

**INSTITUTO TECNOLÓGICO Y DE ESTUDIOS  
SUPERIORES DE MONTERREY  
CAMPUS MONTERREY**

**ESCUELA DE GRADUADOS EN ADMINISTRACION  
PUBLICA Y POLITICA PUBLICA.**



**TECNOLÓGICO  
DE MONTERREY.**

**"MORE PUSHED THAN PULLED: SELF-EMPLOYMENT  
IN RURAL MEXICO TEN YEARS AFTER NAFTA"**

**TESIS  
MAESTRIA EN ECONOMIA Y POLITICA PUBLICA**

**POR  
SINDY AGUSTINA GONZALEZ TIERINA**

**DICIEMBRE DEL 2006**

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*A Dios, por bendecirme con una familia maravillosa.*

*A mis padres, por su amor y apoyo incondicional.*

*A mis hermanas, por ser mis amigas, mis cómplices, mi todo.*

*A Noé, por creer en mis sueños.*

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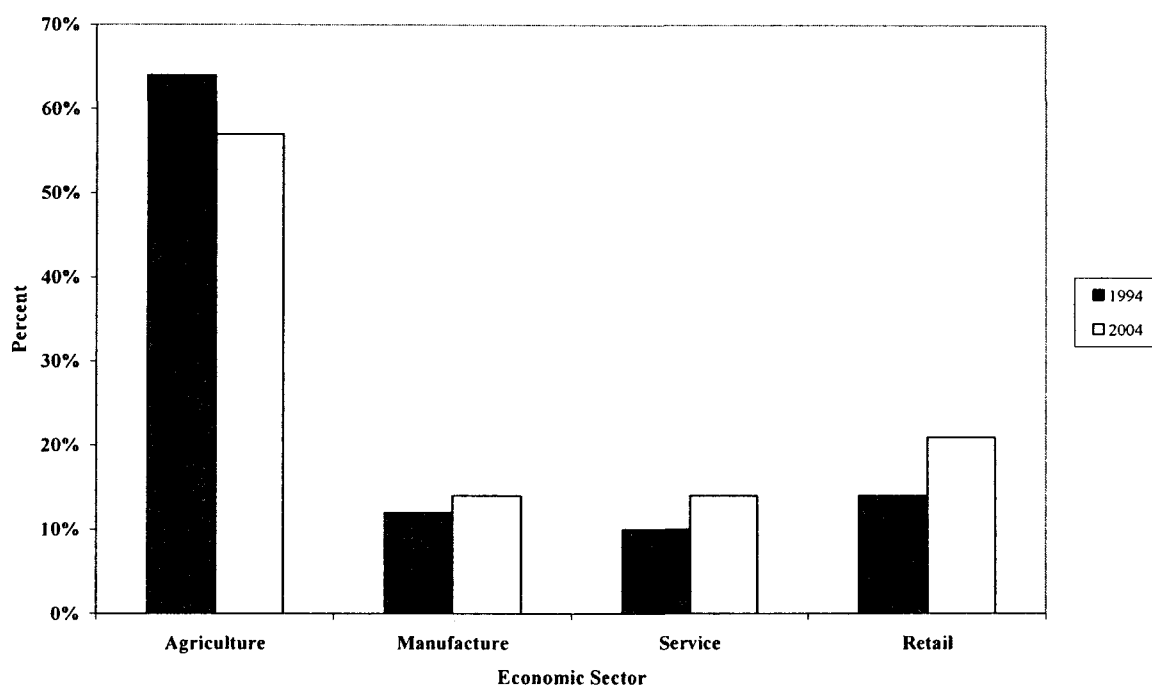
## CONTEXT

During the last decade Mexico has experienced important changes in different ambits: social, political, economic, institutional, etc. Political participation among the Mexican population increased, causing the government decision-making processes to become decentralized, the role of the public sector has been reduced, and a new social policy was directed by the government especially oriented to combat poverty. In terms of international policy, the country enjoys a more open economy and it is more integrated with the world than a few decades ago. In spite of the changes, high poverty had persist and some regions present severe underemployment.

The present investigation concentrates in the Mexican rural sector. Locations with less than 2,500 individuals are considered rural, which are characterized by problems and needs. Frequently, rural people are found in remote areas with difficult access to markets and institutions, with few opportunities to gain jobs and inadequate access to productive assets. The dynamic of the rural economy is complex; its demographic and economic characteristics create differences in the labor force; in the earnings that people living in rural areas get and in the type and prices of good and services they consume; in the problems that they encounter, and the possible solutions to theses problems. However the rural sector is contradictory in the sense that it contains weaknesses and strengths; it has deficiencies but also it has an important potential of social, economic and technological development.

Mexico is a country where the population whom lives in rural areas is abundant and where the agriculture is their principal economic activity, even though it has been declining during the last decade (see graph 1). The retail and service activities have gained importance in the last years among the rural economically active people.

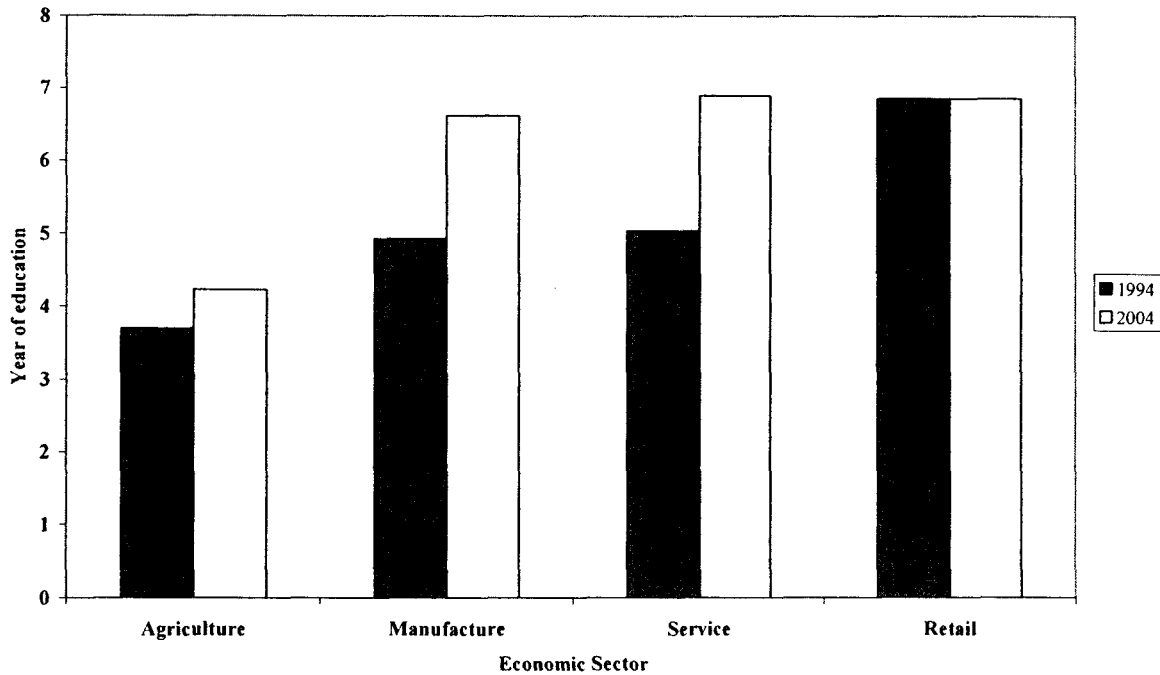
### Percent of economically active people per sector



Graph 1: Own elaboration based on ENIGH 1994 and 2004.

The agricultural sector in the rural area employs the workers with low qualifications (see graph 2), the mean of year education in 1994 was approximately 3.5 years of education (elementary school incomplete) as well they have the lowest labor income. At the same time, the service sector in the rural area employs the workers with the highest level of qualification and these workers perceive the higher labor income on average.

**Mean of years of education in each sector**



Graph 2: Own elaboration based on ENIGH 1994 and 2004.

By the early 1990s, in spite of the fact that about one-quarter of the Mexican labor force and one-third of the total population lived in the rural zone working principally in an agricultural activity, the agriculture production accounted for approximately only 5 or 6 percent of gross domestic product (GDP). This outcome was approximately the same during the last decade (see graph 3), and it reflects in part the low and stagnated participation of the agricultural production in the GDP.



Agricultural GDP / Total GDP



Graph 3: Own elaboration based on INEGI. Sistema Nacional de Cuentas Nacionales

In Mexico during the 1990s was established a reform to the Article 27 with the purpose to integrate the rural Mexico into the global economy (Luers et. al 2006). This reform allows the market to allocate resources introducing a series of privatization and liberalization polices, it was also intended to increase investment in the ejido sector by creating greater credit opportunities for the ejido sector providing them a legal form of collateral. However Luers (et al. 2006) concluded that the Agrarian Reform is not leading to dramatic changes in the rural Mexico.

