

# HUMAN CAPITAL AND DECENTRALIZATION OF EDUCATION (THE CASE OF TLAJOMULCO DE ZUNIGA JALISCO, MEXICO)



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*This paper aims to analyze and determine human capital in the process of education decentralization in Tlajomulco de Zuniga municipality (Jalisco, Mexico). This objective intends to confirm positive relationships between direct schooling-income intended to measure how variables impact and generate income variations directly in the progress of the project. The research is mainly empirical evidence through mathematical, statistical and economic analysis. The results confirm the theory of human capital through the impact of higher level of education on income of individuals in their work. In the case of Tlajomulco de Zuniga, the results show how it is important to invest in education from an early age because this will impact positively in the future of society as a whole.*

**Keywords:** human capital, decentralization of education, Tlajomulco de Zuniga.

## Introduction

Human Capital is third factor of production and therefore it is essential for growth and economic development of a country. Therefore it requires a thorough and detailed study.

Among the authors who began to study human capital may be mentioned Jacob Mincer (1974) known as the father of human capital, Thomas Davenport (2000), Theodore Schultz (1961) and Gary Becker (1964) mainly. According to Thomas Davenport (2000) in company person is the main thing what gives value to the organization. He also pointed out an importance of investing in education. Thus, in the future an individual in the labor market has the possibility of obtaining greater salary than person that has a lower level of education. Indeed, research and empirical evidence confirms the theory of human capital. In the case of

Mexico there are records of investigations from 2000 which show the positive relationship between income and education.

The *purpose* of this study is to confirm the theory of human capital through the impact of a higher level of education on income of individuals in their work, this by empirical evidence through mathematical, statistical and economic analysis (Damodar, 2010) for the municipality of Tlajomulco de Zuniga, Jalisco.

This paper is divided into five parts. The first part mentions the human capital of the way how it is integrated into the production process and what is its importance for economic growth and development. Then, it analyzes what is the current situation regarding education levels in the country, its comparison with the state of Jalisco and its municipalities. Finally, an outline of the number of schools at different levels of education for the municipalities that make up the Metropolitan Area of Guadalajara (MAG) is presented.

The second part covers the issues concerning the theoretical framework of human capital, from its concept, characteristics, pure Mincer model, determination of rates of return from the function of profit, factors that alter this pattern, reviews and theories that support this focus.

In the third part, the study shows local development and possibility for entities, municipalities to take over sectors such as education, i.e., that the present decentralization and power pass into the hands of the municipalities would benefit to these areas. Furthermore, the process appears followed in the country around this approach over the years and what results has now.

The fourth part is formed primarily by the methodology used and the data of the survey conducted and by explanation of the variables used in the econometric models. After estimating by regression analysis models describing the outcome of each to verify or disprove the theory of human capital is presented.

Finally, a comparison of the results obtained in the analysis with research done to other municipalities in the metropolitan area of Guadalajara is presented. This with the intention of seeing in those municipalities where are presented more variations on the individuals' income.

Fifth part offers conclusions and recommendations for the municipality of Tlajomulco de Zuniga that arise with respect to guidelines to follow or to improve local education, so that people are more prepared and therefore their productivity increases and becomes more competitive in the labor market. The last part collects general information about the municipality of Tlajomulco de Zuniga, the databases of the survey and information on the population by level of schooling and average degree for the country and municipalities in the state of Jalisco.

## **Education in Mexico**

### *Analysis on Education for Mexico and the case of the State of Jalisco*

To provide development and growth in a country it is essential that the population has a high quality education and training. By educational background it can be understood the level of individual's education. In Mexico, it is classified by: Preschool, Primary, Secondary, High School and University. In the latter, postgraduate studies such as masters and doctorates are included. Each level of schooling provides the individual the tools to build the necessary knowledge in academia and when increased this, the person can specialize in a specific area which in the near future will provide benefits. Since it will allow it to become a competitive in the job market, obtain decent jobs, and yet there is a monetary income of the effort made.

In Mexico, education is compulsory up to the high school level, as it marks the Constitution of the United Mexican States (2015) in its third article: "Everyone has the right to receive education. The State - Federation, States, Federal District and municipalities, provide preschool, primary, secondary and upper secondary education. Preschool, primary and secondary education in the basic education; this and the high school are mandatory".

This education requires certain elements needed to be offered to a nation and this is where the Federation is responsible for carrying it out. Ministry of Public Education (SEP) offers society infrastructure for schools, libraries; teaching materials, furniture, teachers, etc. All this requires an expense. This public expenditure on education includes government spending on educational institutions, educational administration and transfers to local authorities.

The National Institute of Statistics and Geography (INEGI) through the National Population and Housing Census (CNPV) presents indicators concerning education that give a national and by state average educational level of the individuals perspective. The following graph shows the average level of schooling captured by CNPV for 2010 is presented (See Fig. 1, below).

Fig. 1 shows the degree average per state of the Mexican Republic. As it can be seen, the national average is 8.63, i.e. on average the population aged 15 years and over in the country has a level of education completed through second grade high school. Taking into account the above, it is a low level and even it can be deduced that the country is poor speaking in terms of education, while making a comparison with the census conducted in 2005 which showed that the national average was 8.1, it has been an increase in the educational level of the nation.

In the case of Jalisco the grade average it stood at 8.78, which was the same as the state of Tlaxcala and took place 16 out of 32 states and a federal district. First is the DF with an average of 10.53, i.e. an average level of a year of high school finished. In Fig. 1 the municipalities in the metropolitan area of Guadalajara (MAG) are integrated. It can be seen that the largest municipality with academic training is Zapopan with 10.38 degrees in average schooling. There is a considerable distance from this with the jump nearly 3 degrees of

schooling. Specifically and in relation to the interests of the investigation the municipality of Tlajomulco de Zuniga is located in third place with its population of 15 years and over with completed secondary, only below Guadalajara and Zapopan. Being a municipality that little integrated into MAG, it can be highlighted the fact that to prepare native society of the municipality is priority of local government.

