0696
Capabilities Poverty	-0.2512	-0.2139	-0.1551	-0.0463	-0.1048	-0.1211	-0.1028	-0.0709	-0.1209
Patrimonial Poverty	-0.2546	-0.2850	-0.2441	-0.0052	-0.2186	-0.2031	-0.1795	-0.1754	-0.2057
Secondary School	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	-0.2875	-0.2104	-0.1255	-0.0575	-0.1013	-0.0887	-0.0892	-0.0797	-0.1013
Capabilities Poverty	-0.3519	-0.2875	-0.1893	-0.0696	-0.1409	-0.1336	-0.1375	-0.1160	-0.1540
Patrimonial Poverty	-0.4094	-0.3938	-0.3403	-0.0178	-0.2186	-0.2753	-0.2510	-0.2598	-0.2761
High School	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	-0.3426	-0.2433	-0.1699	-0.1117	-0.1390	-0.1073	-0.1219	-0.1088	-0.1524
Capabilities Poverty	-0.4314	-0.3472	-0.2469	-0.1524	-0.1935	-0.1716	-0.1829	-0.1646	-0.2217
Patrimonial Poverty	-0.5878	-0.5595	-0.4452	-0.2245	-0.4224	-0.3558	-0.3586	-0.3726	-0.3973
College	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	-0.3657	-0.3072	-0.1856	-0.1494	-0.1559	-0.1238	-0.1545	-0.1402	-0.1804
Capabilities Poverty	-0.4738	-0.4094	-0.2874	-0.2220	-0.2225	-0.1962	-0.2249	-0.2183	-0.2647
Patrimonial Poverty	-0.7037	-0.6673	-0.5429	-0.4400	-0.4828	-0.4310	-0.4652	-0.4688	-0.4986
Graduate School	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	-	-	-	-	-	-	-0.1210	-0.1014	-
Capabilities Poverty	-	-	-	-	-0.1783	-	-0.1828	-0.1671	-
Patrimonial Poverty	-	-0.6078	-	-	-0.4394	-0.3782	-0.4109	-0.4097	-0.4594

Note: all figures are significant to the 95% confidence level.

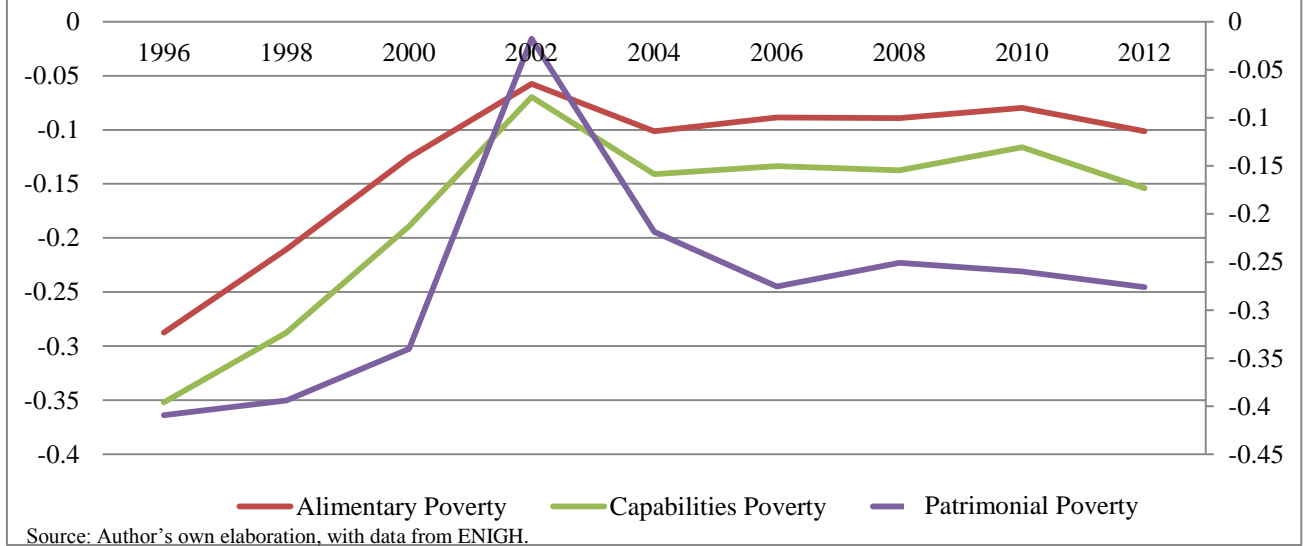
Source: Author's own elaboration, with data from ENIGH.