In 1994 the North American Free Trade Agreement (NAFTA) was established between Mexico, the United States, and Canada. The intention of the agreement was, to lower trade barriers and to implement clear regulations of commerce, to increase the trade and investment opportunities in the region. This created the largest free trade zone by area. (Lederman et. al. 2004). More than ten years later, controversies about the net effect of NAFTA persist. Globalization produces winners and losers. On the positive side, liberalized trade gives advantages to producers and consumers. Producers benefit from a

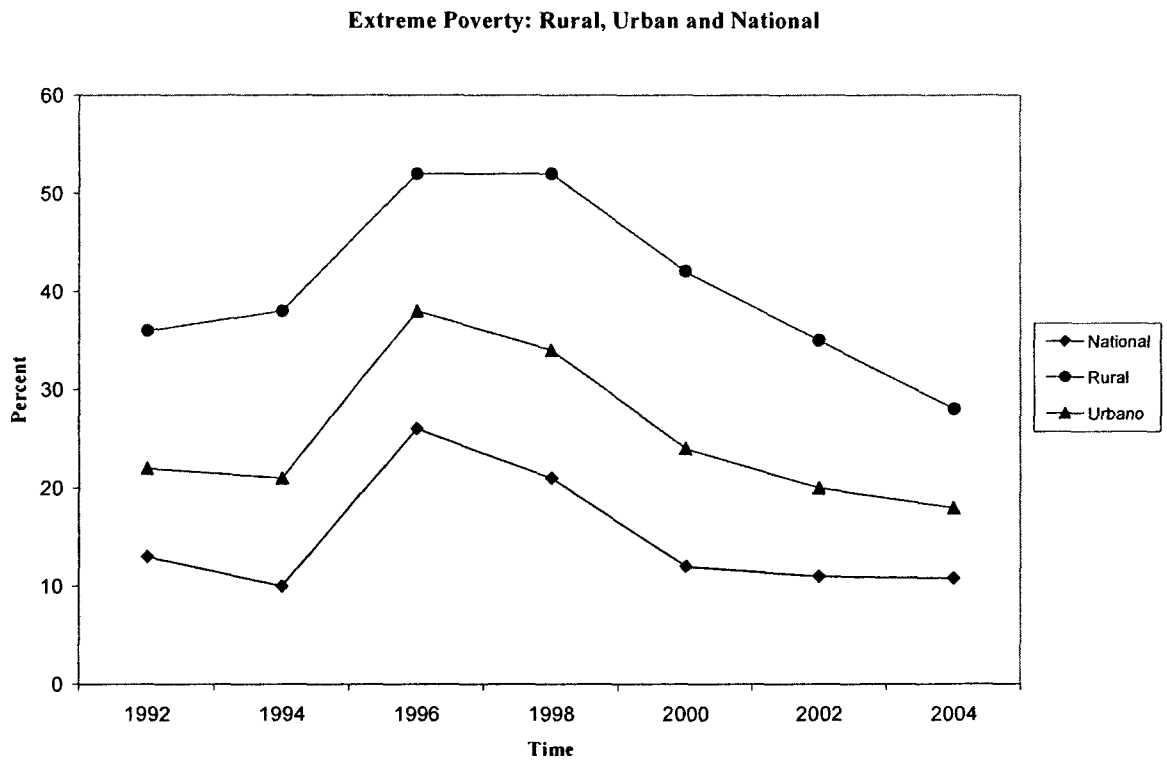
larger supply of production factors at lower prices which results in a rise in productivity that strengthens their competitiveness in global markets. Consumers benefit from a larger supply and variety of goods at competitive price. The trade opening of the country benefited principally the commercial agriculture (dedicated to export) and it had little positive impact for the poor people dedicated to the subsistence agriculture.

According to data from the United States Trade Representative (USRT), from 1993 to 2000, Mexico's exports to the United States and Canada grew 238 percent, and the contribution of the exports growth in the real GDP growth was more than half. In consequence, the Mexican labor market was modified: the majority of the new jobs created between 1994 and 2000 were related by export activity, and some workers had to move from agriculture to services and manufacturing. In addition, the investment was more dynamic in the region because NAFTA's legal framework provides credibility and transparency. Consequently the macroeconomic volatility declined. The average growth rate of investment in Mexico was 12.5 percent from 1996 to 2000. The December 1994 peso crisis (devaluation) affected the Mexican economy causing a significant economic downturn, as result the positive effect of NAFTA on the Mexican economy was modest.

The Mexican labor market has changed in the last years; the trade liberalization demands more skilled workers, more productive, able to compete. In the rural Mexico the quality of the labor force supply is significantly below the quality of demand generating unemployment. Mexican workers do not have unemployment insurance so when the creation of wage-earning jobs is insufficient the population resorts or persists in the selfemployment and the micro businesses, which most of the times does not allow them an appropriate quality of life (Garcia 2005). Every time is more difficult for a big part of the Mexican families to obtain its economic resources to live with the income of an exclusive

supplier, for that reason a big part of the women enter into the labor market (Garcia and Oliveira 2001).

An additional problem in the rural areas is poverty, and it is more visible in the south of the country. The incidence of poverty is higher in rural than urban ones (Cortes et al. 2002) in spite of Mexico being a highly urbanized country. According to estimations from the World Bank based on the ENIGHs (Encuesta Nacional de Ingreso y Gasto de los Hogares) in the year 2004, 28 percent of the rural population lives in extreme poverty, compared with 18 percent of urban population and 12 percent in entire the country (graph 4).



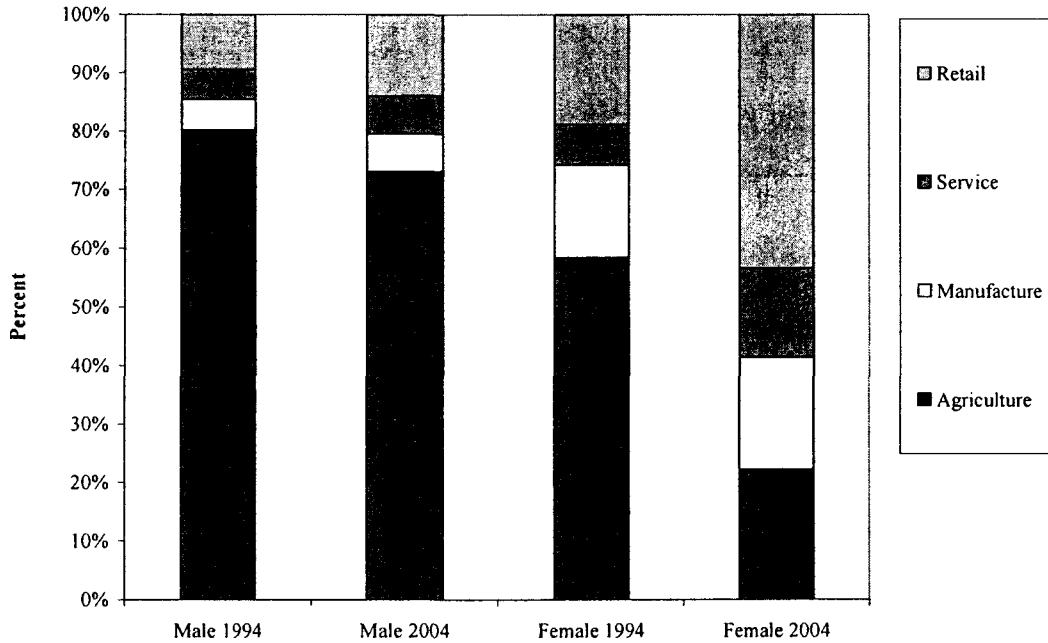
Graph 4: Estimation of the World Bank with data of the ENIGHs.

The sources of rural poverty are complex and multidimensional. The process of economic development has not been able to reduce it in the long run. This is explained in part by the economic crisis of 1994, the low vitality of agriculture, the stagnation of the agricultural wages and the decline of the prices in this sector, low productivity of the land and labor, lack of investment, etc. Under these circumstances self-employment emerge as a vital group of workers in many developed countries, with a considerable strategic importance. In this study we consider a self-employed like a worker who works by himself.

Self-employment generates economic opportunities for rural residents because it provides the possibility for individual household members to earn an income, it helps to alleviate unemployment or underemployment, and it seems as a possible route to leave poverty. Many people living in the rural sector perceive self-employment as a rational answer to labor market conditions (Clark and Drinkwater, 1998).

In recent years Mexican rural women have increased their presence in the labor market (ENIGH 1994 and 2004), and they especially work as self-employees. Women usually work less hours, have less years of education and receive lower wages than their men counterparts (ENIGH 1994 and 2004). The proportion of self-employed has increased more among the female population than men. Rural population, especially women discover in self-employment a source of income for them and their families and a way to collaborate with household expenditures; they have a flexible job and hence contribute to the welfare of the household. In 1994, self-employed women worked predominantly in the agriculture sector; in 2004 they worked mainly in the retail sector (graph 5).

**Distribution of self-employed worker by gender and sector**



Graph 5: Own elaboration based on ENIGH 1994 and 2004.

Since self-employment has emerged as an important source of income for a group of workers in many developing countries. It is important to understand why members of different groups are more likely to be self-employed than others. What are their characteristics? Are the ‘push’ or ‘pull’ factors behind the decision to enter into self-employment of the rural persons? These are some controversies that are analyzed in this investigation. Also, one of the purposes of this study is try to understand the determinants of rural self-employment with the intention to design policies to promote it, and improve their competitiveness. The data source for this analysis is ENIGH 1994 and 2004 (Encuesta Nacional de Ingreso y Gasto de los Hogares).

Is important not forget that the household is the key economic unit in rural Mexico as the choices faced by the rural persons to improve their economic well-being are

frequently determined by the economic activities of other members of the household. It is evident across rural Mexico that improving the economic opportunities for the residents is necessary to understand the economic contribution of the households, the leisure and working decisions, the patterns of consumption (intrahousehold allocation), especially in health and education, and the dynamic of rural self-employment.

In the appendix 2 of this investigation, an analysis of the consumer pattern of the rural households in the year 2004 is presented; it concludes that approximately 40 percent of the total expenditure of the rural households is in food, 22 percent is in housing, and only around 9 percent is in education and health (welfare). The income elasticities reveal the food was a necessity good and the education and health was a luxury good for the rural families.

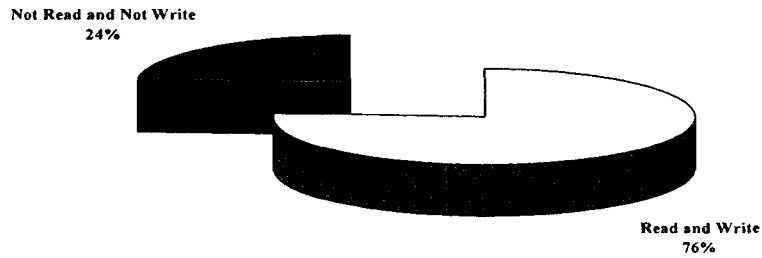
The vocation assigned socially and culturally to women and men conditions their patterns of consumption and their decisions. The opportunity cost of women's leisure is higher than the men's leisure. Usually, part of the wives' time is employed in domestic work and childcare. The rural labor market is very complex; many variables play an important role in the household's working decisions, among them: household size, the profile of household members (age, gender, education, etc.), ownership or access to land (including quantity and quality), season, market conditions, etc.

