

THE CHOICE OF ELDERLY LABOR: EVIDENCE FROM ECUADOR

LA ELECCION DEL TRABAJO DE ANCIANOS: EVIDENCIA DE ECUADOR

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Abstract

What drives elderly people decide to work after retirement? This paper analyzes the economic determinants of the decision to work in Ecuadorian elderly. In the analytical part, authors have analyzed the literature devoted to the study of elderly people, from which several testable hypotheses that relate it to income, education level and complex household have been derived. The article provides empirical evidence from using the Living Conditions Survey (2014). The estimation results suggest that variables as income, education level and belonging to a complex household play a significant role in the decision to work of Ecuadorian elderly.

Keywords: Economics of the elderly, time allocation and labor supply, occupational choice, retirement.

JEL Codes: J14, J22, J24, J26.

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Resumen

¿Qué impulsa a los adultos mayores a trabajar después de la jubilación? Este artículo analiza los determinantes económicos de la decisión de trabajar en adultos mayores ecuatorianos. En la parte analítica, los autores analizan la literatura dedicada a los adultos mayores, a partir de la cual se derivan varias hipótesis comprobables relacionadas con el ingreso, la educación y hogares complejos. El artículo proporciona evidencia empírica usando datos de la Encuesta de Condiciones de Vida (2014). Los resultados de las estimaciones sugieren que variables como el ingreso, la educación y pertenecer a un hogar complejo juegan un papel importante en la decisión de trabajar de los adultos mayores ecuatorianos.

Palabras clave: *Economía de los adultos mayores, asignación de tiempo y oferta de trabajo, elección ocupacional, jubilación.*

Clasificación JEL: *J14, J22, J24, J26.*

1. INTRODUCTION

The elderly population around the world has been constantly increasing. In fact, elderly people represent 13% of the worldwide population, and it is growing about 3% per year (United Nations, 2017). In this sense, as a consequence of declining fertility rates and increased life expectancy, population older than 60 years old will increase from 900 to 2000 million between 2015 and 2050 (World Health Organization, 2017).

Nowadays, the growth of elderly population worries worldwide, due among other reasons to characteristics of the elderly persons, such as low productivity and high economic needs because of health problems (Aísa, Pueyo, and Sanso, 2012). However, elderly people play a key familiar role for helping their families to care their members and increasing their participation in the paid workforce (World Health Organization, 2017). Therefore, this topic is very important for economic decision makers, although elderly population contribute to the workforce, their health care can also be costly for society.

Multiple reasons could explain the decision to work at advanced ages. According to Bachmann (2009), self-employment is the result of the combination of several factors, such as the desire to remain in the labor force and the flexibility in a work schedule. Flexible forms of employment could delay the age of retirement and lead to a social policy that addresses the problem of population aging. On the other hand, Wahrendorf *et al.* (2016), points out that if a person is a self-employed worker it could decrease their chances of receiving a high pension in the future. This fact results in the increase of incentives to work. Based on background literature regarding the elderly

population, we study the Ecuadorian case. Ecuador is a country characterized by a familiar regime (Martínez, 2007). According to this author, in this type of welfare regimes, families face the risks and vulnerabilities of their members in different stages of life, emphasizing the role of women as unpaid caregivers, and the State has a residual role. Additionally, these structures conserve the sense of familiar solidarity. These features are not exclusive of Latin American countries. Esping-Andersen (1999) found similar characteristics in Europe.

In this context, this paper is one of the first empirical studies regarding the motivation to work at advanced ages. Through the study of educational level, family structure and income level; this article aims to analyze the determinants of the decision to work in elderly persons.

In order to determine factors in the choice of working of Ecuadorian elderly persons. The article is organized as follows. Section 2 shows the theoretical framework. Section 3 contains data and the study variables. Section 4 shows the econometrical specification to exam the determinants of the decision to work in elderly. Finally, Section 5 concludes.

2. ANALYTICAL FRAMEWORK

2.1. Education level

According to Wahrendorf *et al.* (2016), the most of the population of workers who are between 65 and 80 years old have the following characteristics: self-employed, men, have higher levels of formal education, and they are wealthier than those who are retired. It happens despite the labor supply *ratio* would decline with age for both women and men (Clark, York and Anker, 1999).

