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Capability development and well-being:
Analysis of the relevance of investments in territorial capital
in marginal rural areas of Mexico

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Chapter 1: Introduction

1.1 Motivation

During the last decades, public administrations from all ideologies have traditionally considered different policies to diminish poverty levels at the country level in their policy tool kits (OECD, 2006 and 2012). Similar to the case of some countries affiliated to the OECD (Organization for Economic Cooperation and Development) and other developing and emerging economies, since 2007 the Mexican Government has introduced the fight against poverty as a top priority in its agenda (Plan Nacional de Desarrollo 2007-2012, Presidencia de la República / National Development Plan 2007-2012, Presidency of the Republic).

Consequently, the Mexican Government has allocated an increasing amount of recourses to minimize this social condition (Scott, 2009). But, despite these efforts poverty levels in Mexico have not decreased, and to the contrary the poverty level among Mexicans increased by 6.56% between 2008 and 2010. (Consejo Nacional de Evaluación de la Política de Desarrollo Social. CONEVAL / National Council for the Evaluation of Social Development Policy).

In this context, the United Nations through the Food and Agricultural Organization (FAO) proposed in 2002 the implementation of a new strategy to fight poverty: the Strategic Project for Food Security (SPFS)/(Proyecto Estratégico para la Seguridad Alimentaria PESA). This project seeks, through technical and methodological support, to enhance the subsistence systems available to the population exposed to poverty, and

improve the production capacity and income of families in poverty condition through the implementation of domestic projects oriented towards human capital formation.

Human capital is a critical component that contributes to the progress of territories, and the analysis of the ways through which people exposed to poverty can develop human capital gives further relevance to the present research. The prescriptive implementation of homogeneous development policies on territories subject to specific heterogeneity has not always produced the desired results. Moreover, policy efforts should focus on improving regional development considering the endogenous particularities of territories so that a sustainable development policy can be implemented in the long term (Florida, Mellander and Stolarick, 2008; Marsden, 2009).

From a purely theoretical point of view, the economical growth of territories could be sustainable in time, depending on the extent to which countries introduce measures that allow them to take advantage, from an endogenous perspective, of the available resources in the territory (Romer, 1986; 1990).

Regarding the specific case of Mexico, different researches emphasize the need of introducing measures that promote education, access to specific physical assets related to farming, as well as development of different capacities related to the human capital inside the territory, with the objective of significantly diminish the poverty levels. (De Janvry and Sadoulet, 2000; Finan, Sadoulet, and De Janvry, 2005; Kay, 2006; de la Fuente, 2010; Hellin, Groenewald, and Keleman, 2012).

In this research we propose to evaluate if the implementation of specific programs aimed to creating and implementing human capital have a positive and significant influence on the welfare level of individuals that live in rural areas over poverty conditions in Mexico, compared with a population that has not been in contact with this strategy at all. Furthermore, we look to confirm the existence of a return on the investment of the program.

The implementation of programs like PESA has a fundamental role in the process of endogenous regional development. The core of this program is the utilization of the regional resources and human capital available, with the purpose of enhancing the use in favour of the territories where it is implemented.

Indeed, the evaluation of the results of a program like PESA has enormous relevance from the academic standpoint. Furthermore the results will allow us to generate recommendations to public administrations in order to improve the design of territorial development policies in rural areas.

From an academic perspective, this analysis allows us to analyze the effect that the directed utilization of endogenous resources has on the welfare level of inhabitants of a specific region. In terms of regional development policies, the intensity of the implantation of support programs may give important results around the implementation of non prescriptive policies that seek to achieve efficient investment return levels regarding development of economically deprived areas.

1.2 Strategies to combat poverty in Mexico

The minimization and elimination of poverty is a component of the social policy contained in every agenda of every government policy, regardless of the ruling political party or whether it comes from national, regional or specific territory policies.

Mexico is not the exception and similar to other Latin American countries employ internal and external resources in a form of international collaboration that permit to terminate this problem and the inherent social and economical repercussions is evident. The Mexican Federal Administration has established as a priority the attention to those Mexicans who live in poverty and marginalization conditions. (Plan Nacional de Desarrollo 2007–2012, Presidencia de la República / National Development Plan 2007-2012, Presidency of the Republic).

A prominent aspect of the governmental interest in diminishing poverty is related to the social expense invested by the Mexican Government that has been gradually increased since 1983, when it represented 6.60% of the Gross Domestic Product (GDP), until 2006 when it reached a proportion of 10.79%. (Scott, 2009)

One of the first steps in the combat of this social problem was to define it in a precise way with the purpose of clearly identifying the potential beneficiaries of different development policies. The Mexican government employs three different measuring measures in a territory, based on, 1) Income related criteria, 2) Schooling level and access to basic and health services, and 3) nutritional level and access to housing.

Thus, the Mexican government acknowledges three different types of poverty:

1. Nutritional poverty: population with a per capita income insufficient to access a minimum acceptable diet.

2. Capacity poverty: individuals that may be able to cover minimal nutritional needs but whose per capita income is so marginal, that they cannot make any acceptable investment in education and/or health.

3. Patrimonial poverty: considers the population that despite of being able to cover the basic needs related to nutrition, education and health, have an insufficient per capita income to access to housing, clothing, footwear or transportation for each of the family members. (Diario Oficial de la Federación del 16.06.2010 / Official Federation Diary, 16.06.2010).

According to this criteria and based on the data of the Consejo Nacional de Evaluación de la Política de Desarrollo Social de México / National Council for the Evaluation of Social Development Policies (CONEVAL), 52 million Mexicans live in poverty, which represents 46.3% of the total population.

In addition, it should be noted that from the total of Mexicans living in poverty conditions 12.8 million people live in extreme poverty conditions, also known as nutritional poverty and two of every three individuals under this condition, live in rural areas. (CONEVAL, Encuesta Nacional de Ingreso y Gasto de los Hogares 2010 ENIGH y Censos y Conteos de Población y Vivienda 2010, del Instituto Nacional de Estadística, Geografía e Informática. INEGI / National Survey for Income and Expenditure at Home ENIGH and Census of Population and Housing 2010 of the National Institute of Statistics, Geography and Informatics).

Despite the efforts undertaken by different public administrations, poverty in Mexico has not diminished and even experienced an increase from 48,8 million people in 2008 (44,5 of the total population) to 52 million in 2010 (46.3 of the total population, equivalent to a 6.56% increase in two years. (Consejo Nacional de Evaluación de la Política de Desarrollo Social. CONEVAL / National Council for the Evaluation of Social Development Policy).

The group of individuals living under extreme poverty conditions also experimented an increment during the same period, 11.7 million people in 2008 to 12.8 million people in 2010. (Consejo Nacional de Evaluación de la Política de Desarrollo Social. CONEVAL / National Council for the Evaluation of Social Development Policy).

1.3 Food and Agriculture Organization (FAO): Strategic Projects in the Mexican context

In Mexico 26% of the population live in rural areas and half of them are under the poverty line. This population is distributed in 196,000 localities with a population of under 2,500 inhabitants.

Regarding poverty in rural areas, at the beginning of the XXI century, the evaluations of the group of subsidies destined to the agricultural and livestock production, demonstrated that in general, the Mexican rural economic support had been useful for the commercial farmers, generating richness and strengthening productive unities. However, it was not the case for farmers classified as poor or in a subsistence regime, because they only received 8% of the total invested budget in priority regions. This means, that percentage was not representing benefits for all rural producers. On one

side, a uniform distribution of the resources did not exist and the few available resources caused dependency on this collective.

Even though the increment in investment and subsidies, the Food and Agriculture Organization (FAO) emphasizes that the lack of results of the programs for developing rural marginalized areas implemented in Mexico, not only has origin in a heterogeneous and poor judgment related distribution of the available resources, but also in the absence of services and institutions that would enable the development of highly marginalized rural areas. Consequently they designed a new intervention strategy that would allow people living in extreme poverty to overcome this condition.

After the implementation in fifteen countries, the Food and Agriculture Organization (FAO) initiated in 2002 the pilot phase of the Proyecto Estratégico para la Seguridad Alimentaria (PESA) / Strategic Project for Food Security (SPFS) in Mexico. In 2005 this program started a national expansion phase.

PESA/SPFS is a program of methodological and technical support, designed for families and groups that reside in rural marginalized areas. The main objective is to improve and innovate the subsistence, production and income systems among deprived segments of the population.

For PESA/SPFS food security is defined as "The access of families from rural marginalized areas to sufficient, healthy, nutritious food that satisfy their alimentary requirements in order to live a healthy, active life, preferably based on local resources,

sustained on environmental, social and economic certainty over time". (Food and Agricultural Organization. FAO, http://www.utn.org.mx/proyecto_pesa.html).

In Mexico, this project has the mission of contributing to develop rural families living in highly marginal conditions, through the implementation of projects and human capital development to permit to achieve food security and minimization of negative consequences of the life conditions within these collectives.

One of the key components of this program is the active participation of individuals living in extreme poverty conditions, in such a way that the beneficiary of the program becomes the principal actor inside the program, condition that allows them to directly diagnose their own problems and look for solutions.

Nowadays the PESA/SPFS has been implemented in 17 States in Mexico, with 130 Rural Development Agencies, 1,500 field technicians, with presence in 800 marginalized municipalities with a budget of 1,750 MDP equivalent to 136.29 million USD (Exchange rate: 12.84, March 30, 2012, Publicado en el Diario Oficial de la Federación por el Banco de México*: http://www.banxico.org.mx/*) (Food and Agriculture Organization. FAO. http://www.utn.org.mx/proyecto_pesa.html).

The PESA/SPFS program seeks to develop capacities at different levels, based on direct work in the communities and involvement of people. To begin this process, there is a wide convocation in the target communities, so the majority of the population becomes acquainted of what is the program about. Just after this, people learn how to organize themselves in groups, as an element that will allow them to achieve community self-

management. The PESA/SPFS methodology is based on workshops through which agreement is promoted among the participants to raise awareness on the reality they are living in their communities. Besides determining the problems they face, they also analyze the external and internal factors that had led families and the community as a whole, to live in extreme poverty conditions.

Once they have achieved a participatory diagnosis of their own communities, based on the inherent cultural patterns, traditions, resource availability and skills they have, these individuals determine what actions contribute the most to improve the conditions in which they live and overcome from a real standing point their poverty condition.

The PESA/SPFS establishes 3 yearly stages that consider developing different abilities and capacities:

1. Healthy home: the objective is to improve the conditions of rural housing with actions such as:

    a. Construction of ecological stoves: this contributes to minimize the harmful effects that smoke has on the families and also, diminishes wood consumption. The effective use of this asset not only diminishes energy expenditure but also lowers the impact over forest resources.

    b. Installation of systems for grain storing and preservation: this permits to avoid losses derived from humidity and plagues such as rodents or insects.

    c. Rainwater water harvesting: consists on establishing systems for water collection from house roof tops for domestic use, but may also guaranty the viability of some self consumption productive activities.

2. Backyard food production:

    a. Vegetable production: individuals are trained in agricultural activities like: soil preparation, installation of greenhouses, seeding and planting, management and pest control, compost production, fertilization systems and soil treatment with natural fungicides, according to the community climatic conditions and available resources.

    b. Poultry meat and egg production: consists on training for the installation of poultry houses, as well as for chicken rising and sanitary management.

3. Projects for income generation: based on the available resources in the micro region and considering skills and traditions of each specific group, commercial projects are established with the purpose of improving family income.

During the Third National Social Science Congress celebrated at the Universidad Nacional Autómona de Mexico (UNAM) on February 2012 the sociologist Rodolfo Stavenhagen, researcher for the El Colegio de Mexico and former Unite Nations (UN) Special Rapporteur for Human Rights of the Indigenous People between 2001 and 2008, sentenced categorically that the policies designed to combat poverty announced in 2000 by the United Nations (UN) have failed (Stavenhagen, R.,2012. Memorias del Tercer Congreso Nacional de Ciencias Sociales, UNAM, del 26 de febrero al 1° de marzo de 2012). Stavenhagen remembered that in 2000 during the Grand Assembly of Heads of State the United Nations (UN) proclaimed the Development Objectives of the Millennium (DOM) in which it was considered, among others "...fight against poverty and diminish it globally to half before 2015" (Stavenhagen, 2012).

Moreover, Stavenhagen regretted that "the specialist predict that this is an impossible mission and that in the last twelve years, no advances had been achieved on this matter" (Stavenhagen, 2012. Memorias del Tercer Congreso Nacional de Ciencias Sociales, UNAM, del 26 de febrero al 1° de marzo de 2012). The Report of the Millennium of the United Nations (UN) has reached the same conclusion. (www.un.org).

1.4 Why is this research relevant?

The reflections and data presented above show that poverty in Mexico has not been successfully combated. Despite of the systematic increase on the investment to fight poverty during the last decade, the population in this condition has increased over the last years.

Among Mexicans who live under poverty conditions, the most vulnerable segment is the one composed by people who live under nutritional poverty conditions they predominantly live in rural areas with high or very high level of marginalization. Facing this panorama the Food and Agricultural Organization (FAO) proposes as a viable alternative the implementation of the Proyecto Estratégico para la Seguridad Alimentaria (PESA) /Strategic Project for Food Security (SPFS).

This is why the present research gains importance and relevance. The prescriptive implementation of homogeneous development policies on territories subject to specific heterogeneity has not always given the desired results. Some territories in Latin America and the South East Pacific have witnessed how the product of regional development parallel to peripheral industrialization process has undermined the

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productive capacity in the regions involved and at the same time their own regional potential and relational power are ignored (Marsden, 2009).

In this called *space of political negation* the regional change is seen as a process in which the catalyst of change is associated to exogenous factors to the territory, while the value of the endogenous resources is put aside to welcome new technologies more in concordance with determined production media with economical repercussions in the short term.

According to Bunker and Ciccantell (2005), the dominant architectural development model prioritizes the scale economies and the political models, generating an uneven development among territories. This is why we consider necessary that both academics and political agents integrate to their vocabularies and their interdisciplinary perspectives when centering efforts in rural or regional development oriented objectives.

What is more, these efforts should concentrate in foster regional development considering the endogenous component of the territories as the key element to sustainable and perdurable development. This concept of territorial development is compatible with the New Rural Paradigm predominant in the design of many international development policies. (OECD, 2006).

Florida, Mellander and Stolarick (2008) postulate that the endogenous development based on the human capital of the regions, not only permits to exploit the internal resources, but also enhances the attractiveness to these territories because of its scarce

dependence of the external economy and potential to take advantage of local agglomeration economies in terms of demand.

In this direction, the implementation of programs as PESA/SPFS play a fundamental role in the process of endogenous development because they are centered on taking advantage of the regional resources as well as of the available human capital.

The evaluation of a program as de PESA/SPFS has great relevance from the academic dimension as well as from the design of development policies. From the academic perspective this analysis will allow us to analyze the effect that exploitation of endogenous resources has on the welfare level of inhabitants of a certain region. In terms of regional development policies the intensity on the implementation of supporting programs may yield important results regarding the implementation of non-prescriptive policies that pretend to reach efficient investment levels on economically unprivileged areas.

1.5 Research scope

At this point it is feasible to extract two important conclusions. From a theoretical perspective, the design of territorial development programs aligned with the *New Rural Paradigm* (OECD, 2006) strongly relays on the implementation of policies where the endogenous resources of a certain territory play a key role. On the other hand and considering the perspective of public administrations, poverty in Mexico has increased along time, despite the efforts and high investment by political authorities.

In recent years the Food and Agricultural Organization (FAO) is conducting an additional effort which observable consequence is the implementation of programs (PESA/SPFS) where capacity development is the central axis of the support strategy. The fundamental objective of this program lays on the achievement that those individuals that have been exposed to this type of programs work their way out of poverty.

However up to date no exhaustive and longitudinal evaluation has been carried out concerning the real effect that this program has over the individuals that reside in the territories where it has been fully implemented.

Based on economical postulates and insights from the capability approach to human development, we will evaluate from a temporal perspective if the utilization of endogenous resources and specially if capabilities development positively and significantly influence the welfare level of individuals who live en extreme poverty conditions in contrast with the population that has not been in contact with this territorial development strategy.

1.6 Research objectives

In this study, we pretend to evaluate if support programs aimed at combating poverty through the creation and implementation of specific human capital development actions, such as PESA, positively influence the well-being level of individuals who reside in deprived rural areas, compared to a segment of the population that have not enrolled this territorial development policy.

More concretely, this investigation seeks to achieve the following specific objectives.

- Identify the profile characteristics of the program's beneficiaries and confirm that, from the investor agent perspective, the beneficiaries are exposed to severe poverty conditions, compared to non-beneficiaries residing in the analyzed communities.

- Evaluate the economic impact that follows the implementation of the PESA program and determine if households who directly benefit from this well-being enhancing program achieve income levels that are significantly higher than those observed among non-beneficiary households.

- Estimate the non-economic impact resulting from the implementation of the PESA and determine if the resources allocated to education and healthcare (in terms of spending) are significantly higher among beneficiary households, compared to those reported by non-beneficiary households.

- Generate recommendations so that policy makers at all administrative levels can improve the design of well-being enhancing policies in deprived rural areas.

Chapter 2: Theoretical underpinning

2.1 The complexity of regional development: The role of technology and human capital

What factors significantly contribute to social and economical development in remote and rural territories that lag behind their urban counterparts? Logically there is not a unique answer to this complex question, and actions associated to the creation of employment derived from gigantic investment policies, as well as the implementation of a strong technological regime in the region are the most commonly recommended solutions from the literature advocated to design territorial development policies (Solow, 1956; Romer, 1990; Marlet and Van Woerken, 2004).

In particular, the arsenal of theoretical postulates that intend to explain economical and territorial development is vast and it is commonly accepted that the starting point is Solow's exogenous technology-based growth model (Solow, 1956). This model considers technology as exogenous and non-affected by the marginal index of substitution among capital and labor force. Ullman (1958) and Jacobs (1969) concentrate their efforts in evaluating the role of human capital on the transmission and diffusion of knowledge and their positive effects on economical development. Jacobs (1961, 1969) emphasizes the role that cities and regions have in the transference and diffusion of knowledge according to the diversity scale of cities.

Andersson (1985a, 1985b) explores the historic role that creativity has on regional economical development, emphasizing the importance of knowledge, culture, communications and creativity while establishing that tolerance is an important component for the stimulation of creativity in different cities and regions.

