



Analysis of Labor Informality in Villavicencio, Colombia (2015-2018)

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Abstract

In this article the socioeconomic profile of the employed population in the informal sector of the municipality of Villavicencio (Colombia) is determined, and for this, the data obtained from the Great Integrated Household Survey GEIH (2015-2018) are used and a probit model is applied. It is concluded that being a woman, having a low level of education, earning low income, being single, working more hours per week, not having a work contract, not having a retiree plan, belonging to the subsidized health regime, increase the probability of being in the informal labor market.

Keywords: labor economics, informality quality of employment, probit model.

Classification JEL: C25, E26, J1, J3, J81.

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Análisis de la informalidad laboral en Villavicencio, Colombia (2015–2018)

Resumen

En este artículo se determina el perfil socioeconómico de la población ocupada en el sector informal del municipio de Villavicencio (Colombia), para ello, se utilizan los datos obtenidos de la Gran Encuesta Integrada de Hogares GEIH (2015-2018) y se aplica un modelo Probit. Se concluye que ser mujer, tener un bajo nivel de educación, devengar bajos ingresos, estar soltero, laborar más horas por semana, no tener contrato laboral, no cotizar para pensión, pertenecer al régimen subsidiado de salud, aumentan la probabilidad de estar en el mercado laboral informal.

Palabras clave: economía laboral, informalidad, calidad de empleo, modelo probit.

INTRODUCTION

Informality is a condition experienced by countries with weak economic structures, which do not have the capacity to absorb most of the labor offered, forcing them to stick to this sector as an escape valve to generate income.

The consequences of this situation are related to the capacity of the State in the generation of income: the increase in the retirement age -because most of the population that is in informality does not belong to the retiree system-, the poor quality of employment; low income levels that do not allow to escape from monetary poverty; the occupation of public space and mobility problems, among other causes.

In the city of Villavicencio this phenomenon occurs in a greater proportion compared to other cities; according to [García \(2011\)](#), due to low industrialization, and also because this region is dependent on the agricultural sector and there is a high institutional presence (state size), which raises the level of

bureaucracy and red tape for the formalization of companies.

This research focuses on identifying the socioeconomic profile of the employed population in the informal sector in Villavicencio for 2015-2018, through the characterization of this population and the estimation of the parameters that affect informality. The starting point is that circumstances such as a low educational level, being old and being a woman, are factors that have a positive impact on informality.

There are different definitions of informality that have been used in the literature, among which are those proposed by the Regional Education Project for Latin America and the Caribbean (PRELAC) and those used by the National Administrative Department of Statistics (DANE).

For the purpose of this research, DANE definition was used to determine those who are informal and those who are not. The used methodology was Maximum Likelihood (MV), a *probit model* was estimated, where the endogenous

variable takes the value of one (1) if the individual is in the informal sector and the value of zero (0) if he is not. The exogenous variables are age, gender, level of education, marital status, branches of economic activity, worked hours per week, affiliation to the social security system (health and retiree), income and employment contract.

The identification of the socioeconomic profile of the employed population in the informal sector in Villavicencio is important because it allows to determine the causes of informality in social and economic matters, becoming a tool for the elaboration of public policy, focused on the reduction of this situation.

The results of the study show that the socioeconomic profile of people who work in informality is associated, with a greater probability, with a low educational level, being a woman, performing in the hotel and household activity, working more hours per week, have lower income, not having a retiree plan and being in the subsidized health regime.

This article has five sections. The first corresponds to this introduction. The second exposes the literary review that

indicates some definitions and causes of informality, the models used to determine the socioeconomic profile of the informal population from the perspective of other authors and the relationship with the theory of human capital and that of the life cycle. In the third component, the econometric method is explained. In the fourth part, the results and the discussion of them are stated. Finally, the conclusions are presented.

LITERARY REVIEW

What is labor informality?

One of the main stylized facts of the economies of developing countries are the high rates of informality of their labor markets. In this sense, to begin the study of the phenomenon of informality, it is necessary to make a conceptual approach to understand it.