More specifically and making a comparison of the municipalities of the MAG with others of the state of Jalisco is presented below a box that exposes the 20 highest average rates of schooling State in 2010. As shown in Tab. 1 effectively MAG municipalities are within the top 20 but not continuously. Zapopan and Guadalajara lead the list in that order. The biggest distinction is evident in the place that belongs to the municipality of El Salto as it is in 21st place; this is too far from the average of the other municipalities.

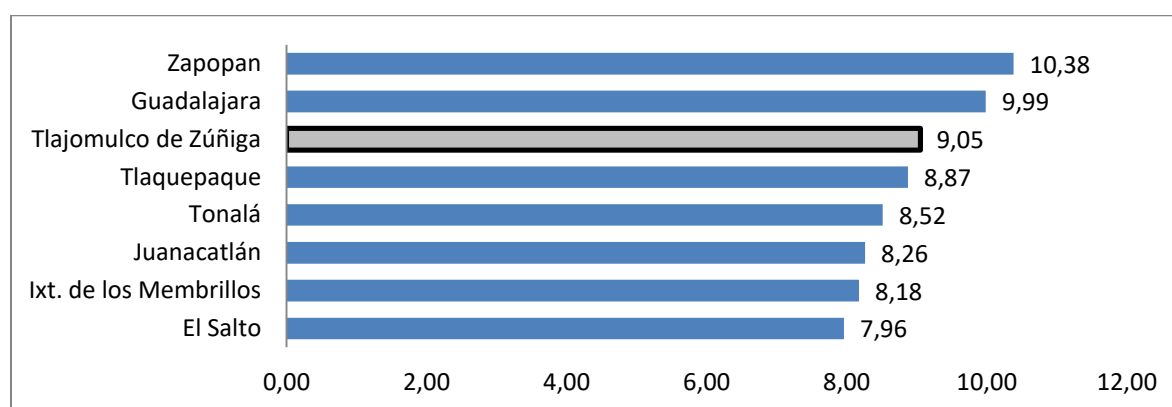


Figure 1 - Average length of schooling for MAG in 2010  
(Results of authors' elaboration based on data from the Census of Population and Housing in 2010 (INEGI, 2010))

### *Education in Tlajomulco de Zuniga*

The infrastructure is a fundamental part for a society to have a quality education, this by building schools and schools from preschool to higher level. The municipality of Tlajomulco de Zuniga in 2010 had 161 pre-schools, 157 primary, 60 secondary schools, 20 high schools and 20 schools in training for work. To analyze the level of infrastructure are presented in the following Tab. 2 the same data for the municipalities that make up the MAG.

The Tab. 2 shows the differences between the municipalities of MAG on the type of schools they have. In preschools, first is the city of Guadalajara, and it is expected this result because it is the state capital of Jalisco and therefore where most of the population is concentrated. In this order, Zapopan, Tlaquepaque, Tonalá and Tlajomulco de Zuniga maintain more than 100 schools each. El Salto, Juanacatlán, and Ixtlahuacán of Membrillos are left behind with less than 100 schools. In the case of Tlajomulco de Zuniga, its level of schools could be accepted due to the growth experienced in recent years. The population begins to clump together in the region and the demand for education is evident.

In the case of primary schools, the same order is maintained. Only Tlajomulco de Zuniga scale up one place and let down the municipality of Tonalá. With regard to secondary schools the order is maintained in Guadalajara by having 232 followed by Zapopan, Tlaquepaque, Tlajomulco de Zuniga, Tonalá, El Salto, Ixtlahuacán of the Membrillos. As it is noted, as the level of education increases the number of schools decreases in the municipalities. In high school the order remains constant only that the school type training for work is zero in the municipality of Juanacatlán and also in its previous level of education.

Table 1 - Average length of schooling for the municipalities of Jalisco in 2010  
(Own elaboration based on data from the Census of Population and Housing in 2010, INEGI (2010))

| Rank | Municipality         | Average degree of schooling | Rank | Municipality                  | Average degree of schooling |
|------|----------------------|-----------------------------|------|-------------------------------|-----------------------------|
| 1    | Zapopan              | 10.38                       | 14   | Ixtlahuacán de los Membrillos | 8.18                        |
| 2    | Guadalajara          | 9.99                        | 15   | Etzatlán                      | 8.14                        |
| 3    | Zapotlán el Grande   | 9.44                        | 16   | Acatlán de Juárez             | 8.14                        |
| 4    | Puerto Vallarta      | 9.36                        | 17   | El Grullo                     | 8.12                        |
| 5    | Tlajomulco de Zuniga | 9.05                        | 18   | Tuxpan                        | 8.11                        |
| 6    | Tlaquepaque          | 8.87                        | 19   | Colotlán                      | 8.09                        |
| 7    | Autlán de Navarro    | 8.64                        | 20   | San Marcos                    | 8.00                        |
| 8    | Chapala              | 8.63                        | 21   | El Salto                      | 7.96                        |
| 9    | Tonalá               | 8.52                        | 22   | Tequila                       | 7.95                        |
| 10   | Ocotlán              | 8.42                        | 23   | Ameca                         | 7.94                        |
| 11   | Juanacatlán          | 8.26                        | 24   | El Arenal                     | 7.89                        |
| 12   | Sayula               | 8.24                        | 25   | Amatitán                      | 7.86                        |
| 13   | Ahualulco de Mercado | 8.23                        |      |                               |                             |

Table 2 - Schools preschool, primary, secondary, high school and training for the work of the GMA

(Own elaboration based on data from INEGI, 2010)

|             | Jalisco | Zapopan | Guadalajara | Tlajomulco de Zúñiga | Tlaquepaque | Tonalá | Juanacatlán | Ixt. de los Membrillos | El Salto |
|-------------|---------|---------|-------------|----------------------|-------------|--------|-------------|------------------------|----------|
| Preschool   | 5378    | 623     | 768         | 161                  | 252         | 179    | 11          | 21                     | 62       |
| Primary     | 5937    | 521     | 715         | 157                  | 204         | 167    | 15          | 23                     | 64       |
| Secondary   | 1910    | 192     | 232         | 60                   | 63          | 41     | 4           | 9                      | 19       |
| High school | 758     | 95      | 145         | 20                   | 32          | 18     | 0           | 3                      | 5        |
| Training    | 623     | 64      | 290         | 9                    | 30          | 14     | 0           | 3                      | 3        |

With this explanation it can be concluded that the municipality of Tlajomulco de Zuniga is located in the fourth place of all municipalities from MAG. This position was for the year 2010. Education in this part of Jalisco it is good compared to the municipalities of smaller population or for whatever reason they are lagging behind in support from the State or the Federation.