In the year 2004 in Rural Mexico approximately a quarter of the housewives (mothers) did not know how to read and write (graph 6), 20 percent of the housewives did not have any education and 35 percent had incomplete primary (Graph 7). These are some facts that reflect an imperative need for more and better education. Szekely (1998) recognizes that if the wife in the family is more educated, the household has better wage

opportunities and elevated revenues; the family has fewer children and better educated.

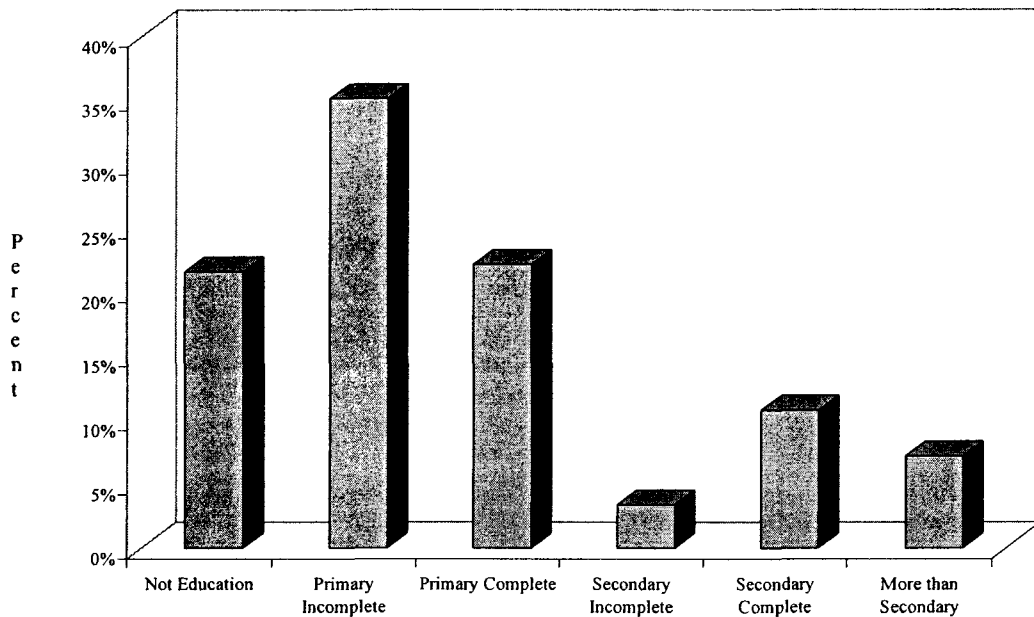
Changes in the women's education affect the patterns of expenditures of the households.

### Rural Mother's Literarcy



Graph 6: Own elaboration based on ENIGH 2004.

### Rural Mother's Education



Graph 7: Own elaboration based on ENIGH 2004.

Mexico's rural areas represent an important key for the growth of the country as a whole. One of the most important goals of the national economic policy is to increase the competitiveness and reduce inequality in the rural areas. Those responsible for the economic development, economic planners and policy makers require knowing the characteristics and needs of the rural economy and the impact which their intervention will have on the persons.

This study is organized as follows. The section II is presented the paper which briefly reviews the literature on determinants of self-employment and its connection to the rural economy. It illustrates a model of household labor supply to understand the labor decisions considering the family structure. An idea of rural Mexico in 1994 and 2004 is given. As well an analysis via probit equations and some estimation of the returns to human capital in the rural areas are presented. The section III gives some public policy recommendations about the rural Mexico and especially of self-employment. The appendix 1 presents some graphs and tables of rural statistics. The appendix 2 presents an idea of the patterns of consume in the rural households using the Quadratic Almost Ideal Demand System (QUAIDS).



*More Pushed than Pulled: Self-employment in rural Mexico ten years after  
NAFTA*

**Abstract**

Who are the self-employed in rural Mexico? This paper tries to answer that question with special emphasis on the role of human capital in self-employment decisions. The model presented suggests that the need for leisure/flexibility may have a driving effect once the household framework is considered. Imperfect markets may hinder possible gains of self-employment with particular groups being more vulnerable (e.g. women). Some estimated parameters in this study for propensities to become self-employed and returns to education vary between 1994 and 2004, the first decade of the North American Free Trade Agreement (NAFTA). Pull and push factors emerge in the decision to enter into self-employment in rural area. Being self-employed still may be the best or sole option for a considerable percentage of the population. The latter may suggest that if self-employment in the rural sector is posed as a development strategy, this should come with adequate policy supports.

*Keywords: self-employment, education, rural households, Mexico.*

## **i. Introduction**

Economic analysis of the Mexican rural sector presents an extraordinary challenge for both policy makers and scholars: despite its difficulties it is very important. Before the North American Free Trade Agreement (NAFTA) started operating, opinions about its effects on the Mexican agricultural sector seemed quite divided. There was one camp that forecasted that it would cause severe trouble to Mexican farmers given that they do not have access to credits and subsidies as their American and Canadian counterparts. The optimistic group predicted that the agricultural sector would flourish, assuming that foreign investments and comparative advantages on fruits and vegetables should surpass any negative effect of free trade. More than ten years later<sup>1</sup>, opinions on the net effect of NAFTA are still divided. Even with the general benefits of globalization for national wellbeing, there are adjustment costs for some groups in the country, globalization produces winners and losers. The commercial opening of the country benefited principally commercial agriculture (Lederman et. al. 2004) and it had little impact for the poor people dedicated to low-scale agriculture; subsistence farmers have seen how the prices of their small surpluses (usually grains) drop.

Poverty indices remain very high in the rural areas (Cortes et al. 2002), and migration (to cities and out of the country) has not ceased. High levels of poverty combined with slow economic growth in the formal sector have forced a large part of the developing world's rural population to move into self-employment and to conduct activities in the informal labor market. We believe self-employment is a critical variable to understand poverty, welfare and the development process in rural areas.

There are many factors that figure out in the literature that may possibly explain the decision to enter into self-employment; these could be 'push' or 'pull' factors (Messenger

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<sup>1</sup> NAFTA started operating on January 1, 1994.

and Stettner, 2000). The push factors generally make wage-employment less attractive or not viable, for example low wages, lack of prosperity or unemployment (Stanworth and Curran, 1973). In this situation a person is 'pushed' into self-employment by a lack of alternatives. In other study, Audretsch et al. (2006) conclude that unemployment reduces the chances of enjoying a paid job and the opportunity cost to become self-employed. On the other hand, the pull factors make self-employment more attractive, for example flexible schedule, work environment, high profits, etc. Structural economic transformations, particularly the move from a good-producing economy to a service-based economy, have been identified as an important 'pull' factor that influences the self-employment decision.

Who are the self-employed in the rural Mexico? Why are some people self-employed? What are their characteristics? Are they pushed or pulled to entry into self-employment? These are some controversies that this study pretends to explore. This investigation analyzes changes in the characteristics of Mexican rural households one decade after the entrance of NAFTA and identifies the determinants of rural self-employment; the role of human capital in rural self-employment decisions and the role of household specificities on the labor strategies are considered too. Some factors figure out in the literature such as the nature of the employment sector, age, level of education, gender, marital status, family size, region of the country, physical capital, and etcetera, help to understand better the labor market in the rural sector.

Mexico's rural areas represent an important key for the growth of the country as a whole. Policy makers are interested in implementing policies to impulse employment in these areas, and given that self-employment has contributed significantly to the quantity of new jobs in the rural areas, they need to study rural self-employment and its role as a potential solution to unemployment and poverty. Policies for stimulating entrepreneurship

and self-employment in the rural areas will have to take the factors that characterize the self-employee into account. The knowledge of self-employment as an emerging human resource priority can improve public policies and the programs that support and promote self-employed people.

The main conclusion of this study is that the women, the least educated and the older persons have higher probabilities to being self-employed (vulnerable people). Also, the self-employed perceive a lower wage than the wage workers. The women self-employed were working especially in the agricultural sector before NAFTA, but after it they have turned principally to work in the retail and service sectors (see graph 8 in the appendix 1), while the men self-employed have been working principally in the agriculture sector before and after NAFTA (see graph 9 in the appendix 1).

The paper is organized as follows. Section II briefly reviews the literature on determinants of self-employment and its connection to the rural economy. In section III an expanded canonical model investigates the effects of households' characteristics and human capital on self-employment decisions. Section IV introduces the data and presents a snapshot of rural Mexico in 1994 and 2004. In section V the estimation strategy is delimited and the econometric analysis performed. Section VI briefly concludes and suggests some avenues for future research.

## **ii. The literature self-employment and self-employment on a rural context**

A number of approaches have been developed to explain the supply and demand of self-employment, emphasizing various degrees of sociological, psychological and economic factors. Messenger and Stettner (2000) expose two traditional theories that attempt to explain the entry into self-employment in terms of workers' economic utility. The pull

theory asserts that workers are pulled into self-employment due to their own particular knowledge and skills, and their need for non-pecuniary benefits such as autonomy and flexibility (Knight, 1933). Stanworth and Curran (1973), establish that pull factors make self-employment more attractive, for example high profits or a more flexible schedule (caring children is usually more compatible with self-employed worker than employed worker). In the other side, the push theory holds that people are pushed into self-employment when they lack good opportunities in the wage and salary labor market (Schumpeter, 1934); thus, potential employees who have the most limited wage and salary options or particular barriers, would be those most likely to enter self-employment.

Granger et al., (1995) have used a similar dichotomy but with other labels: the “unemployment push” and the “entrepreneurial pull”. The first is characterized as a cyclical unemployment which restricts labor market opportunities and push persons to self-employed, and the second is when the economic vitality combined with personal ambitions increase the number of self-employed.

There are many studies about the determinants and characteristics of the self-employed. Rees and Shah (1986) have reported a non-linear relationship between self-employment and age. Calvo and Wellisz (1980) and Kidd (1993) concluded that an individual’s age might affect her propensity to become self-employed via a number of different channels. For instance, age may act as a proxy to capture the effects of the individual awareness, knowledge and experience in the labor market thereby reflecting general human capital. Also, as an individual becomes older, she may have accumulated the financial resources required for self-employment, hence age may capture effects related to financial, as well as human capital. Brown, Farrell and Harris (2002) found that the proportion of individuals in self-employment increases with age, a finding that is consistent

with the hypothesis that older, displaced workers might turn to self-employment given their relatively low probability of re-employment. It might also reflect the ability of older workers to acquire the necessary start-up capital for and to better absorb the income uncertainty associated with self-employment, on the account of their longer accumulation of wealth. They also found that individuals in self-employment have relatively few formal qualifications.