Table 1 shows some definitions, using the characteristics of the informal labor market. In particular, following [Ortiz, Uribe and García \(2007\)](#) and [Galvis \(2012\)](#), this research uses the DANE definition to determine the endogenous variable.

Table 1. Main definitions of informality

Author	Definition
DANE (2016)	Informality is considered in accordance with a criteria of three components: the first is related to the size of the company (less than five workers) and its contractual relationship with unpaid family members, domestic workers, laborer, self-employed and employers; the second is characterized by unpaid workers regardless of the size of the firm; finally, public workers are not taken into account.
Cárdenas & Mejía (2007)	Informality is referred to all activities that perform operations within the law and evade or elude the payment of taxes and contributions.
Mejía & Posada (2007)	"The informal sector will be understood as the set of productive activities that do not comply, ex ante, with the state regulations on economic, sanitary or environmental matters, and must adhere to them". (p. 2)
García (2011)	"Informality is a residual sector, which escapes from unemployment, whose activities offer income only for survival". (p. 72)
Guataquí, García & Rodríguez (2010)	The concept of informality obeys two criteria, the first is the "strong" where people who fail to comply with the following conditions are informal: contribution to the social security system or being retiree, having a written employment contract and accruing at least 95% of the minimum wage per hour; On the other hand, the weak definition corresponds to all the above characteristics plus those that belong to the subsidized regime.
Sandoval (2014)	"Labor informality is a phenomenon that some years ago was considered a particular feature of some economies, especially those less developed, whose existence overflowed the archetype of how modern economies should work" (p. 11).
Palacios (2011)	"The informal sector would be the result of a surplus of labor for employment". (p. 592)
Ochoa & Ordóñez (2004)	Informality is caused by a structural problem of the economy to offer enough formal jobs, where it is used as an option for the generation of income by households.
Quejada, Yáñez & Cano (2014)	"Informality represents an alternative source of income due to the lack of opportunities for people to obtain a job in the formal sector". (p. 127)

Source: Own elaboration based on different authors.

Causes of labor informality

One of the causes of labor informality could be related to the lack of capacity of companies to hire labor. In this sense, [Sánchez \(2012\)](#) states that "one of the characteristics of this type of occupation is its low remuneration, its concentration in the tertiary sector and

its increase in recessive periods of the economic cycle" (p. 121).

Likewise, [Sandoval \(2014\)](#) showed that "statistical analysis also shows that informality is related to unemployment and the lack of formal employment" (p. 41), because the unemployed do not find a job for a short period of time, they

decide to enter informality as the last subsistence alternative.

Additionally, [Bonilla \(2015\)](#) assures that “the size of informality and job precariousness, is the result of the lack of formal and dignified employment and, consequently, of unemployment, it is a national emergency problem resulting from the structural conditions of stagnation of the Mexican economy” (p. 76). It is evident that one of the main causes of informality is the imbalance that occurs in the labor market.

With reference to the above, [Cota & Navarro \(2015\)](#) ratify that “it is important to mention that these changes in the Mexican labor market have occurred due to the global trend of the globalization process and government policies play an important role in the development of those processes” (p. 244).

This is because international trade can benefit those who participate in it, but if its economic structure is not strengthened to compete, it can generate decreases in Gross Domestic Product, which generates an increase in unemployment and this translates into increases in the informality rate.

Likewise, [Núñez \(2002\)](#), [Cárdenas and Mejía \(2007\)](#), [Mejía and Posada \(2007\)](#) and [Osorio \(2016\)](#), state that informal employment is the product of the actions of the State when it increases taxes. Additionally, it is not efficient in

the performance of its functions, especially when ensuring the conditions for companies to grow. [Garzón, Cardona, Rodríguez and Segura \(2017\)](#) sustain:

An informal worker “Vendor” (“ventero in spanish”) of the streets and sidewalks of the cities is one who, having a subsistence job, works during the day to eat at night, and whose vulnerability is given by his scarce or nonexistent possession of assets and by a minimum structure of opportunities. (p. 14)

The above-mentioned demonstrates that the State must guarantee conditions for the productive system to be more efficient, as are the roads that interconnect the different municipalities, the elimination of concessions on the roads because of the increase in the costs of production, maintain a political stability that reduce country risk and offer a minimum of skills to the population to be required in the productive sector due to their high level of labor productivity.