## **Theoretical framework**

### ***Introduction to the concept of human capital***

Economic growth can be defined as the increase in income and services produced in an economy in a given period. Within the production process 3 production factors are involved. These are: land, labor and capital. The land is represented by all soil resources, mining and natural in general. The value of land depends on many factors such as proximity to major urban centers, availability of natural resources, climate, etc. The work factor integrates all the capabilities of the worker as physical, mental and humanities that are necessary for the production of goods and services. This effort of the worker intends to obtain economic benefit, in this case, a monetary benefit interpreted as income.

The capital is essential for economic growth. This is the result of the accumulation of human production and through which productive assets and services that serve to generate wealth and improve the quality of life of a society will be obtained. One can distinguish three kinds of capital:

Physical capital  
Human capital  
Financial capital

### ***Concept of human capital***

The concept of human capital is defined as the knowledge, talents, skills and abilities in which the individual invests throughout his life to satisfy his personal welfare and increase productivity in the labor market. This investment is mainly in education, and in addition to improvements health, culture, higher social status and prestige.

Initially human capital was seen as a factor of production, where no knowledge is required prior individual had acquired in an educational institution. Thus, the physical capacity only cared that this had to work. Adam Smith (1819) disagreed with this concept: the individual insisted to drive economic activity through the skills for which acquiring he paid a price. These skills became fixed and realized capital (Keelay, 2007, p.30). For capitalism only labor generated for economic growth is essential. It has to be noted that individual will be interested to get skills, talents, knowledge, causes productivity of this work area, increases benefits in production processes. To quote Adam Smith (1819):

"The annual product of labor of any nation can increase in value, increasing either the number of productive workers or the productive forces of those workers who have been employed previously. It is evident that the number of productive workers could never increase if not as a result of increasing capital funds to keep the productive forces of the same number of workers cannot be increased but as a result of either the increase and improvement of the machines and tools that facilitate and reduce the work or a more appropriate division and distribution of employment, in any case, an additional capital is almost always required. "

Gradually, it shows an importance of human capital, because firstly the theory was criticized due it's representing of capitalists' interests. Thus, the issue drew the attention of approaches of Theodore Schultz (1961), Gary Becker (1964) and Jacob Mincer (1974), which provided knowledge and stressed the importance of human capital. On the one hand, the work of Schultz emphasized that human capital, specifically education, was a key pillar to economic growth of a nation. Also for Schultz, the investments made in education would ensure positive rates of returns. Meanwhile Becker, in addition to supporting the work of Schultz, said the family nucleus is like a business, because parents invest in better education for their children to increase their future income.

### *Characteristics of human capital*

For the Theory of Human Capital (THC), investment in education increases an individual productivity in work area, i.e., the more years of schooling has accumulated the increase in income will be higher compared to the individual who has no studied (Thurow, 1975). Investment in education will be given to the point where the individual notes that the marginal return on this investment is greater than or equal to the rate of return on alternative investments, i.e. that benefits from study are greater than engage in other activities.

For THC capabilities that comprise a person are developed throughout his life, this is clear, through education, but there are some "skills" that could be defined as innate because every human being developed better in other activities for the environment that has surrounded him all his life, without learning that requires any investment. Davenport (2000) emphasizes that human capital is composed of an equation which integrates the ability. This is composed by knowledge, skill and talent of the individual. Knowledge that is that intellectual context interact the individual, skill where the person develops in an activity with ability, intelligence and disposition, and finally the talents are those innate abilities that the person has special in some activity (Fig. 3).

However, human capital acquired by the individual cannot be stolen. But this human capital should continue to grow, being updated, because otherwise the new information, technological innovation, new social problems, among others, would leave obsolete the individual and his chances of getting an opportunity in the labor market would decline in a way more than proportional. The fact to study brings many benefits; these can be classified as monetary and nonmonetary. Within the monetary benefits include the following: by

increasing his knowledge through a level of education an individual productivity in the labor markets increases and thus the salary will also rise proportionately.