**Figure 3: Evolution of the Marginal Effect of Elementary Education on the Probability of Poverty**

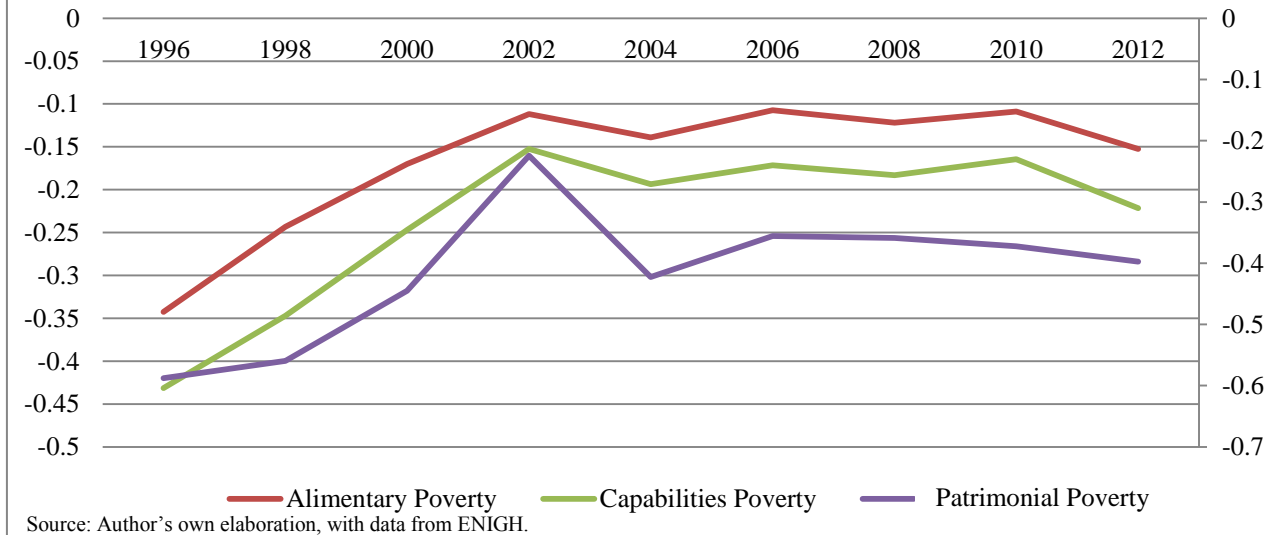


**Figure 4: Evolution of the Marginal Effect of Secondary Education on the Probability of Poverty**

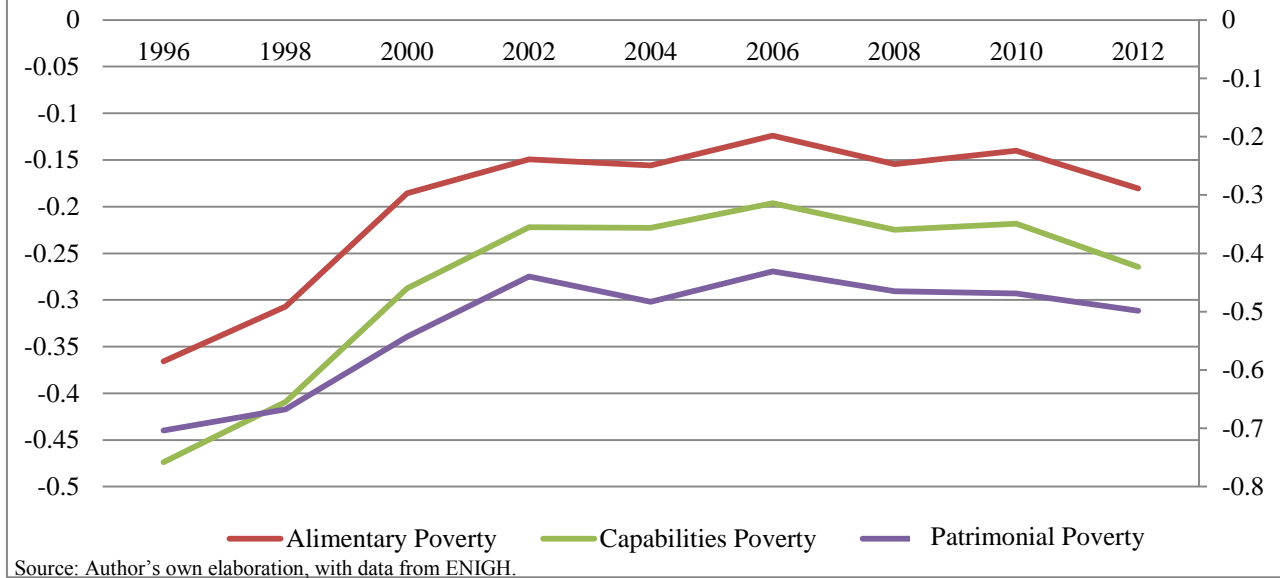




**Figure 5: Evolution of the Marginal Effect of High School Education on the Probability of Poverty**



**Figure 6: Evolution of the Marginal Effect of College Education on the Probability of Poverty**



A possible explanation lies in the temporal dimension. Since the period studied is 1996-2012 we are limited by such frame. If the effect of education in 2012 was less negative than it was in 1996, it may be due to the fact that 1996 was a special point in time in which having a higher stock of human capital became critical to avoid poverty, like an economic crisis. For the Mexican case this is not a far-stretched explanation, since the 1993-1995 years were ones of severe economic stress, high unemployment and currency devaluation. It is possible that 1996





was a point in time in which the marginal effect of any educational level on the probability of poverty was particularly large. After the crisis, and into the decade of prosperity and stability that followed, the effect of education returned to its previous or “normal” level. But for an observer who is looking from 1996 onwards this might seem like education is losing its importance. Further studies that look before such crisis would be needed to support this explanation.

Another explanation for this particular trend might refer to the fact that education is becoming more and more widespread in Mexico. Looking back to Table 1, it is easy to observe that in 2012 there were more people in each of the educational levels than there were in 1996. A higher average degree of education increases the supply of educated workers, which in turn would decrease the returns to education. As Cortez (2001) explains, it is the change in the composition of the educational distribution in Mexico that could explain this diminished return to education. However, it would be overly simplistic to attribute all the changes seen in Figures 3-6 to the increasing number of educated people, especially considering that the same Cortez (2001) warns about the complicated structure of the Mexican labor market in which unions and minimum wages play major roles.

#### 5.2.4 Occupation

According to the yearly analysis previously performed, having a household head that works in the primary sector of the economy (agriculture, mining, fishing) is associated with an increased probability of poverty for those households. On the contrary, if the job of the household head lies in the secondary (manufacture, industry) or in the tertiary sector (services) of the economy, then the associated probability of poverty was significantly decreased.

Table 14 shows the evolution of the marginal effects of household head occupation on the probability of poverty. The reference category is occupation in the primary sector. The results are plotted in Figures 7 and 8.