Used models to determine the causes of labor informality

There are several models that permit determining the causes of labor informality, among the most used are those of maximum likelihood. This methodology is characterized by its dichotomous endogenous variable, that is, it takes values of one or zero. The exogenous variables that explain the behavior of the endogenous one can be numerical or dichotomous (dummy).

From the aforementioned methodology, the most commonly used is the probit models. We highlight the works of [Salinas, González and Marín \(2012\)](#), [Ramírez, Ávila and Arias \(2015\)](#), [Galvis \(2012\)](#), [Guataquí, García and Rodríguez \(2010\)](#), [Robles \(2015\)](#), [Roldán and Ospino \(2009\)](#) [Ortiz, Uribe and García \(2007\)](#), [Bernal \(2009\)](#) and [Sánchez \(2013\)](#). Likewise, under this methodology the following use logit models, [Delgado \(2013\)](#), [Jiménez \(2017\)](#) and [Quejada and Ávila \(2017\)](#), among the most outstanding.

Parametric econometric models are also used, such as panel data where the determinants of informality are validated according to some entities (such as municipalities), accepted if the explanatory variables are the same for territorial entities; these models were used by [Ramírez, Zambrano, Mogrovejo and Carreño \(2016\)](#) and [García \(2011\)](#).

In relation to the above, the model used in this research is the probit model, since there is literary evidence that shows its benefits to determine the socioeconomic characteristics of people who are in labor informality.

Socioeconomic determinants of labor informality

Informality in the labor market is one of the characteristics of developing countries. In this sense, some economic studies attempt to determine the socio-

economic profile of people employed in the informal sector. Hence, this section presents a brief review of the regional (Latin America), national and local literature (for the city of Villavicencio, Colombia).

At the regional level, studies have been carried out to find the main factors that affect the probability that a person belongs to informality. In this sense, for the case of the Argentine economy, [López and Monza \(1995\)](#) estimated the size and attributes of the urban informal sector, using descriptive statistics and a comparative analysis. The main results of this study is that the attributes of the informal sector that most contribute to informality are: being too young or too old, maximum 19 years old and minimum 45 years old; in these cases, the probability of belonging to the informal sector is high. With respect to the level of education, the study shows a greater participation of the labor force with secondary education and a low level of income.

On the other hand, [Huesca and Camberos \(2009\)](#) carry out a work for Mexico where they show the segmented remuneration relationships in men and women through a logistic model, which shows that at an older age and years of work experience, agents have a high probability of carrying out some informal activity. This dynamic is due to the entrepreneurial capacity of the own agents to carry out their work in the informal sector.

In a more recent study, [Beccaria and Groisman \(2015\)](#) find that a high level of education, being a woman and old, represents a lower probability of belonging to the informal sector. With respect to the previous results, it can be affirmed that both studies agree on the effect of age and education on informality.

Likewise, for the Mexican case, [Levy and Székely \(2016\)](#) show that people with more year of schooling and older people are less likely to belong to the informal sector.

In Colombia, studies try to establish the characteristics of informal workers. [Ochoa and Ordóñez \(2004\)](#) point out that more education and people between 25 and 35 years old are less likely to belong to the informal sector, while women are more likely to enter informality because many of them are married and they have to contribute to the household income, they need flexible schedules to alternate the two activities.

On the other hand, [Ortiz, Uribe and García \(2007\)](#) show that for each year of education the probability of belonging to the informal sector decreases, as does the work experience and the condition of being a man, while with respect to age, for each year of lifetime the probability of joining the informal sector increases by 0.6 %.

Likewise, [Roldán and Ospino \(2009\)](#) analyze labor market informality in

the metropolitan areas of Barranquilla, Cartagena and Montería, using a probit model with information from the Continuous Household Survey ECH, finding that the older they are, the lower the probability of belonging to the informal sector (up to 32 years old). Likewise, for each additional year of education the probability of belonging to the informal sector is reduced by 5% and, with respect to marital status, those who are married or in a free union are less likely to belong to the informal sector.