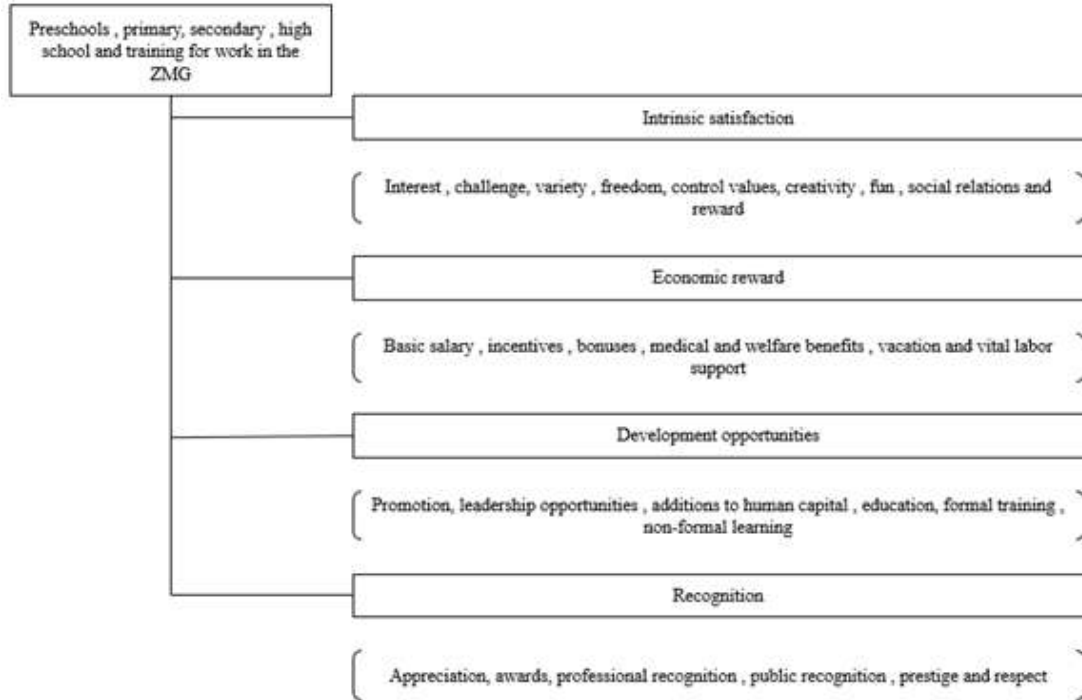


Figure 3 - Return on human capital  
(Contreras (2000, 19))

As can be seen in Fig. 4, increasing the level of education stimulates the salary of the worker and makes him more competitive. Speaking in terms of human capital without monetary benefits of increasing levels of education, this would not exist. Another benefit is that by increasing the level of knowledge, the individual grows and develops cultural skills, financial, health, social, among others, that make a human being more capable and interested in their social environment. See Fig. 4.

Now, within these non-monetary benefits are as follows: better health care, food consumed cultural and social activities that are performed. Apart from this the individual to increase his salary access to other interests, like going to plays, exhibition galleries, access to training and class changes (social lifts).



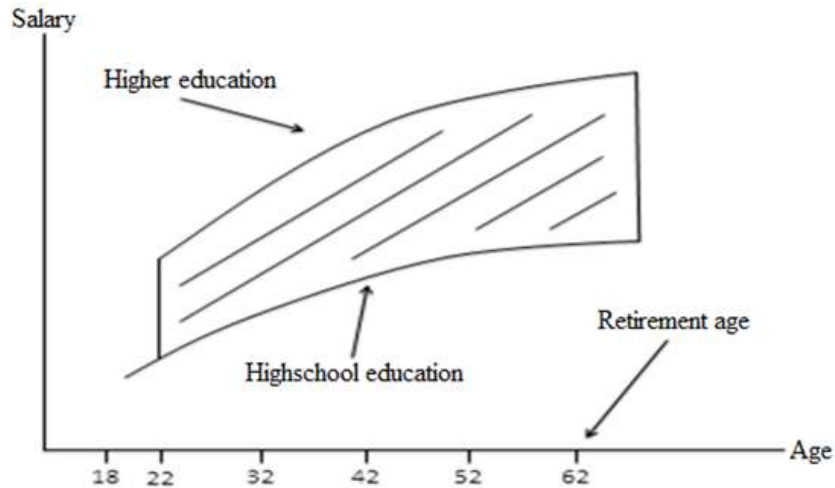


Figure 4 - Profile of income by level of education of the individual  
(Lassibille, 2004)

### ***Internal rate of education returns***

In short, some of the most important ideas for the human capital which have a direct impact on income and labor supply are as follows:

- a) The time devoted to work activities will increase because higher education suggests higher wages for workers.
- b) Having a higher education level in the job will be more and there will be a reduction of unemployment.
- c) The individual who has a lot of knowledge and a high level of education also load more years of life and to increase his employment opportunities that exist in the experience, training and skills for better jobs.

### ***Model of human capital***

In the THC in income level of the individual will not depend solely on the level of education. In addition to this there are other variables such as experience, skills to reinforce or learn to perform these activities; knowledge captured by the new information provided will cause that human capital increase ever. This will make it more competitive in the labor market. Time is a key factor for human capital and is not describable by a static model in the market for educational services. It requires a dynamic optimization model that defines as investment in human capital leads individuals to perceive better future income. In this way the individual will invest in education until it is fulfilled for the marginal unit of education equation:

$$\int_0^t C_i e^{-ri} di = \int_t^T R_i e^{-ri} di \quad (1)$$

Where:

$C_i$  = Is the cost of the marginal unit of education and training in the period  $i$ .

$R_i$  = The performance of such training in the  $i$ th period.

$r$  = Is the interest rate.

Suppose  $t$  is years-long education and  $T$  is the time when the individual decides to work. If  $i = 0$ , the base period is the one where education begins. As such, the individual will invest in education to the point where the marginal unit of education is met. This model of investment in education can deduce that: the larger the distance between  $t$  and  $T$  performance will be higher because the knowledge gained will be reflected in the level of wage compensation. Within the horizon time,  $T$ , it may be mentioned that the earlier it start investing in education, performance is maximized because the years to be allocated to the labor market will be at an early age and have no impact on factors such as health, aging, human capital updated, among others.

### ***Model of schooling***

At first it was assumed that the human capital of the individual was acquired only in the period of schooling and investments are concentrated in the early years of his life. At the end of these years begins productive activity that extends to the retirement stage,  $T$ ; during the  $(T - s)$  years of professional life the individual does not invest in some training. With this, coupled with the hypothesis that human capital does not depreciates by making use of it throughout his life can be inferred that the compensation profile is flat in this work stage.

This is expressed as follows:

$$LnE_t = LnE_0 + \sum_{j=0}^s r_j k_j \quad (2)$$

Assuming that the production costs of training in education are integrated by the opportunity costs, and then  $K_j$  is equal to one and have the following:

$$LnE_t = LnE_0 + \sum_{j=0}^s r_j \quad (3)$$

In this equation  $LnE$  represents the expected income logarithm;  $r_j$  is the marginal rate of return on investment applied in the school year  $j$  y  $\sum r_j$  and represents the performance of all school years.