Other finding is that home ownership is positively associated with self-employment. Johansson (2000) concluded that house ownership, a higher age, and little unemployment experience tend to decrease the risk of existing self-employment, and thus make self-employment duration longer. In addition, he found that individuals with wealthier parents are more likely to become self-employed, supposedly because their parents' money can help alleviate liquidity constraints.

Blanchflower (2004) found that in Europe the probability of being self-employed is lower the more educated an individual is, while the opposite is true in US. The evidence regarding the relationship between education and the propensity to become self-employed remains inconclusive. Schiller and Crewson (1997) have reported that couples with young children, may be less likely to bear the risk associated with self-employment. Blanchflower (2000) concluded that that in the OECD countries the probability of being self-employed is higher among men than women and rises with age. The least educated have the highest probability of being self-employed. Other finding of the study is that workers in agriculture, retailing, real state and construction are especially likely to be self-employed. Self-employment rates are generally higher in poorer countries (with respect to other OECD members) such as Greece, Turkey, Mexico, Korea and Portugal. As a proportion of non-agricultural employment self-employment has declined in some countries (Austria,

Belgium, Japan, Luxembourg, Norway, Spain, Netherlands and the USA) but increase in others (Australia, Canada, Finland, Iceland, Ireland, New Zealand, Portugal, Sweden and United Kingdom).

Quinn (1980) speculated that some wage-and-salary workers switch to self-employment toward the end of the life cycle as an alternative to withdrawal from the labor force. He assumes that there is much more flexibility in hours and wages among the self-employed and that the change in class of work is a form of partial retirement. Fuchs (1981) conclude that self-employment at older ages is a well-established feature of the US labor market. Paniagua (2002) established that the development of self-employment is a consequence of the tertiary processes in western societies, and a solution to high rates of unemployment and under employment and the difficulties of professional insertion in the labor market.

Crosta and Pezzino (2003) concludes that even though agriculture represents a fundamental resource in a context of poverty, most rural household in Mexico now derive a large portion of their incomes from non-farm employment. The point was previously made by Sadoulet, De Janvry and Davis (2001).

### **iii. The Household Economy**

Under the standard neoclassical/rational paradigm households are utility maximizers. Notice however, that even under the assumption of complete markets and exogenous prices<sup>2</sup> the problem of understanding intrahousehold allocations cannot be fully avoided. Moreover, when incomplete markets and rural households are considered, complex patterns

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<sup>2</sup> The separability assumption allows modeling the maximization of income independently of the household preferences. The detailed discussion for farm households is found in Singh et al. (1986).

of income and utility maximization appear. Many variables play an important role in the household's working decisions, among them: household size, the profile of household members (age, gender, education, etc.), ownership or access to land (including quantity and quality), season, market conditions, etc.

We investigate the labor decisions of households. Although individuals are the ones who supply labor it is difficult to understand their working behavior without considering their household/family structure and circumstances. Under this simple framework individuals can “consume” leisure<sup>3</sup> and work for someone else or work as self-employed. Our departure is the canonical model of household labor supply.

Consider the following static household problem,

$$\text{Max}U(c_h, l_i(s_i) | i = 1, \dots, I) \quad (1)$$

s.t.

$$pc_h \leq \sum_i L_i w_i + m \quad (2)$$

$$\bar{L}_i = L_i + l_i \quad \forall i \quad (3)$$

$$w_i = f(e_i, l_i, s_i) \quad \forall i \quad (4)$$

where the function  $U$  is the utility of the household (in a unitary sense),  $c_h$  is the household's consumption, and  $l_i$  is the individual leisure. The budget constraint includes the price level  $p$ , the amount of hours each individual works  $L_i$  with a particular associated wage  $w_i$  and an exogenous income for the whole household. Both leisure and hours work add to the individual endowments. Finally  $e_i$  represents the educational level of each person and  $s_i$  her sociodemographic profile.

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<sup>3</sup> In this study “leisure” is defined in very broad terms: it can be time devoted to rest, raise children, perform domestic tasks, used to acquire human capital (attend school), etc.



## ***Behavior***

The maximization problem posed is very similar to the standard textbook model, however two variants are present. First the utility produced by leisure depends upon the specific sociodemographic characteristics of the person who consumes it. Technically speaking there is a complementarity between leisure and other variables present in the household. That is, when maximizing:

$$\frac{\partial U}{\partial c_h} = \frac{\partial U}{\partial l_i(s_i)} \quad \forall i \quad (5)$$

so even under an egalitarian utility function leisure would not necessarily be consumed uniformly since  $s_i$  differs among household members.

Second, the wages depend upon specific educational profiles and on the demanded leisure. This is important, because the demand for leisure can have a wage effect besides the substitution effect. This means that when maximizing and applying the chain rule:

$$\frac{\partial U}{\partial c_h} = \frac{\partial U}{\partial c_h} \frac{\partial c_h}{\partial w_i} \frac{\partial w_i}{\partial l_i(s_i)} + \frac{\partial U}{\partial l_i(s_i)} \quad \forall i \quad (6)$$

Now the hypothesized sign of  $\frac{\partial U}{\partial c_h} \frac{\partial c_h}{\partial w_i} \frac{\partial w_i}{\partial l_i(s_i)}$  is negative, assuming consumption is a normal good, and that greater flexibility is penalized. Thus, leisure is more costly than the forgone consumption. To the extent that markets are imperfect, the penalization of acquiring extra leisure may be dramatic.

## **iv. The data**

The meaning of rural varies country to country, but in official definitions it usually refers to concentrations of population under a certain threshold, which generally set at 1,000 to

2,500 individuals. In this study we consider locations with less than 2,500 individuals like rural.

The data source for this analysis is ENIGH 1994 and 2004 (Encuesta Nacional de Ingreso y Gasto de los Hogares), which are household income-expenditure surveys, collected by INEGI (Instituto Nacional de Estadística Geografía e Informática). The main aim of these surveys is to provide a reliable source of information on household expenditure, income and other aspects of household finances, as well as a series of sociodemographic characteristics. The ENIGHs allow inferring some ideas of the rural Mexico. The differences among ENIGH 1994 and 2004 are minimum.

We can deduce some information of the data; the percentage of workers in the agricultural sector in rural communities is significantly higher than in other sectors, in spite of it decreased during last decade from 64% to 57% (see table 4 in the appendix 1). As a result, the service and manufacture sectors has acquired importance among working age people. The years of education of the rural persons have increased, but these still being low. The agricultural sector employs workers with less qualification, and consequently they receive the lowest wages (see table 4 in the appendix 1).

The mean of education of the rural men self-employed increased in the last decade (3.12 to 4.64 years of education) but it still low compared with the mean of education of the employee (6.46 years of education). The mean of age of self-employed, 44 years for men and 42 for women, is above the mean of age of the employee, 33 years.

The proportion of women that work increased in last ten years, but they work less hours, they have less years of education and receive lower wages than men counterparts (see table 6 in the appendix 1).

In the last decade the proportion of self-employment women is higher than self-employment men, women find in self-employment a manner to collaborate with the expenditure of the family and to have a flexible job (see table 5 in the appendix 1). Caring children is more compatible with a self-employed work than a wage work; this fact is consistent with the pull theory explained in the section II. While people working in the agricultural sector is still the dominant group in rural areas (see table 5 and 6 in the appendix 1), the proportion has declined after NAFTA (see table 6 in the appendix 1).

In the last decade the rural households advance in several socioeconomic and cultural aspects, but this improvement has not been enough. Some of the households persist in a very precarious situation with vital necessities unsatisfied, like water or electricity (see table 7 in the appendix 1). The family size and the index of economic dependency have decreased in the last years. In spite of the percent of illiterate persons greater of fifteen years old has been reduce in the last decade, it continue high in 2004 (17.82%), as well the percent of illiterate head household maintain elevated in 2004 (21.50%). The mean of the head household's education increases but it is continue below elementary education (2.93 to 4.4 years of education). The percent of women head household raises of 10.31% to 20.29%.

#### **v. Estimation strategies and econometric analysis**

Some estimated parameters in this study for propensities to become self-employed and returns to education between 1994 and 2004 are presented in this section.

A natural starting point for the discussion of who are the self-employed consists of investigating which variables are correlated with participation in the labor market on that condition (self-employed). The literature discussed in section II provides a series of

guidelines and suggestions regarding which variables are expected to have an effect on the self-employment decision (e.g. gender, age, etc.). This first objective can be accomplished directly with standard probit analysis. A very nice feature of this characterization is that the estimates of the probit analysis can be utilized to explore self-selection issues. Under this interest, the probit can be seen as a first stage, and later the Inverse Mills Ratio (IMR)<sup>4</sup> is calculated to measure and correct self-selection; it is used in a second stage equation (Heckman 1979).

In this paper the maximization problem posed in section III suggests that there can be a self-selection effect of self-employment in returns to education of the employed. First of all because the “sample” would not be complete (i.e. migration, people working without payment in their home, etc.). So it is worth it to explore a selection effect in returns to education, and if found investigate if it is pushed or pulled driven.

The returns to education are associated with increases in the labor productivity as a result of the greater availability of knowledge and abilities, which are obtained mainly by investment in formal education; such investment produces a benefit for the persons translated in a higher labor income. We analyze the returns of education in the rural Mexico using a Mincerian equation, where the labor income of the worker is presumed to depend upon years of education, and some sociodemographic characteristics. Thus, our second stage equation will be a Mincerian equation augmented with the IMR (Inverse Mill’s Ratio) of the first stage.

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<sup>4</sup> The inverse Mills ratio is Usually denoted  $\lambda(Z)$ , and defined by  $\lambda(Z) = \phi(Z)/\Phi(Z)$ , where  $\phi(Z)$  is the standard normal pdf and  $\Phi(Z)$  is the standard normal cdf.