In fact, Martin, Schoeni, and Andreski (2010) argue that high levels of education are associated with good life conditions for older people. Elderly people, who exhibit well developed skills, as well as formal education, would stay longer in labor market. Indeed, salaries could be affected by the experience of people. In addition, high education levels could decline the disability in elderly population (Schoeni *et al.*, 2006). However, jobs, which involve physical force, workers are motivated to retire early (Aísa, Pueyo and Sanso, 2012).

In this sense, Reddy (2016) after comparing informal and formal labor markets, argues that people who exhibit lower education are more likely to work in the informal sector and would not have access to social insurance and retirement benefits. Hence, it is expected that the elderly people would have to work. In this context, we derive the following hypothesis:

H1: Elderly people with a high level of education will be less likely to work than those with a low level of education.

2.2. Complex family household

A complex household or an extended household is formed by a complete or an incomplete conjugal nucleus and by other relatives. There is no presence of non-relative members of the head of household (Barahona, 2006).

Thus, if the head household is an elderly person, he could have the obligation to work to support his family. Considering welfare production, different situations of families involve different forms of unpaid work. These types of employment would be determined by demographic changes such as the reduction of the size of the households, the reduction of the fertility, the increase of the life expectancy and the socioeconomic factors like the loss of the purchasing power of income (Martínez, 2015). These factors lead to the creation of new family arrangements such as extended homes, in which, the elderly could be the head of household. It means that the family plays an important role as to whether older workers believe that they are able and want to continue working after 65 years old (Kerstin, Rignell and Lars, 2011).

On the other hand, recent evidence shows that youngest people stay longer or move back to their parent's home easily. In fact, Matsudaira (2016) argues that economic situation, characterized by low wages, expensive apartment rents and high levels of investment in education; could force people to change living arrangements. For example, a person could prefer to share his apartment with roommates or live alone. In this sense, elderly owners would reduce over time (Chiuri and Jappelli, 2010). Nevertheless, the fact that elderly people live with relatives, should not necessarily be negative. Rahaman (1999) provides empirical evidence that the presence of relatives improves the life of elderly people, since relatives could take care of them (Cigno and Komura, 2017; Ulker, 2008). Conversely, labor activities of children could be affected when they take care of their elderly parents, depending on the degree of social security in the country. This situation could be present even after the parent's demise (Fevang, Kverndokk, and Røed 2012). Thus, the elderly persons who belong to smaller families, with four or fewer members, are more likely to participate in labor market in both rural and urban areas (Singh and Das, 2015).

In this context, our second hypothesis is:

H2: Elderly people living in complex homes will be less likely to work than those living in nuclear families.

2.3. Income level

The decision to work until the minimum age of retirement would be more likely to depend on personal finances than other areas such as worker health (Kerstin, Rignell and Lars, 2011). Other reasons even include fertility decisions, which would be also associated to the choice to retire. In fact, people would choose the time to retirement in function of children (Mizuno and Yakita, 2013; Hock and Weil, 2012).

According to Arendt (2005), elderly persons with low-incomes have poorer functional capability, lower physical activity and lower psychological well-being. This fact could be translated into a list of labor abuse (Reddy, 2016). The author observes that the majority of the elderly workforce is engaged in poorly paid jobs in the informal sector, either as casual workers or as self-employed in low-skilled or unskilled occupations. A negative relationship between income and elderly labor force participation is reported by Clark, York and Anker (1999).

However, elderly people could also have high levels of productivity, in such a case; individuals could be more incentive to retire early because their incomes when they were young were greater than those of the less productive people were. Therefore, their pension will be greater or remain for a longer time in the labor market (Aísa, Pueyo, and Sanso, 2012). In addition, in an aging country workingage, individuals will see a large fraction of their labor income redistributed to the elderly through taxes to comply with policies established by the local government in favor of the elderly (Hock and Weil, 2012). In other words, individual would be motivated to retire. In this context, we propose:

H3: Elderly with a high income level will be less likely to work than those with a low income level.