The latter can be defined as:

$$\sum_{j=0}^s r_j = r_s s \quad (4)$$

Thus the potential income is shown as follows:

$$\ln E_t = \ln E_0 + r_s s \quad (5)$$

And the net income of the individual can be expressed as:

$$\ln Y_t = \ln Y_0 + r_s \quad (6)$$

For the application of this model in the investigation, its expression is as follows:

$$\ln \text{ing} = f(\text{Esc}) + \varepsilon \quad (7)$$

$$\frac{\delta \ln \text{ing}}{\delta \text{Esc}} > 0$$

Where:

$\ln \text{ing}$  = expected income natural logarithm

$\text{Esc}$  = Schooling

$\varepsilon$  = error term disturbance

This model relates linearly the logarithm of income of the individual with years of schooling. Thus with the econometric estimation performance is evaluated investment in education.

### ***Experience model***

Throughout its productive stage the individual acquires knowledge in the labor market that can be defined as experience. So in the initial human capital hypothesis regarding schooling in relation to income this new variable that influences positively integrates with income this function is defined as:

$$\ln E_t = \ln E_0 + r_s s + \sum_{j=s+1}^{t-1} r_j k_j \quad (8)$$

Where  $\sum r_j k_j$  represents the total contribution of professional investment income, which can be expressed as follows:

$$\sum_{j=s+1}^{t-1} r_j k_j = r_p \sum_{j=s+1}^{t-1} k_j \quad (9)$$

Based on the theory of investment in human capital, the proportion of income invested during each period ( $k_j$ ) decrease over the life cycle of the individual. With support from Mincer, professional investments made at a time ( $j$ ) can be represented by a linear function decreasing with time spent in the labor force:

$$k_j = k_0 - \left(\frac{k_0}{T}\right)j \quad (10)$$

Where ( $k_0$ ) is the gross income invested during the first period of professional life, ( $j$ ) measure the years of professional life and ( $T$ ) the total investment period. Gross income is expressed by a parabolic function dedicated to the professional life, where:

$$LnE_t = LnE_t + r_s s + r_p k_0 t - \left(\frac{r_p k_0}{2T}\right)t^2 \quad (11)$$

So net income (gross income - training costs):

$$Y_t = E_t - C_t = E_t(1 - k_t) \quad (12)$$

In this model the performance of education and experience of the individual's income is estimated.

### ***Mincer model***

The analysis of education yields requires tools that verify the benefits that this entails contrasted with reality. In 1974 Jacob Mincer unveiled an equation which helped analyze and quantify these yields. To determine this equation Jacob Mincer (1974) took two fundamental approaches. These were: the skills that determine the individual's income are observable and these are not normally distributed. Before conceptualizing the model, Mincer (1974) defined the importance of age-income and income-education, called Mincerian income functions. In these functions is related personal income ( $Y$ ) of the individual to the years of schooling ( $Esc$ ), expressed as follows:

$$Y_i = f(ESC_i) + \varepsilon_1 \quad (13)$$

To this function must be added a variable representing the post-investment period called years of experience ( $Exp$ ), which is expressed as age minus years of schooling minus 6, that is:

$$Exp_i = (Edad_i - Esc_i - 6) \quad (14)$$

Thus the model of human capital (CH) would be expressed as follows:

$$Y_i = f(Esc_i, Exp_i) + \varepsilon_i \quad (15)$$

Where:

$$\frac{\partial Y}{\partial Esc} > 0, \frac{\partial Y}{\partial Exp} > 0$$

In this model they are left out dummies or not dummy like gender, sector of employment, informal employment, etc., while important to investigate specific issues are not taken into consideration for the human capital at first (Cortes, 2002). The equation Mincer (1974) defines estimated by ordinary least squares (OLS) a semi log model. Here the dependent variable is income and this is expressed in logarithm. This logarithmic transformation of income leads into the model consideration of normality in statistics. It is also easier to work with her in the regression models and interpret the estimated coefficients in relative terms. The independent variables are the years of schooling, work experience and work experience squared. This is represented as follows:

$$Lning = \beta_0 + \beta_1 Esc + \beta_2 Exp + \beta_3 Exp^2 + \varepsilon \quad (16)$$

Where:

ing = Individual income

Esc = Years of schooling

Exp = Years of work experience

$\varepsilon$  = error term

In this model it is showed that each additional year that the individual invests in education will delay the benefits he gets as his income, yet this will be offset by increased income to join the labor market. However, the experience variable is taken into consideration because it represents the learning of people in terms of age. Experience variable squared refers to the individual's income increase, but decreasing order, i.e., there comes a time where worker productivity begins to decrease and thus his income also because of his age.

For Mincer (1974), the individual's income increased through two pathways. One is through education that invests in school and which is required in the labor market, and the other is more specific, where the experience acquired in the workplace and skills provides greater productivity by increasing income also.

***The endogenous character of education***

In the above problem it is drawn the possibility of observing a history of certain individual's life cycle of a single individual to alternative educational investments, so it is suggested that one should conform to observe only the path by the individual's expected income has been chosen a level of schooling and taking into account that this decision is based on income potential and opportunity costs. Selection bias raises another problem called endogeneity of education. For human capital theory education is seen as the result of an optimization process which emphasizes that each individual will have his level of investment depending on his capabilities and opportunities provided for the instrument. Within the model of human capital the cause of determining the schooling level is unknown and assumed that this is an exogenous variable.

Thus it can be said that there are factors that cannot be observed as are those of individuals or family factors that directly affect education and salary level features. As a result, estimates by Mincer method remain biased. Then the correlation that occurs between wages and schooling of individuals cannot be interpreted within a function of income and the effect that education generates on wages of people because they cannot be attributed only to this variable all impact as there are individuals who have a less education than other.

To correct this problem of education endogeneity is presumed using the called instrumental variables. This has the aim to find a variable that is correlated with the level of education and is independent of the error terms of the earnings equation. This process is performed as follows:

$$\ln \text{ing} = \alpha + \beta s + \tau \quad (17)$$

With:

$$s = c + dZ + v \quad (18)$$

Here the variable Z directly affects the level of schooling, but has no effect on earnings less than it is through education. The process is in first to estimate the effect of the instrument on education and then to have the effect of this instrument on earnings.

**Local development*****Definition of local development and decentralization***

At first it must define the word "local".