**Table 14: Evolution of the Marginal Effect of Household Head Occupation on the Probability of Poverty**

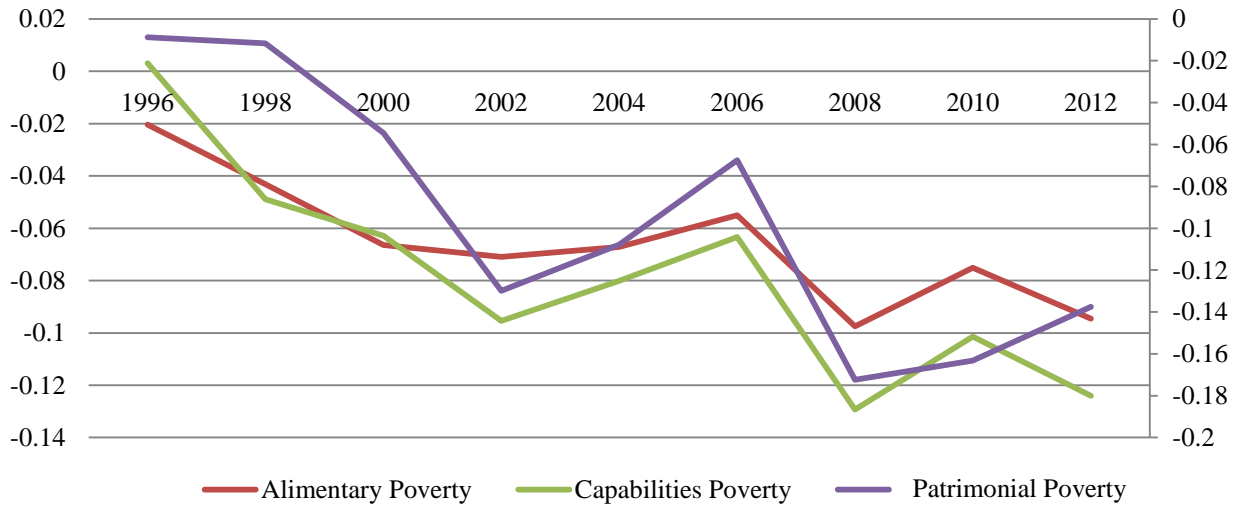
	1996	1998	2000	2002	2004	2006	2008	2010	2012
<b>Secondary Sector</b>									
Alimentary Poverty	<b>-0.0204</b>	-0.0432	-0.0664	-0.0709	-0.0671	-0.0550	-0.0975	-0.0752	-0.0946
Capabilities Poverty	<b>0.0031</b>	-0.0490	-0.0629	-0.0954	-0.0801	-0.0633	-0.1293	-0.1014	-0.1241
Patrimonial Poverty	<b>-0.0088</b>	<b>-0.0117</b>	-0.0545	-0.1299	-0.1079	-0.0676	-0.1723	-0.1632	-0.1376
<b>Tertiary Sector</b>									
Alimentary Poverty	-0.0577	-0.0445	-0.0785	-0.0933	-0.0720	-0.0655	-0.1162	-0.1227	-0.1263
Capabilities Poverty	-0.0439	-0.0499	-0.0935	-0.1282	-0.0839	-0.0861	-0.1452	-0.1574	-0.1584
Patrimonial Poverty	-0.0362	<b>-0.0246</b>	-0.0685	-0.1678	-0.1231	-0.1001	-0.1828	-0.2234	-0.1724

Note: all figures, except those in bold are significant to the 95% confidence level.

Source: Author’s own elaboration, with data from ENIGH.

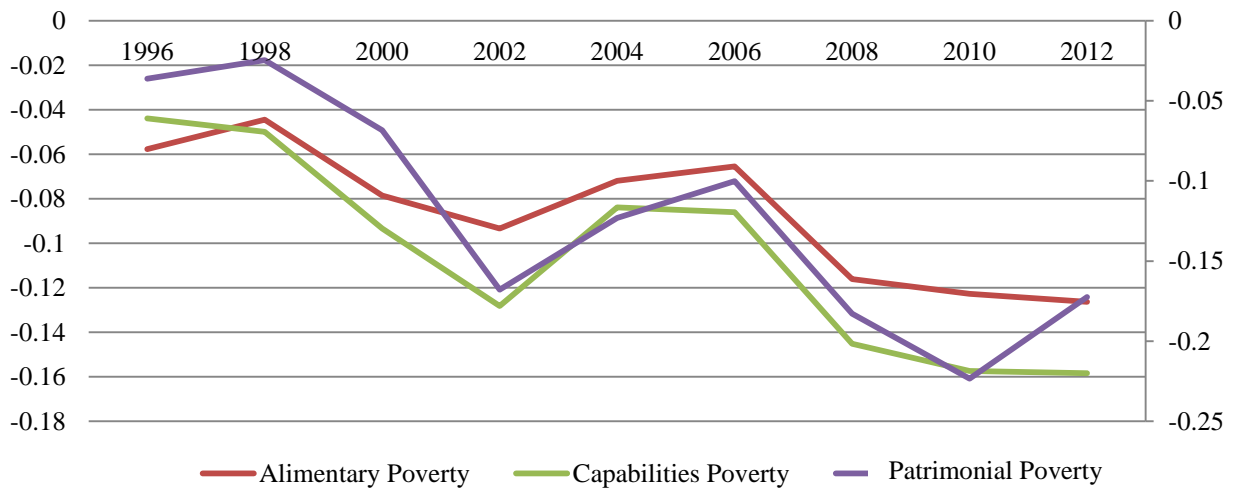


**Figure 7: Evolution of the Marginal Effect of Working in the Secondary Sector on the Probability of Poverty**



Source: Author's own elaboration, with data from ENIGH.

**Figure 8: Evolution of the Marginal Effect of Working in the Tertiary Sector on the Probability of Poverty**



Source: Author's own elaboration, with data from ENIGH.