### *Who are the Rural Self-employed?*

We start by estimating a probit model (both for 1994 and 2004) to explain the decision of becoming self-employed considering some variables suggested by the literature. In this model the probability of living in rural areas and being self-employed depends on the person's gender<sup>5</sup>, age, years of education, marital status, number of children, and the economy sector in which they work. Our samples consist of economically active adults aged between sixteen and sixty-five, non-students that report labor income. They live in locations with 2500 persons or less. The equation estimated for each year is:

$$\text{RuralSelf-employed} = \beta_0 + \beta_1 \text{Female} + \beta_2 \text{Education} + \beta_3 \text{Age} + \beta_4 \text{MaritalStatus} + \beta_5 \text{Agriculture} + \beta_6 \text{Manufacture} + \beta_7 \text{Retail} + \beta_8 \text{Couple} + \beta_9 \text{Children} + \beta_{10} \text{Ownership} \quad (7)$$

The dependent variable (*Rural self-employment*) in this study is a dichotomous variable set to one if the person reports herself as self-employed and set to zero otherwise<sup>6</sup>. The variable *Female*, takes a value of one if the individual is women, and zero otherwise. The variable of *Education* is a discrete variable describing years of education, and it focuses only on formal education and completed years of education. The variable of *Age* is self explained (in discrete numbers). *Marital status* is a dummy variable set as one if the person is married or in cohabitation and is set as zero otherwise (separated, widowed, divorced and single). *Agriculture* is a dummy variable set as one if the person works in the agriculture sector, and zero otherwise. *Manufacture* is a dummy variable set as one if the person works in the manufacture sector and zero otherwise and *Retail* is a dummy variable set as one if the person works in retail sales. The category of reference is the *Service* sector.

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<sup>5</sup> We tested a double selection model (Amemiya 1985), with the hypothesis that there was a previous self-selection of the women who decided to participate in the labor market. However, we didn't find conclusive evidence to reject the null hypothesis of no female self-selection into the labor market.

<sup>6</sup> In otherwise are included the employees in non-agriculture sector, employees in agriculture sector, employed persons without payment, employers with workers and employee in a family company.

*Children* consider the number of children below six years that live in the house. *Ownership* is a dummy variable set as one if the person owns a house<sup>7</sup> and zero otherwise.

The parameters of this model can be interpreted as the effect on the probability of being self-employed in the rural sector of an infinitesimal change in each independent continuous variable and the discrete change in the probability for dummy variables. The rural self-employment probit parameters estimated for 1994 and 2004 are presented in Table 1. All the parameters have the expected sign, with varying degrees of significance.

Probit Procedure						
Analysis of parameters estimates						
	1994			2004		
Parameter	Estimate	t-value	p> t	Estimate	t-value	p> t
Intercept	-3.47151**	-14.40	0.000	-2.96663**	-14.23	0.000
Female	0.13800	1.12	0.262	0.12640	1.31	0.190
Education	-0.00935	-0.69	0.490	-0.01030	-1.02	0.306
Age	0.00663*	1.68	0.093	0.01397**	4.20	0.000
Agriculture	0.89923**	7.51	0.000	0.70768**	7.33	0.000
Manufacture	0.50835**	3.14	0.002	0.01075	0.07	0.945
Retail	0.69060**	3.66	0.000	0.77646**	6.04	0.000
Status marital	0.75157**	6.20	0.000	0.1316	1.45	0.146
Child	0.09915**	2.67	0.008	0.07606*	1.78	0.074
Ownership	0.31386**	2.90	0.004	0.21648**	2.22	0.026
Log likelihood	-650.8924			-702.1816		

Table 1. Result of the probit models for 1994 and 2004. Values with \*\* significant at a 95% level, values with \* are significant at a 90% level.

The probit analysis shows very interesting results. First, in spite of *Female* is not a statistically significant variable but it has the anticipated sign, being rural women

<sup>7</sup>The house could be entirely paid or under a mortgage.

increments the probability of being self-employed; they found in self-employment a way to cooperate with the expenditure of the family and have a flexible job. This result is compatible with the pull theory; it establishes that some pull factors, in this case a flexible schedule, make more attractive the self-employment.

The opposite effect appears in the educational level, although this variable is not statistically significant, it has the expected sign, the less human capital a person acquires the more likely she or he will be self-employed; this result is maintained during the last decade. This result is consistent with the push theory; a person is 'pushed' into self-employment because his low educational level restricts his alternatives in the wage labor market.

The probability to be self-employed rises with the age, and this effect is higher in the year 2004 than 1994. This result is consistent with the push theory; displaced older workers might turn to self-employment given their relatively low probability of re-employment and their lack of opportunities in the wage labor market. Quinn (1980) establishes the older workers are attracted into self-employment because they see it as a form of partial retirement, age in this circumstances is a pull factor. Finally, age reflects the ability of older workers to acquire the necessary start-up capital for their own business; in this perspective age acts as a pull factor. Age may reflect effects related to financial as well as human capital, and it could be a pull or a push factor, but given the disadvantaged situation of the rural areas it is more related with the push theory.

The home ownership is positively associated with self-employment; however its influence seems decreasing. A house may be used as collateral to secure loans necessary to start up small business, and it is a pull factor that makes self-employment more attractive.

Marital status remains statistically and economically significant explaining the probabilities of being self-employed, nevertheless its influence seems decreasing. This result may reflect some leisure necessity that matches with the pull theory and makes self-employment more attractive. In addition it may be a sign of a form of risk pooling with married people being attracted to self-employment because they can offset some income risk with other household member.

If the number of children less than six years old in the family increases, the probability of being self-employed increases too; it probably will reflect some preference/need for leisure consistent with the pull theory.

Finally, with respect to the sector of the economy, the probit analysis shows that self-employment is less likely to occur in the service sector. Some further investigations are needed to disentangle the causalities, i.e. if it is the consequence that services pick the people with the highest education levels.

We generate the inverse Mill's ratio (IMR) of this probit model, and then include it as an explanatory variable in the estimation of the Mincerian regression.

### ***The Returns to Education in Rural Mexico***

We analyze the returns of education in the rural Mexico using a Mincerian equation with the purpose to analyze the effect to be self-employee in the wage of the person. Our primary specification for the conditional expectations function for earnings is a semi-logarithmic spline and step model (Hungerford and Solon 1987). The model permits that the log-wages changes at different rates depending of years of education at different stages of the school career, as well as to make discrete steps at particular years of education. The



$\beta$ 's are splines, and the sum of  $\beta$ 's is the slope of the log-wage function at a particular level of education. The employed specification is the following:

$$\begin{aligned} LnW = & \alpha_0 + \beta_y Y + \beta_p P(Y-6) + \beta_J J(Y-9) + \beta_{CH} CH(Y-12) + \theta_1 Exp + \theta_2 Exp^2 + \theta_3 Selfemployment \\ & + \theta_4 Male + \theta_5 MaritalStatus + \theta_6 North + \theta_7 South + \theta_8 Ownership + \theta_9 Mill'sRatio \end{aligned} \quad (8)$$

Where,

VARIABLE	DESCRIPTION
<i>LnW</i>	Is natural logarithm of the worker's hourly wage
<i>Y</i>	Is the number of years of education completed
<i>P, J, H y C</i>	Indicators functions that set one if the person has completed the elementary school, middle school, high school and college respectively. Years 6, 9 and 12 are the diploma year corresponding to these levels of education
<i>Exp</i> <sup>8</sup>	Is the number of years of labor market experience
<i>Exp2</i>	Is the number of years of labor market experience to the square
<i>Self-employment</i>	Set 1 if the person is self-employee, 0 otherwise
<i>Male</i>	Set 1 if the person is male, 0 otherwise
<i>Marital Status</i>	Set 1 if the person is married or cohabited, 0 otherwise
<i>Regn</i>	Set 1 if work in the north region, 0 otherwise
<i>Regs</i>	Set 1 if work in the south region, 0 otherwise
<i>Dumten</i>	Set 1 if the person is own of the house, 0 otherwise
<i>Mill's Ratio</i>	Is the Inverse Mill's Ratio of the probit that explains self-employment

Table 2. Description of variables

<sup>8</sup> Experience = Age – Years of Education – 5.

Table 3 summarizes the results.

	1994		2004	
	Parameter estimate	t Value	Parameter estimate	t Value
$\alpha_0$	<b>-0.661624</b>	-4.406225	<b>-1.153015</b>	-7.811667
$\beta_y$	<b>0.071755</b>	8.115925	<b>0.072140</b>	7.994734
$\beta_j$	0.009311	0.449213	0.035473	1.882119
$\beta_H$	<b>0.099471</b>	3.830760	<b>0.059636</b>	2.571745
$\beta_C$	<b>0.115030</b>	4.499190	<b>0.134852</b>	6.520057
$\Theta_1$ Exp	<b>0.044303</b>	8.844710	<b>0.050773</b>	12.033344
$\Theta_2$ Exp <sup>2</sup>	<b>-0.000652</b>	-8.321627	<b>-0.000579</b>	-8.100854
$\Theta_3$ Self-employment	<b>-0.993902</b>	-14.693423	<b>-0.780558</b>	-11.045043
$\Theta_4$ Male	<b>0.130874</b>	3.409334	<b>0.235445</b>	6.970426
$\Theta_5$ Marital Status	<b>0.572841</b>	11.619665	<b>0.207044</b>	5.871350
$\Theta_6$ Regn	<b>0.051939</b>	1.582238	<b>0.206354</b>	6.272055
$\Theta_7$ Regs	<b>-0.143784</b>	-3.907045	<b>-0.316344</b>	-8.900481
$\Theta_8$ Ownership	<b>-0.097996</b>	-2.395163	<b>-0.087329</b>	-2.481982
$\Theta_9$ Mill's ratio	<b>0.635066</b>	15.059181	<b>0.784103</b>	16.524616
$R^2$	0.2869		0.3574	

Table 3. Results of the log-wage model. Values in bold are significant at a 95% level

It is observed that in both estimations, the model and the majority of the coefficients are statistically significant. In both years, the slopes increase with the level of education in the rural area ( $\beta$ 's  $>0$ ). Consequently, the returns to middle school years ( $\beta_y + \beta_j$ ) are greater than those to elementary years ( $\beta_y$ ); the returns to high-school years ( $\beta_y + \beta_j + \beta_H$ ) are greater than to middle school; and the returns to collage ( $\beta_y + \beta_j + \beta_H + \beta_C$ ) are greater than to high school.