Romer (1986, 1990) endogenous growth model connects technology to the available human capital and knowledge with economic growth. Inventiveness or creativity in the neoclassic reference frame is no longer considered exogenous. Lucas (1988) extends the endogenous model of Romer (1986) and identifies the specific function of externalities created by human capital in the economic development of territories. Underlying this model is the postulate that human capital accumulation—i.e., accumulated knowledge that allows the efficient exploitation of knowledge spillovers among the participants of the economy—increases territorial's knowledge and encourages territorial development.

From an economic view, the theoretical deductions resulting from the above mentioned postulates strongly support the notion that education and skill development gain importance as key factors explaining territorial economical development (De Janvry and Sadoulet, 2000; Kay, 2006; Florida, Mellander and Stolarick, 2008). In a broad sense, these concepts are linked to Becker's (1975) postulates which emphasize the relevance of human capital factors—understood as the accumulated talent and knowledge acquired through formal education or experience—in explaining individual and territorial development.

Human capital is defined as the sum of several individual attributes such as: formal education, labor market experience, talent and skills generated through experiential

knowledge, and the knowledge obtained from third persons (Becker, 1975). This kind of capital is considered unique because knowledge cannot be alienated from a person as other type of tangible and financial assets. Moreover, Becker (1975) states that the presence of high levels of human capital affects individuals' attitudes and market behaviors, which clearly has repercussions on their professional development.

Recently the fundamental role of human capital as territorial economic development catalyst has been documented in studies at country level (see e.g., Barro, 1991; Florida, Mellander, Stolarick, 2008), as well as in some other developed geographic environments (Rauch, 1993; Simon and Nardinelli, 1996; Simon, 1998).

Additionally, an interesting result reported by more recent empirical studies relating human capital levels and territorial development points that human capital across US territories tend to diverge and the observed differences are turning more pronounced over time (Berry, 2005).

Scholars often measure human capital as the educational attainment of the population. But, recent studies show that this type of measure only captures a part of the individual's knowledge and capacities, and that conventional metrics do not accurately measure other factors more related to accumulated experience, creativity, and skills linked to innovation capacity and entrepreneurial abilities. Recently, Florida and his colleagues (2002a, 2002b, 2002c, 2004) suggest that accurate human capital measures should include components related to the individual's occupation and type of experiential-driven knowledge, in order to identify what factors increase the "creative class" in a territory. These authors propose to analyze the effects of explicit knowledge,

distinguishing explicit organized knowledge (i.e., science, engineering, administration, finance, law, health care and education) from that resulting from more creative-oriented education profiles (i.e., art, culture, entertaining). Comparative studies show that the effect of creative-oriented human capital on territorial development is greater compared to generated by individuals with more structured or organized human capital in Sweden (Mellander and Florida, 2006) and in the Netherlands (Marlet and Van Woerken, 2004).

On the basis that human capital is a key ingredient for economic growth, we question what factors explain the development of human capital across territories, and what factors contribute to maximize the effects of human capital on territorial development. Three arguments have been proposed on this issue.

First, it has been argued that education centers and universities play a key role in the creation of initial advantages of human capital (Glaeser, et al., 2001). Second, research indicates that comfort—i.e., security level in the community and access to key services and leisure centers—matters for attracting and retaining people with high educational level and a high level of abilities (Glaeser, 1994; Glaeser, et al., 2001; Clark, 2003; Shapiro, 2006). Third, Florida (2002a, 2002b, 2002c) proposes that tolerance and openness towards diversity explains the magnet effect of territories and their capacity to develop a sustainable knowledge-based economy over time. Additionally, Florida, Mellander, and Stolarick (2008) suggest that these three attributes are not necessarily mutually exclusive. In fact, they propose that these factors play a complementary role in terms of distribution of talent and territorial development.

Nowadays the debate around the role of human capital is open, and it does not exclusively focus on its effect over economic development. On contrary, the theoretical debate orbits two elements (Florida, Mellander, Stolarick, 2008). First the problem of how to accurately measure human capital dominates among academics and policy makers in charge of designing development policies. Second, concerns on which factors contribute to explain the territorial distribution (concentration) of human capital.

As for the first issue dealing with the measurement of human capital variables, it should be said that in many occasions, mainly due to lack on information, human capital is analyzed through conventional metrics related to educational attainment (formal education and training). Policy makers often assume that underlying this economic principle is the fact that education investments are made with a future perspective of economic outcomes, mostly linked to the labor market. However, measuring human capital through conventional measures only permits to identify the potentially accumulated knowledge derived from such education. Recently, Marlet and Van Woerkens (2004) for Sweden, and Mellander and Florida (2006) for the Netherlands find that human capital measures based on occupational levels present a more complete and real picture of the available human capital within territories and, consequently, helps measure the impact of human capital over territorial development. Therefore, it is possible to conclude that education provides a certain level of knowledge and capacities which are not necessarily capitalized on productive activities; and that tacit experiential knowledge can serve to channel skills and abilities into the labor market and, thus, enhance individual and collective performance (Florida, Mellander, Stolarick, 2008).

At this point, it is noteworthy note that a first connection between theoretical postulates and this research can be made. As we previously mentioned, the implementation of support policies—i.e., PESA/SPFS—plays a potentially critical role in the process of regional endogenous development, because this program seeks to boost regional resources as well as the available human capital in order to transform them in productive resources with direct repercussions on the benefited territories' welfare.

Concerning the second source of debate—the causes of the geographic distribution of human capital across territories—diverse arguments have recently emerged from the literature. Florida (2005) proposes that the greater concentration or dispersion of human capital results from the capacity of territories to create and disseminate human capital territorially. While some regions are more susceptible to capitalize on their infrastructures (education centers) by producing more human capital, other territories adopt a role of exporters of human capital to other regions. Thus, the mere presence of educational or formation centers that generate economic incentives do not warrant a higher accumulation of human capital.

Various studies have empirically corroborated that standards of living contribute to explain the observed differences in the levels of concentration of human capital. In their studies for the US, Lloyd and Clark (2001), Florida (2002) and Shapiro (2006) find that regional quality of life and greater social and cultural comfort explain the higher concentration of human capital. In the European context, recent studies by Lafuente, Vaillant and Serarols (2010) and Vaillant, Lafuente and Serarols (2012) address the problem of business location and concentration of human capital in urban and rural areas of Catalonia. From the analysis performed on new knowledge-based businesses,

these authors conclude that location decision-making and, consequently, the higher concentration of knowledge-based service businesses in rural Catalonia results from entrepreneurs' preferences related to quality of life.

In the light of existing evidence, the excessive mobility of human capital must be understood as a characteristic that may determine the level of territorial development. Thus, it is important to question how to tackle this problem in the case of underprivileged rural areas, seeking to reduce their vulnerability and foster their economic sustainability. Increased flows of goods and services, people and knowledge constantly challenges the traditional concepts of what is meant by rural economic continuity (Marsden, 2009).

2.2 Factors explaining territorial development: Existing evidence

The analysis proposed in this doctoral thesis focuses on the development of rural territories and gains increased attention considering that a fourth of the population of countries members of the OECD, reside in rural or nonmetropolitan areas (Kilkenny, 2010).

From a regional policy making perspective, it has been acknowledged that the endogenous development of deprived regions, that is, employing their own resources, does not exclusively enhances by allocating additional financial resources. This has led to implementing policies and programs in numerous countries, with the explicit objective of developing rural regions and makes them more competitive through the active exploitation of local available assets (OECD, 2006).

During the last decades, policies focused on identifying and targeting local economic opportunities have become a key objective of policy-makers at all administrative levels, regardless of their ideology. Regional policy has experienced a drastic shift from a paradigm where subsides and additional economic resources were used to reduce regional disparities; towards a broader and more holistic view where development policies and support programs aim at enhancing regional competitiveness by taking into account different aspects which, besides economic components, include standards of living, health care, education, entrepreneurial focus, among others. This new approach is characterized by different factors. First, there is a strong support to the strategic development of local businesses. Second, greater attention is paid to available territorial assets and existing knowledge, while exogenous investments and transferences have become less relevant. Finally, increased awareness on the collective nature of the governance of the implemented support policies has emerged at the national, regional and local government level by including in the implementation stage of support programs other stakeholders with a less dominant governmental role (OECD, 2006).

Recent research efforts on rural development seek to integrate the processes through which it is possible to identify the unequal demographic and industrial resource allocation to the returns to non-farming activities. The specific demographic and location characteristics of rural areas condition their economic activity and generate associated costs. Therefore, research on rural development should take into consideration in the analysis spatial economics (Kilkenny, 2010) as the fundamental engine of economical growth at the local level is employment and the fundamental unity of spatial economy is labor market (Johnson, Otto, and Deller, 2006).

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Concerning empirical evidence, for the purposes of this doctoral thesis four major factors have been identified as key ingredients for territorial development:

1. Location and resource availability (infrastructures): Individuals choose rural areas to locate their businesses depending on the access they will have for required inputs and on the capacity of channeling their outputs to the market or alternatively, where spatial, technological and labor conditions are beneficial to their competitiveness interests (Stahl, 1987; Johnson, 1991; Henderson, 1994; Lafuente, Vaillant, Serarols, 2010).

2. Economic activity threshold: research acknowledges differences in operational scales and in critical productive mass, in terms both population and business interrelations. This implies that individuals would choose rural areas which offer to their businesses the possibility to access other service businesses which are critical to the sustainable development of their economic activity (Shonkwiler y Harris, 1996; Barkley, Henry, Kim, 1999; Henderson, Kelly, Taylor, 2000).

3. Population flows: People migrate from remote rural areas to more economically active and prosper urban areas with the purpose of enhancing their welfare and exploit their human capital (Renkow and Hoover, 2000; Mills and Hazarika, 2001; Goetz and Rupasingha, 2004; Barkley, Henry, and Li, 2004; Chen and Rosenthal, 2008). Additionally, Huang, Orazem and Wohlgemuth (2002) report that, despite higher human capital is associated with higher income in rural areas, the relationship between human capital and income is dampened by the brain drain towards urban territories.

4. Introduction of exogenous technology and economical activity: The expansion of labor demand is found to contribute to the development of deprived areas; however, rural areas often adopt technologies from exogenous investments which reduce local labor force opportunities. This is sharp contrast with the importation of human capital from other regions that are capable of dealing with the new regional industrial thread that many rural areas seek to develop by employing their existing resources (Renkow, 2003). Khan, Orazem, and Otto (2001) propose displacement as an alternative to rural migration. Nevertheless, as the authors recognize, the economic and non-economic cost might be excessively high if the necessary conditions for their effective utilization are not met at the local level, and this leads to an inefficient incorporation of labor force not only due to the local social structure, but also to the disconnect between the rural population's capacities and knowledge and the new adopted economic activity.

We now turn our attention to the effectiveness of support policies in Latin America. Existing evidence on this issue presents mixed results, which is consistent with the diverse nature of the adopted programs. On the one hand, the implementation of specific policies shows how support programs lead to a partial positive outcome in terms of economy and territorial development. Bretón Solo de Zaldívar (2002) finds that in countries with great agglomerations of indigenous population, programs designed to alleviate poverty do not effectively reach rural segments of the population. In his study on Bolivia, Ecuador, Guatemala and Mexico, it was observed that local leaders and groups take control over resources coming from territorial development programs, which diminishes their potentially positive impact. (Bretón Solo de Zaldívar, 2002).

Finan, Sadoulet and de Janvry (2005) analyze the impact of land ownership as a strategic policy to reduce poverty. The authors conclude that land property is an important aspect that significantly contributes to reduce poverty in rural areas. However, these authors find that the positive effect of land ownership on rural areas' welfare is effective only when other alternative mechanisms interact with support actions. These mechanisms are associated with the development of schooling and the provision of basic and essential public services such as water and the necessary infrastructure for the effective use of the land.

Kay (2006) analyses a variety of elements related to generalist and specific policies in Latin America. One of the main conclusions regarding the spatial effect observed in the support programs and territorial development relate to the lack of institutional coordination when it comes to implement territorial policies. The author emphasizes that many support programs show that support policies are exclusive to rurality or urbanity, in terms of groups of beneficiaries, which determines capital flows and resources across the benefited territories. This lack of coordination between rural and urban territories conditions the level of convergence between economic activity, resource mobility and generation of wealth (poverty reduction) among territories subject to specific or general territorial strategies.

In a context of trade liberalization, Hellin, Groenewald, and Keleman (2012) analyze the impact of support programs oriented to corn farmers in Mexico. The results reported by these authors indicate that, although many farmers intensified corn production, corn farmers looked for employment outside the territory and abandoned corn production. In this case, the territorial support program partially reached its objectives, since the

potential of small corn farmers to overcome poverty by diversifying their crops or expanding their lands did not efficiently materialize.

In the case of Mexico, a micro regional strategy based on a holistic approach towards rural development exists, in which the coordination of different policies and initiatives are oriented to develop 263 rural micro regions characterized by their high level of underdevelopment. Each micro region has a strategic community around which actions over priorities are established through a highly participative process that includes all local communities sectors (OECD, 2006).

It should be noted that empirical evidence dealing with the implementation of support programs in Mexico is not encouraging. However, the partial effectiveness of support programs documented for developed economies, such as the US, are equally mixed in terms of the repercussions of the different policies applied. For example, Kilkenny and Johnson (2007) documented that the US government spent 40 billion USD in rural development programs, from which 14 billion USD where spent by the Department of Agriculture (USDA) in non rural programs related to transportation infrastructure, rural housing, rural energy, communication infrastructure and rural businesses. Subsidies from the USDA seek to maintain rural towns alive so in a certain way they may compensate spatial rationalization (Kilkenny, 2010). The effects of these policies are not evident, have not been designed from an economic perspective, and are not subject to economic or spatial analysis. In fact, according to economic literature, investments aim at reducing the cost of transportation favor urbanization more than rural development (Fujita, Krugman, and Venables, 1999).

On contrary, programs that seek to increase rural housing may exacerbate the spatial slope of property prices, which in turn, may inhibit mobility or even favor migration of poor people (Kilkenny, 2010), whereas programs that increase the abilities of rural people may generate a gradual migration of rural people with a higher human capital, leaving their towns in a weaker economic position (Kilkenny, 2010).

It has also been discussed that instead of fighting against spatial rationalization, rural development policies in developed countries should favor the communities' adjustment towards a smaller number of rural settings, bigger and more prosperous (Brown, 1987; Kilkenny and Johnson, 2007). Alternatively, policies might target the coordinated allocation of residents and businesses to a given area, in such a way that these rural areas are not excluded and they have a minimal efficient scale that permits them to create value from their economic activities over time (Kilkenny, 2010).

From the reviewed evidence, it is important to question if spatial rationalization is efficient for a territory or, on the contrary, if public and private costs of maintaining those that remain in communities that have fallen under the minimal efficiency scale overpass national welfare. The question demands an answer that considers the own economic activities of territories, their associated costs and the utilization of available goods and human capital, which must be part of an endogenous system (Krichel y Levine, 1999; Brueckner y Kim, 2001).

Both the cost of distance and the consequences of a low population density make evident the market failures that negatively affect rural areas. Providing public services to dispersed rural residents are expensive actions. From a rural areas perspective, the

cost of transportation is also high from remote rural areas which makes that local businesses cannot compete, despite input availability that allow them to lower production costs or reach higher productivity levels (Mutti, 1981; Gersovitz, 1989; Venables and Limao, 2002). This way, policy makers should acknowledge that rural products may be discharged because they are less accessible (Wu and Gopinath, 2008).

In this scenario, rural businesses compensate their location-related disadvantages with lower rents and salaries, which partially explains income disparities and housing prices. It is also evident that the low cost in rural areas attracts poor people. Fisher (2007) suggests that the decision to reside in a rural area might be endogenous with respect to poverty status. In fact, people with high human capital migrate from rural areas and people with low human capital often reside in non-metropolitan areas (Kilkenny, 2010).

Remote and low population density rural areas are also disadvantageous because of the lack of externalities associated to the economy or well, because of the lack of feedback derived from the location of their businesses (Shonkwiler and Harris, 1993, 1996; Barkley and Henry, 1998), or because the low or null division and labor opportunities that limit knowledge spillovers or innovation (Duranton, 1998; Barkley, Henry and Kim, 1999; Duranton and Puga, 2001; Partridge and Rickman, 2008).

In those places where population or population density are low, the size of the market may be insufficient to justify the fixed cost to establish a business (Berry, 1967; Kilkenny, 1998). Additionally, the cost of transportation and communication may induce monopoly power for the sale of goods and services in remote rural areas

(Holmes and Stevens, 2004; Richards, Acharya and Kagan, 2008) or even the local commerce and occupation of labor force (Shonkwiler and Taylor, 1988; Sexton, 2000).

As a result of these theoretical considerations and of the existing empirical base, a second connection between the present doctoral thesis and the analyzed theoretical postulates analyzed emerges. Moulaert et al. (2005) and Neumeier (2012) propose that the inefficient results shown by different local development programs are the result of the lack of knowledge of the multidimensional nature of territorial development. The successful implementation of development programs results from the integration of different domains of intervention, where economic, housing, educational and cultural aspects play a central role (Moulaert et al., 2005, p. 1973).

The unattractiveness of deprived rural areas that are analyzed in this dissertation is not the exception to this phenomenon. Our proposal gains relevance because we identify if the creation of different types of human capital and their subsequent exploitation in the local setting generates incentives so that residents who benefited from the program succeed in increasing (improving) their welfare conditions.

The chronic deprivation that people in extreme poverty conditions suffer over time is generally the consequence of a generational driven process whose last outcome is poverty persistence. Persistent poverty is associated with negative events or the unrecoverable collapse of poor people which might be idiosyncratic (e.g. prolonged diseases of family head) or covariant (e.g. regions immerse in complex political emergencies) (Hulme, Moore y Shepherd 2001).

We must acknowledge that poverty is a complex phenomenon and that different factors explain persistent poverty among regions. Geographical distance (i.e. physical distance to important cities or costs) and isolation (i.e. access difficulty because of topography) as well as physical limitations related to low agricultural productivity are common to rural regions. Several inter-connected constructs that agglomerate economic, social and political factors shape the patterns that make poverty a persistent phenomenon. Market failures limit public and private investments in rural areas, and unproductive extractive activities are symptoms commonly associated with underprivileged regions.

The design of the analyzed support program (PESA/SPFS) and its longitudinal character are in consonance with the concept of longitudinal social welfare-enhancing purposes. Policy efforts seek to adopt social innovation systems to modify social dynamics associated to economical and social inclusion (Moulaert et al., 2005), and they represent the starting point for the introduction of multidimensional actions through specific policies. With the purpose of assuring progressive territorial development, support programs that look for a structural change must consider the different interactions that exist between economic, technology and social factors (Neumeier, 2012).