From this perspective, [Galvis \(2012\)](#) finds what profiles associated with informality in Colombia are related to a high probability of belonging to the informal sector, being a woman, if the individual is in the youngest or in the oldest range of age, or households where there are young children, or if the individual has been looking for a job for a prolonged time, or if the individual has a low level of education, or if the person is self-employed or domestic worker, and also when the person works for the construction sector.

In this sense, [Salinas, González and Marín \(2012\)](#) show, based on the definition of informality proposed by the ILO, that the probability of belonging to the informal sector decreases with age and a higher level of education (human capital). In addition to this, it was also found that married women, male heads of household and self-employed workers are more likely to belong to informality. Unlike the previous study, this does not

consider the life cycle, because workers during their life do not have the same level of productivity.

Likewise, [Sánchez \(2013\)](#) characterizes the labor market, highlighting that there is greater participation by the female gender, workers over 40 years old and with low levels of education.

On the other hand, [Quejada, Yánez and Cano \(2014\)](#) identify that the main determinant variable of labor informality in Colombia is the scarce human capital, the probability of entering the formal and informal market is associated with fewer degrees of education, which means, a worker with fewer years of schooling is more likely to belong to the informal sector.

[Ramírez, Ávila and Arias \(2015\)](#), through the use of a probit model, determined how people who are in the subsidized regime have a 44% probability of belonging to the informal sector, as well as the condition of being a woman with respect to men increases the probability of being informal by 11.73 %. In addition to this, the age variable shows that for every ten years of age the probability of belonging to the informal sector is reduced by 6.9% and having complete primary education reduces the probability of being informal by 12.45 %.

At the local level, [Yépez and Zambrano \(2011\)](#) identified the determinants of labor informality in the metropolitan

area of Pasto. The micro-econometric methodology used to estimate the determinants of labor informality was a logit model. Among the main results, it is found that there is an inverse relationship between level of schooling and informality. In addition, the economic sectors where informality is most present are: commercial, construction and services.

Likewise, informal employment affects both men and women alike, while noting that the socioeconomic stratum of the household is not a significant determinant. Finally, the study shows that the headship of the household is not important to determine that Pasto's labor market has informality.

Finally, [León and Caicedo \(2016\)](#) identify some factors that generate informality in Villavicencio: low institutional level, minority of age, not being married and belonging to activities such as commerce or construction.

Informality with respect to human capital and life cycle

Within the studies that address the factors that influence informality, education and age are the most representative variables. Hence, the theory of human capital and the life cycle are key to support the results of these studies.

One of the first authors to work on the theory of human capital was Becker

(1983), who identified a series of factors, which show that at a higher level of qualification, the unemployment rate decreases; while the workforce of younger workers is more mobile, because they are looking for better opportunities.

At a theoretical level, it is established that an increase in school education represents a greater productivity of workers, and therefore, a better salary remuneration. In this sense, formal companies have preferences for the most skilled labor, since this is reflected in an increase in production.

According to [Villalobos and Pedroza \(2009\)](#), there is sufficient empirical evidence regarding the relationship between investment in human capital and better remunerated jobs. With the accumulation in human capital, future returns are expected, given that the probability of accessing formal jobs in the economy is increased by the agents that make this investment.

On the other hand, life cycle theory shows that agents are less productive in their younger and adult stages, a situation that shows an inverted u behavior similar to the negative quadratic function, depicting age and productivity.

According to [Duval and Orraca \(2011\)](#), from the theories of the informal sector, the young workforce decides to acquire experience in this sector, then makes a transition to the formal sector, and sub-

sequently retires to be a self-employed worker. Likewise, [Levy and Székely \(2016\)](#) are able to demonstrate that for Latin America, the life cycle theory is applicable to the study of informality, given that the younger they are they tend to achieve their work experience in the informal sector until there is an opportunity to access the formal sector. On the other hand, older people increase the probability of belonging to informality.