Both dynamics show that in 2012, compared to the beginning of the period, there is a greater effect of working in the secondary or tertiary sector of the economy. In other words, having a non-agricultural occupation (namely, industry or services) is associated with a larger decrease in the probability of poverty for 2012 than for 1996. For the case of industrial occupations, the effect of holding one of these jobs went from practically zero (not affecting the chances of poverty in the household) in 1996, to reducing the probability of being in poverty by 10-14% in 2012; this change proved to be highly significant in the statistical tests.<sup>5</sup>

Holding a job in the services sector, as compared to holding one in the agricultural sector, was associated with a 3-5% decrease in the probability of poverty in 1996, and at the end of the period, the associated decrease was in the 12-17% range. The increased effect of working in the services reflects the growing importance of this kind of occupations that actively employs half the labor force and produces over 70% of the country's GDP (Coll-Hurtado & Córdoba y Ordoñez, 2006). In the statistical analysis, the difference between the 1996 and 2012 effects proved to be also highly significant, meaning that in 2012 the associated decrease in the probability of poverty was significantly larger than that of 1996<sup>6</sup>.

#### 5.2.5 City Size

Big cities are usually associated with economic activity, emerging opportunities, better service coverage, and lower poverty rates than rural areas. For instance, Baker (2008) states that while one third of those living in cities are poor, they only account for one quarter of the world's poor. It is no surprise, therefore, that the year-by-year analysis showed that living in a big city or urban area (+15,000 inhabitants) is associated with a decreased probability of a household suffering poverty.

Table 15 and Figure 9 show the evolution of this marginal effect over the studied period. For the cases of alimentary and capacities poverty the positive trend is pretty much the same, the effect is less and less negative with each year passing. This means that in 1996, living in a big city, as opposed to living in rural areas, was associated with a decreased probability of suffering poverty of around 24%, but this effect gradually was reduced until the end of the period, where the associated reduction in the probability of poverty was around 11-15%.

For the case of patrimonial poverty, the highest poverty threshold analyzed, the dynamic is quite different; for the period between 1996 and 2002 living in a big city had a larger and larger effect with time, with reductions in the chances of being poor starting at 15% and peaking at 30% in 2002. From there on the trend is the same as the other two poverty thresholds, with a solid reduction of the effect of urban locations until 2010 and a slight increase for 2012.

However, statistical testing of the variations between 1996 and 2012 reveal that for none of the three levels of poverty was this change significant<sup>7</sup>. In other words, while the effect is highly significant for all years and even though the trend shows a steady decline of the relevance of

<sup>5</sup> All three P-values for the Wald tests were 0.000

<sup>6</sup> All three P-values for the Wald tests were 0.000

<sup>7</sup> With P-values of 0.139 (alimentary poverty), 0.147 (capacities poverty) and 0.870 (patrimonial poverty)