Most quantitative analysis tends to approach poverty from a chronic point of view, paying special attention to economic and poverty factors. The analysis proposed in this study moves away from this conventional perspective and conceptualizes poverty from a multidimensional perspective, in which we analyze a set of welfare factors related to health, education, isolation, lack of social eco (management capacity) and security.

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The multidimensional analysis of the phenomenon subject to analysis (poverty) is based on a solid theoretical foundation that allows us to reach relevant conclusions with relevant policy-making implications. The arguments presented in this section allow us to conclude that the proposed analysis accurately assesses regional development.

The study of the different relations that exist among the creation and active implementation of human capital within rural territories may gain relevance if this analysis matches existing theory with the identification of efficient links or demographic aspects that contribute to enhance the potentially positive effects of support programs.

2.3 Hypothesis Development: Analysis Based on the Capability Approach

For most policy makers two outcomes of pertinent importance in the development of regions are 1) inclusiveness of development 2) effectiveness of support programs. The objective of an inclusive development is the equitable creation and distribution of (economic and social) benefits so that poor communities and/or regions are not left behind. For instance, an inclusive development policy that focuses on economic progress aims at reduction and even elimination of income inequalities (World Bank, 2000). Such an inclusive development policy has been necessitated by limited trickle down of economic growth i.e. when economies grow the benefits of growth does not necessarily percolate to the poor in an autonomous manner (Aghion and Bolton, 1997; Carter and Barrett, 2006). As such the state of the poor has received wide attention, both through the work of scholars and policy makers.

Drawing on insights from the capability approach developed by Sen (1983, 1985, 1999), individuals' well-being has to be evaluated in terms of the freedoms and opportunities that people value. Thus, human development is defined as the process of extending the real freedoms that people enjoy, i.e., enhancing people's capabilities (Sen, 2008).

The capability approach is a normative framework for assessing inequalities based on effective opportunities that people have. The core concepts of the capability approach are the individual's functionings, i.e. the person's 'beings' and 'doings', which can be elementary (i.e., nutrition, health, life expectancy) or more complex (i.e., civil activism in the community or self-respect) and the people's capabilities, which represent the genuine opportunities or freedoms to realize their functionings (Sen, 1999, 2008).

The capability approach focuses on the intrinsic importance of various aspects of quality of life rather than the accumulation of goods, which implies that human development is multidimensional (see e.g., Robeyns, 2006; Sen, 1999). At the same time Sen does not underrate the role of economic growth on well-being and, on contrary, he notes that '…the real limitations of traditional development economics arose not from the choice of means to the end of economic growth, but in the insufficient recognition that economic growth was no more than a means to some other objectives. The point is not the same as saying that growth does not matter. It may matter a great deal, but, if it does, this is because of some associated benefits that are realized in the process of economic growth' (Sen, 1983, p. 753).

This way, the capability approach proposes that poverty is an outcome of capability deprivation and that inequality is not just the absence of income or income imbalance,

but the inability of the poor to exercise their freedoms (Sen, 1991, 2008). Development occurs when people have greater freedoms that enhance their ability for self-reliance and influence the immediate socio-economic and institutional environment (Alkire and Deneulin, 2009).

The set of people's capabilities encompasses both the access to resources—e.g., goods, services, and intangibles such as human and social capital—and a series of conversion factors which can rely on personal factors (e.g., physical and psychological characteristics), social factors (e.g., gender-related, institutional, public goods) and environmental conditions (e.g., changes that affect river flows and soil fertility). Conversion factors allow individuals to transform their capabilities into functionings (Robeyns, 2006). Thus, the capability approach defines capabilities in terms not only of the access to resources, but also of the conditions that facilitate the conversion of resources (capabilities) into well-being achievements (functionings).

Individual decisions on what capabilities should be exploited and what functionings should be pursued operate via a concept of positive freedom which differentiates potential choices (i.e., achievable functionings) from realized choices (i.e., achieved functionings) (Sen, 1985). The proposition of free agency centralizes on the argument that goals and decisions that improve well-being are contingent on individual's freedom to choose and act on whatever they think is in their well-being. Freedom of choice therefore takes a pivotal role in the definition and improvement of well-being (Alkire, 2002). As a result, underlying the concept of free agency is the notion that the active participation and involvement of people in decision-making processes increase their

well-being by allowing people to select and prioritize the development of those capabilities that they consider most valuable.

To sum up, the capability approach offers a framework that allows at both evaluating well-being from a multidimensional perspective and distinguishing between well-being freedoms and well-being achievements. This aspect is of great relevance for evaluating support policies, as the clear delimitation of capabilities and functionings permits us to analyze the impact of capability-enhancing programs on well-being.

We now turn our attention to the role of investments in territorial capital on well-being by focusing on their connectedness. Figure 1 provides an overview of the proposed conceptual framework which emphasizes the relationship between investments in territorial capital and various well-being dimensions related to income and expenditures in human capital and health.

Figure 1. Investments in territorial capital and rural development

Type of resource	Territorial capital:	Investments in territorial capital:	Well-being outcomes:
- Human capital	Education, labor experience, skills and social capital	Training and advisory services, technical assistance	- Household income - Consumption: expenditures in education and health
- Physical capital	Housing infrastructures, communication infrastructures, and technical facilities	Land improvement, improving infrastructures economic diversification	
		Capability-enhancing interventions	Functionings

Source: Author's elaboration.

The multidimensional view of well-being inequalities proposed by the capability approach is increasingly drawing policy-makers' attention (Robeyns, 2006). As we indicated above, inclusiveness and effectiveness are core objectives pursued by most policy makers in the implementation of poverty reduction programs in marginal rural areas (World Bank, 2008).

Nevertheless, two factors might create a disconnection between the objectives and outcomes of support policies. First, inclusive policies have been necessitated by limited trickle down of economic growth, i.e., in a period of economic growth its benefits do not necessarily directly percolate to the poor, thus hampering the effectiveness of the focal program (Aghion and Bolton, 1997; Carter and Barrett, 2006; Meyer and Sullivan, 2008; Stiglitz, 1998). Thus, the conceptualization of development through increases in per capita income might yield a well-being indicator because it does not capture the availability of needs—or functionings in terms of the capability approach—such as health, education and safety of a large section of the society.

The second aspect that might tamper the inclusiveness and effectiveness of support policies relate to the little interest in creating or developing capabilities (opportunities) that allow individuals to realize their functionings (their needs) (Arkile, 2002; Sen, 1999, 2008). Since the 1990s, different programs have been implemented in developing countries seeking to reduce poverty and promote human development. Existing evidence suggests that support programs have clear positive effects on schooling, preventive health care and consumption (e.g., Barrientos, 2013; Dahl and Lochner, 2012; Gao et al., 2014; Rawlings and Rubio, 2005).

Although their generally positive effects on households' economic and non-economic well-being, support programs—often driven by policy objectives—might create dependencies among the targeted population segments which, in turn, can generate unintended negative effects such as reduced work efforts and lower marriage rates (Blank, 2009).

This is somewhat paradoxical because programs designed to combat poverty might create the need for perpetual exogenous support to achieve their goal. Moreover, in the absence of capacity-enhancing actions (e.g., through investments in human capital or physical infrastructures), beneficiaries have little incentives to develop the capabilities that they think improve their long term well-being. From a capability perspective, this implies that the impact of programs with a low capability-enhancing orientation and a high focus on the achievement of basic needs (functionings) could be short-lived and lasts only as long as the support program. Although the capability analysis is less precise because it includes well-being dimensions that are often hard to quantify, which constitutes the main criticism to this approach, poverty reduction projects should be evaluated on the basis of both how capability-enhancing they are and how they contribute to meet people's functionings (Robeyns, 2006).

In the context of this study, two aspects of the analyzed program (PESA) might play a critical role. On one hand, the PESA promotes the active participation and involvement of community members in the development of their projects. On the other hand, the PESA is a capability-enhancing poverty reduction program that emphasizes investments in territorial capital to capitalize on existing resources and enhance the beneficiaries' well-being.

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As far as community participation is concerned, note that the PESA gives beneficiaries the freedom to diagnose their own reality and develop the capabilities that they reason best fit their needs (i.e., functionings). This approach is necessary because beneficiaries are the targeted stakeholder in the design and implementation of the PESA and without them the program would cease to exit. We argue that active participation in development projects associated with the enrolment in non-conditional voluntary program (PESA) increases the beneficiaries' incentives to prioritize and pursue those needs (functionings) that they consider most valuable by exploiting their available resources (capabilities). This logic and evidence suggest the following relationship between enrolment in support programs and beneficiaries' well-being.

H1: A positive relationship exists between the active participation in support programs and well-being, measured by income and expenditures in education and health.

We now focus on the relationship between investments in territorial capital (capabilities) and well-being outcomes (functionings). In the context of the study, the PESA empowers beneficiaries to exploit different capabilities related to 1) 'knowledge acquisition' which relates to the genuine opportunity to choose to access the knowledge that the PESA offers to beneficiaries, and 3) 'technology improvement' which results from the possibility to choose to introduce new technologies in the household's economy (see Figure 1).

Scholars emphasize the importance of human capital development (Becker, 1993; Sen, 1999), and empirical evidence shows that human capital can act as a catalyst of regional

economic development by developing intrinsic abilities and skills with economic potential (Barro, 1991; Gao et al., 2014; Meyer and Sullivan, 2008; Simon, 1998). For instance, training might contribute to increase productivity, which can translate in increased individual well-being through wage employment or entrepreneurship (Becker, 1975). Human capital development strategies can be more effective in improving well-being by widening the spectrum of consumption choices among beneficiaries. Additionally, all PESA beneficiaries have the possibility to choose to invest in those physical assets that they consider necessary to carry out their projects. This type of investment is critical as it helps introduce (or renew) infrastructures and/or technology that can potentially contribute to improve agriculture and water management practices, as well as to expand productive options (Vargas, 2010).

From a capability perspective (Robeyns, 2006; Sen, 1991, 1999), investments in human capital and physical capital represent an effort to create or develop households' capabilities which can be used by individuals to pursue their functionings (well-being outcomes) (Figure 1).

Sen (1985, 1999) advocates for an analysis of well-being through variables linked to individual's funtionings, paying less attention to economic metrics. To evaluate the effects of policy interventions on well-being, a growing body of literature has focused on consumption data (e.g., Gao et al., 2014; Kaushal et al., 2007; Meyer and Sullivan, 2008). While income data are easier to collect in household surveys, consumption is more sensitive to economic changes and accurately captures spending patterns (Meyer and Sullivan, 2008). Also, and unlike income, data on consumption are more

informative about changes in the households' economy as a result of the incorporation to the labor market or the participation in support programs.

In this study, household income and expenditure patterns in education and health are key metrics to evaluate well-being (see e.g., Gao et al., 2014; Meyer and Sullivan, 2008), and we argue that consumption choices are relevant to evaluate the inclusiveness and effectiveness of support programs. But, how do beneficiaries make consumption choices? Moreover, do they use the economic output of their local projects to meet basic needs (food) or invest in human capital or health?

Consumption choices are especially hard for poor families residing in marginal areas. We argue that decisions regarding whether to meet short-term functionings—e.g., housing and food—or invest in long-term functionings—e.g., education and health—can be better articulated if individuals have the possibility to truly exploit their capabilities (available resources). In this sense, the orientation of the SFPS contributes to develop capabilities with long-term perspective. This approach increases households' security and stability, thus creating the conditions to diversify consumption and pursue new and different functionings related to human capital and health. Taken together, these arguments and evidence suggest that capability-enhancing poverty reduction programs enhance the exploitation of these capabilities among beneficiaries, thus increasing their well-being. Therefore, we hypothesize:

H2: Among beneficiaries, a positive relationship exists between investments in territorial capital—measured by human capital and physical capital—and well-being outcomes, measured by income and expenditures in education and health.

We expect that specific investments in human and physical capital resulting from the implementation of the PESA program facilitate occupation among the beneficiaries, thus improving their well-being levels. It is also expected that territorial development enhances as a result of these specific investments and the active implementation of the created human capital.

This temporal vision is useful in the sense that it permits to clearly identify a convergence point between the PESA program and the beneficiary, which is a necessary condition to match this research's objectives to existing theoretical approaches.

Chapter 3: Research design – Data and Method

The present research is based on a quantitative methodology that will allow us to build databases from direct field inquiry. We analyzed a sample of 1,122 individuals that have been exposed to PESA/SPFS since 2007.

In order to strengthen the results, in parallel we analyzed an equivalent control group, integrated by people that reside in the same rural communities where the impact of the PESA/SPFS program was analyzed, but that never had any kind of exposure to these type of strategies.

3.1 Sample design, database and variable definition

3.1.1 The sample

The population analyzed in this research is geographically distributed in a micro-region of the State of Mexico, which is located in the central region of the country and its part of two municipalities: Amanalco de Becerra and Donato Guerra. The analyzed communities are approximately 125 km southwest of Mexico City (Figure 2).

Amanalco de Becerra has a population of 22,868 (INEGI, Censo de Población y Vivienda 2010, Consulta interactiva de datos), an extension of 219.8 km2 (Estadística Básica Municipal del Estado de México, Amanalco de Becerra en http://igecem.edomex.gob.mx/recursos/Estadistica/PRODUCTOS/AGENDAESTADIS TICABASICAMUNICIPAL/ARCHIVOS/Amanalco.pdf) and a population density of 104.04 inhabitants per square kilometer.

Figure 2. Geographic location of the analyzed rural communities
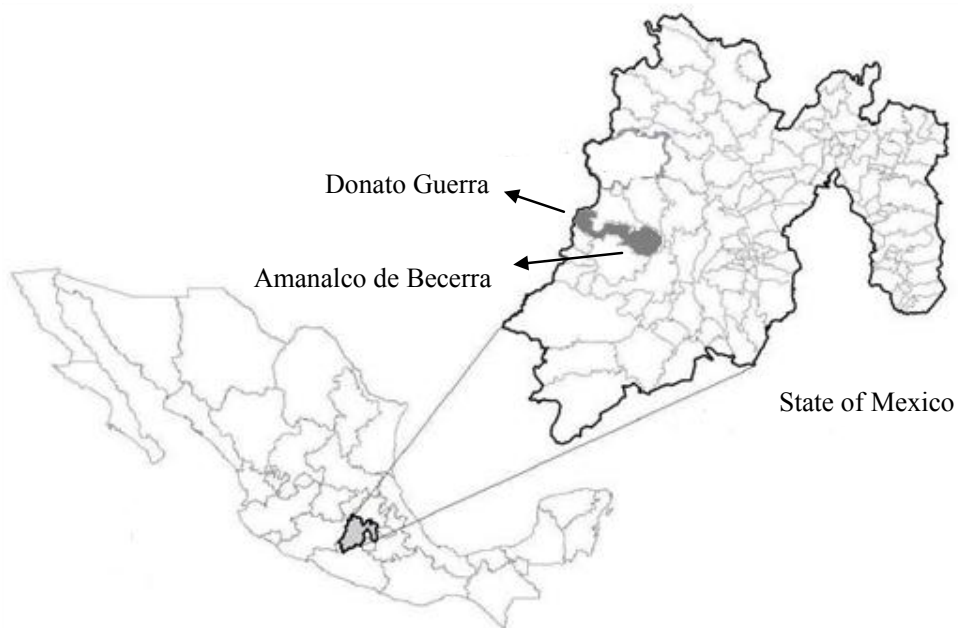
Source: Authors' elaboration.

On the other hand the municipality of Donato Guerra has a population of 33,455 (INEGI, Censo de Población y Vivienda 2010, Consulta interactiva de datos), an extension of 181.36 km2 (Estadística Básica Municipal del Estado de México, Donato Guerra en http://igecem.edomex.gob.mx/recursos/Estadistica/PRODUCTOS/AGENDAESTADIS TICABASICAMUNICIPAL/ARCHIVOS/Donato%20Guerra.pdf) and a population density of 184.47 inhabitants per square kilometre.

The territory of this micro region has an extension of 411,238 square km. and its climatic conditions may vary from template sub humid to semi warm humid. Mostly composed by mountain systems with altitudes that vary from 2,300 to 2,941 meters above the sea level it has a natural vocation for agricultural, livestock and forestry

activities, fundamentally for family consumption. (Censos y Conteos de Población y Vivienda 2010, Instituto Nacional de Estadística, Geografía e Informática. INEGI).

The whole area subject of study has a population of 17,649 inhabitants divided into 3,530 families, distributed in 26 communities, 25 of which are considered highly marginalized and one extremely marginalized, according to the National Institute of Statistics, Geography and Informatics (INEGI) based on the Mexican Government poverty classification. These communities are distributed along 2 municipalities, 22 of them belong to Amanalco de Becerra and 4 of them to Donato Guerra. (Table 1)

Table 1. Communities under analysis

No	Local Communities	Population	Municipality
1	El Pedregal	253	Amanalco
2	San Miguel Tenextepec	876	Amanalco
3	San Lucas	1,009	Amanalco
4	San Lucas 4ª. Secc.	226	Amanalco
5	San Mateo	1,642	Amanalco
6	Rincón de Guadalupe	1,015	Amanalco
7	Agua Bendita	596	Amanalco
8	El Potrero	1,155	Amanalco
9	Capulín 1ª. Secc.	579	Amanalco
10	Capulín 2ª. Secc.	275	Amanalco
11	Capulín 3ª. Secc.	474	Amanalco
12	La Providencia	139	Amanalco
13	San Martín Obispo	1,234	Donato Guerra
14	Huacal Viejo	180	Amanalco
15	Capilla Vieja	191	Amanalco
16	San Sebastián Grande	817	Amanalco
17	San Sebastián Chico	471	Amanalco
18	Nueva Colonia Tres Puentes	206	Donato Guerra
19	Pueblo Nuevo	683	Amanalco
20	Corral de Piedra	246	Amanalco
21	San Jerónimo	1,806	Amanalco
22	San Jerónimo 1ª. Secc.	251	Amanalco
23	Polvillos	1,158	Amanalco
24	San Miguel Xooltepec	1,555	Donato Guerra
25	El Zacatonal	89	Amanalco
26	San Antonio Hidalgo	532	Donato Guerra

This study employs a sample of 1,122 individuals that actively participated in the PESA Program (PESA Beneficiaries). On the other hand, with the purpose to strengthen our results, in parallel we analyzed a control group of 1,118 people (Non beneficiaries), composed by individuals who live in the same communities and in the same conditions, but that have not been in contact with strategies such as PESA at all. All field data was collected in face-to-face interviews, from June 15th to November 30th 2012.