2.4. Case study: Ecuadorian elderly persons

Many developing countries belonging to regions such as Africa, Asia and Latin America are ill equipped in order to provide medical assistance to elderly population. As a result, elderly persons tend to rely on members of their household and family for their well-being and survival. However, elderly people could also be head household.¹ In average, Latin America has 84% of elderly male household head and 40% of elderly female household head (Bongaarts and Zimmer, 2002). In this context, the head household guarantees welfare of his family providing economics sources, education, feeding, and others. In other words, those elderly people could be working, even if they are at age of retiring.

In Ecuador, according to current Ecuadorian legislation and considering that in 2017, the minimum wage is USD 375, persons older than 60 years old that contributed 30 years to the Social Security Ecuadorian System (IESS) receive between 80% and 450% of the basic salary. Persons older than 65 years old who have 15 years or more to contribute to IESE, receive maximum 300% of the basic salary; and those over 70 years old and with 10 years or more of contributing, receive maximum 250% of the minimum wage. However, if an elderly person decide to come back to labor market,

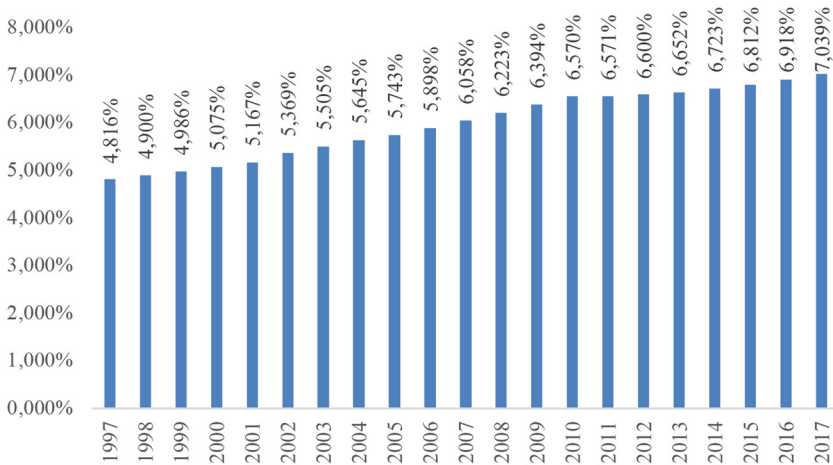
¹ Head household is the person who is recognized by all of the members of the household due to their responsibilities, prestige, decisions, economic reasons or traditions (National Institute of Statistics and Census from Ecuador, INEC, 2014).

he/she is entitled to an improvement in his retirement pension, as long as, he/she ceases his new job and has contributed at least twelve months (Instituto Ecuatoriano de Seguridad Social, 2014). The profile of workers older than 65 years old in Ecuador is distributed as follows: only 3% of the population has adequate work², 5,3% of them are in underemployment³, 13,7% have inadequate work⁴ and 8.9% of the population have unpaid work⁵ (INEC, 2013).

According to the INEC, the elderly group represents 7,4% of the Ecuadorian population. This group has constantly been increasing, as shown in Figure 1. In fact, the population doubled its value between 1997 and 2017, at the same time, that life expectancy was 75 years old in 2010 and it will rise to 80.5 years old in 2050.

FIGURE 1

EVOLUTION OF PERCENTAGE OF THE ELDERLY POPULATION IN ECUADOR



Source: Ecuadorian Population and Housing Census 2010, Population Projection and Retroprojections of Population at Provincial Level by Sex and Age group: 1990-2010. INEC.

² People who work in poor conditions, in terms of income and working hours, established by law.

³ People who work less than 40 hours per week and who received income below the basic wage and have the desire and availability to work additional hours.

⁴ People who work less than 40 hours a week and who receive income below the minimum salary and do not have the desire and availability to work additional hours.

⁵ Employed persons who do not receive income from job.

From them, 45% live in conditions of poverty and extreme poverty due to unsatisfied basic needs; 42% live in the rural sector; 15% of poor households are composed of an older adult living alone. 15% are victims of negligence such improper treatment by another person that causes them harm, risk of their health, their welfare or their property; 75% do not have access to contributive social insurance (Ministerio de Inclusión Económica y Social, 2013). These numbers bring to light a latent problem, since these characteristics could force older adults to continue or start working at an advanced age in order to satisfy needs or to generate income for their families. This situation is observed in Ecuador despite the constant efforts of the Government to avoid that. For example, Ecuadorian government has implemented policies such as: (i) the Elderly Law, which aims to guarantee rights related to maintaining an adequate standard of living (Elderly Law, 2016); (ii) the payment of monthly pensions to persons older than 65 years old, who are vulnerable and who had not contributed to social insurance (Ministerio de Inclusión Económica y Social , 2013); (iii) the Ecuadorian Constitution (2008), in Articles 36, 37 and 38, concludes that elderly persons will receive priority and specialized attention in fields of social and economic inclusion, and protection against violence in public and private sectors.