The returns of elementary education are almost the same in both periods ( $\beta_y \approx 0.7$ ). The difference of returns between elementary school and middle school is higher in 2004

(0.10) than in 1994 (0.8). The returns of high school are higher in 1994 (0.18) than 2004 (0.16), and the returns of college are similar in both years ( $\approx 0.30$ ). We can infer that the returns to middle school in the rural Mexico are higher after North American Free Trade Agreement (NAFTA), and that is due principally to increases in the relative demand for skill workers. There is a positive and diminishing return of the labor-market experience, and this effect has maintained over this time period.

There is a negative effect in the labor income if the person is self-employed. Possibly, self-employed workers are paying a premium for the flexibility of their work (for example women), which is consistent with the pull theory. As well it could be because self-employed commonly have low levels of education than wage employees, which is well-matched with the push theory.

Also, there is a positive effect in the labor income if the person is married or in cohabitation. The workers in the north of the country receive higher wages than the workers in the central part of Mexico, and they receive higher wages than workers in the south. The north region of the country is the most exposed to international trade and the wage gains are higher in this region. Regional differences in wages continued to widen during the last decade. Males receive a premium over women, and this gap has increased after NAFTA in the rural areas. In spite of the fact that ten years have passed, other effects are qualitatively very similar.

The coefficient to the inverse Mill's ratio is significantly positive in both periods indicating a positive selection into "being self-employed in both periods" and it support the selectivity bias correction procedure to obtain better estimators.

## **vi. Implications and conclusions**

This paper intends to shed some light on the evolution of self-employment in rural Mexico between 1994 and 2004. A simple model was presented to analyze rural self-employment. Pull and push factors appear in the decision to being self-employed. Persons looking for a flexible job (women, married, persons with children) are attracted by self-employment as the pull theory says. While persons with relatively low qualifications and quite limited chances for finding a job in the wage labor market (least educated person, women, older persons) are pushed into self-employment to alleviate the unemployment, underemployment or poverty. We interpret this result as a signal that rural people see self-employment as a necessity rather than an opportunity, the rural self-employed are more pushed than pulled to enter into self-employment.

The selfemployment have some criticisms, for example some of them don't pay taxes, they are low-paid, they don't have a secure income, they need some money to start a bussiness and some times they don't have it, they don't have any employer benefit package, etcetera.

The importance of self-employment among women in the last years has risen for the reason that it permits women to work more autonomously and it possibly will provide the flexibility needed to achieve the family obligations. Women generally face difficulties in starting up a business; they tend to start a business with less capital than men (Rooney et al 2003).

Human capital accumulation raises individual incomes, but under imperfect markets, the lack of physical capital and other factors (i.e. technology) may hamper its

returns. Once controlling for education: self-employed persons do have smaller returns to human capital compared to their employed counterparts. There is a reduction in this effect in 2004 with respect to 1994, but still its magnitude is economically significant. It is very possible that self-employed rural workers are paying a premium for the flexibility of allocation their time or because of they have lower educational levels than wage employees.

From a development perspective the fact that both women and rural workers in the south have smaller returns than their male/north counterparts, and that these effects are accentuating themselves raises a red flag. As so, if job opportunities appear in rural areas, this may facilitate that workers exit self-employment. The evidence found, suggests that the latter effect can be highly correlated to human capital. Again, that it is not uniform across regions.

In terms of economic public policy, rural self-employment is a development strategy that be supposed to come with adequate public policy supports because it is expected to be a possible exit from poverty and unemployment. In the next section we present various public policy recommendations to rural self-employees.

### **III. Public Policy Recommendation**

Should public policy be designed to support rural self-employed workers? This study was motivated by the need to provide an analysis of the rural self-employment with some purposes, first of all to understand the characteristics of the rural self-employees and their behavior in the last decade, and to facilitate policy makers in the design and implementation of policies to impulse self-employment in these areas.

Self-employment appears as catalyst to job creation and it represents one of the most efficient ways for solving redundancy problem because it is a way of activating surplus workers (Brkanovic, 2004). Although self-employment permits women and men to alleviate underemployment and unemployment, work more autonomously, offer the flexibility needed to accommodate family-related responsibility; their poor education, the lower income associated with self-employment, and the instability in income associated with fluctuations in the demand for products and services situate many self-employees in a vulnerable situation (Rooney et al 2003).

Giving some benefits of self-employment government should design public policies oriented to create the proper environment to self-employment, support and promote it. Next we present some recommendations of public policy to rural self-employee based on the paper Rooney et al (2003) and Brkanovic (2004).

#### **Public Policy Recommendations:**

- A) Construct a favorable economic environment for start-ups business in the rural areas.

- a. Provide the basic public services (e.g. water, electricity, roads) to the rural communities with the most imperative necessities unsatisfied.
- b. Facilitate the establishment and regulation of new business to reduce the administrative cost.
- c. Improvement of legal environment.
- d. Offer especial tax incentives to investors in the rural areas with the purpose to incentive inversion there.

B) Promote the self-employment in the rural areas.

- a. Give information about the advantages and disadvantages of the self-employment.

Some of the advantages of the self-employment are: Independence, employment when other opportunities are few, control over business decision, better standards of living, being the boss, etc.

Some of the disadvantages of self-employment are: Fluctuating income, possibility of business failure, unrelenting responsibility, etc.

- b. Provide assistance and technical skill development before open a business.
- c. Development of pilot programs and projects which will be transformed into permanent structures of support.

C) Rural self-employed individuals usually are isolated; they often need information regarding professional development, health, marketing opportunities, etc; for that reason is indispensable to develop access to training, consulting and the necessary information to rural self-employees, with the purpose to raise their competitiveness.

- a. Give non-financial support to self-employees (information, courses, etc) to persuade persons to enter into self-employment and help them to obtain good results.
- b. Make government subsidies or training available to rural self-employed who wish to improve their skills to increase their competitiveness.
- c. Provide information about sources of business with financial support of the government, banks, credit unions or professional associations.
- d. Make easy the transfer of information from suppliers of services to rural self-employees.
- e. Stimulate economic activities among the self-employees oriented to export with the purpose to take advantages of the globalization.

D) Financial security and access to credit. The most frequent obstacle of the rural self-employees is lack of access to credit and financial institutions (Knight 1996). The government's responsibility in this area should be offering services in rural areas not already offered by private sector because of they are disperse. As well, rural women face additional obstacles to get a credit, because their gender per se and because other factors related to the kind of businesses women tend to manage (e.g., smaller business, home-based, part time). Some of the policy alternatives in this situation are for example:

- a. Identify under-serviced rural areas or populations.
- b. Strengthening of existing and establishment of financial institutional infrastructure in the rural areas.
- c. Special tax incentives for rural financial institutions.



- d. Provide micro credits targeted at vulnerable groups (women, least educated, persons with children).
  - e. Implement a credit program for rural women that do not have any possessions to guarantee the loans to start their business.
- E) Build alternatives to sustain self-employment during economic slowdowns especially the more vulnerable self-employee. For example:
- a. Identify among self-employees the more vulnerable groups.
  - b. Guarantee access to low interest emergency loans.
  - c. Provide information and incentives to households to save money in order to face unexpected difficulties.
  - d. Create stronger relations between government programs and rural self-employment associations.
- F) A growing number of women are becoming self-employed during the last decade, they find in self-employment a source of income for them families and a flexible job. Nevertheless they face some additional difficulties because of their low educational level, reduced access to credit, discrimination, cultural aspects, etc.
- a. Make government training available to rural women self-employees who wish to improve their skills or education.
  - b. Provide information about financial support of the government and new opportunities of business.
  - c. Build rural women self-employment associations.

This study has presented a framework about the characteristics of self-employees and the factors (pull or push) behind the decision to enter into self-employment. The importance of self-employment to job creation and alleviation of poverty in the rural areas should be considered by the policymakers, and the best way for them to promote it is to understand the determinants of rural self-employees.