A team of eight agricultural technicians that were previously trained conducted these interviews. They had a duration that would vary from 20 to 40 minutes, depending on the profile of the interviewee and a pretested inquest was used and in which we considered information comprised between 2007 and 2011.

We obtained information for both groups under study, beneficiaries and non-beneficiaries, related to social, economical and productive profile, as well as access to basic services, academic profile and entrepreneurial activities. And specifically for the group of beneficiaries the inquest was complemented with information related to the benefits of participating in the PESA/SPFS program.

The posterior analysis allowed us to study the effect of the use of endogenous resources, over the level of welfare in populations that live in extreme poverty conditions in a determined region, based on the recent theoretical postulates that conclude that education and skill development among a specific population, is the main engine of economical territorial development (De Janvry, Sadoulet, 2000; Kay, 2006; Florida, Mellander and Stolarick, 2008) according to the new rural paradigm that considers the

endogenous component of a territory, as the key element towards territorial development (OECD, 2006).

3.1.2 Variable definition and descriptive analysis

The quantitative analysis tends to approach poverty from an economical and consume point of view. In this research we propose to conceptualize poverty from a multidimensional point of view, according to which we will analyze as a whole, deprivations related to: health services, education, isolation and lack of social eco (management capacity) and safety.

When evaluating a strategy as PESA, we move away from conventional measurements of human capital in order to approach it through a multi-variable angle, acknowledging the multi-dimensional nature of territorial development (Moulaert, et al., 2005; Lafuente, et al., 2012; Neumeier, 2012) in which different intervention domains are integrated, and aspects related to economy, housing, education and culture, play a central role (Moulaert et al., 2005, p. 1973).

We considered variables that allow us to evaluate the different dimensions that conform the extreme poverty status, both, of beneficiaries of PESA/SPFS and the control group. As a starting point, we identified for each of the beneficiaries, which was the amount of investment. That includes governmental investment and also the contributions destined by the beneficiary to implement their own projects. These projects considered by PESA/SPFS were:

1. Ecological stoves that encourage significant savings in wood consumption (Patsari type): they substantially improve the health conditions by practically

eliminating smoke emitions to the house interior, but also permit an important

saving in wood expenditure diminishing the impact on forest resources and the

family expense for this concept in monetary terms and time destined to

combustible material recollection.

2. Systems for water harvesting: consist on the installation of tubular network on

   rooftops for water capture and posterior storing. With this type of projects the

   time destined to fetch water, diminishes.

3. Grain storage silos: allow a more efficient storing of familiar production;

   avoiding loses derived from humidity, contamination and plagues such as

   rodents.

4. Greenhouses for vegetable production: they are installed in the family backyard

   and permit the access to a healthier more balanced diet that at the same time

   generates a family saving because expenditure on this kind of food diminishes.

5. Poultry houses for egg and meat production: through these mechanisms it is

   possible to increase technology of backyard poultry management, with the

   correspondent family production improvement, which reduces looses due to

   predators and increase family saving by limiting food costs.

Each of these different projects is accompanied by organizational training that allows

the beneficiaries to integrate groups and teams to receive and distribute materials and

supplies and for the posterior construction, installation and operation of projects, all of it

accompanied by technical training depending on the nature of each project.

Besides training, permanent support by agriculture technicians is available to guarantee

that the projects are properly functioning in the best possible conditions, reason by

which it becomes critical to determine how many training hours each beneficiary has received during his/her experience in the PESA program.

We evaluated variables that allow us to determine if an improvement in the welfare level existed compared to the control group in terms of income, savings, and time, as well as diversification of activities and redistribution of family income. Therefore, we built a group of variables that allow us to evaluate the different dimensions that comprise the poverty status of the PESA Beneficiaries and a control group of non-beneficiaries and determine, whether there is an improvement in the welfare level of the beneficiaries compared to the control group, regarding: income, savings in money and time, as well as, activity diversification and redistribution of family income. Also to establish the availability of basic services like: water for domestic and productive use, school and health services. Additionally, measure the school level of the family nucleus members and establish if derived from the participation in the PESA Program any of them was able to resume studies at any level.

On the other hand, we could determine whether a family had an entrepreneurial activity prior to its participation in the PESA Program or if, they were able to initiate an entrepreneurial activity derived from participating in the Program. It should be noted that we established the level and origin of the family income as well as the family expenditure, contrasted with any possible savings generated by participating in the PESA Program, and get to know the exact purpose of those expenses, that is, if that money was spent in: productive activities, education, home improvement, family expense improvement, leisure activities or others. Among other benefits derived from the Program, we determined whether savings in time where generated and if so, if this

extra time was dedicated to: education, production, community activities or leisure and

finally measure the beneficiary perception related to welfare level (Table 2).

Table 2. Operationalization of employed variables in this research

Concept	Variables definition
Variables related with the investment made by PESA	
1. Total investment	Total economical amount invested (MXP and USD)
1.1 Governmental Investment (PESA)	Total amount from PESA (MXP and USD)
1.2 Beneficiary investment	Total amount invested by the family (MXP and USD)
2. Investment in tangible assets	
2.1 Ecological system for cooking and heating	Dichotomous variable associated to the installation of the ecological system for cooking and heating
2.2 Ecological system for water storage	Dichotomous variable associated to the installation of the ecological system for water storage
2.3 System for grain storage	Dichotomous variable associated to the installation of the ecological system for grain storage
2.4 System for vegetables production	Dichotomous variable associated to the installation of the ecological system for vegetables
2.5 System for chicken meat and egg production	Dichotomous variable associated to the installation of the ecological system for chicken meat and egg production
3. Technical training: Investment in human capital	
3.1 Construction and installation of projects	Dichotomous variable that shows the presence of technical training for the development of projects
3.2 Backyard Agricultural production	Dichotomous variable that shows the presence of technical training for backyard agricultural production
3.3 Backyard Livestock production	Dichotomous variable that shows the presence of technical training for backyard livestock production
3.4 Zoo-technical training	Dichotomous variable that shows the presence of zoo-technical training
3.5 Sanitary training	Dichotomous variable that shows the presence of sanitary training
Welfare dimension evaluated	
Food production	- Square meters destined for food production - Generation of food production related income: income obtained from productive activities
Labor productivity	- Variation in the number of hours dedicated to productive activities
Economic performance	- Variation of family income - Contribution of the productive activity to the family income - Redistribution and diversification of family income: percentage of income dedicated to food, education and health
Educational performance (schooling)	- Family members with elementary, high school or college studies - Family members who resumed studies
Entrepreneurial activity	- New entrepreneurial activity derived from the incorporation to the PESA program - Recent Entrepreneurial activity derived from the incorporation to the PESA program

Source: Self devised.

Table 2. Continued.

Concept	Variables definition
Demographic control variables	
Family size	Number of family members
Sex	Sex configuration of the family
Age	Age configuration of the family
Belonging to an ethnical group	Dichotomous variable that shows belonging to an ethnical group
Geographic location	- Municipality where family lives - Community where family lives
Employment status	- Number of family members that have a job - Length of job service - Contribution to family income of each economically active member

Source: Self devised.

Descriptive statistics for the variables related to the demographic profile of the surveyed individuals are presented in Table 3. The first variable accounts for the gender of the respondent. This variable is dichotomous and takes the value of one is the respondent is a male and zero otherwise. From Table 3 we note that our sample is biased towards women (32.65% of respondents are male). This holds for the two municipalities analyzed; however, it should be noted that the proportion of men in Amanalco (33.33%) is significantly higher (at the 5% level) than that in Donato Guerra (30.74%).

The second profile variable relates to the age of the respondent. This variable is expressed in years and the descriptive in Table 3 show that individuals in the sample are nearly 39 years old. We also report statistically significant differences in the age distribution of respondents across municipalities: respondents residing in Amanalco are significantly older (39.35 years old) than individuals who live in Donato Guerra (36.95 years old).

Table 3. Profile of the sampled individuals

	Amanalco		Donato Guerra		Full sample	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Gender (1 for male)	0.3333** (0.4714)	7,860	0.3074 (0.4615)	2,830	0.3265 (0.4689)	10,690
Age (years)	39.3459*** (14.0551)	6,215	36.9464 (12.8253)	1,680	38.8353 (13.8367)	7,895
Family size	3.3553 (1.4248)	7,860	3.3297 (1.3746)	2,830	3.3486 (1.4117)	10,690
Number of children	2.1366*** (0.8752)	5,710	2.2187 (0.9343)	2,195	2.1594 (0.8927)	7,905
Marital status: married	0.6561 (0.4751)	2,210	0.6410 (0.4801)	585	0.6530 (0.4761)	2,795
Marital status: consensual union	0.2014 (0.4011)	2,210	0.2222 (0.4161)	585	0.2057 (0.4043)	2,795
Marital status: single	0.0701 (0.2554)	2,210	0.0855 (0.2798)	585	0.0733 (0.2607)	2,795
Marital status: single parent	0.0339*** (0.1811)	2,210	0.0769 (0.2667)	585	0.0429 (0.2027)	2,795
Marital status: widow	0.0701* (0.2554)	2,210	0.0513 (0.2208)	585	0.0662 (0.2487)	2,795
Marital status: divorced	0.0023 (0.0475)	2,210	0.0000 (0.0000)	585	0.0018 (0.0423)	2,795

Note: The mean number of children only refers to those families that report at least one child. *,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

The sampled families on average report 3.35 members; and the average family size among residents of Amanalco (3.36) is not significantly different relative to that of Donat Guerra residents (3.33). A different picture emerges when analyzing the average number of children per family, as the number of children reported by families in Amanalco (2.14) is significantly lower than the number of children among families in Donato Guerra (2.22).

As for marital status, the vast majority of the sample (85.87%) is either married (65.30%) or lives in consensual union (20.57%). In addition, the proportion of single residents stands at 7.33% for the whole sample, and it is important to note that the

proportion of singles in Donato Guerra (7.69%) is significantly higher than that found in Amanalco (3.39%). There is also a slightly significant difference in the number of widows in these two communities (7.01% in Amanalco and 5.13% in Donato Guerra) and finally, the number of divorced people is on average 0.18% (the difference in the result for Amanalco and Donato Guerra are not significantly different).

We further explored the characteristics of the sampled families in terms of the number of children (Table 4). Here it can be seen that, on average, 73.95% of families in our sample raise at least one child, being this proportion slightly higher among Amanalco residents (76.25%). Also, the descriptive statistics in Table 4 reveal that families in our sample mainly have two children (Amanalco: 33.14% and Donato Guerra: 27.74%), and that respondents reporting two or three children account for over 50% of the sampled families (Amanalco: 50.70% and Donato Guerra: 53.18%).

Table 4. Distribution of the number of children among the sampled families

Number of children	Amanalco		Donato Guerra		Total	
	Families	Percent	Families	Percent	Families	Percent
0	2,150	27.35%	635	22.44%	2,785	26.05%
1	1,370	17.43%	550	19.43%	1,920	17.96%
2	2,605	33.14%	785	27.74%	3,390	31.71%
3	1,380	17.56%	720	25.44%	2,100	19.64%
4	300	3.82%	125	4.42%	425	3.98%
5	50	0.64%	5	0.18%	55	0.51%
6	5	0.06%	5	0.18%	10	0.09%
7			5	0.18%	5	0.05%
Total	7,860	100.00%	2,830	100.00%	10,690	100.00%

Additional information relates to the educational profile of the sample groups, mainly because there are significant differences (Table 5). The initial panel in this table refers to education attainment of parents. The first variable indicates whether the individual is

literate or not. As for the full sample, 89.18% of the individuals are alphabetized. There is a highly significant difference considering that in Amanalco de Becerra 88.40% of the sampled individuals are able to read, in contrast to a 91.33% in Donato Guerra.

Table 5. Descriptive statistics for the selected variables related to education attainment

	Amanalco		Donato Guerra		Full sample	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Panel A: Education attainment of parents						
Literacy (1 for literate)	0.8840*** (0.3202)	7,845	0.9133 (0.2815)	2,825	0.8918 (0.3107)	10,670
Years of schooling	5.5534*** (3.2186)	7,860	5.9558 (3.0704)	2,830	5.6600 (3.1848)	10,690
Primary studies (1 if positive)	0.5592*** (0.4965)	7,860	0.6042 (0.4891)	2,830	0.5711 (0.4949)	10,690
Secondary studies (1 if positive)	0.2742*** (0.4461)	7,860	0.2473 (0.4315)	2,830	0.2671 (0.4425)	10,690
Post secondary studies (1 if positive)	0.0363*** (0.1869)	7,860	0.0477 (0.2132)	2,830	0.0393 (0.1943)	10,690
University studies (1 if positive)	0.0095*** (0.0972)	7,860	0.0177 (0.1318)	2,830	0.0117 (0.1075)	10,690
Panel B: Number of children studying						
Primary studies	1.8194 (0.7699)	5,128	1.8307 (0.8049)	1,890	1.8225 (0.7794)	7,018
Secondary studies	1.2329*** (0.4685)	1,619	1.4043 (0.6025)	789	1.2890 (0.5224)	2,408
University studies	1.1645 (0.3893)	152	1.1579 (0.4136)	57	1.1627 (0.3951)	209

Note: Values in Panel B refer only to those families with children at school. *,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

The same significant difference is appreciated in the education variables. In Amanalco de Becerra the average schooling years is 5.55, while in Donato Guerra this figure is 5.96. Also, 55.92% of individuals from Amanalco de Becerra attended primary school (60.42% in Donato Guerra), whereas 27.42% have secondary studies (24.73% in Donato Guerra). From this schooling level ahead, a drastic reduction is observed: only 3.63% of the sampled individuals in Amanalco de Becerra have post secondary studies

and 4.77% in Donato Guerra. Finally, the proportion of individuals with university studies in 0.95% and 1.77% in Amanalco de Becerra and Donato Guerra, respectively.

For the second panel, that relates to children studying there is no statistical difference between Amanalco de Becerra and Donato Guerra for primary studies. We note an important difference for secondary studies because for Donato Guerra we registered 1.4043 years and for Amanalco de Becerra 1.1645 years. Relative to the distribution of the number of children according to their studies in Amanalco de Becerra (Table 6a.), 82.51% of the families with one or two children, attended primary school, 98.21% have secondary school studies and 99.34% have studied at university level.

In contrast, the number of children who attend school in families with more children drastically decreased. Only 15.37% of the families with three children have primary studies, 1.67% secondary studies and 0.66% university studies. And for those families with four children or more 2.13% have primary studies, 0.12% made secondary studies and no families at all, could send their children to university school.

Table 6a. Distribution of the number of children according to their studies (Amanalco)

Number of children	Primary studies		Secondary studies		University studies		Total	
	Families	Percent	Families	Percent	Families	Percent	Families	Percent
1	1,940	37.83%	1,273	78.63%	128	84.21%	3,341	48.43%
2	2,291	44.68%	317	19.58%	23	15.13%	2,631	38.14%
3	788	15.37%	27	1.67%	1	0.66%	816	11.83%
4	102	1.99%	2	0.12%			104	1.51%
5	6	0.12%					6	0.09%
6	1	0.02%					1	0.01%
Total	5,128	100%	1,619	100%	152	100%	6,899	100%

Regarding the same information but for Donato Guerra, 79.31% of the families with one or two children, attended primary school, 93.91% have secondary school studies and 98.24% have studied at university level.

On contrary, the number of children who could attend school in families with more children significantly decreased. Only 18.78% of the families with three children have primary studies, 6.08% secondary studies and 1.75% university studies (Table 6b). For families with four children or more, 1.90% had the possibility to attend primary school, but no families send their children neither to secondary nor university school.

Table 6b. Distribution of the number of children according to their studies (Donato Guerra)

Number of children	Primary studies		Secondary studies		University studies		Total	
	Families	Percent	Families	Percent	Families	Percent	Families	Percent
1	752	39.79%	518	65.65%	49	85.96%	1,319	48.21%
2	747	39.52%	223	28.26%	7	12.28%	977	35.71%
3	355	18.78%	48	6.08%	1	1.75%	404	14.77%
4	32	1.69%					32	1.17%
5	3	0.16%					3	0.11%
6	1	0.05%					1	0.04%
Total	1,890	100%	789	100%	57	100%	2,736	100%

Concerning family income, no significant differences are appreciated: 2,482.05 MXP for Amanalco and 2,517.74 MXP for Donato Guerra (Table 7). On the other hand, income originated from small scale production is significantly lower in Amanalco de Becerra 219.81 MXP against 295.13 MXP in Donato Guerra. This important difference can also be observed concerning the income originated in employment 1,474.15 MXP for the families from Amanalco and 1,594.70 MXP for those living in Donato Guerra.

It is also relevant to mention the differences among Amanalco de Becerra and Donato Guerra in relation to the money they receive from the government in the form of subsidies. The first group receives 364.76 MXP and the second one 268.40. There are also other income sources that also show significant in difference, 371.78 MXP against 330.08 MXP, respectively.

Table 7. Income at constant prices (monetary values expressed in 2011 Mexican pesos)

	Amanalco		Donato Guerra		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Mean income	2,482.05 (1,363.10)	7,850	2,517.74 (1,176.85)	2,830	2,491.51 (1,316.36)	10,680
Small scale production	219.81*** (604.24)	7,850	295.13 (613.05)	2,830	239.75 (607.47)	10,680
Family business	43.72 (289.44)	7,850	38.25 (248.64)	2,830	42.28 (279.22)	10,680
Employment	1,474.15*** (1,430.13)	7,850	1,594.70 (1,565.05)	2,830	1,506.07 (1,467.96)	10,680
Government subsidy	364.76*** (547.74)	7,850	268.40 (487.68)	2,830	339.25 (534.16)	10,680
Remittance	10.39* (151.73)	7,850	5.52 (97.03)	2,830	9.10 (139.36)	10,680
Others	371.78** (891.44)	7,850	330.08 (727.52)	2,830	360.74 (851.28)	10,680

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

In figure number 2, it is possible to observe that the income level in both communities in the year of 2007 and 2008 evolved very similarly, but from the second semester of 2008 a significant difference between both groups started to be apparent.