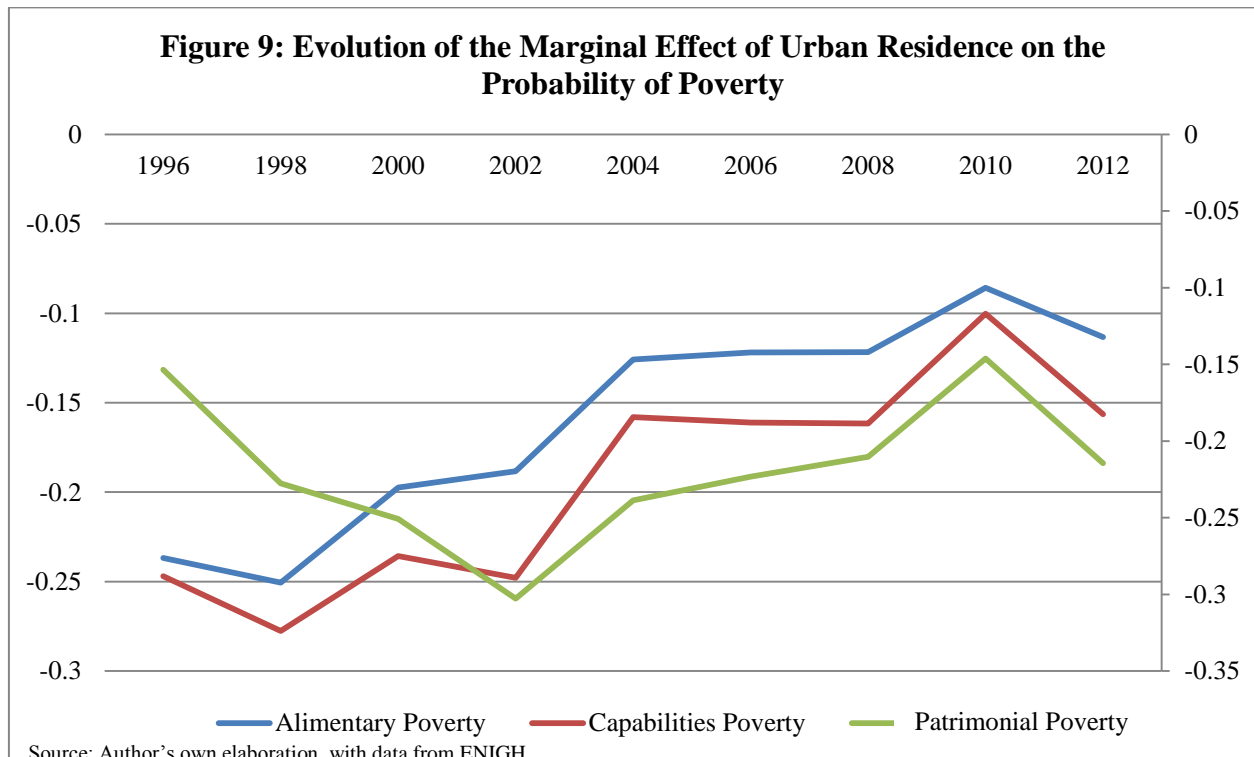


living in big cities, there is no statistical evidence to support the claim that the effect of urban residence is different in 2012 from what it was in 1996.

**Table 15: Evolution of the Marginal Effect of Urban Residence on the Probability of Poverty**

	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	-0.2367	-0.2505	-0.1975	-0.1884	-0.1258	-0.1220	-0.1217	-0.0858	-0.1133
Capabilities Poverty	-0.2470	-0.2776	-0.2358	-0.2479	-0.1581	-0.1612	-0.1616	-0.1002	-0.1564
Patrimonial Poverty	-0.1536	-0.2276	-0.2509	-0.3028	-0.2387	-0.2232	-0.2102	-0.1461	-0.2145

Note: all figures are significant to the 95% confidence level.  
Source: Author's own elaboration, with data from ENIGH.



### 5.2.6 Household Size

Household size is speculated to have an unclear effect on poverty. Lanjouw & Ravallion (1994) explain that on one side there is the much widespread theory that the size of the household holds a positive correlation with poverty, in other words larger households face bigger chances of falling in this state, given the income-consumption relationship; on the other side there is the argument that states that larger households benefit from scale economies, reducing their probability of being poor. It has also been hypothesized that larger households help increase the labor supply of the household and consequently to increase wages, not to mention its role as substitute of social security systems.



In this study, after a year-by-year analysis, the effect of household size was positive and significant for all the years in the sample and for all three models of poverty. Table 16 and Figure 10 show the evolution of this effect. The graphic analysis shows a considerable decrease in the effect of household size for the models of alimentary and capacities poverty, while the model for Patrimonial poverty shows also a decrease, albeit a less pronounced one.