Productivity not only responds to the accumulation of human capital, but also to the experience acquired with age. From this perspective, [Pérez \(2016\)](#) points out that there are some exogenous factors such as salary satisfaction, psychological and social conditions that affect labor productivity, and where the agent that has just entered the labor market has no experience and cannot put the recently acquired human capital to the service of that labor market.

METHODOLOGICAL APPROACH

A probit model was used to estimate the socioeconomic profile of the employed population in the informal sector of the city of Villavicencio. The mathematical specification is presented according to the work of [Salinas, González and Marín \(2012\)](#):

$$Y_i = \alpha + \beta X_i \quad [1]$$

Variable Y_i is discrete (equation 2) and can take two values, one or zero, where one corresponds to the population that is in the informal sector and zero to the population that is in the formal one.

$$Y = \begin{cases} 1 \\ 0 \end{cases} \quad [2]$$

The set of information of the individuals to be studied is related to a series of variables X_i , which are the socioeconomic characteristics (age, gender, income level, educational level, among others), and are used to explain the endogenous variable. According to [Salinas, González and Marín \(2012\)](#), a binary model is the occurrence of an event with the conditionality observed in equation 3:

$$P_i = P_r(Y_i = 1 | \alpha_i) \quad [3]$$

Since the model only takes two values, one and zero, the conditional probability is also the conditional expectation (equation 4). The functionality of the model can be conditioned so that the values do not exceed the interval between $[0,1]$. It can be assumed that α_i is composed of a row vector of explanatory variables.

$$E(Y_i | \alpha_i) = 1P_i + 0(1 - P_i) = P_i \quad [4]$$

Function $P_i = F(X_i\beta)$ holds the characteristics presented in equation 5:

$$F(-\infty) = 0; F(\infty) = 1; f(x) = \frac{dF(x)}{dx} > 0 \quad [5]$$

$F(\cdot)$ is a monotone increasing differentiable function with real domain and a range between $(0,1)$, the non-linear model is expressed in equation 6:

$$Y_i = F(X_i'\beta) + \nu_i, \quad [6]$$

where,

$$\nu_i = E(Y_i | X_i) - F(X_i'\beta) \quad [7]$$

In addition, the distribution of the probit model is expressed in equation 8:

$$F(X'\beta) = \int_{-\infty}^{x'\beta} \frac{1}{\sqrt{2\pi}} e^{-\frac{s^2}{2}} ds = \theta(X'\beta) \quad [8]$$

The parameters of the model are not the marginal effects that the linear models show, given the estimate is not linear, when the normal distribution is used, the marginal effects are those presented in equation 9:

$$\frac{\partial \theta(X_i')}{\partial X_i} = \theta(X_i'\beta)\beta_i \quad [9]$$

The sign in the derivative is interpreted as the change that is generated by a variation in the units of the explanatory variables and their value is their

respective change. The negative sign of an exogenous variable means that the probability Y_i is decreasing.

For the purposes of this study, the probit model uses the variables shown

in Table 2, which were chosen for their relevance in other studies, such as Salinas, González and Marín (2012), Galvis (2012), Quejada, Yáñez and Cano (2014) and Bernal (2009), among others.

Table 2. Variables description

Variables	Description
Labor informality	It is the dependent variable and takes the value of one (1) when it is informal or the value of zero (0) when it is formal.
Gender	Dummy variable that is given the value of one (1) when it is male and zero (0) when it is female.
Age	Numerical variable measured in years.
Schooling level	Variable that is composed of subcategories such as: none, preschool, elementary school, high school, middle school and college or university.
Social security in health regime	It is divided into: contributory, special and subsidized.
Work contract	Take the value of one when you have a contract and zero when you do not have one.
Marital status	Dummy variable that has subcategories such as: married, separated, widowed and single.
Hours worked per week	Numerical variable measured in hours per week.
Contribution to retirement plan	It is composed of: pay, does not pay and it is a retiree.
Natural logarithm of income	Numerical variable measured in Colombian pesos, which takes the natural logarithm to express the results in percentage terms.

Source: own elaboration based on information from the GEIH 2015-2018.