Figure 2. Income
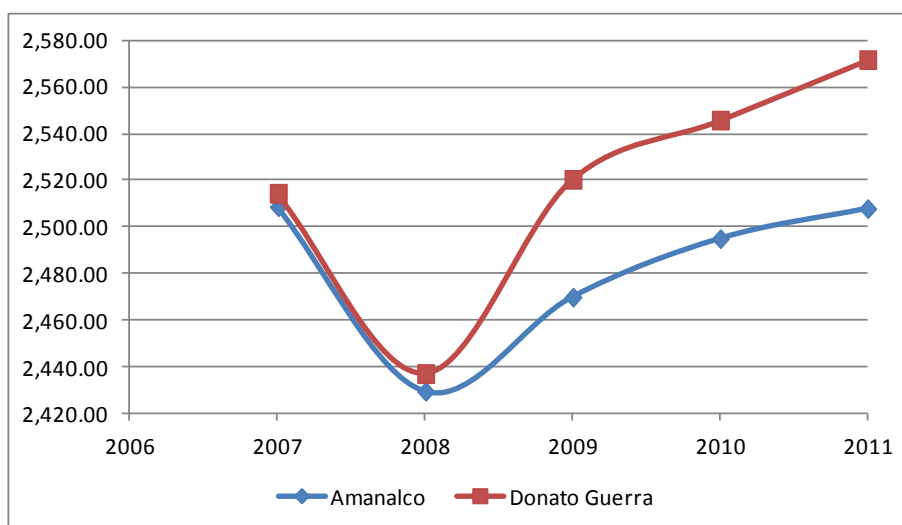
Source: self-devised

It is also relevant to draw the distribution of the sampled families according to their income (Table 8). It can be observed that 74.32% of families have an income level from 1,001 to 3,000 MXP, with no significant differences in this income range, between Amanalco de Becerra (74.35%) and Donato Guerra (74.28%). The lowest segment of the sampled population, those who whose income is under 1,000 MXP represents 3.50% of the sample and the higher segment, with an income beyond 3,001 MXP is 22.17%.

Table 8. Distribution of families according to income at constant prices (2011 MXP)

Income (in Mexican $)	Amanalco		Donato Guerra		Total	
	Families	Percent	Families	Percent	Families	Percent
Less than 1,000	304	3.87%	70	2.47%	374	3.50%
Between 1,001 and 2,000	2,861	36.45%	920	32.51%	3,781	35.40%
Between 2,001 and 3,000	2,975	37.90%	1,182	41.77%	4,157	38.92%
Between 3,001 and 4,000	1,110	14.14%	490	17.31%	1,600	14.98%
Between 4,001 and 5,000	353	4.50%	85	3.00%	438	4.10%
More than 5,000	247	3.15%	83	2.93%	330	3.09%
Total	7,850	100%	2,830	100%	10,680	100%

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Along five years, time analyzed in this study, the income distribution in Amanalco de Becerra, experienced several variations. Four of the segments, decreased over time, in favor of the group of people whose income was located between 3,000 – 4,000 MXP that experienced an increase from 16.94% in 2007, to 19.73% in 2011, as well as the group with the lowest income, that is, below 1,000 MXP, increased from 19.41% in 2007 to 27.63% in 2011.

Figure 3a. Income distribution across time by income intervals in Amanalco (proportions expressed at constant prices in 2011 Mexican pesos)
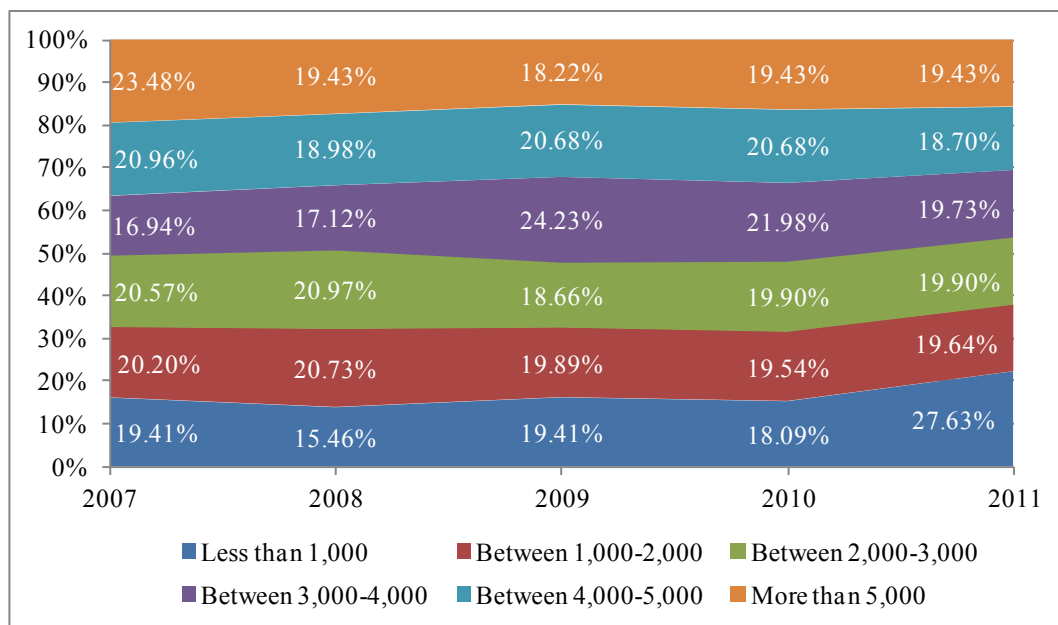
Source: Self devised

In relation to the second group in Donato Guerra, income distribution experienced different variations. It is important to note that the number of people with the highest income decreased from 25.30% in 2007 to 13.25% in 2011. At the far end, it is notable that the group of people with the most inferior income, that is, below 1,000 MXP decreased from 37.14% to 10.00% in the same period.

Figure 3b. Income distribution across time by income intervals in Donato Guerra (proportions expressed at constant prices in 2011 Mexican pesos)
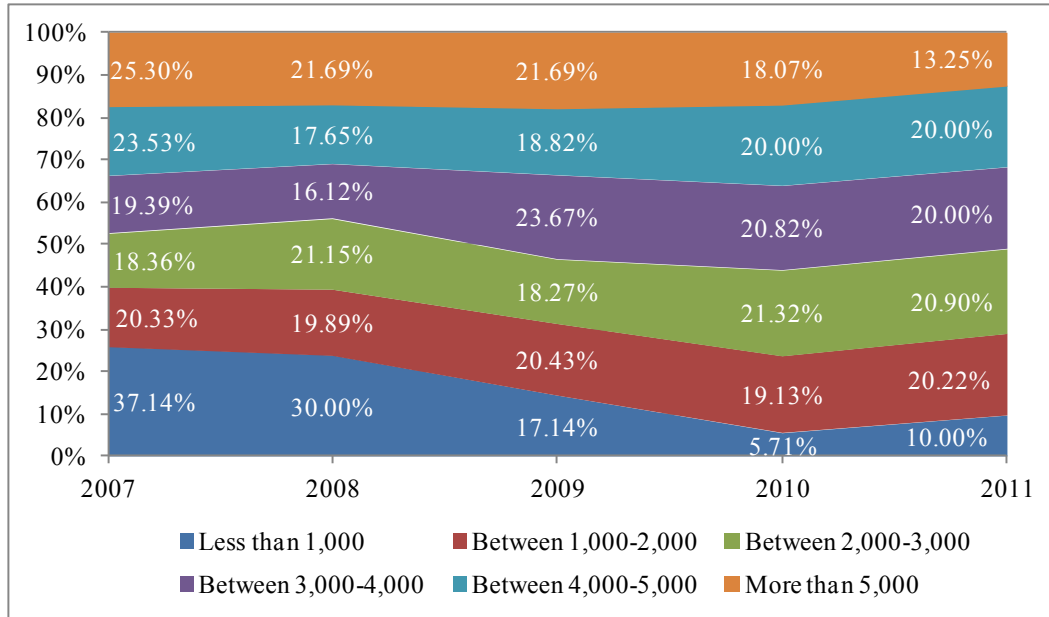
Source: Self devised

In relation to the distribution of working family members in the sample groups, it is important to note that labor force is mainly composed by fathers (92.60%) and although mothers represent 14.67% of it, in Amanalco de Becerra it is equal to16.51% but in Donato Guerra it is 9.58%. Also, in both communities two or three, either sons or daughters complement the family paid workforce. (Panel A)

As for working experience, fathers have an average of 15.78 years of accumulated experience, although there is a significant difference considering that in Amanalco de Becerra this average is 15.01 years and in Donato Guerra it is 17.93 years. In reference to the experience of the mothers, it is the opposite, 17.83 and 15.95 years respectively, with an average of 17.36 years, this is 1.58 years more of experience in reference to the

fathers. As for the experience of the first, second or third son or daughter, it begins at

6.59 years and goes down to 2.5 for the younger children. (Panel B)

Table 9. Labor: Descriptive statistics for working family members

	Amanalco		Donato Guerra		Full sample	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Panel A: Labor activity						
Father works	0.9261 (0.2871)	7,850	0.9258 (0.2622)	2,830	0.9260 (0.2807)	10,680
Mother works	0.1651 (6.7770)	7,850	0.0958 (0.6613)	2,830	0.1467 (5.8200)	10,680
Number of sons/daughters working	0.0346 (0.2095)	7,850	0.0212 (0.1513)	2,830	0.0311 (0.1959)	10,680
Families with one son/daughter working	0.0297 (0.1697)	7,850	0.0219 (0.1464)	2,830	0.0276 (0.1639)	10,680
Families with two son/daughter working	0.0028 (0.0529)	7,850	0.0011 (0.0325)	2,830	0.0023 (0.0483)	10,680
Families with three son/daughter working	0.0003 (0.0160)	7,850	0.0000 (0.0000)	2,830	0.0002 (0.0137)	10,680
Panel B: Labor experience						
Father	15.0128*** (10.9679)	7,249	17.9344 (15.2377)	2,606	15.7854 (12.3095)	9,855
Mother	17.8372** (13.2614)	694	15.9530 (12.0247)	234	17.3621 (12.9802)	928
First son/daughter labor experience	6.5455 (5.0101)	231	6.7581 (5.3153)	62	6.5904 (5.3153)	293
Second son/daughter labor experience	4.0000 (2.1822)	22	1.3333 (0.5774)	3	3.6800 (2.2308)	25
Third son/daughter labor experience	2.5000 (0.7071)	2	0.0000 (0.0000)	0	2.5000 (0.7071)	2

Note: Values in Panel B refer to those cases where the family member reports labor experience. *,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

Considering the distribution of families with sons or daughters who work (Tables 10

and 11), according to their income, we note from Table 10 that only 7.12% of the

poorest families, that is, those whose income is under 1,000 MXP have working

children, in contrast to 18.31% of the next segment of families with an income between

1,001 and 2,000 MXP. Additionally, we observe that the distribution of families

according to the analyzed income levels is inverse U-shaped. For instance, the number

of families with higher income levels grows up to 4,000 MXP (29.15% of families earn

between 2,001 to 3,000 MXP). But, after this family income level the number of

families with higher incomes drastically decreases: only 9.49% of families earn between

4,001 and 5,000 MXP, while 5.76% of families report an income over 5,000 MXP.

Table 10. Distribution for families with working sons/daughters according to their income level at constant prices (2011 MXP)

Income (in Mexican $)	Amanalco		Donato Guerra		Total	
	Families	Percent	Families	Percent	Families	Percent
Less than 1,000	19	7.98%	2	3.51%	21	7.12%
Between 1,001 and 2,000	38	15.97%	16	28.07%	54	18.31%
Between 2,001 and 3,000	66	27.73%	20	35.09%	86	29.15%
Between 3,001 and 4,000	76	31.93%	13	22.81%	89	30.17%
Between 4,001 and 5,000	27	11.34%	1	1.75%	28	9.49%
More than 5,000	12	5.04%	5	8.77%	17	5.76%
Total	238	100%	57	100%	295	100%

Table 11. Families with working sons/daughters across time

	Amanalco		Donato Guerra		Total	
	Working sons/daughters	Families	Working sons/daughters	Families	Working sons/daughters	Families
2007	1.14	37	1.00	9	1.11	46
2008	1.13	38	1.00	10	1.10	48
2009	1.11	47	1.00	12	1.08	59
2010	1.16	57	1.08	12	1.14	69
2011	1.17	59	1.14	14	1.16	73
Total	1.14	238	1.05	57	1.13	295

Another variable considered, was the distribution of family expenditures, to determine in what type of goods or services the families in the communities subject to study destine their income. Results in Table 12 show that family income is mainly spent on food (61.01%) and there are no significant differences between both groups. The following expenditure in importance is education, with an average of 13.34%, but in this case a significant difference can be noted. Families in Amanalco de Becerra spent 14.36% of their income in education (10.49% in Donato Guerra). A similar result was found for healthcare expenditures: families spent 7.22% and 5.52% in Amanalco and Donato, respectively. Also, 7.90% of income is allocated in transportation and 10.98% in other expenses, with no significant differences between groups.

Table 12. Distribution of family expenditures (expressed as proportion)

	Amanalco		Donato Guerra		Full sample	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Food	0.6104 (0.1099)	7,855	0.6094 (0.0848)	2,820	0.6101 (0.1039)	10,675
Education	0.1436*** (0.1035)	7,853	0.1049 (0.0806)	2,820	0.1334 (0.0995)	10,673
Healthcare	0.0722*** (0.0607)	7,855	0.0552 (0.0506)	2,820	0.0677 (0.0587)	10,675
Transportation	0.0772*** (0.0581)	7,851	0.0838 (0.0483)	2,820	0.0790 (0.0558)	10,671
Others	0.0966*** (0.0750)	7,855	0.1467 (0.0718)	2,820	0.1098 (0.0774)	10,675

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

In figure 4a we can observe that the distribution of family expenditures in Amanalco de Becerra from 2007 to 2011, registered some variations along time. Healthcare, transportation and other expenditures diminished in this period, but the expense in food and education was increased. A similar result was obtained in relation to the families in Donato Guerra (Figure 4b).

Figure 4a. Distribution of expenditures across time in Amanalco
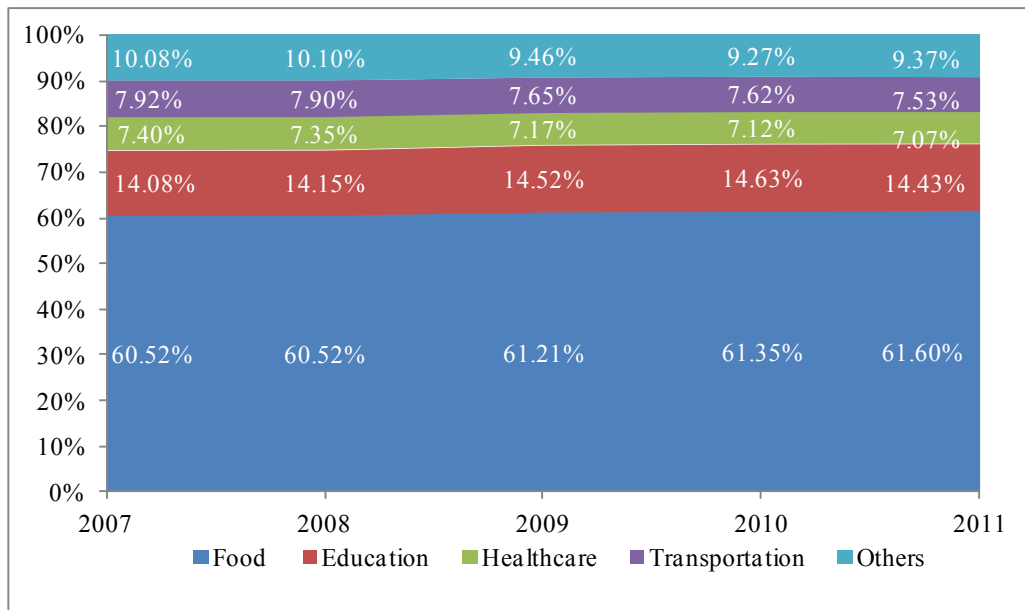
Figure 4b. Distribution of expenditures across time in Donato Guerra
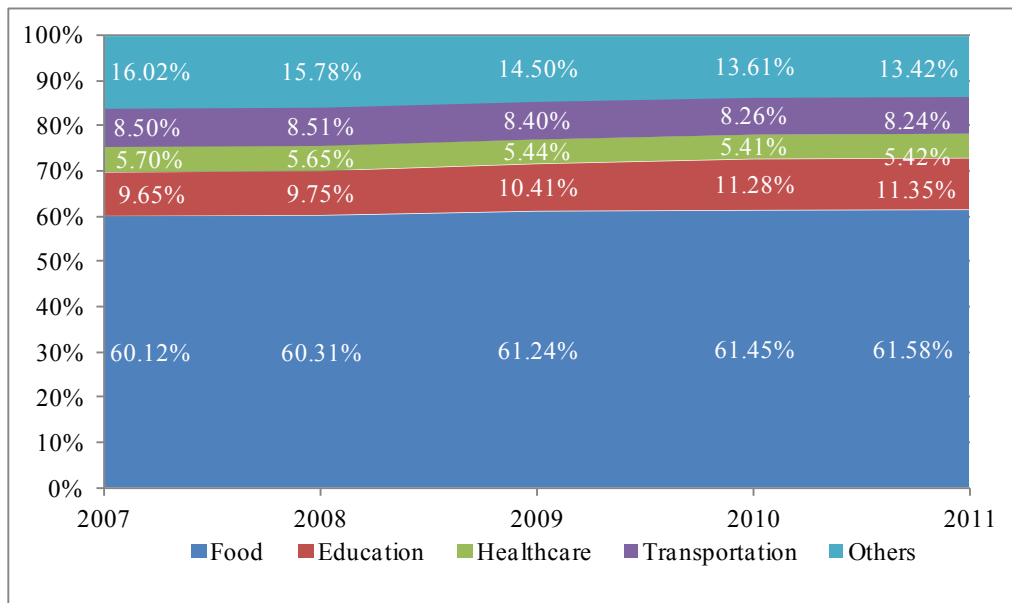
Additionally, we include in the analysis a set of variables related to the entrepreneurial activity of individuals residing in the analyzed regions.

It can be noted from table 13 that 3.92% of the sampled individuals own an established business in Amanalco de Becerra and these have been entrepreneurially active for 7.18 years, this fact represent a difference with individuals in Donato Guerra considering that 4.70% in this group own a business that has been active for 8.40 years. And finally 3.60% of the individuals in both groups have the intention to start their own business in the future.