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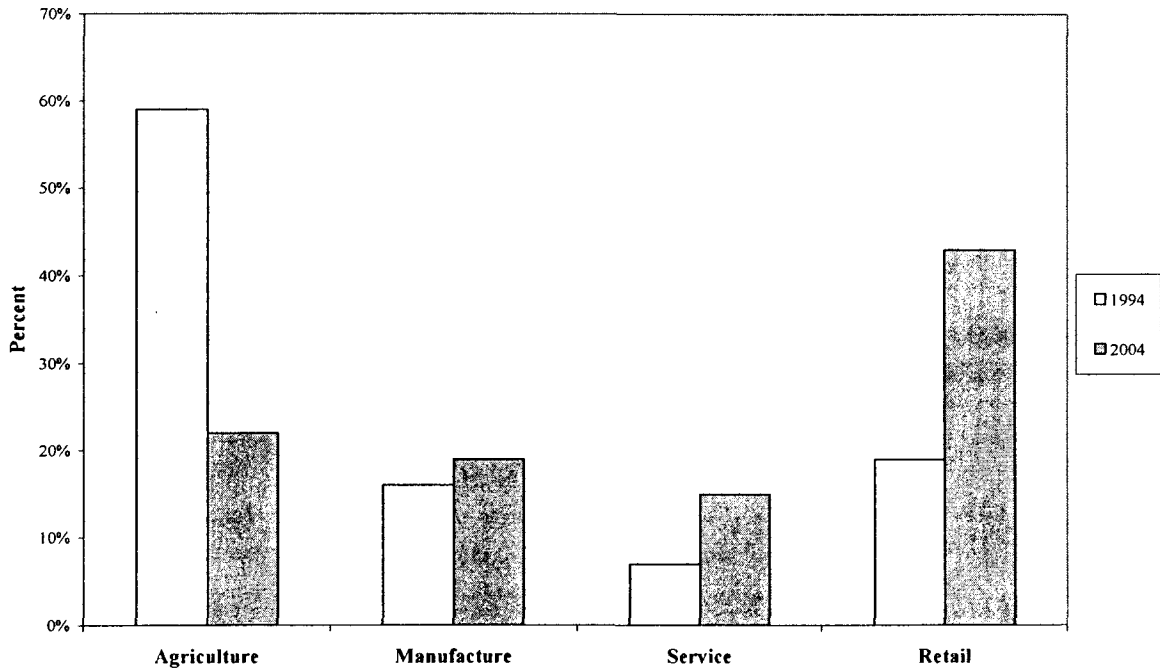
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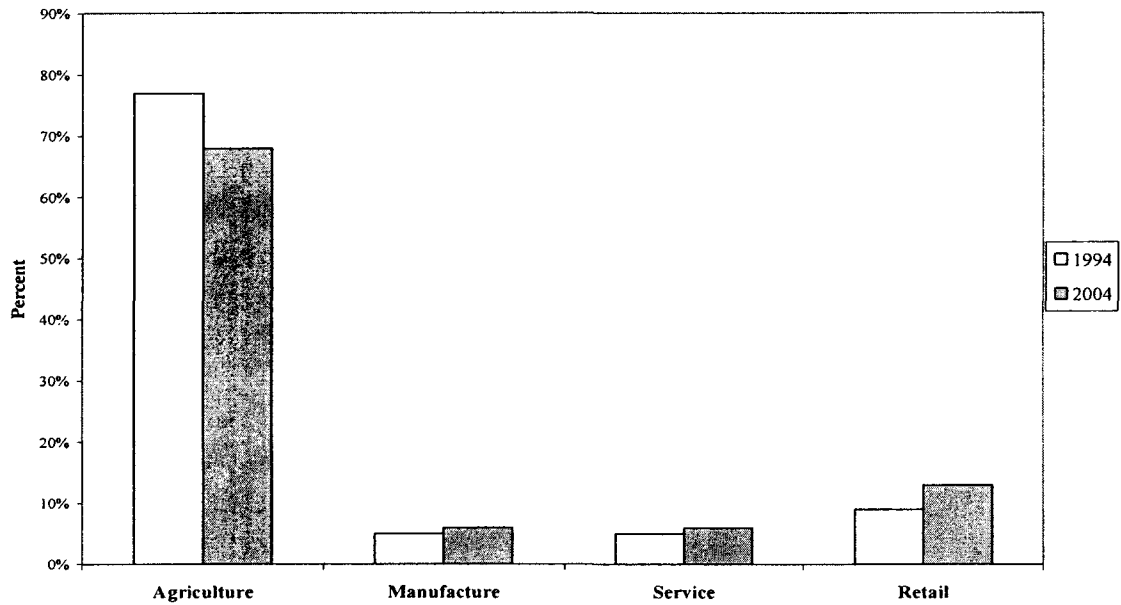
## Appendix 1

### Distribution of self-employed women per economic sector



Graph 8. Source ENIGH: Distribution of women self-employed per economic sector.

### Distribution of self-employed men per economic sector



Graph 9. Source ENIGH: Distribution of men self-employed per economic sector.

Sector	1994			2004		
	Mean of education	Mean of labor income	Percent of economically active people in the sector	Mean of education	Mean of labor income	Percent of economically active people in the sector
Agriculture	3.70	1,722	64%	4.23	1,846	57%
Manufacture	4.93	3,621	12%	6.62	6,296	14%
Service	5.04	2,132	10%	6.9	2,377	14%
Retail	6.86	7,053	14%	6.86	8,458	21%

Table 4. In the rural Mexico the majority of the economically active people work in the agriculture sector. The agriculture sector employe the workers with less qualification and they have the lower labor income, while the service sector employe the workers with the highest qualification and the highest labor income.

	1994			2004		
	Female	Male	Total	Female	Male	Total
Self-employment	47%	30%	34%	37%	25%	29%
Employee	52%	65%	62%	61%	70%	67%
Entrepreneur	1%	5%	4%	1%	4%	3%

Table 5. Distribution of the rural workers by position in the work. The proportion of women in self-employment is higher than men in both periods.

<b>Self-employment</b>				
	<b>1994</b>		<b>2004</b>	
	<b>Male</b>	<b>Female</b>	<b>Male</b>	<b>Female</b>
Mean of Age	43.03	40.88	44.30	41.61
Mean of Education	3.12	2.41	4.64	4.96
Mean of hours work	52.08	26.69	49.63	35.87
Mean of income*	4,526	1,945	4,870	2,903
Percent in Agriculture	77%	59%	68%	22%
Percent in Manufacture	5%	16%	6%	19%
Percent in Service	5%	7%	6%	15%
Percent in Retail	9%	19%	13%	43%
Percent married or cohabited	85%	90%	87%	71%
<b>Employed</b>				
	<b>1994</b>		<b>2004</b>	
	<b>Male</b>	<b>Female</b>	<b>Male</b>	<b>Female</b>
Mean of Age	30.79	30.01	33.48	32.66
Mean of Education	4.78	5.24	6.46	7.25
Mean of hours work	51.21	37.31	47.56	41.06
Mean of income*	5,554	5,408	4,876	3,789
Percent in Agriculture	65%	34%	54%	24%
Percent in Manufacture	7%	19%	10%	20%
Percent in Service	11%	35%	13%	41%
Percent in Retail	4%	12%	5%	14%
Percent married or cohabited	51%	46%	64%	42%
<b>Entrepreneur</b>				
	<b>1994</b>		<b>2004</b>	
	<b>Male</b>	<b>Female</b>	<b>Male</b>	<b>Female</b>
Mean of Age	42.69	40.94	43.98	38.22
Mean of Education	4.49	4.18	5.75	8.83
Mean of hours work	53.64	48.7	54.96	40.72
Mean of income*	8,340	7,203	12,115	11,274
Percent in Agriculture	81%	60%	63%	35%
Percent in Manufacture	2%	17%	9%	19%
Percent in Service	9%	3%	7%	11%
Percent in Retail	5%	20%	8%	35%
Percent married or cohabited	91%	79%	85%	24%

Table 6. Characteristics of the rural workers. A large amount of the rural workers are in the agriculture sector, but this amount has decreased in the last decade. People in the service and retail sectors has increased in the last decade. The women work fewer hours than men and this gap is bigger among self-employees. The rural self-employees are the least educated and they receive the lower total income. \*Weighted with the population expansion factors.

<b>Rural Household's Characteristics</b>		
	<b>1994</b>	<b>2004</b>
Family Size <sup>a</sup>	5.00	4.26
Index of Economic Dependency <sup>a</sup>	2.59	1.92
Persons Per Room <sup>a</sup>	2.99	1.54
Illiterate People Greater of Fifteen Years Old <sup>b</sup>	24.87	17.82
Head Household Illiterate <sup>b</sup>	31.89	21.50
Women head household <sup>b</sup>	10.31	20.29
Head household's education <sup>a</sup>	2.93	4.4
Head household's age <sup>a</sup>	46	49
Household with earth floor <sup>b</sup>	36.09	25.24
Household without energy <sup>b</sup>	16.97	4.05
Household without tube water <sup>b</sup>	44.91	23.91
Household without restroom <sup>b</sup>	87.94	11.72
Household with refrigerator <sup>b</sup>	28.29	60.11
Household with TV <sup>b</sup>	55.82	79.21
Household with radio <sup>b</sup>	24.56	55.06
Household with car <sup>b</sup>	3.98	26.77

Table 7. Rural household's characteristic. The rural households improve between 1994 and 2004; however some of them persist in a very precarious situation with imperative necessities unsatisfied.

a) Average.

b) Percent.

## **Appendix 2**

### **Consumption Patterns in Rural Mexico**

#### *1. Introduction*

In the third section paper we present a model to investigate the household's working decisions. The household is a utility maximizer, the equation (1) illustrates that the household utility depends of the leisure and consumptions of their members. In the paper we attempt to analyze the leisure or work decisions; in this section we present a QUAIDS model to obtain some features of the rural patterns of consumption.

The central objective of the rural development should be the progress of the rural persons, in order to improve their standards of living and well-being, and to increase their efficiency and competitiveness. The household is the key economic unit in rural Mexico, the opportunities faced by the rural young persons to improve their economic welfare depends especially on the economic activities and the education of their parents.

Is evident that to improve the economic opportunities of the rural residents is necessary to considerate the economic role of the households, the decisions of labor and leisure, their patterns of consumption, especially in human capital (health and education). In the long run, the investment of the family in human capital increases the capacity of production, and the possibilities of consumption of their members. How resources are allocated within the household depend on the household size and composition, which person controls the resources, the requirements of the family, the education of the head household, the preferences, etc.

There are many theories about the allocation of resources within the household. Brandan and Udry (1999) explain the dictatorial or unitary model that had seen the household as a single entity, where the members of the family share the same preferences.

This model assumes that there is a household head that has the last say, and the intrahousehold allocation can be altered only by variations in the household income and prices. The unitary model expects that resources within the household are shared, as a result, the way the public transfers are spend among members of the family does not matter.

In the other extreme is the household collective model, introduced by Chiappori (1988, 1992) and Apps and Rees (1988), that model perceives the household as a group of individuals with different preferences. Only the household's total consumption is observed, and not their distribution among members, furthermore this model assumes that the allocation of resources in the household is Pareto-efficient, as a result is impossible increase the welfare of one member of the family without reducing the welfare of another member. One implication of this model is that changes in the individual control of resources "bargaining power", explain changes in the consumption patterns.

The household collective models started a controversial discussion among policymakers in relation to the design of government transfer programs; the reason is the policies planed on the unitary model may not have the better results because the dominant preference is of the parents or the head household.

## *II. - The model: Quadratic Almost Ideal Demand System (QUAIDS)*

Next we present the model that helps us analyses the consumer expenditure pattern of the rural households. We estimate a Quadratic Almost Ideal Demand System (QUAIDS) as proposed by Banks et al. (1997). The demand systems give information on demand response to adjustments in income (expenditure), prices of the goods, and other interesting variables for the rural households.

Muellbauer (1976) called Price-Independent Generalized Logarithmic (PIGLOG) to the Demand system specifications that have expenditure shares linear in logarithmic total expenditure and arise from indirect utility functions that are themselves linear in logarithm total expenditures. The PIGLOG class implies linear-logarithmic Engle curves. Some examples of PIGLOG demands are the AI demand system (Deaton and Muellbauer 1980) and the Translog Model (Jorgenson et al. 1976).