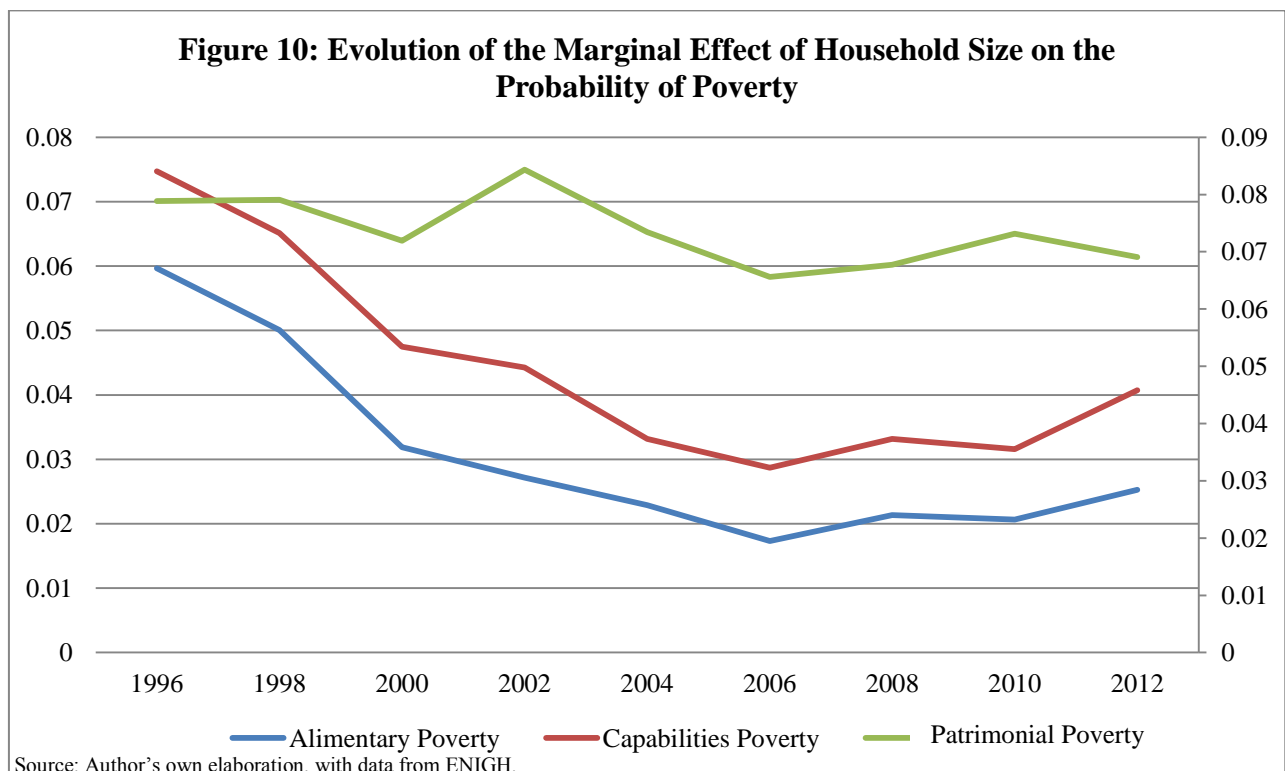
The statistical analysis confirmed this, indicating that for all three cases, the effect of household size was significantly reduced between 1996 and 2012<sup>8</sup>. In other words, larger households were associated with a lower probability of poverty in 2012 than they did in 1996, holding everything else equal. While having one extra member in the household (above the mean) represented a 6-8% increased probability of poverty in 1996, in 2012 this increase was in the 2-7% range.

**Table 16: Evolution of the Marginal Effect of Household Size on the Probability of Poverty**

	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	0.0596	0.0501	0.0319	0.0272	0.0229	0.0173	0.0213	0.0206	0.0253
Capabilities Poverty	0.0747	0.0651	0.0475	0.0443	0.0332	0.0287	0.0332	0.0316	0.0407
Patrimonial Poverty	0.0789	0.0791	0.0719	0.0843	0.0734	0.0656	0.0677	0.0732	0.0691

Note: all figures are significant to the 95% confidence level.

Source: Author's own elaboration, with data from ENIGH.



<sup>8</sup> With P-values of 0.035 (alimentary poverty), 0.049 (capabilities poverty) and 0.004 (patrimonial poverty)



## 6. Conclusion

This study attempted to analyze the determinants of household poverty in Mexico and their evolution between 1996 and 2012. Using survey data from the last 17 years, information was obtained about the household head's socio-economic and demographic characteristics. Using such characteristics, and some of the household itself, logistic regression models were estimated that projected the probability of poverty occurring in the household, at different intensities of poverty as reflected by the three lines used. Marginal effects were then calculated for each of the determinants. Finally, the behavior of such marginal effects through time were analyzed and tested for statistical significance.

With regard to the probability of poverty, the variables that were positively correlated were: being a larger-than-average, a rural-located, or a female-headed household, having a household head who had no formal education or whose work lied in agriculture or other primary activities. On the other hand, the variables that were correlated with a decreased probability of poverty occurring were: all educational levels (elementary school, secondary school, high school, college and graduate studies), industrial or services occupations, living in urban locations, and the age of the household head.

The analysis of the temporal evolution of this determinants' influence suggests that the negative effects of age and urban location of the household are not significantly different in 2012 from those already acting in 1996. On the contrary, the effects of education are certainly smaller at the end of the period, suggesting a decrease in the returns to education possibly attributable to the growing access to education and a higher average educational attainment among the Mexican population. The effect of holding on to an occupation that lied outside the agricultural sector (industry or services) showed evident increase during the period, these reflect the growing importance of the secondary and tertiary sector of the economy, as well as reflect the problems and disadvantages that agricultural workers still face in modern Mexico. Finally, while being a larger-than-average household is consistently associated with an increased probability of poverty, this increase is smaller in magnitude for 2012 than it was for 1996.