3. DATA AND MEASUREMENT

3.1. Data

In order to analyze the motivation to continue working Ecuadorian elderly population, we use data from the Living Conditions Survey (LCS). This survey was conducted by the INEC, between 2013 and 2014. The LCS includes information of 15 952 442 individuals and 1 215 862 expanded observations correspond to elderly persons.

Missing data due to non-response of the interviewees not exceed 10% of the sample; therefore, it was not necessary to use imputation techniques, so we proceeded to eliminate the observations. On the other hand, before the implementation of the model, an analysis of outliers was performed. All variables are categorical, with the exception of income, that is to say this variable presented outside values upper and lower extremes. After elimination of observations containing outlier values the number of observations is 1 032 066.

The majority of the elderly population working is concentrated in the Sierra (mountain region). Furthermore, 44% of elderly population in Ecuador worked in 2014. According to LCS, 54% of the sample are women.

In addition, 75% of the elderly population identifies as Mestizo, followed by 8% of Indigenous. In the case of elderly people who work, 56.6% live in the rural area, characterized by economic activities such as agriculture, livestock, handicrafts, etc. The low level of education from Ecuadorian elders could be associated with this fact,

since 67% of elderly working people only have basic education. Consequently, a high rate of participation in household chores (78%) was observed. Another relevant fact of the Ecuadorian elderly is that 74% of them do not receive income by pension or retirement. Finally, 17% of people who receive pension or retirement continue working, compared to 83% of people who do not receive pension and continue to work.

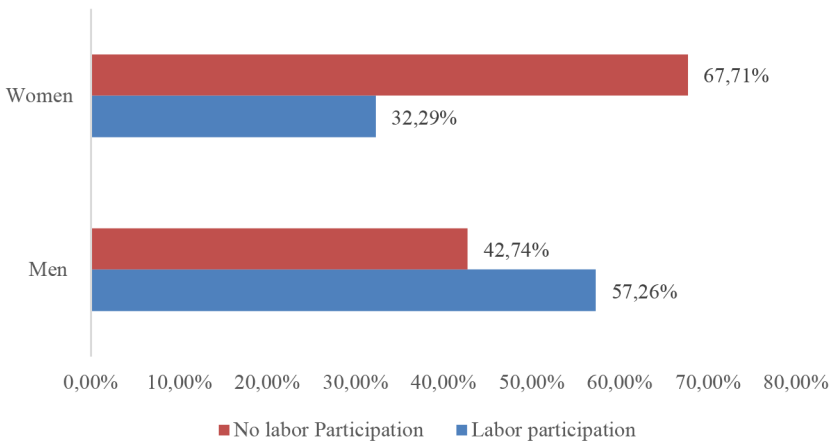
3.2. Measurement

3.2.1. Dependent variable

Labor participation: The dependent variable takes values of one if the elderly person worked during the reference period and zero otherwise. Figure 2 shows that the most of Ecuadorian elderly who work are men.

FIGURE 2

ELDERLY LABOR PARTICIPATION BY GENDER



Source: LCS, INEC (2014).

3.2.2. Independent variables and control variables

In table above, we present a list of the independent variables and control variables, including in the model. Each of the independent variables reflects socioeconomic

aspects of elderly people, in line with the hypothesis of the analytical framework (*H1-H3*). A full description of the variables is presented in the Online Appendix.