Banks et al. (1997) begins with the simplest general form of demand and they define the budget shares in the following form:

$$w_i = A_i(p) + B_i(p) \ln x + C_i(p)h(x) \quad (1)$$

for goods  $i= 1, \dots, j$ , where  $\mathbf{p}$  is the J-vector of price  $s$  and  $A$ ,  $B$ ,  $C$  and  $h$  are differentiable functions. The equation (1) affirms that expenditure shares ( $w_i$ ) are linear in logarithmic income ( $\ln x$ ) and in another smooth function  $h(x)$ . Lewbel (1991) defines the rank of any demand system as the dimension of the space spanned by its Engel curves. The  $C_i(\mathbf{p}) h(x)$  term allows for the nonlinearities in some goods and it can be thought as three columns of a matrix with J rows. Given that the maximum possible rank of a matrix with  $s$  columns and  $j$  rows, is  $\text{Min}(s, j)$ . So the maximum possible rank of the matrix with 3 columns and J rows formed from the equation (1) will be 3 (assuming  $J > 3$ ).

Also, Banks et al. (1997) prove that if demand systems are exactly aggregable in the form of equation (1), consistent with utility maximization and have a rank of 3, then their indirect utility functions will be of the form:

$$\ln V = \left\{ \left[ \frac{\ln m - \ln a(p)}{b(p)} \right]^{-1} + \lambda(p) \right\}^{-1} \quad (2)$$

where the term  $[\ln m - \ln a(\mathbf{p})]/b(\mathbf{p})$  is the indirect utility function of a PIGLOG demand system and the term  $(\lambda)$  is a differentiable, homogeneous function of degree zero in prices  $\mathbf{p}$ .

The AI model has an indirect utility function given by the equation (2) but with the term  $\lambda$  set to zero. The terms  $\ln a(\mathbf{p})$  and  $b(\mathbf{p})$  are defined as:

$$\ln a(p) = \alpha_0 + \sum_{i=1}^j \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^j \sum_{k=1}^j \gamma_{ij} \ln p_i \ln p_k \quad (3)$$

and

$$b(p) = \prod_i p_i^{\beta_i} \quad (4)$$

to complete the specification:

$$\lambda(p) = \sum_{i=1}^j \lambda_i \ln p_i \quad \text{where} \quad \sum_{i=1}^j \lambda_i = 0. \quad (5)$$

The QUAIDS is defined by equation (2), (3), (4) and (5) .

Substituting equations (3-5) into the indirect utility function (2), the following indirect utility function is obtained:

$$\ln V = \left\{ \left[ \frac{\ln m - (\alpha_0 + \sum_{i=1}^j \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^j \sum_{k=1}^j \gamma_{ij} \ln p_i \ln p_k)}{\prod_i p_i^{\beta_i}} \right]^{-1} + \sum_{i=1}^j \lambda_i \ln p_i \right\}^{-1} \quad (6)$$

Applying Roy's Identity to equation (6) completes the Quadratic Almost Ideal Demand System specification (QUAIDS) proposed by Banks et al. (1997).



$$w_i = \frac{\partial \ln a(p)}{\partial \ln p_i} + \frac{\partial \ln b(p)}{\partial \ln p_i} (\ln x) + \frac{\partial \lambda}{\partial \ln p_i} \frac{1}{b(p)} (\ln x)^2$$

(7)

The budget share are given by

$$w_i = \alpha_i + \sum_{k=i}^j \gamma_{ik} \ln p_k + \beta_i \ln \left[ \frac{m}{a(p)} \right] + \frac{\lambda_i}{b(p)} \left\{ \ln \left[ \frac{m}{a(p)} \right] \right\}^2$$

(8)

To calculate QUAIDS model elasticities, differentiate equation (8) with respect to  $\ln m$  and  $\ln p_k$  respectively, to obtain

$$u_i = \frac{\partial w_i}{\partial \ln m} = B_i + \frac{2\lambda_i}{b(p)} \left\{ \ln \left[ \frac{m}{a(p)} \right] \right\}^2$$

(9)

$$u_{ik} = \frac{\partial w_i}{\partial \ln p_k} = \gamma_{ik} - u_i \left( \alpha_k + \sum_j \gamma_{kj} \ln p_j \right) - \frac{\lambda_i B_k}{b(p)} \left\{ \ln \left[ \frac{m}{a(p)} \right] \right\}^2$$

(10)

The budget elasticities are given by  $e_i = u_i/w_i + 1$ . The uncompensated price elasticities are given by  $e_{ik} = u_{ik}/w_i$ .

### III. – The Data

The data source for this analysis is ENIGH 2004 (Encuesta Nacional de Ingreso y Gasto de los Hogares), which are household income-expenditure surveys, collected by INEGI (Instituto Nacional de Estadística Geografía e Informática). The ENIGH allows inferring some ideas of the patterns of consume in the rural Mexico. The main aim of these surveys is to provide a reliable source of information on household expenditure, income and other aspects of household finances, as well as a series of sociodemographic characteristics.

This analysis consists of monetary and non monetary consumption, and it is restricted only to market goods. The non monetary consumption includes gifts, household consumption, transfers, etc; and it is included in the analysis to avoid underestimate the consumption.

In this study five categories of goods were employed: food, welfare, cloth, house and other. If the household does not buy a good, the household buy zero units, but it faces a positive price for that good. The total expenditure is used as proxy for total expenditure. The description of the consumption categories is:

*Food.* - This category takes in all the food (for example: grains, legumes, meats, milk, fruits, vegetables, drinks, etc.)

*Welfare.* - In this category is incorporated the consumption in education (tuition, books, school articles, recreation services, etc) and health (health care, medicines, operations, etc).

*Cloth.* - This category consists in the expenditure of clothing, shoes and accessories of the members of the family.

*House.* - This category includes all the spending of the family in their house, for example furniture, rent, improvement, items for the house, services, etc.

*Other.* - This category integrates services and commodities that are not included in the others categories (transport, items for communication, public transport, meals consumed outside the house, etc).

#### *IV. – Empirical Results*

The households that are included in the analysis live in rural areas of Mexico (less than 2,500 persons). To analyze the pattern of consumption we employ three classes of families:

- Families with at least two spouses.
- Families with only a man.
- Families with a woman and children below 14 years old.

The mean of the expenditures shares of every category of consumption for the three classes of families are in the table 8:

	Household : At least one man and one woman	Household : One man	Household : One woman and children below 14 years old
Food	0.4092 (0.180)	0.4570 (0.232)	0.4120 (0.1831)
Cloth	0.0551 (0.052)	0.0361 (0.044)	0.0614 (0.0536)
House	0.2344 (0.141)	0.2642 (0.198)	0.2424 (0.1488)
Other	0.2198 (0.135)	0.2111 (0.187)	0.1902 (0.1276)
Welfare	0.0813 (0.098)	0.0314 (0.060)	0.0939 (0.1090)

Table 8: Mean of Expenditures Shares

Source: Own elaboration with data of the ENIGH.

Note: The terms in parenthesis are the standard deviations.

We can deduce that the rural families with a man spend the highest share of their total expenditure in food (0.4570), and the lowest share of their total expenditure in welfare (0.0813) than the others types of rural families. Also, the rural families with a woman and children below 14 years old spend higher shares of their total expenditure in cloth (0.0614) and welfare (0.1090) than the other type of families.

The income and own price elasticity of each category of consumption for the three classes of rural families are in the table 9:

	Household : At least one man and one woman		Household : One man		Household : One woman and children below 14 years old	
	Income Elasticity	Demand Elasticity	Income Elasticity	Demand Elasticity	Income Elasticity	Demand Elasticity
Food	0.7900 (0.009)	-0.8078 (0.021)	0.7992 (0.038)	-0.8533 (0.101)	0.9330 (0.055)	-0.8032 (0.1084)
Cloth	1.0265 (0.023)	-1.0446 (0.080)	1.1806 (0.099)	-0.8911 (0.411)	0.8895 (0.116)	-0.5929 (0.4009)
House	0.9236 (0.014)	-1.027 (0.011)	0.8493 (0.059)	-1.0869 (0.069)	0.8536 (0.077)	-0.9928 (0.0535)
Other	1.3101 (0.013)	-0.956 (0.024)	1.4994 (0.062)	-1.1996 (0.1569)	1.3498 (0.080)	-1.0047 (0.1572)
Welfare	1.4179 (0.152)	-0.903 (0.034)	2.6505 (0.737)	-1.4888 (0.224)	1.2898 (0.783)	-0.5496 (0.1363)

Table 9. Income Elasticity and Demand Price Elasticity

Source: Own elaboration with data of the ENIGH

Note: The terms in parenthesis are the standard errors.

A negative relation among the demand of a good and its own price is observed in all the categories of consumption of the rural families (demand elasticity < 0). The category of welfare that include education and health is a luxury good (income elasticity > 1) for the three types of rural families and it is more obvious for the family with a man. The food and house are necessity goods for all families (income elasticity < 1); cloth is a necessity good only for the family with a woman and children below 14 years old (income elasticity < 1).

#### *V. – Conclusions*

The utility of a rural family depends among other things of their member's consumption and leisure. Many variables play an important role in the household's working and consuming decisions, among them: household size, the profile of household members (age, gender, education, etc.), ownership or access to land (including quantity and quality), season, market conditions, etc.

Some of the features found in the patterns of consume of the rural household in year 2004 are:

- The rural family dedicates approximately 40 to 45 percent of their total expenditure in the category of food.
- The rural family with women and children dedicates 9 percent of its total expenditure to welfare, while the family with a man dedicates only 3 percent.
- A negative relation among the demand of a good and its own price is observed.
- The food and house are necessity goods, while education and health (welfare) are luxury good for all families in the rural household.

The consumption of the rural households in education and health are important for the development of the rural economy, and as a result for the development of the country as a whole. Numerous rural households live in extreme poverty and others have different essential necessities unsatisfied, education and health are luxuries good for them. Public policies oriented to promote and support the consumption in education and health in the rural areas are necessities.

Tecnológico de Monterrey, Campus Monterrey



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