RESULTS AND DISCUSSION

To determine the socioeconomic profile of the employed population in the informal sector of the municipality of Villavicencio in 2015-2018, a probit model was estimated, taking as endogenous variable informality, which takes a value of one if someone belongs and zero if she does not belong. The exogenous variables are the socioeconomic characteristics of the people who are

in the informal and formal sectors of the economy. The data was taken from the Great Integrated Household Survey (GEIH) for 2015-2018.

The exogenous variables explain the behavior of the endogenous in 86.09 %, showing a high goodness of fit to be a binary model. Its specification and sensitivity is in the order of 82.60% and 89.33 %, respectively, which shows that the model are well specified and its

degree of sensitivity with respect to the variables chosen is significant. In addition, a correlation matrix was calculated between the explanatory variables and

no multicollinearity was found between them. Table 3 shows the results of the model.

Table 3. Variables associated with informality

Variable	Marginal effects
Age	0.0019236*** (0.00034)
Primary school	0.4602032*** (0.00913)
High school	0.4301056*** (0.00855)
Middle education	0.4150856*** (0.01005)
None	0.393239*** (0.01417)
Gender	-0.0864644*** (0.00813)
Contributive	-0.1175711*** (0.00955)
Special	-0.2074486 (0.01638)
Contributes to elderly retirement	-0.4394214*** (0.0085)
Retirees	-0.01638184** (0.02088)
Employment contract	-0.4581462*** (0.00706)
Income	-0.0613817*** (0.00624)
Married	0.0070035 (0.02414)
Separated	0.0041381 (0.02469)
Single	0.0557933** (0.02597)
Hours worked per week	0.002071** (0.00024)
Mines and quarries	-0.0963177 (0.272)

Note: Standard error in parentheses and *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: own calculations from the GEIH (2015, 2016, 2017 y 2018)

It has to be highlighted that in the case of Villavicencio in 2015-2018, the life cycle theory explains informality, as stated by [Duval and Orraca \(2011\)](#) and [Levy and Székely \(2016\)](#). Figure 1 shows that the population from 7 years to 17 years is in a lesser proportion in the formal sector, but from 18 years to 44 years, the population employed in

Villavicencio has greater participation in the formality.

This has an explanation, the youngest population are just recently joining the labor market, which embodies lower skills that translate into lower productivity, therefore young labor is not preferred by companies in the formal sector.

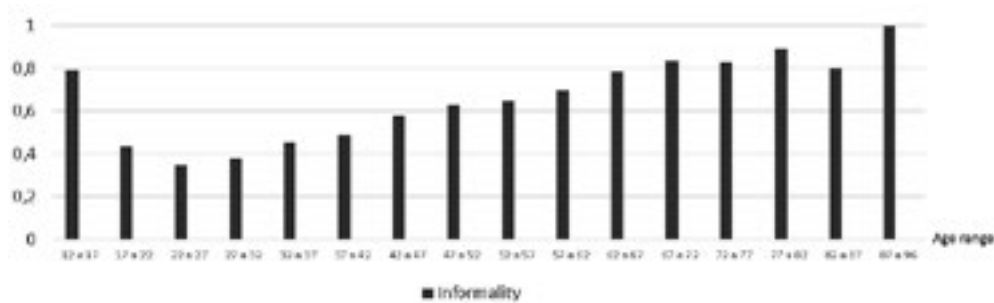


Figure 1. Life cycle and informality.

Source: Own calculations from the GEIH of 2015-2018.

Correspondingly, the most adult population reach declining marginal levels of productivity, with the highest demand for labor between age range of 17-22 to 42-47 years old, as shown in Figure 1. In addition, the older population has the possibility of accumulating money and knowledge, after having worked in the formal sector, which allows them to enter informality by their own (self employed) in the last years of productivity.

In this sense, the theory that relates age to the probability of belonging to the informal sector is not linear. It is argued that the sign of the coefficient

depends on the life cycle in the studies of [López and Monza \(1995\)](#), [Huesca and Camberos \(2009\)](#), [Ochoa and Ordóñez \(2004\)](#), [Ortiz, Uribe and García \(2007\)](#), [Galvis \(2012\)](#), [Sánchez \(2013\)](#) and [León and Caicedo \(2016\)](#). However, for Villavicencio, this pattern cannot be easily extracted, because the variable “squared age” is not significant in the estimated model.