José Arocena refers local to a correlative notion global. Here, more specific aspects are integrated. For there, local development must have local actors to take charge of the construction processes of collective identities. As local actor we understood individuals, groups or institutions acting in a local society to improve their quality of life. Fernando Barreiro (1988) defines three categories of local actors:

- 1) The actors linked to decision-making (political and institutional)
- 2) The actors tied to particular techniques (experts-professionals)
- 3) The actors linked to the action on the ground (the active population and all its expressions)

More specifically Arocena (1988, p 26) defines local actor as an "Agent in the field of political, economic, social and cultural are carriers proposals that tend to better capitalize on local potential. Indeed, it is an advantage the better use of resources, but highlighting the quality of the processes in terms of natural and social equilibrium ". As mentioned by this author, in local development is intended to help local actors to present an improvement in economic, social, cultural terms, among others, from within, that is, from the local level, the endogenous that can be interpreted as municipalities. While it is true that the colonies are more within a municipality, it is the latter that is responsible for providing the necessary services so that they work in the best possible way.

Now, the players have local development initiatives with the intention to take part greater autonomy from the Federation. This process of transferring tasks and functions to municipalities can be defined as decentralization, where power is not concentrated in a few governing bodies, but specific tasks are defined to the states which make decisions on their own, but without avoiding the maximum power. In the case of Mexico the decentralization process has not been established and is in the process of definition, but there is evidence that in the municipalities of the border and in the center there has been a process of administrative modernization and it was extended designing development policies.

### ***Attempted decentralization in Mexico***

The need for reform at the national level to promote local development has increased in recent years, as the result of three factors.

First, in the context of globalization of the economy, it requires reorganization relations between the nation-state and state-local.

Second, the economic crisis that Mexico has suffered in recent years has impacted large urban areas where the benefits of economic growth concentrated. Due to the crisis, the presence of unemployment, lack of social welfare and agglomeration has given rise to territorial horizons expanded to promote economic growth.

Thirdly, there is a problem because the crisis brings financial conflicts that make the nation-state incapable of inducing the municipalities for optimal local development and as a result backward and regional inequalities to develop. Despite all this, the central government was able to present a decentralization strategy in 1983 amending article 115 of the Constitution to cede greater autonomy and responsibilities to municipalities. This process is linked to the international environment that seeks to equally allow endogenous development to strengthen and support the growth and development of a nation. Para the year 1992 the National Agreement for the Modernization of Basic Education and Normal (ANMEB) was

published where the federal government, states and the National Union of State Workers (SNTE) agreed that the education system had reached its exhaustion after 70 years.

In this model presented central authority would follow up his duties as responsibility for educational plans and programs, wage bargaining, substantive aspects of the teaching profession, control of fiscal resources for education, while the states would be responsible for the operational aspects as well as the option to add own content to the education system with a previous analysis of the central authority. The agreement raised four strategies:

- 1) Increase education spending by both the federal government and state.
- 2) Reorganization of the education system, with two axes:
  - Educational Federalism, which transfers to state governments the schools, material and financial resources of basic and normal education, leaving the responsibility of central government regulations.
  - Social participation, comprising teachers, parents and authorities to achieve greater involvement of the community to the proper functioning of schools.
- 3) The development of contents and educational materials; reform of content and methods in preschool; curricula and textbooks of primary, replantation program by subjects in secondary, rather than areas.
- 4) The re-evaluation of the magisterial function: update, professional salary, housing, social teaching career and appreciation for its work (Fierro, Tapia, and Red 2009).

Little progress was the initiative, as the central authority outlined the obligations for states and just after years the transfer of operational functions was only allowed. This is part of the decentralization that is required in local development.

## **Methodology and research data**

### ***Research data***

The data analyzed in the following section was obtained in a survey conducted in 2008 in the town of Tlajomulco de Zuniga. This set of questions was applied to a sample of the population of the municipality. With a total of 150 surveys randomly throughout the municipality to people over 18 yo, 123 were taken for analysis for the 27 missing had errors in their registration by the respondent.

Following are defined the variables used in the regression models:

Lning. Income individuals in terms of logarithm to facilitate the use of variables to perform econometric analysis.

Esc. Level of education of the individual. This variable is defined by grades of each level of study, i.e. it starts from the primary taking these 6 years of learning, in junior high school three years learning and high school 3 years as well. From the top level or degree varies the exact reference and it is why not determine the years of this level of schooling. This explains the variable that will be used in the variable of integrated experience for its calculation.



Age. Variable defined in completed years of the individual.

Age2. Variable created based on the high age squared.

Exp. This created and based on the time the individual has spent working on the labor market. The following was used for definition:  $Exp = (Age - \text{Grados of schooling} - 6)$ .

Exp2 = Squared experience.

Gen = Gender is defined by gender (male = 1, female = 0).

Cap = Training the individual at some point in their working lives (trained Individual = 1, untrained individual = 0).

Each one is used in the 9 models that estimate and analyze the results with the intention to verify the theory of human capital. See Tab. 3.

Table 3 - Statistical variables used in the regression models  
(Based on data obtained from the survey applied research)

|                    | Edad       | Edad2      | Ingreso    | Lning       | Exp        | Exp2       | Esc       |
|--------------------|------------|------------|------------|-------------|------------|------------|-----------|
| Media              | 33.2276422 | 1265.19512 | 4412.60163 | 8.12183591  | 17.9       | 532.238    | 9.3276423 |
| Median             | 30         | 900        | 3750       | 8.22951112  | 16         | 256        | 9         |
| Maximum            | 65         | 4225       | 15250      | 9.63233478  | 59         | 3481       | 21        |
| Mínimum            | 16         | 256        | 750        | 6.62007321  | 0          | 0          | 0         |
| Standard deviation | 12.7451778 | 972.447004 | 3212.10309 | 0.78935604  | 14.6138717 | 727.996245 | 4.079724  |
| Curtosis           | -0.4720007 | 0.83231336 | 2.40382219 | -0.15340661 | -0.193225  | 3.30342929 | 0.2694429 |
| Slant              | 0.69839027 | 1.2388449  | 1.4942101  | -0.5013929  | 0.802276   | 1.8802955  | -0.144    |

***Influence of schooling, experience and experience squared on the natural logarithm of personal income***

The incorporation of variable experience to the full square the basic model HC with this is explained by the empirical evidence if there is an impact of these on income directly and simultaneously as each one influences. The theory states that schooling is positively related to income, as well as experience. The experience squared meanwhile must relate negatively as it is created with the intention to verify the impact of the individual to increase his lifetime.

$$Lning = \alpha + \beta_1 Esc_1 + \beta_2 Exp_2 + \beta_3 Exp_2^2 + \varepsilon \quad i = 1,2, \dots, 123 \quad (19)$$

Where:

Lning = Natural logarithm of personal income.