Table 13. Entrepreneurial activities among the sampled individuals

	Amanalco		Donato Guerra		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Owner of an established business	0.0392* (0.1941)	7,858	0.0470 (0.2117)	2,830	0.0413 (0.1989)	10,688
Firm age (years)	7.1894** (5.7995)	301	8.4091 (6.2468)	132	7.5612 (5.9587)	433
Intention to launch a business in the future	0.0038 (0.0617)	7,858	0.0028 (0.0531)	2,830	0.0036 (0.0595)	10,688

Note: Values for the variable firm age refer to those individuals who are entrepreneurially active (business owners). *,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

It was also determined how the number of business owners and entrepreneurial intention evolved along time, from 2007 to 2011. Results in table 14 show that the entrepreneurial activity of people residing in both Amanalco de Becerra and Donato Guerra increased during the analyzed period.

Table 14. Entrepreneurial activities of the sampled individual across time

| | Amanalco | | | | Donato Guerra | | | |
| | Entrepreneurs (business owners) | | Entrepreneurial intention | | Entrepreneurs (business owners) | | Entrepreneurial intention | |
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
2007	0.0337 (0.1806)	1,571	0.0019 (0.0437)	1,571	0.0442 (0.2057)	566	0.0000 (0.0000)	566
2008	0.0344 (0.1822)	1,571	0.0013 (0.0357)	1,571	0.0442 (0.2057)	566	0.0000 (0.0000)	566
2009	0.0375 (0.1901)	1,572	0.0025 (0.0504)	1,572	0.0459 (0.2095)	566	0.0018 (0.0420)	566
2010	0.0426 (0.2021)	1,572	0.0013 (0.0357)	1,572	0.0495 (0.217)	566	0.0018 (0.0420)	566
2011	0.0477 (0.2132)	1,572	0.0121 (0.1093)	1,572	0.0512 (0.2207)	566	0.0106 (0.1025)	566
Total	0.0392 (0.1941)	7,858	0.0038 (0.0617)	7,858	0.0470 (0.2117)	2,830	0.0028 (0.0531)	2,830

Third, a set of variables related to available land per family was included. There are no significant differences between the two groups subject to study. On average, families own 1.11 hectares. From this surface they destine 0.20 hectares for housing and 0.90 hectares for productive purposes.

Table 15. Land: Descriptive statistics for 2011

| | Amanalco | | Donato Guerra | | Total | |
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Surface area (hectare)	1.1128 (1.1482)	1,562	1.1046 (12.7146)	566	1.1106 (6.6264)	2,128
House size (hectare)	0.0664 (0.1429)	1,562	0.5855 (12.6923)	566	0.2045 (6.5467)	2,128
Productive area (hectare)	1.0464 (1.1364)	1,562	0.5192 (0.5397)	566	0.9061 (1.039)	2,128

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

It is important to note that 64.33% of the sampled families own less than 1.0 hectare, 22.51% have an available surface from 0.51 to 1.50 hectares and the remaining 13.16% have more than 2 hectares.

Table 16. Distribution of families according to the size of the land

	Amanalco		Donato Guerra		Full sample	
	Families	Proportion	Families	Proportion	Families	Proportion
Less than 0.50 hectares	509	32.59%	311	54.95%	820	38.53%
Between 0.51 and 1 hectare	396	25.35%	153	27.03%	549	25.80%
Between 1.01 and 1.50 hectares	279	17.86%	58	10.25%	337	15.84%
Between 1.51 and 2 hectares	110	7.04%	32	5.65%	142	6.67%
More than 2 hectares	268	17.16%	12	2.12%	280	13.16%
Total	1,562	100%	566	100%	2,128	100%

Regarding access to public services it was determined that 95.77% of the families from Amanalco de Becerra have an education center in their own communities, compared to 98.56% of the families in Donato Guerra and the average time neccesary to reach them is 20.75 minutes.

Another basic public service would be the access to water. In Amanalco de Becerra 94.97% of the families have water for domestic use and 40.39% have it for productive use, in contrast to 90.11% and 6.36% in Donato Guerra constituting a significant difference between communities.

In relation to the access to healthcare services, 96.50% of the individuals in Amanalco de Becerra have it and 72.99% of them are available in their home region and 27.01% have this service outside their region. The time that these individuals require to get to the healthcare center is 29.78 minutes.

On the other hand, 99.65% of the families in Donato Guerra have access to healthcare services and 81.80% of them in their own region and 24.67% outside it. In this case the transportation time required to get to the healthcare center is 28.10 minutes.

Table 17. Access to public services (education, water and healthcare) by community in 2011

	Amanalco		Donato Guerra		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Panel A: Access to education centers						
Education center in the community (1 if positive)	0.9577*** (0.2012)	1,514	0.9856 (0.1190)	557	0.9652 (0.1832)	2,071
Time necessary to reach the education center (minutes)	20.7229 (11.0190)	1,505	20.8527 (6.6810)	550	20.7577 (10.0432)	2,055
Panel B: Access to water						
Domestic use	0.9497*** (0.2185)	1,572	0.9011 (0.2988)	566	0.9369 (0.2433)	2,138
Productive use	0.4039*** (0.4908)	1,572	0.0636 (0.2443)	566	0.3138 (0.4642)	2,138
Panel C: Healthcare						
Access to healthcare service	0.9650*** (0.1838)	1,572	0.9965 (0.0594)	566	0.9733 (0.1611)	2,138
Healthcare service in the home region	0.7299*** (0.4441)	1,570	0.8180 (0.3862)	566	0.7533 (0.4312)	2,136
Healthcare service outside the region	0.2701*** (0.4441)	1,570	0.1820 (0.3862)	566	0.2467 (0.4312)	2,136
Time necessary to get to the healthcare center (minutes)	29.7865*** (18.0139)	1,569	23.4488 (10.6465)	566	28.1063 (16.6214)	2,135
Public service (dummy if positive)	0.9892 (0.1035)	1,570	0.9965 (0.0594)	566	0.9911 (0.0939)	2,136

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

The last set of variables deals with the variables linked to the PESA program. We first explore the profile of the PESA beneficiaries vis.-à-vis. the sub-sample of non-beneficiaries. The beneficiaries group, was integrated by 1,020 individuals from two communities, Amanalco de Becerra and Donato Guerra, in the State of México. In parallel a control group of 1,118 non-beneficiaries from the same two communities was considered.

Table 18. Sample distribution by geographic area

Community	PESA beneficiaries	No beneficiaries	Total
Amanalco	802	770	1,572
Donato Guerra	218	348	566
Total	**1,020**	**1,118**	**2,138**

In relation to the basic profile of the sampled individuals, we can mention that 32.65% are males and it can be noted that in the group of PESA beneficiaries 24.71% are males in contrast to 39.89% in the non-beneficiaries group, fact that constitutes a significant difference between the both.

Some other significant differences are related to the age of the individuals in both groups. Beneficiaries 39.24 years and non-beneficiaries 38.09 as well as for the family size 3.6 and 3.11 and also for the number of children 2.1 and 2.2 respectively.

Table 19. Profile of the sampled individuals

	PESA beneficiaries		No beneficiaries		Full sample	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Gender (1 for male)	0.2471*** (0.4313)	5,100	0.3989 (0.4897)	5,590	0.3265 (0.4689)	10,690
Age (years)	39.2419*** (13.9446)	5,085	38.0996 (13.6109)	2,810	38.8353 (13.8367)	7,895
Family size	3.6045*** (1.5098)	5,100	3.1150 (1.2717)	5,590	3.3486 (1.4117)	10,690
Number of children	2.1091*** (0.8906)	3,665	2.2028 (0.8924)	4,240	2.1594 (0.8927)	7,905

Note: The mean number of children only refers to those families that report at least one child. *,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

As for the number of children detected in the sampled families, figures in table 20 show that 95.36% of them have up to three children. The majority of these families (31.71%) have two children, followed by the segment of those that do not have any children at all (26.05%) and those that have three children.

Table 20. Family size: Distribution of the number of children among the sampled families

	PESA beneficiaries		No beneficiaries		Total	
Number of children	Families	Percent	Families	Percent	Families	Percent
0	1,435	28.14%	1,350	24.15%	2,785	26.05%
1	950	18.63%	970	17.35%	1,920	17.96%
2	1,620	31.76%	1,770	31.66%	3,390	31.71%
3	890	17.45%	1,210	21.65%	2,100	19.64%
4	170	3.33%	255	4.56%	425	3.98%
5	25	0.49%	30	0.54%	55	0.51%
6	5	0.10%	5	0.09%	10	0.09%
7	5	0.10%			5	0.05%
Total	5,100	100.00%	5,590	100.00%	10,690	100.00%

Table 21 presents the results for the education attainment of PESA beneficiaries. According to this table 86.94% of the PESA beneficiaries are literate in contrast to 91.22% of the non-beneficiaries, fact that constitutes a significant difference among groups. The same condition of differentiation is appreciated regarding the years of schooling 5.13 and 6.14 respectively and it is possible to conclude that more individuals belonging to the group of non-beneficiaries had access to education ranging from primary to university studies and also more of their children attended primary school. In the case of university studies, 1.25 of beneficiaries' sons and daughters have university studies, while this figure stands at 1.02 among non-beneficiaries.

Table 21. Descriptive statistics for the selected variables related to education attainment

	PESA beneficiaries		No beneficiaries		Full sample	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Panel A: Education attainment of parents						
Literacy (1 for literate)	0.8694*** (0.3370)	5,090	0.9122 (0.283)	5,580	0.8918 (0.3107)	10,670
Years of schooling	5.1314*** (3.0937)	5,100	6.1422 (3.1905)	5,590	5.6600 (3.1848)	10,690
Primary studies (1 if positive)	2.8153*** (2.5690)	5,090	2.6254 (2.6732)	5,580	0.5711 (0.4949)	10,690
Secondary studies (1 if positive)	0.6346*** (1.1911)	5,090	0.8235 (1.2877)	5,580	0.2671 (0.4425)	10,690
Post secondary studies (1 if positive)	0.0196*** (0.1387)	5,100	0.0572 (0.2323)	5,590	0.0393 (0.1943)	10,690
University studies (1 if positive)	0.0059*** (0.0765)	5,100	0.0170 (0.1293)	5,590	0.0117 (0.1075)	10,690
Panel B: Number of children studying						
Primary studies	1.7771*** (0.7710)	3,149	1.8594 (0.7843)	3,869	1.8225 (0.7794)	7,018
Secondary studies	1.2860 (0.5222)	1,231	1.2923 (0.5228)	1,177	1.2890 (0.5224)	2,408
University studies	1.2500*** (0.4695)	128	1.0247 (0.1562)	81	1.1627 (0.3951)	209

Note: Values in Panel B refer only to those families with children at school. *,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

Another important aspect of the two groups under study is the origin and amount of the family income. The average income for both is 2,491.51 MXP, although there is a significant difference considering that the PESA beneficiaries mean income is 2,437.65 MXP and the non-beneficiaries is 2,540.69 MXP.

The most important source of household income for both groups is employment 1,391.67 MXP and 1,610.42 MXP respectively. On the other hand, small scale production in the PESA beneficiaries group is 196.25 MXP, amount significantly lower compared to the 279.43 MXP of the non-beneficiaries.

It is important to mention that PESA beneficiaries income from government subsidies is 328.69 MXP against 348.87 MXP of the non-beneficiaries, fact that constitutes a significant difference.

Table 22. Income at constant prices (monetary values expressed in 2011 Mexican pesos)

	PESA beneficiaries		No beneficiaries		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Mean income	2437.65*** (1368.44)	5,098	2540.69 (1265.05)	5582	2,491.51 (1,316.36)	10,680
Small scale production	196.25*** (503.31)	5,098	279.43 (686.52)	5,582	239.75 (607.47)	10,680
Family business	45.26 (247.20)	5,098	39.56 (305.51)	5,582	42.28 (279.22)	10,680
Employment	1391.67*** (1472.17)	5,098	1610.42 (1456.42)	5,582	1,506.07 (1,467.96)	10,680
Government subsidy	328.69** (417.30)	5,098	348.87 (621.78)	5,582	339.25 (534.16)	10,680
Remittance	8.25 (154.08)	5,098	9.88 (124.44)	5,582	9.10 (139.36)	10,680
Others	465.08*** (976.76)	5,098	265.57 (704.68)	5,582	360.74 (851.28)	10,680

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

According to their income level, results in table 23 indicate that 74.56% of the PESA beneficiaries families earn between 1,001 to 3,000 MXP as for their non-beneficiaries counterparts 74.11% have an income in this range. Apparently there is no outstanding difference, but it is important to mention that the distribution of families varies. In the lower level of this range (1,001 and 2,000 MXP) there are 6.39% less non-beneficiaries families and in the upper range (2,001 and 3,000 MXP) we found 5.94% more non-beneficiaries families.

Table 23. Distribution of families according to their income level at constant prices (2011 Mexican pesos)

Income (in Mexican $)	PESA beneficiaries		No beneficiaries		Total	
	Families	Percent	Families	Percent	Families	Percent
Less than 1,000	183	3.59%	191	3.42%	374	3.50%
Between 1,001 and 2,000	1,975	38.74%	1,806	32.35%	3,781	35.40%
Between 2,001 and 3,000	1,826	35.82%	2,331	41.76%	4,157	38.92%
Between 3,001 and 4,000	825	16.18%	775	13.88%	1,600	14.98%
Between 4,001 and 5,000	163	3.20%	275	4.93%	438	4.10%
More than 5,000	126	2.47%	204	3.65%	330	3.09%
Total	5,098	100%	5,582	100%	10,680	100%

Significant differences were found when working family members variables were analyzed. In the PESA beneficiaries group 89.94% of the fathers work, in contrast to the 95.04% for non-beneficiaries group. In reference to mothers that work, the difference was 23.73% and 6.40% respectively, so participation of mothers in the family labor force is significantly mayor for the PESA beneficiaries group.

In addition, the number of children working was 4.57 for PESA beneficiaries and 1.77 for the control group. Also, 4.16% of PESA beneficiaries have one son or daughter in

the labor market in comparison to 1.49% in the case of non-beneficiaries. In reference to labor experience in the PESA beneficiaries group, fathers reported 16.93 years, mothers 19.91 years, first children 5.96, second son or daughter 3.8 years, no information of a third son or daughter was obtained. On the other hand, father in the non-beneficiaries group reported 14.78 year of labor experience, mothers 13.18, first children 8.16, second son or daughter 3.0 and 2.5 years for the third son or daughter.

Table 24. Labor: Descriptive statistics for working family members

	PESA beneficiaries		No beneficiaries		Full sample	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Panel A: Labor activity						
Father works	0.8994*** (0.3009)	5,098	0.9504 (0.2586)	5,582	0.9260 (0.2807)	10,680
Mother works	0.2373* (8.4195)	5,098	0.0640 (0.2447)	5,582	0.1467 (5.8200)	10,680
Number of sons/daughters working	0.0457*** (0.2277)	5,098	0.0177 (0.1602)	5,582	0.0311 (0.1959)	10,680
Families with one son/daughter working	0.0416*** (0.1997)	5,098	0.0149 (0.1210)	5,582	0.0276 (0.1639)	10,680
Families with two son/daughter working	0.0041*** (0.0641)	5,098	0.0007 (0.0268)	5,582	0.0023 (0.0483)	10,680
Families with three son/daughter working	0.0000 (0.0000)	5,098	0.0004 (0.0189)	5,582	0.0002 (0.0137)	10,680
Panel B: Labor experience						
Father	16.9352*** (14.6666)	4,586	14.7846 (10.3249)	5,269	15.7854 (12.3095)	9,855
Mother	19.9167*** (13.9674)	576	13.1818 (9.8566)	352	17.3621 (12.9802)	928
First son/daughter labor experience	5.9667*** (4.5003)	210	8.1687 (6.0260)	83	6.5904 (5.3153)	293
Second son/daughter labor experience	3.8095 (2.4004)	21	3.0000 (0.8165)	4	3.6800 (2.2308)	25
Third son/daughter labor experience	0.0000 (0.0000)	0	2.5000 (0.7071)	2	2.5000 (0.7071)	2

Note: Values in Panel B refer to those cases where the family member reports labor experience. *,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

In relation to the distribution of family expenditures, significant differences were found. PESA beneficiaries destined 59.85% of their family income in food, 14.63% for education, 6.43% for healthcare and 8.24% in transportation, compared to the non-beneficiaries expenditure: 62.08 in food, 12.16% in education, 7.09 in healthcare and 7.58 for transportation.

Table 25. Distribution of family expenditures (expressed as proportion)

	PESA beneficiaries		No beneficiaries		Full sample	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Food	0.5985*** (0.1084)	5,100	0.6208 (0.0984)	5,575	0.6101 (0.1039)	10,675
Education	0.1463*** (0.1055)	5,100	0.1216 (0.092)	5,573	0.1334 (0.0995)	10,673
Healthcare	0.0643*** (0.0597)	5,100	0.0709 (0.0575)	5,575	0.0677 (0.0587)	10,675
Transportation	0.0824*** (0.0616)	5,100	0.0758 (0.0496)	5,571	0.0790 (0.0558)	10,671
Others	0.1085* (0.0808)	5,100	0.1110 (0.0741)	5,575	0.1098 (0.0774)	10,675

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

As for the surface families have available, no significant differences were found between groups. In average the surface they posses is 1.11 hectares, from which they destine for housing 0.204 hectares and for productive purposes 0.90 hectares.

Table 26. Land: Descriptive statistics for 2011

	PESA beneficiaries		No beneficiaries		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Surface area (hectare)	0.9423 (1.0010)	1,010	1.2626 (9.0917)	1,118	1.1106 (6.6264)	2,128
House size (hectare)	0.0624 (0.1117)	1,010	0.3328 (9.0315)	1,118	0.2045 (6.5467)	2,128
Productive area (hectare)	0.8799 (0.9958)	1,010	0.9298 (1.0763)	1,118	0.9061 (1.039)	2,128

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

As for the distribution of families according to the size of the land, results show that 64.33% of the families in both groups live and work in a surface of less than one hectare, 22.51% have for this same purpose between 1.01 and 2 hectares and 13.16% posses major surface.