On the other hand, people with low levels of education are more likely to belong to the informal sector; the employed population that has at least one level of primary education presents

a probability of 46.02% of belonging to the informal sector with respect to the higher level; likewise, in the case of secondary school, the probability is 43.01 %, for an average of 41.50% and if the individual does not have an education of 39.32 %. Figure 2 validates the importance of education as a determinant variable of informality, as expressed by the previous results, it is also observed that the theory of human capital explains the informality in the city of Villavicencio, as [Becker \(1983\)](#) and [Villalobos and Pedroza \(2009\)](#).

It is also evident that at a lower level of education, the probability of entering informality increases, as concluded by [Ochoa and Ordóñez \(2004\)](#), [Ortiz, Uribe and García \(2007\)](#), [Galvis \(2012\)](#), [Salinas, González and Marín \(2012\)](#), [Sánchez \(2013\)](#), [Quejada, Yánez and](#)

[Cano \(2014\)](#), [Beccaria and Groisman \(2015\)](#) and [León and Caicedo \(2016\)](#).

Contrary to the above stated, [Ramírez, Ávila and Arias \(2015\)](#) affirm that with less education the probability of entering the informal sector decreases, as it happens with the people employed in the informal sector of Villavicencio who do not have an education (46.09 %), possibly due to the fact that 83.25% are over 40 years old and have a considerable amount of experience. In this sense, [Levy and Székely \(2016\)](#) assert that although population has a higher level of education than former generations, the level of informality has been similar because the problem lies in the effect of the labor market, which is affected by structural and institutional type of variables, such as tax regulations.

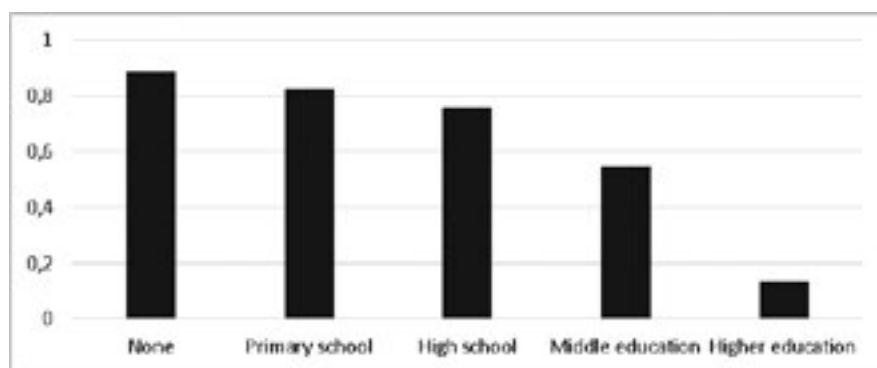


Figure 2. Human capital and labor informality.

Source: Own calculations from the GEIH del 2015-2018.

Education for the people from Villavicencio who are in the labor market is a determining variable to define their

informality or formality condition. According to the results of the investigation, it can be affirmed that as the

population is more educated, it begins to be attractive to the formal sector and the proportion of people employed in this sector increases, as evidenced in Figure 2. This is corroborated by the results of the econometric model, in which the higher the level of education the lower the probability of belonging to the informal sector.

The results of the research show, with respect to gender, that the condition of being a man decreases the probability of participating in informality by 8.64% with respect to women, in the same sense [Quejada, Yáñez and Cano \(2014\)](#), [Sánchez \(2013\)](#), [Galvis \(2012\)](#), [Salinas, González and Marín \(2012\)](#), [Ochoa and Ordóñez \(2004\)](#) and [Ortiz, Uribe and García \(2007\)](#) find the same relationship in their studies. The above applies to Villavicencio because women collaborate with income for the household without neglecting their daily work in their families, which is why they look for jobs with flexible hours that allow them to carry both activities. However, [Beccaria and Groisman \(2015\)](#) affirm that the condition of being a man increases the probability of belonging to the informal sector.