Given the evolution of the determinants of poverty, further research could be aimed at understanding the increasing importance of the manufacturing and services sector, as well as to analyze the burden of those working in the agriculture; to understand if other forms of human capital, such as health or experience, are also of importance; to explore the effect on poverty of the recently-achieved universal health coverage, or to analyze the effect and relative importance of the informal sector, notoriously large in the Mexican economy. The full understanding of the determinants of poverty is of crucial significance, especially for poverty-alleviating policy-makers. This is only ever more important in a country that, like Mexico, counts as much as half its population among the poor.



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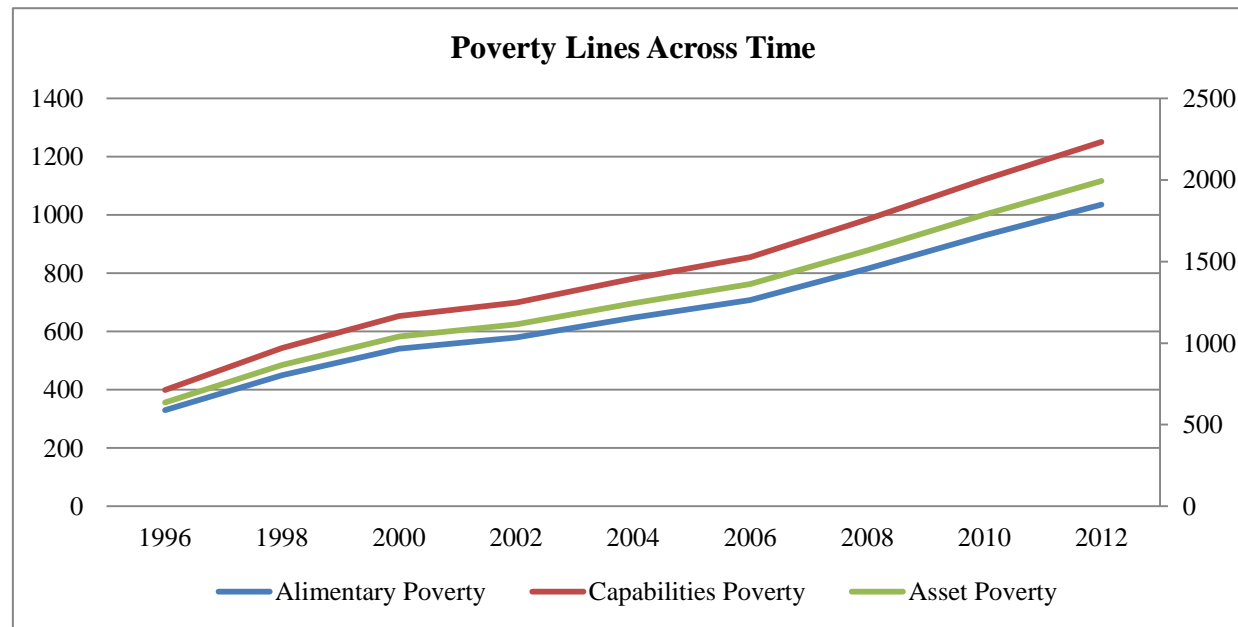


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**Appendix 1:Poverty Lines (in pesos, per capita)**

	1996	1998	2000	2002	2004	2006	2008	2010	2012
Alimentary Poverty	\$330.10	\$449.60	\$540.48	\$578.76	\$646.78	\$707.72	\$815.02	\$929.10	\$1,035.47
Capabilities Poverty	\$398.65	\$542.98	\$652.74	\$698.98	\$781.12	\$854.71	\$984.26	\$1,122.04	\$1,250.39
Patrimonial Poverty	\$635.30	\$865.38	\$1,040.35	\$1,114.09	\$1,244.96	\$1,362.23	\$1,568.61	\$1,788.18	\$1,992.47

Source: CONEVAL



Source: CONEVAL.

Note: Patrimonial Poverty is graphed on the secondary axis.

## *Acknowledgement*

*The author would like to thankfully acknowledge valuable advice and support in the realization of the present work from Prof. Jorge Garza-Rodríguez, Dr. Andrés Palacio, Nayeli Salgado-Granados, Vladana Ajvaz, and Milan Lakićević.*

*The present study benefited greatly from helpful methodological insights and econometric recommendations made by Prof. Raquel Carrasco Perea, from Universidad Carlos III de Madrid.*