$\alpha$  = Intercept (ordered in the origin) Mincerian function of personal income.

Esc = Degree of education of the individual.

Exp = Experience of the individual.

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Exp2 squared = Experience.

$\alpha$  = Variable typical minimum disturbance in quadratic models with normal distribution, zero mean and constant variance:  $\varepsilon \sim N(0, \sigma^2)$ .

$$Lning = f(Exp, Exp2) + \varepsilon$$

$$\frac{\delta Lning}{\delta Exp} > 0; \frac{\delta Lning}{\delta Exp^2} < 0$$

Table 4 - Coefficients and statistical estimated by model OLS  
(Authors elaboration based on data obtained from the survey applied research)

| Variable | Coefficient | Standard error | Statistic t | Probabilility p |
|----------|-------------|----------------|-------------|-----------------|
| Esc      | 0.052571    | 0.020128       | 2.611847    | 0.0102          |
| Exp      | 0.056079    | 0.014793       | 3.790824    | 0.0002          |
| Exp2     | -0.000971   | 0.000297       | -3.266086   | 0.0014          |
| Constant | 7.147624    | 0.271945       | 26.28330    | 0.0000          |

|                                 |          |
|---------------------------------|----------|
| R2                              | 0.144278 |
| R2 Adjusted                     | 0.122705 |
| Typical error of the regression | 0.739343 |
| Summ of squared residuals       | 65.04870 |
| Statistic Durbin-Watson         | 1.781897 |
| Media of variable dependent     | 8.121836 |
| Statistic F                     | 6.687927 |
| Statistic probability F         | 0.000328 |
| Sample size                     | 123      |

$$Lning = 7.147624 + 0.052571Exp + 0.056079Exp^2 - 0.000971Exp^3 \quad (20)$$

The data obtained from the estimation show that the three variables almost constant have a very good chance for all are significant at levels greater than 99%. The whole model is significant because the probability of the F statistic confirms with 0.000328 as a result. Signs of the variables satisfy the hypothesis, schooling is positive, so is experience and squared experience remains negative for the reasons described above.

However, the coefficient estimates regarding the relationship posing with expected income defined for every year of schooling income increased by 5.2% approximately. For each year of experience will be an increase in income of 5.6% but at once this decrease by 0.09%. The R<sup>2</sup> register a score of 0.1444 which says that the three variables together explain 14.44% of changes in personal income expected. This is very good because if a comparison with the previous model the schooling variables and experience is represented only 6.7% overall.

By an operation it is shown how predictive is the model. For this case the following operation is performed:

$$\frac{0.739343}{8.121836} = 9.10\%$$

With this result it is concluded that the productive capacity of the model is 9.10%. With regard to the theory that makes a relationship of this model which presents graphically a concave curve in terms of personal income in logarithm and experience which suggests that at older age the increase in personal income expected will be at diminishing marginal rates since human capital is depreciated over the years as described in the following:

Initially it is the result of the regression model:

$$Lning = 7.147624 + 0.052571Esc + 0.056079Exp - 0.000971Exp^2$$

From this is derived the experience variable with respect to the logarithm of income:

$$\frac{\delta Lning}{\delta Exp}$$

The result is:

$$\frac{\delta Lning}{\delta Exp} = 0.056079 - 0.001942Exp$$

With this will be determined the age at which the curve reaches its maximum and thereafter begins to decline the result of the decreasing rate. Here equals 0:

$$\frac{\delta Lning}{\delta Exp} = 0.056079 - 0.001942Exp = 0$$

$$\delta Lning / \delta Exp = 0.056079 - 0.001942Exp$$

Performing algebraic operations remains a division as follows:

$$\frac{0.056079}{0.001942} = 28.8769 \sim 28 \text{ years}$$

This result means that after 28 years in the survey the income will tend to decrease. Perhaps it is critiqued which is a very early age as the other empirical evidence shows that on average the maximum age is between 50 and 55 years old. In the case of this research it should be noted that people who is registered in the survey are young people who do not have much experience and which will come a few years of life speaking in terms of human capital. Yet the theory is true and the evidence confirms it.

The graph below in Fig. 5 shows the above:

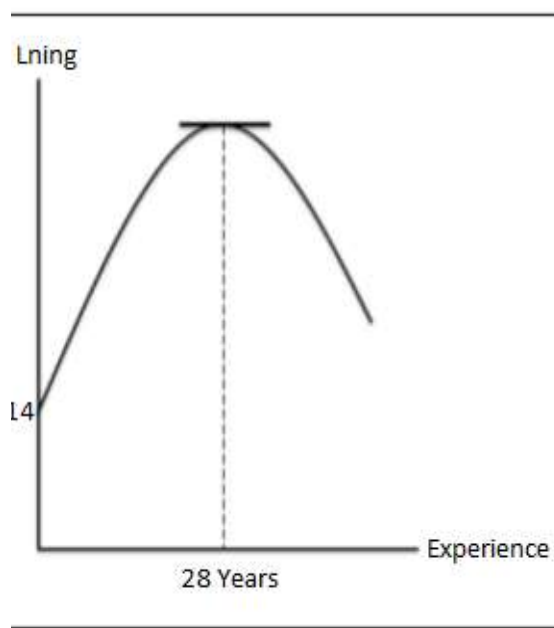


Figure 5 - Relationship between the logarithm of expected income and experience  
(Own elaboration based on data obtained from the survey applied research)