With regard to marital status, it is evident that occupied and single persons have a probability of entering the informality of 5.57% with respect to those who are widowed. In this sense, [Galvis \(2012\)](#) states that singles are more likely to enter informality with respect to other marital status.

In the same way, it can be affirmed that single people have less economic anxieties that force them to belong to formality, because this segment of the market generate higher income. While informal singles who may have lower income, but they do not require higher levels of education, and their working hours are more flexible, as well as the entry barriers to informality.

With regard to working conditions, it should be noted that persons linked to the contributory and special social security scheme have a lower probability of belonging to informality at 11.75% and 20.74% respectively, while those who do not contribute pension and who do not have an employment contract, they are positively related to informality.

On the other hand, people who has a retirement plan or fund or are retired have a probability of being in the formality of 43.94% and 16.38% respectively, in comparison with those who do not contribute to retirement funds or are not retired. This indicates that not saving for a retirement and not being a retired increases the probability of being linked to the informal sector. Likewise, people without an employment contract have a probability of 48.43% of being in informality.

On the other hand, the income variable is strongly related to informality, since it contains people with lower salaries, as found by [Galvis \(2012\)](#) and [Beccaria](#)

and Groisman (2015). On the other hand, Huesca and Camberos (2009) state that from 1992 to 2002 men who worked by their own (self-employed) in informality in Mexico, received better income than those in the formal sector, because the self-employed are older and have considerable work experience.

For the city of Villavicencio it can be affirmed that the income is the result of the productivity of their workforce, for this reason, the informal sector welcomes those that due to their low productivity are marginalized by the formal companies, since these people are thinking of maximizing their profits through the marginal product of their labor.

Regarding the hours worked per week, it was found that occupations with high intensity of hours worked per week, have a probability of being in the informality of 0.0207 %. Similarly, Sánchez (2013) states that “the probability of informality is greater (*ceteris paribus*) in occupations of very low and very high intensity in weekly work hours” (p. 33).

In the case of Villavicencio, the result is consistent with the aforementioned because the people employed in the informality and, as mentioned above, especially women seek flexible schedules to carry out activities in their home, it is for this reason that it is preferred to work in this sector. Likewise, there are employers who abuse working hours and in turn people who work in the sector

when they cannot find a job, and therefore decide to take extended days to take care of their jobs.

CONCLUSIONS

It was found that the socioeconomic profile of the employed population in the city of Villavicencio for the year 2015-2018 obeys to the following characteristics: being a woman, having a low level of education, earning low income, being single, working more hours per week than allowed by law, not having an employment contract, not contributing for a retirement, belonging to the subsidized health regime, increase the probability of being informal.

Specifically, with respect to human capital, results show that the most educated population in the city of Villavicencio, as expressed by the theory of human capital with Becker (1983) and Villalobos and Pedroza (2009), end up being the most attractive for the formal sector because it is more productive and its probability of belonging to the informal sector is lower. These findings are consistent with what was found for Colombia by Ochoa and Ordóñez (2004), Ortiz, Uribe and García (2007), Galvis (2012), Salinas, González and Marín (2012), Sánchez (2013), Quejada, Yáñez and Cano (2014); and for Argentina by Beccaria and Groisman (2015). In this sense, the importance of continuing to strengthen the opportunities to access higher education, through scholarships and other incentives that

facilitate the increase of human capital is evident.

In the case of working conditions, it is concluded that people who are in informality present a precarious working features, since, in coherence with [Ramírez, Ávila and Arias \(2015\)](#), they are in the subsidized security system, they do not contribute for a pension, they do not have an employment contract, their income tends to be low and, as [Sánchez \(2013\)](#) states, their working hours are long. Therefore, it is recommended that the competent authorities increase control over regulations about

compliance of labor policies that favor formal employment opportunities.

Summing up, it is pertinent that the government elaborates a public policy in which it takes into account the profile of the population that is in informality, so that it strengthens human capital, improves working conditions and leverages formal economic activities. Finally, it is recommended to advance in future research that allows determining the quality of employment, considering the relationship that exists between informality and underemployment.

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