TABLE 1
DESCRIPTION OF INDEPENDENT VARIABLES

Variable	Description	Categories
Education	The variable indicates the most advanced level of education that the elderly person attended.	Not education (<i>reference group</i>) Illiterates Primary High school Higher education
Family structure	This variable indicates whether the person lives in a nuclear household plus other relative (uncles, cousins, siblings, in-laws, etc.).	Head household Complex household Crowded home
Income level	It is the income of the elderly person measured in US dollars.	Logarithm of the total income
Age	It represents the age of the people in the sample.	Years
Gender	This variable indicates if the elderly is a woman or a man.	Man (<i>reference</i>) Woman
Ethnic	It is a categorical variable that presents information about the ethnic self-identification of the elderly people.	Others (<i>reference</i>) Indigenous Mestizo White Montuvio
Civil Status	It is a categorical variable that represents the civil status of the elderly people.	Have a partner (<i>reference</i>) Not have a partner
Region	It is a categorical variable that collects information about the geographical region in which the elderly person lives.	Sierra (<i>reference</i>) Coast Amazon Galapagos
Area	It is a categorical variable that collects information about the area of residence of the elderly people.	Rural (<i>reference</i>) Urban
Health insurance	It is a categorical variable that contains information about people receiving health insurance such as IESS (general or voluntary), ISSFA , ISSPOL or private health insurance do not continue working except of those who receive Rural Social Security.	Have health insurance (<i>reference</i>) Not have health insurance

3.2.3. Descriptive statistics

Table 2 presents the descriptive statistics of the independent variables as well as the correlations between them.

TABLE 2
STATISTICS AND CORRELATION

	Mean	SD	1	2	3	4	6
Age (1)	74.37	7.376	1				
Head of household (2)	0.625	0.483	-0.0339*	1			
House overcrowding (3)	0.145	0.353	-0.0055	-0.0265	1		
Complex_household (4)	0.1458	0.347	0.2368*	0.5232*	0.0874*	1	
Income (6)	230.7157	233.531	0.0007	0.0018	0.1730*	-0.0099	1

Significance level: * = 10%, ** = 5%, ***1%.

Source: Survey of living conditions, 2014.

This table highlights the high standard deviation for the income variable. This finding is not surprising for cross-sectional data with a large sample, when a variety of persons is concerned. We use the natural logarithm for this variable.

4. METHOD

Considering the factors that the literature proposes as the main determinants of economic participation in elderly and the socio-demographic characteristics of the population sector under study, a *probit* model is estimated in order to determine the main determinants of the labor participation of the Ecuadorian elderly population. Therefore the final specification model is:

$$P_i = \beta_0 + \beta_i X_i + e_i \quad (1)$$

Where P_i takes 1 if the elderly person was in labor force during the reference period and 0 for elderly who were not in labor force. X_i Represents a collection of demographic and socioeconomic characteristics of elderly persons such as: age, gender, area, region, marital status, ethnics, income, level education, and others that are described in above section; X_i also represent the family structures, if an elderly is

head of household or lives in a complex home or in a home overcrowding. β_i are the respective coefficients, and e_i is the error term.

Weighting of the sample

Before the model was estimated, we analyze the statistical projections of the census 2010 presented by the INEC and the results of the ECV 2014, since studies like McIntosh and Danigelis (1995) provide evidence that a non-representative sample could be a problem in this type of data.

Table 3 presents an explanation for weighting estimations. It is showed that the sample is underrepresented in the urban area and over-represented in the rural area. In conclusion, we obtain weighted estimations using the expansion factor calculated by the INEC in order to avoid biased estimators (Solon, Haider and Wooldridge, 2015).

TABLE 3
EXPLANATION FOR THE VARIABLE WEIGHTING

	2014 Census projection	Unweighted 2014 LCS	Weighted 2014 LCS
	Area		
Urban	63.3%	46.0%	67.7%
Rural	36.7%	53.9%	32.9%

Source: Survey of living conditions, 2014 and Census Projections.

Model specification Analysis

The multicollinearity and heterocedasticity tests were performed on all models proposed. In the 4 models, the predictors are correlated and have heterocedasticity, so this problem is corrected using robust standard errors

5. RESULTS

The estimates enable us first to comment on the quality of the econometric model. The Pseudo R-squared values are low (between 20% and 26%), which is typical of cross-sectional data.

Table 4 shows the results of the estimation of the probabilistic model of discrete choice, *probit*. Model 1 considers only the variables to compare the hypotheses proposed level of education (*H1*), complex household (*H2*) and income (*H3*). Model 2 includes all control variables. Finally, Model 3 and Model 4 include variables of robustness for the income and complex household variables.