Table 27. Distribution of families according to the size of the land

	PESA beneficiaries		No beneficiaries		Full sample	
	Families	Proportion	Families	Proportion	Families	Proportion
Less than 0.50 hectares	369	36.53%	451	40.34%	820	38.53%
Between 0.51 and 1 hectare	301	29.80%	248	22.18%	549	25.80%
Between 1.01 and 1.50 hectares	149	14.75%	188	16.82%	337	15.84%
Between 1.51 and 2 hectares	59	5.84%	83	7.42%	142	6.67%
More than 2 hectares	132	13.07%	148	13.24%	280	13.16%
Total	1,010	100%	1,118	100%	2,128	100%

Access to public services was also examined and significant differences were found, 95.54% of the PESA beneficiaries group have an education center in their own communities in contrast to 97.42% for the non-beneficiaries group, the time required to reach these education centers is 20.28 minutes and 21.19 respectively.

A similar condition was found in reference to access to water 90.98% of the PESA beneficiaries have access to domestic and 27.25% for productive use, in contrast to 96.15% and 35.15% of the non-beneficiaries.

Also significant differences related to the access to healthcare services were detected 94.41% of the PESA beneficiaries have access to them, 66.60% in their home region,

33.50% outside their communities and they require 28.46 minutes to get to the nearest health facility. On the other hand, 100% of the non-beneficiaries have access to healthcare services, 83.36% in their home region, 16.64% outside their communities and it takes them 27.78 minutes to get to the healthcare center.

Table 28. Access to public services (education, water and healthcare) by community in 2011

	PESA beneficiaries		No beneficiaries		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Panel A: Access to education centers						
Education center in the community (1 if positive)	0.9554** (0.1586)	986	0.9742 (0.1586)	1,085	0.9652 (0.1832)	2,071
Time necessary to reach the education center (minutes)	20.2802** (10.6146)	978	21.1913 (9.4827)	1,077	20.7577 (10.0432)	2,055
Panel B: Access to water						
Domestic use	0.9098*** (0.2866)	1,020	0.9615 (0.1924)	1,118	0.9369 (0.2433)	2,138
Productive use	0.2725*** (0.4455)	1,020	0.3515 (0.4445)	1,118	0.3138 (0.4642)	2,138
Panel C: Healthcare						
Access to healthcare service	0.9441*** (0.2298)	1,020	1.0000 (0.0000)	1,118	0.9733 (0.1611)	2,138
Healthcare service in the home region	0.6650*** (0.4722)	1,018	0.8336 (0.3726)	1,118	0.7533 (0.4312)	2,136
Healthcare service outside the region	0.3350*** (0.4722)	1,018	0.1664 (0.3726)	1,118	0.2467 (0.4312)	2,136
Time necessary to get to the healthcare center (minutes)	28.4641 (18.0733)	1,017	27.7809 (15.1816)	1,118	28.1063 (16.6214)	2,135
Public service (dummy if positive)	0.9872* (0.1123)	1,018	0.9946 (0.0731)	1,118	0.9911 (0.0939)	2,136

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

Concerning the group of variables dealing with the investments and benefits derived from the PESA policy, results in Table 29 show that financial support linked to the PESA has increased between 2009 and 2010.

In 2009 the contributions were: governmental 3,879.36 MXP, beneficiaries 395.55 MXP for a total investment of 4,274.92 MXP. In 2010 they were 9,924.21 MXP and 3,296.07 respectively for a total of 13,220.28. The investment linked to the PESA program was increased in 8,945.36 MXP from one year to the subsequent, representing a 309.25% variation.

Table 29. Monetary investments linked to the PESA program at constant prices (2011 Mexican pesos)

Investment	2009		2010		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Government	3,879.36*** (3,216.36)	679	9,924.21 (4,482.16)	443	6,266.05 (4,787.14)	1,122
Beneficiary	395.55*** (370.28)	679	3,296.07 (1,505.93)	443	1,540.77 (1,728.90)	1,122
Total investment	4,274.92*** (3,560.22)	679	13,220.28 (5,982.09)	443	7,806.82 (6,396.32)	1,122

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

One of the most important components of the PESA program is the training given to the beneficiaries. In 2009 they received 17.62 hours of methodological and 17.11 hours of technical training for a total of 34.73 hours. The subsequent year they received 25.48 hours of methodological training, 26.54 hours of technical training for a total of 52.02 hours. This is 25.48 hours more of training in 2010, that represents and increment of 51.01%.

Table 30. Training linked to the PESA program (expressed in hours of training)

	2009		2010		Total	
Type of training	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Methodological	17.62*** (15.07)	1,020	25.48 (13.49)	1,020	21.55 (14.83)	2,040
Technical	17.11*** (15.12)	1,020	26.54 (16.61)	1,020	21.83 (16.56)	2,040
Total training	34.73*** (27.85)	1,020	52.02 (27.24)	1,020	43.37 (28.87)	2,040

*,**,*** indicates significance at the 0.10, 0.05, and 0.01, respectively (two-tailed).

It is very important to consider the perceived impact of the PESA program on the family's welfare position. In the year 2009, the result is that 35.47% of the families perceived a great improvement, 32.41% a positive one, 5.14% slight improvement 0.49% very little and 26.48 no improvement at all.

The year after, 52.87% of the beneficiaries perceived a great improvement, 41.44% a positive one, 4.45% a slight improvement, 0.59% a very little and 0.69% no improvement at all.

Table 31. Perceived impact of the PESA program on the family's welfare position

	2009		2010		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Family's welfare improved greatly	0.3547 (0.4787)	1,012	0.5287 (0.4994)	1,010	0.5401 (0.4986)	1,009
Positive improvement	0.3241 (0.4683)	1,012	0.4144 (0.4929)	1,011	0.4083 (0.4918)	1,009
Slight improvement	0.0514 (0.2209)	1,012	0.0445 (0.2063)	1,011	0.0396 (0.1952)	1,009
Family's welfare improved very little	0.0049 (0.0702)	1,012	0.0059 (0.0768)	1,011	0.0059 (0.0769)	1,009
No improvement	0.2648 (0.4415)	1,012	0.0069 (0.083)	1,011	0.0059 (0.0769)	1,009

The number of observations varies due to the presence of some missing values.

Regarding the benefits derived from the PESA program, note that beneficiaries reported they had more time available to destine to specific activities. In the year 2009 they could use 18.23 extra hours for productive activities, 0.73 hours for education, 3.59 to help their communities, 0.06 for leisure activities and 2.83 hours for other activities. This same benefit was also observed in the subsequent years, 2010 and 2011.

In terms of economic benefit, beneficiaries reported 359.24 MXP in savings in 2009, 572.61 MXP for 2010 and 557.79 MXP in 2011. Their income also experimented a benefit of 11.34 MXP in 2009, 69.27 MXP for 2010 and 70.67 MXP in 2011. Those who reported no benefit at all, were 4% in 2009 and 2010 and 1% in 2011.

Table 32. Benefits derived from the PESA program

	2009		2010		2011	
Type of benefit	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Panel A: Time (in hours)						
Total time	25.70 (72.29)	1,020	25.96 (73.60)	1,020	26.27 (74.20)	1,020
Extra time used to productive activities	18.23 (38.12)	1,020	17.46 (35.49)	1,020	19.07 (45.35)	1,020
Extra time used in education	0.73 (5.78)	1,020	0.93 (6.14)	1,020	1.17 (8.80)	1,020
Extra time used to help the local community	3.59 (11.89)	1,020	3.40 (11.69)	1,020	3.21 (9.93)	1,020
Extra time used in leisure	0.06 (0.88)	1,020	0.07 (0.92)	1,020	0.06 (0.88)	1,020
Extra time used in other activities	2.83 (8.25)	1,020	3.00 (8.34)	1,020	3.01 (8.36)	1,020
Panel B: Economic benefit (in constant prices)						
Savings (in 2011 Mexican pesos)	359.24 (663.27)	1,020	572.61 (650.55)	1,020	557.79 (636.66)	1,020
Income (in 2011 Mexican pesos)	11.34 (56.19)	1,020	69.27 (185.53)	1,020	70.67 (222.00)	1,020
No benefit	0.04 (1.25)	1,020	0.04 (1.25)	1,020	0.01 (0.04)	1,020

As a result of the implementation of the PESA program, beneficiaries perceive some factors that explain the improvement in their family's welfare (Table 33). In the two years analyzed, the most important improvement factors among beneficiaries relate to the access to 1) financial resources (13.79%), 2) food (12.80%), monetary savings (9.92%), health-care services at home (7.94%), water (7.74%), more free time (6.25%) and to better production means (5.06%).

It is important to note that from 2009 to 2010, the perception of factors increased significantly in reference to monetary (6.24% - 12.57%), less expenditure or savings (3.07% - 8.02%), access to better production means (2.97% - 4.95%) and food (4.56% - 9.90%)

Table 33. Perceived factors that explains the improvement in the family's welfare position as a result of the PESA program

	2009		2010		Total	
	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.	Mean (Std. Dev.)	Obs.
Time	0.0803 (0.2719)	1,009	0.0634 (0.2437)	1,010	0.0625 (0.2422)	1,008
Monetary	0.0624 (0.2421)	1,009	0.1257 (0.3317)	1,010	0.1379 (0.345)	1,008
Family income	0.0010 (0.0315)	1,009	0.0198 (0.1394)	1,010	0.0188 (0.1361)	1,008
Less expenditure	0.0307 (0.1727)	1,009	0.0802 (0.2717)	1,010	0.0992 (0.2991)	1,008
Better access to water	0.1169 (0.3215)	1,009	0.0762 (0.2655)	1,010	0.0774 (0.2673)	1,008
Access to better production means	0.0297 (0.1699)	1,009	0.0495 (0.2170)	1,010	0.0506 (0.2193)	1,008
Food	0.0456 (0.2087)	1,009	0.0990 (0.2988)	1,010	0.1280 (0.3342)	1,008
Access to more production inputs	0.0000 (0.0000)	1,009	0.0010 (0.0315)	1,010	0.0010 (0.0315)	1,008
Health at home	0.0852 (0.2794)	1,009	0.0792 (0.2702)	1,010	0.0794 (0.2704)	1,008

The number of observations varies due to the presence of some missing values.

3.1.3 Econometric strategy

In line with the characteristics of the PESA and the arguments that underpin this study (Chapter 2), households choose (and are accepted) to participate in the PESA on the basis of expected well-being improvements. Thus, without modeling the PESA enrolment first, any model explaining the effect of this program on subsequent well-being metrics would yield biased results, regardless of whether the model controls for covariates linked to the program (Wooldridge, 2002). One would be tempted to consider this econometric problem a perfect candidate for a sample selection model (Heckman, 1979). Yet, the characteristics of the PESA entail important econometric considerations that condition our modeling strategy.

First, we examine the effects of the PESA on future well-being. Families choose to participate in the PESA mostly driven by factors related to their preferences and available capabilities. Thus, this problem is one of self-selection (Heckman and Robb, 1985). Also, future well-being of average beneficiaries may originate in factors other than those strictly related to the decision to participate in the program (Greene, 2003).

Therefore, the first stage employs treatment effect models to scrutinize the effect of the PESA on the subsequent well-being of beneficiaries. This method, originally proposed by Rubin (1974) and further developed by Imbens and Angrist (1994) and Angrist et al. (1996), controls for self-selection problems by modeling well-being as a function of an endogenous dummy variable that accounts for the participation choice (PESA).

In treatment effect models, the well-being outcomes are observed for all observations, in our case beneficiary and non-beneficiary households. This is consistent with the notion that individual well-being is not created but rather affected by the PESA. In the treatment model the endogenous dummy variable indicating the treatment condition (adoption of the PESA) directly enters into the outcome equation (Wooldridge, 2002). In this study, the treatment effect model has the following form:

$$\text{Participation in SPFS}_i = \alpha_0 + \beta_1 \text{Human capital}_i + \beta_2 \text{Physical capital}_i + \beta_3 \text{Control variables}_i + \varepsilon_i \tag{1}$$

$$\begin{aligned}\text{Well-being } (t+1)_i = {} & \alpha_0 + \delta_1 \text{Participation in PESA}_i + \delta_2 \text{Human capital}_i \\ & + \delta_3 \text{Physical capital}_i + \delta_5 \text{Control variables}_i + u_i\end{aligned} \tag{2}$$

Equation (1) is the treatment probit model where i indexes individuals, and β_j is the vector of parameters. In equation (2)—the outcome equation— well-being refers to the three analyzed metrics: household income, expenditure in education, and expenditure in health. Coefficients (δ_j) are estimated via OLS. The terms ε_i and u_i are the normally distributed errors for the probit and OLS regressions, respectively. In terms of the study hypotheses, we expect that $\delta_1 > 0$ to corroborate that there is a positive relationship between the voluntary participation in the PESA program and the analyzed dimensions of well-being (**H1**).

The second stage analysis evaluates the relationship between investments in territorial capital and well-being. A potential selectivity problem arises in the estimation of a model with post-enrolment well-being as dependent variable. The investments in

territorial capital resulting from the participation in PESA are used (at different intensities) exclusively by participating households.

Consequently, the sample is censored and this gives rise to a sample selection bias. In this scenario a standard regression model is not a viable approach to assess the effects of investments in territorial capital, and an analysis that addresses potential sample selection offers a more comprehensive modeling approach.

Heckman (1979) defines sample selection as a special case of the omitted variable problem in which the inverse Mills ratio λ is the omitted variable in the outcome equation. Thus, we use the two-step Heckman method (Heckman, 1979). This technique represents a solution for the omitted variables bias (Heckman, 1990), and allows to estimate consistent coefficients for the effects of investing in territorial capital on subsequent well-being metrics.

The probit model in equation (1), in which the dependent variable equals to one if the household participates in the PESA, is used to estimate the inverse Mills ratio. The second step estimates the outcome equation with the inverse Mills ratio as an explanatory variable as follows:

$$\text{Well-being } (t+1)_i = \alpha_0 + \delta_1 \text{Human capital}_i + \delta_2 \text{Investments in human capital}_i$$
$$+ \delta_3 \text{Physical capital}_i + \delta_4 \text{Investments in physical capital}_i \qquad (3)$$
$$+ \delta_5 \lambda_i + \delta_6 \text{Control variables}_i + \nu_i$$

In equation (3) well-being refers to the analyzed outcomes, namely income, expenditure in education, and expenditure in health. Human capital refers to training hours (technical and methodological), while investments in human capital include the economic funds provided by the PESA and the in-kind investment by beneficiaries. Coefficients (δ_j) are estimated by OLS and the model is performed solely on the sample of beneficiaries. Finally, the term ν_i is the normally distributed disturbance term. In this case, we expect that $\delta_2 > 0$ and $\delta_4 > 0$ to corroborate the positive relationship between the beneficiaries' investments in territorial capital linked to the PESA and the analyzed well-being outcomes (**H2**).

Chapter 4: Empirical findings

4.1 Impact of poverty reduction programs on beneficiaries' well-being

The treatment regression models relating the participation in the PESA and subsequent well-being levels are depicted in Table 34.

Concerning the probit model estimating the participation in the PESA, results show that participation in the PESA increases for larger households where the educational attainment of the family head is low, for single parent households, and for households who have lower levels of productive land and evident difficulties to access school premises.

Hypothesis 1 proposes a positive relationship between the participation in the PESA and well-being outcomes. This hypothesis is supported. The results in Table 34 show that the coefficient for the participation in the PESA is positive and statistically significant for the three analyzed well-being variables.

To help interpret the results for the effect of the PESA on well-being we computed the average treatment effect on the treated (ATET) following the matching method by Rosenbaum and Rubin (1983). Underlying the estimation of the ATET is the assumption of conditional mean independence or selection on observables (Wooldridge, 2002, p. 607). In line with our theoretical underpinning, this implies that the household's profile ($\mathbf{x}$) conditions the decision to participate in the PESA (equation (1)).

The   ATET   is   computed   for   each   adopting   household   as

$$ATET(\mathbf{x}_i) = \frac{1}{N}\sum_{i=1}^{N}[D_i - \hat{p}_i(\mathbf{x}_i)]y_i / [\hat{p}_i(D_i = 1) \times (1 - \hat{p}_i(\mathbf{x}_i))] \text{ (Angrist, 1998)}.$$

The Rosenbaum-Rubin method also allows at computing the effect of non-participating in the PESA on well-being, that is, the non-treatment effect on non-participating households (ATENT) conditional on the analyzed variables (**x**) as

$$ATENT(\mathbf{x}_i) = \frac{1}{N}\sum_{i=1}^{N}[D_i - \hat{p}_i(\mathbf{x}_i)]y_i / [\hat{p}_i(D_i = 0) \times (1 - \hat{p}_i(\mathbf{x}_i))].$$

For income, keep in mind that this variable was logged to reduce skewness, thus we obtained the exponentiated value of the estimated treatment effect to correctly interpret the magnitude of the effects of the program on income. The estimated ATET (7.21) indicates that the average effect of participating in the PESA is an improvement in the household's yearly income of MXN $1,352.89\,(\exp(7.21) = 1,352.89)$. For an average household reporting a yearly income of MXN 29,193.50 (roughly equivalent to USD 1,737.31), this result translates in an increase of 4.63% in income as a result of participating in the PESA. The estimated treatment effect on the household's income (ATE) is significantly higher (*t*-test: 18.40 and $p < 0.001$) than the estimated income increase of MXN 126.47 reported for non-adopting households (ATENT: 4.84).

Table 34. Treatment effects model: Impact of the PESA on household's well-being

	Participation in PESA	Income (*t+1*)	Expenditure in education (*t+1*)	Expenditure in health (*t+1*)
		(1)	(2)	(3)
Participation in PESA		0.6058**	0.3056***	0.0627**
		(0.2528)	(0.0690)	(0.0326)
Years of schooling of the household head	–0.0443***	0.0295***	0.0053***	0.0011*
	(0.0075)	(0.0050)	(0.0014)	(0.0006)
Father's labor experience	–0.0116	0.0845***	–0.0091***	–0.0022*
	(0.0285)	(0.0106)	(0.0033)	(0.0012)
Mother's labor experience	0.1664***	0.0178	–0.0154***	–0.0047***
	(0.0367)	(0.0172)	(0.0048)	(0.0018)
Family members in primary school	–0.2120***	–0.0376	0.0254***	–0.0017
	(0.0671)	(0.0294)	(0.0088)	(0.0033)
Family members in secondary school	0.0505	0.0347	0.0223***	–0.0026
	(0.0794)	(0.0285)	(0.0087)	(0.0030)
Land area for housing (hectares)	0.3560**	–0.3520***	–0.0069	0.0638***
	(0.1628)	(0.0727)	(0.0216)	(0.0078)
Land area for productive activity (hectares)	–0.1002***	0.0097	0.0047	0.0024**
	(0.0184)	(0.0111)	(0.0032)	(0.0012)
Sex of the household head (one for man)	0.1003	0.1507***	0.0011	0.0020
	(0.1151)	(0.0434)	(0.0132)	(0.0046)
Age of the household head	–0.0012	–0.0019***	–0.0005**	–0.0005**
	(0.0017)	(0.0007)	(0.0002)	(0.0002)
Family size	0.1948***	0.0498*	0.0101**	0.0129**
	(0.0662)	(0.0282)	(0.0045)	(0.0051)
Married or consensual union	–0.4558***	0.1634***	0.0161	0.0059
	(0.1217)	(0.0596)	(0.0175)	(0.0066)
Access to education centers (hours)	0.2391**			
	(0.1186)			
Access to health care centers (hours)	0.0818			
	(0.0726)			
Community	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes
Inverse Mill's ratio (lambda)		–0.3459**	–0.1641***	–0.0827***
		(0.1545)	(0.0421)	(0.0196)
Intercept	0.4662***	9.3287***	–0.1785***	0.0412*
	(0.1578)	(0.1926)	(0.0544)	(0.0222)
Wald test (chi2)		496.86***	821.65***	650.79***
Pseudo R2	0.1533			
LR chi2	211.02***			
Observations		6,414	6,414	6,414

Standard error is presented in brackets. *, **, *** = significant at the 10%, 5%, and 1% level, respectively.