### *Comparison studies in Jalisco on the Theory of Human Capital*

Until recently the Human Capital Theory had not been applied about whether its determination for the Mexican case was true or not. Because of this began to conduct research to test the theory in the country and particularly in the case of the state of Jalisco. Nationwide data from 1996 to 2005 based on the expanded role of the Mincer model which is composed of the variables of education, experience and squared experience obtained. The following Tab. 5 shows the results obtained:

As estimates for 1996, 1998, 2000, 2002, 2004 and 2005 show and verify the theory of human capital results shown in the table 5. Schooling variable is positively associated with the expected income of the individual, because of its direct effect on income is between 10% and 11.5%, and is to tell the schooling represented for those years an average of 10.86% increasing each year education in which the person invested. In the case of experience variable this maintains a positive relationship in the same way as brand theory and the percentage changes over the years studied range from 1.1% to 1.9%. This result may seem very low, but in reality the idea that the experience has a direct and positive effect on the expected income people met, while the result remains positive is valid for research.

**Table 5 - Results of Mincer human capital model for Mexico**  
(Return on investment in human capital: The case of Ciudad Guzman, Jalisco (Diaz Sanchez, 2009))

|      | Schooling | Experience | Experience |
|------|-----------|------------|------------|
| 1996 | 10.2%     | 1.6%       | -0.2%      |
| 1998 | 10.1%     | 1.9%       | -0.2%      |
| 2000 | 10.4%     | 1.6%       | -0.1%      |
| 2002 | 11.1%     | 1.9%       | -0.2%      |
| 2004 | 11.9%     | 1.1%       | -0.1%      |
| 2005 | 11.5%     | 1.3%       | -0.1%      |

The variable squared experience with its negative sign marks the effects of age and schooling on income, but the result shows that it is very little compared the impact of experience variable. The recorded result explains that the variable affects and creates a decrease in the income of individuals from 0.1 to 0.2% for the years described. Now, for the results of the THC in the state of Jalisco a series of investigations were conducted in several municipalities, these were: Guadalajara (1997), Tlaquepaque (2001) and Zapopan (2003) developed by Dr. Hector Cortes Fregoso, Ciudad Guzman (2007) by Rosario Diaz Sánchez (2013), El Salto by Ulises Osvaldo de la Cruz Guzman, Tonalá (2013) by Marta Sotelo and Tlajomulco de Zuniga by Victor Hugo Garcia Oliva (not published manuscript).

The results are shown below in Tab. 6:

**Table 6 - Results of Mincer human capital model for the municipalities of Jalisco**  
(Own elaboration prepared with data from several studies about human capital)

|                      | Schooling | Experience | Esperience |
|----------------------|-----------|------------|------------|
| Guadalajara          | 9.6%      | 1.7%       | -0.0089%   |
| Tlaquepaque          | 13%       | 4%         | -0.034%    |
| Zapopan              | 7%        | 2.3%       | -0.4%      |
| Ciudad Guzmán        | 9.5%      | 5%         | -0.8%      |
| El Salto             | 7.7%      | -2.9%      | 0.6%       |
| Tlajomulco de Zúñiga | 5.2%      | 5.6%       | -0.09%     |
| Tonalá               | 6.9%      | 1.8%       | -0.04%     |

Again, it is met the assumption that marks the theory of human capital concerning the impact of the variables schooling and experience on income of individuals.

In the results of Table 6 it can be seen that the municipality in which the school has a greater impact on income is Tlaquepaque with 13%. Hence, Guadalajara and Ciudad Guzman follow with coefficients of 9.6 and 9.5% respectively as the highest, while Tlajomulco de Zuniga ranks as the lowest, but the result if it hits the salary. Tonalá resulted in a considerable percentage of 6.9% which suggests that although it is a municipality whose main activity is the craftsmanship, an impact is generated if the person has more schooling.

Regarding the variable experience there is a complete change as the municipality that resulted highest coefficient is Tlajomulco de Zuniga with 5.6% which explains the variations of this with the expected income. Second, it is positioned Ciudad Guzman with 5% and Tlaquepaque with the third. In this shift is the last place with 1.7% Guadalajara with what it

can be concluded that for some municipalities, experience is higher and schooling lower as factors that positively affect salary. Finally, squared experience keeps its negative relationship and the municipality of Guadalajara once again holds the lead to only decrease at a rate of 0.0089 of the income for each year of life that the individual has, the last place is held by City Guzman with -0.08%.

Making a comparison of the municipalities studied with the results of research conducted at national level, it can be commented that there is a relationship with the variables and results. With the level of schooling an average result is shown, i.e., not away between coefficients for both areas. With experience it is noted a slight increase for the results of the municipalities, but this is accepted and in the end the squared experience it remains the same similarly.

### **Conclusions**

The Theory of Human Capital as a tool to measure the impact of education on the expected income of the people is valid and demonstrates how impacts through the empirical evidence shown in this research. Estimates confirmed how education and experience determine changes directly on the expected income of individuals.

In the case of Tlajomulco de Zuniga, the results show how its important to invest in education from an early age because this will impact positively in the future for society as a whole. In this municipality and according to the econometric estimates that were made to the basic model of human capital, for each year of schooling is expected that income increase by an average 5.2%, experience equally to increase by 5.6% but at the same time present a decrease of 0.009% with squared experience on expected income. This is due to deterioration or depletion of human capital that occurs with increasing the age of individual, decreasing their skills and abilities

It is important to mention that the decentralization process in which is currently working at the national level maintains a positive outlook. The efforts made with the intent to disrupt key sectors such as education and which states take charge are aimed to better results in terms of educational quality. For the state of Jalisco, it is still much to work on, but municipalities are working for this change to be generated from the endogenous.

That said and verifying that the investment in education generates high returns for both the individual and the population as whole, municipalities should focus on proposing in their municipal development plans support to the education sector and also a request to the federal government for granting both financial and administrative support. For its part, the creation of local academies and training courses for members of a locality is key elements if it is want to increase the productivity of individuals.

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*Paper submitted on 02 September 2016*