Concerning household's consumption, the results for expenditures in education and health reveal a shift in consumption patterns from housing and food, transportation and other expenditures to education and health as a result of participating in the PESA. Regardless of the monetary value of households' consumption, increases in the relative weight of expenses on education and health are evidence of enhanced well-being as a result of the participation in the PESA program. More concretely, in the case of educational expenses the ATET is 0.0334, which indicates that the average effect of participating in the PESA is an increase in the percentage of total expenditures dedicated to education of 3.34 percentage points. For an average household whose expenses on education represent 13.60% (0.1360) of total consumption, the result implies that, on average, education expenses would rise to 16.94% of total consumption (a variation rate of 24.56%).

The estimated treatment effect on the beneficiaries' education expenses is significantly greater (*t*-test: 28.80 and $p < 0.001$) than the estimated increase of 1.27 percentage points reported for non-beneficiaries (ATENT: 1.27). The estimated effect of participating in the PESA on health expenses is an increase of 1.32 percentage points (ATET: 0.0132) which implies a variation of nearly 20% in the spending on health for an average household. The estimated ATET is significantly higher than the estimated effect of not participating in the program (ATENT: −1.10) (*t*-test: 21.34 and $p<0.001$).

To better illustrate the magnitude of the effect resulting from the participation in the PESA program, a supplementary analysis explores the effects of the PESA by testing for differences in the well-being outcomes shown by beneficiaries before (*t*-1) and after

(*t*+1) the enrolment in the PESA. To enhance the comparative analysis of well-being changes in beneficiaries and non-beneficiaries, the well-being values were centered on the program enrolment period so that values for both beneficiaries and non-beneficiaries refer to the same years.

Results in Table 35 show that, compared to non-beneficiaries, well-being changes are more pronounced among the group of beneficiaries. For beneficiaries average income increased 4.22% after the participation in the PESA, while average income of non-beneficiaries only grew 1.67%. Although beneficiaries have lower income levels, looking at the distribution of income we note that the inequality gap narrowed between beneficiaries and non-beneficiaries during the analyzed period. Table 35 shows that average income increased noticeably (8.70%) for the fraction of beneficiary households in the bottom decile of the distribution of income.

Differences in consumption patterns are also remarkable between the two groups. Among beneficiaries, average education expenses increased to 14.91% of total consumption among beneficiaries, and the number of households with no education expenses decreased after the implementation of their projects. Similarly, we report significant changes in the level of health spending and in the number of households with no health expenditures. On contrary, in the group of non-beneficiaries both the level of health spending and the number of households with no health expenditures slightly worsen during the analyzed period.

Table 35. Changes in well-being outcomes before and after the PESA

	Before PESA (*t-1*)	After PESA (*t+1*)	Variation	Wilcoxon signed-rank test (Z-value)
Panel A: Household income (in 2011 constant Mexican pesos)				
Beneficiaries	28,488.84 (14,350.80)	29,690.52 (15,600.00)	1,201.68	4.102***
No beneficiaries	30,340.68 (16,165.00)	30,847.44 (16,195.00)	506.76	1.725*
Panel B: Education expenditures (% of total consumption)				
Beneficiaries	14.37% (197)	14.91% (172)	0.54	6.237***
No beneficiaries	12.03% (243)	12.31% (242)	0.28	1.748*
Panel C: Health expenditures (% of total consumption)				
Beneficiaries	6.22% (307)	6.78% (271)	0.56	10.127***
No beneficiaries	7.19% (241)	6.98% (244)	–0.21	–2.634**

Note: For income, values in brackets refer to the income at the first (bottom) decile of the income distribution. For the variables related to expenses in education and health, values in brackets indicate the number of households that do not spend in the focal category, that is, zero expenditure in education and health. *, **, *** = significant at the 10%, 5%, and 1% level, respectively (Wilcoxon signed-rank test).

4.2 Tackling poverty through human capital formation and public investments strategies

This section examines the effect of capability-enhancing actions on the analyzed dimension of well-being (Table 36). Specifically, and having confirmed that PESA beneficiaries experience significant increases in their well-being (section 4.1), we analyze if the reported improvements in well-being originate in the territorial capital investments linked to the PESA.

Hypothesis 2 states that, among beneficiaries, the investments in territorial capital—i.e., human capital and physical capital—linked to the PESA are positively related to subsequent well-being outcomes. Results support this hypothesis in the case of the methodological training variable (human capital investment) and the beneficiaries' investments in physical capital, while we find no support for this hypothesis when the investments in territorial capital are measured by technical training and the government's investment in physical capital (Table 36).

We find that, among beneficiaries and holding other variables constant at their means, the estimated average income increase resulting from each extra hour of methodological training is $0.46\% (\exp(0.0046) - 1 = 0.0046)$ (Model 1 in Table 36). In the case of spending on education and health, results indicate that a one-hour increase in methodological training shifts consumption patterns by raising the relative weight of education and health expenditures four and five percentage points, respectively (Models 2 and 3 in Table 36).

Table 36. Heckman model: Investments in territorial capital and household's well-being

	Participation in PESA	Income (*t+1*)	Expenditure in education (*t+1*)	Expenditure in health (*t+1*)
		(1)	(2)	(3)
Investment in technical human capital (hours)		−0.0060*** (0.0011)	−0.0012*** (0.0002)	0.0002 (0.0002)
Investment in methodological human capital (hours)		0.0046*** (0.0012)	0.0004** (0.0002)	0.0005*** (0.0002)
Governmental investment in physical capital (a)		−0.0494 (0.0457)	−0.0148 (0.0094)	0.0120** (0.0061)
Beneficiaries' investment in physical capital (a)		0.0449** (0.0205)	0.0154** (0.0062)	0.0109*** (0.0040)
Years of schooling of the household head	−0.0443*** (0.0075)	0.0493** (0.0205)	0.0025 (0.0033)	−0.0021 (0.0023)
Father's labor experience	−0.0116 (0.0285)	0.0465** (0.0237)	−0.0101** (0.0042)	0.0019 (0.0029)
Mother's labor experience	0.1664*** (0.0367)	−0.0865 (0.0935)	−0.0168 (0.0149)	0.0110 (0.0103)
Family members in primary school	−0.2120*** (0.0671)	−0.0194 (0.0628)	0.0068 (0.0096)	−0.0048 (0.0067)
Family members in secondary school	0.0505 (0.0794)	0.0061 (0.0834)	0.0188 (0.0129)	0.0047 (0.0090)
Land area for housing (hectares)	0.3560** (0.1628)	−0.7088*** (0.2276)	0.0199 (0.0371)	0.0834*** (0.0255)
Land area for productive activity (hectares)	−0.1002*** (0.0184)	0.0536 (0.0534)	−0.0042 (0.0086)	0.0045 (0.0059)
Sex of the household head (one for man)	0.1003 (0.1151)	−0.1188 (0.1121)	−0.0097 (0.0175)	0.0073 (0.0122)
Age of the household head	−0.0012 (0.0017)	−0.0011 (0.0017)	−0.0010*** (0.0003)	0.0004** (0.0002)
Family size	0.1948*** (0.0662)	0.0394* (0.0219)	0.0252*** (0.0094)	0.0065 (0.0066)
Married or consensual union	−0.4558*** (0.1217)	0.2193 (0.1602)	0.0016 (0.0254)	0.0036 (0.0176)
Access to education centers (hours)	0.2391** (0.1186)			
Access to health care centers (hours)	0.0818 (0.0726)			
Community	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes

(a) Monetary values are deflated with respect to inflation and expressed in constant 2011 Mexican Pesos
Standard error is presented in brackets. *, **, *** = significant at the 10%, 5%, and 1% level, respectively.

Table 36. Continued

	Participation in PESA	Income (*t+1*)	Expenditure in education (*t+1*)	Expenditure in health (*t+1*)
		(1)	(2)	(3)
Inverse Mill's ratio (lambda)		–0.7657** (0.3637)	–0.1964*** (0.0530)	–0.0596 (0.0737)
Intercept	0.4662*** (0.1578)	10.6327*** (0.6093)	0.2065** (0.1022)	–0.0564 (0.0696)
Wald test (chi2)		98.27***	459.42***	125.15***
Pseudo R2	0.1533			
LR chi2	211.02***			
Observations		6,414	6,414	6,414

(a) Monetary values are deflated with respect to inflation and expressed in constant 2011 Mexican Pesos Standard error is presented in brackets. *, **, *** = significant at the 10%, 5%, and 1% level, respectively.

Methodological training provides beneficiaries with knowledge on how to efficiently capitalize on their available productive resources. For instance, by instructing beneficiaries in enhanced agriculture practices and water collection systems, this type of knowledge equips beneficiaries to both increase agricultural productivity and improve the quality of their products.

On contrary, it is noteworthy that technical training negatively impacts future income and future spending on education. This type of training emphasizes operational aspects of the assets acquired through the PESA (e.g., stoves, water tanks) and mostly instructs beneficiaries on how to handle new equipments. By studying all technical aspects of the new assets beneficiaries obtain valuable operational knowledge which might improve individuals' capacity to run new equipments. However, we argue that the potential productivity effect of technical training is surpassed by the impact of methodological training which is more directly related to the household's economic activity.

The results for the investments in physical capital highlight the role of the beneficiaries' investments. Specifically, results in Model 1 (Table 36) show that a 10% increase in the beneficiary's investment raises average income by 0.43% $(\Delta X^{\beta} - 1 = 1.10^{0.0449} - 1 = 0.0043)$. Although the estimated net effects are rather small, we find a significantly positive relationship between the beneficiaries' investments in physical capital and future levels of spending on education and health. For instance, among beneficiaries, the expected change in the weight of education expenditures as a result of a 10% increase in physical capital investments is 0.15 percentage points $(\beta \times \ln(\Delta X) = 0.0154 \times \ln(1.10) = 0.0015)$. Similarly, an increase of 10% in the beneficiary's investment in physical capital would raise the relative weight of expenditures on health would rise 0.10 percentage points.

Chapter 5: Concluding remarks

5.1 What can we say about territorial development?

In this doctorate thesis, we proposed that capability-enhancing programs that aim at reducing poverty contribute to achieve individual functionings, thus improving various well-being dimensions. Building on the capability approach, which emphasizes that poverty is an outcome of capability deprivation (Sen, 1983, 1999), we hypothesized that investments in territorial capital increase households' capabilities, thus creating the conditions to diversification of consumption and pursuit of new and different functionings related to human capital and health.

Overall, the findings of this study are consistent with prior studies that emphasize the critical role of poverty reduction programs in improving well-being conditions of underprivileged households residing in marginal rural areas (see e.g., Rawlings and Rubio, 2005; Robeyns, 2006; Gao et al., 2014). Additionally, households do not realize the generally positive effects of the territorial capital investments generated by the PESA at the same intensity. We argue that discrepancies may arise from differences in the value created by investments in territorial capital, and from differences in the level of functionings deprivation among households which might impact the coupling of capability-enhancing actions (i.e., territorial capital investments) to the achievement of functionings (i.e., needs).

Results reveal that the PESA program helped narrow the income inequality gap between beneficiaries and non-beneficiaries. But, the findings also show that beneficiaries—who

report lower income levels than non-beneficiaries—spend more resources on education, even before the implementation of their projects. In line with Robeyns (2006), these results suggest that not all functionings-poor households are necessarily income-poor, following the well-known 'two-dollar a day' poverty measure of the World Bank, and vice versa.

This paper has important implications for how policy makers can match solutions generated by poverty reduction programs with the objective of breaking the intergenerational transmission of poverty via investments in territorial capital. First, public administrations of all ideologies and international organizations channel funds to rural communities based on the number of poor households according to income criteria. Based on the results of this study, we suggest that well-being policies should not be restricted to financial instruments only, and that policy makers need to turn their attention to variables linked to different types of funtionings (e.g., education and health) when analyzing well-being in marginal rural areas.

Second, the prioritization of capability-building interventions—i.e., investments in territorial capital—with a long-term perspective also increase psychological-oriented capabilities by promoting consensus processes that increase security and stability at economic and social levels (Stiglitz, 1998; Robeyns, 2006). Nevertheless, poverty reduction programs are often driven by policy objectives that impose change, which might mitigate their impact on well-being. Under these conditions, efficient information schemes are critical to create communication channels that help align the interests of policy makers with those of the targeted communities. This way, the investments resulting from the implementation of support programs would not only contribute to

improve different dimension of well-being (i.e., functionings) that the beneficiaries value the most. Additionally, support programs built on community participation and involvement may prove themselves efficient in breaking the potential unintended negative effects that result from the dependencies that support program can create in the targeted communities (Blank, 2009).

Third, education and health are at the core of individual development (Stiglitz, 1998, p. 27). Based on the results indicating that a significant shift in consumption patterns follows the participation in the PESA program, we suggest that agendas that call for inclusive development should take into account the capabilities and the 'freedom of agency' of beneficiaries as this approach might be the fundamental level change that addresses the needs of the poorest communities in a region.

5.2 Connecting this study to the Mexico's reality

At this point, it now seems appropriate to articulate the results of the present study in the context of the reality of the fight against poverty that constitutes a top priority for the Mexican Administration (Plan Nacional de Desarrollo 2007-2012, Presidencia de la República). This is especially relevant because, despite de increased amount of resources allocated to reduce social and economic deprivation (Scott, 2009), poverty in Mexico has increased by 6.56% between 2008 and 2010 (Consejo Nacional de Evaluación de la Política de Desarrollo Social, CONEVAL).

As a convenient starting point, and in accordance with Bird et al. (2002), it must be noted that investments in human capital should represent a critical aspect when it comes to design support strategies and programs that seek to reduce poverty in the long term.

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In this sense, investments in education and policies targeting the stimulation of employment are essential. New policies are needed and building strong political, human and social capital must be prioritized, instead of putting emphasis on the creation or accumulation of physical and financial capital.

According to Pratschke and Haase (2007), rather than adopting an individual-level model, the development of operational hypotheses must be based on the specific characteristics of the analyzed community, keeping in mind that the use of spatial data from Population Census to estimate social disadvantages is not enough.

Poor people residing in remote rural areas should not be institutionally excluded. Rather, they must receive efficient attention to enhance their multi-task profiles and exploit their accumulated knowledge. This way, extremely deprived communities can create a sustainable way out of poverty (De Janvry and Sadoulet, 2000) and cut the link between immigration to urban areas and welfare. Of course a solid reference framework is essential, including accurate qualitative and quantitative indicators to systematically evaluate communities exposed to high poverty levels.

Building on the theoretical arguments that frame this study, poverty must be viewed as a multidimensional condition at the regional or territorial level, and where the targeted rural areas present specific potentialities, dissimilarities as well as their own demands and necessities. Therefore, rural development policies must focus on promoting elements directly related to a higher level of well-being (Lafuente et al., 2010). The results derived from this study, jointly with evidence indicating that poverty has progressively increased in Mexico, I strongly recommend a radical change in the way

that policy approaches poverty. The empirical findings presented in this dissertation support the argument that human capital formation is a key ingredient that contributes to increase well-being levels in marginalized communities.

Support policies, such as PESA/SPFS, have proven themselves to be efficient in that the program's methodology both considers community participation as a key vehicle to design specific solutions to region-specific problems, and offers permanent technical support and supervision that helps combat certain dimensions of poverty (education). I argue that these components should be included in all support programs oriented to the minimization of poverty in rural areas (Valencia-Sandoval et al., 2010).

Additionally, the predominant agricultural orientation and the use of fragmented land for productive purposes characterize rural areas in México. This is a second aspect of rural Mexico's reality that has to be analyzed. Among average residents in rural Mexico who own land, an additional hectare of land for productive activities would increase their level of well-being 1.3 times on average, compared to agricultural workers (Finan et al., 2005). This aspect is of particular interest. The results of this study point to the presence of a human capital effect when it comes to alleviate poverty in marginal rural areas of Mexico. Thus, in communities where land plays a key role in the household's economy, access to additional land might help to significantly improve their well-being and, consequently, human capital investments should match the agricultural orientation of these territories to effectively capitalize on existing resources in the targeted region.

Finally, and in consonance with the results emerging from this investigation, I consider that welfare-enhancing support programs that seek to combat poverty should not be

restricted and exclusively implemented in regions exposed to severe poverty conditions. On contrary, these policies should be part of the country's development strategy and should be included as a transversal component of the different policy settings of the government at top administrative levels.

5.3 Limitations of the study and future research avenues

It must, however, be mentioned a series of limitations to the present study that, in turn, represent avenues for future research. First, and although our analysis disentangles key consumption components, data do not permit the direct analysis of the underlying consumption decision-making processes. Further research on this issue would be valuable. For example, future studies should evaluate the households' response to different incentives and investments in order to determine the actions that have a greater impact on consumption patterns.

Second, like other studies on well-being, the income and consumption variables are analyzed individually. This measurement issue suggests the need for more data on the potential complementarities and/or substitution effects between different well-being dimensions. From a capability approach, specifically designed future research can address this point by testing the informative power of poverty measures that consider various well-being dimensions or the cost to access a minimal set of basic functionings.

Finally, cultural contexts and territorial differences might affect the effectiveness of poverty reduction programs across countries. The geographic specificity of the study calls for obvious caution when interpreting and generalizing its findings.

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