TABLE 4

ESTIMATION RESULTS

Variables	Model 1	Model 2	Model 3	Model 4
<i>Education (H1). Reference: No level education</i>				
Primary	-0.00785 (0.00513)	0.0448*** (0.00633)	-0.00680 (0.00630)	-0.5013*** (0.0066)
High_school	-0.280*** (0.00800)	-0.175*** (0.00961)	-0.17886*** (0.0093)	-0.3595*** (0.0098)
Higher	-0.509*** (0.0120)	-0.521*** (0.0134)	-0.47294*** (0.0126)	-0.5680*** (0.01320)
<i>Family structure (H2)</i>				
Complex household	-1.496*** (0.00702)	-0.963*** (0.00818)	-0.770821** (0.00534)	-1.442** (0.00534)
House overcrowding				-0.1019*** (0.00746)
Head of household			0.31332** (0.0082)	
<i>Income (H3)</i>				
Log_Income_perc	-0.266*** (0.00252)	-0.0171*** (0.00318)		
Log_Regula_income_perc			-0.204334** (0.00115)	
Log_labor_income_perc				0.37344*** (0.00120)
<i>Natural Region. Reference: Sierra</i>				
Coast		-0.276*** (0.00527)	-0.30501** (0.00534)	-0.4652*** (0.00558)
Amazon		-0.241*** (0.0134)	-0.28763*** (0.01378)	-0.2839*** (0.01466)
Galapagos		-0.0742 (0.0866)	-0.2823*** (0.08785)	-0.8133*** (0.09874)
<i>Ethnics. References Others</i>				
Mestizo		-1.492*** (0.0411)	-1.3262*** (0.03947)	-1.4632*** (0.0405)

Tabla 4 (continuation)

Variables	Model 1	Model 2	Model 3	Model 4
Indigenous		-1.000*** (0.0421)	-0.77968*** (0.0405)	-0.7459*** (0.04181)
Afro_descendent		-1.346*** (0.0424)	-1.12169*** (0.04100)	-1.2638*** (0.04216)
White		-1.661*** (0.0421)	-1.4880*** (0.04060)	-1.5606*** (0.04459)
Montuvio		-1.505*** (0.0421)	-1.3331*** (0.04049)	-1.4550*** (0.04466)
Age		-0.113*** (0.000371)	-0.10484*** (0.000370)	-0.9862*** (0.000373)
Gender (women)		-1.220*** (0.00497)	-1.0333*** (0.0063)	-1.2847*** (0.0052)
Urban_area		-1.201*** (0.00586)	-1.19095*** (0.00552)	-1.4175*** (0.00581)
<i>Civil Status</i>				
Marital_Status_Partnership		0.0325*** (0.00507)	0.204343*** (0.00634)	-0.71402*** (0.00533)
Health_insurence		-0.359*** (0.00537)		-0.3325*** (0.00520)
Cons	1.404*** (0.0122)	11.37*** (0.0531)	10.619*** (0.0508)	9.328*** (0.0525)
N	1.032.431	1.032.431	1.032.431	1.032.431
Log Likelihood	-668.053.77	-554.960.41	-540.854.86	-506.376.53
Pseudo R2	0.06	0.2162	0.2361	0.2848
FIV	1.19	1.25	1.27	1.21
AIC	1.336.119.5	1.109.958.8	1.081.747.7	1.046.262.9
BIC	1.336.190.6	1.110.183.9	1.081972.8	1.046.488

Standard errors in parentheses.
 *p < 0,01 **p < 0,05 ***p < 0,01.

TABLE 5
 MARGINAL EFFECTS

Variables	Model 1	Model 2	Model 3	Model 4
<i>Education (H1). Reference:</i>				
<i>No level education</i>				
Primary	-0.0019 (0.0013)	0.0108** (0.0015)	-0.0017 (0.0015)	0.0120** (0.0016)
High_school	-0.0674** (0.0019)	-0.0417** (0.0023)	-0.0427** (0.0022)	-0.0835** (0.0022)

Tabla 5 (continuation)

Variables	Model 1	Model 2	Model 3	Model 4
Higher	-0.1185** (0.0026)	-0.1187** (0.0028)	-0.1083** (0.0027)	-0.0993** (0.0027)
<i>Family structure (H2)</i>				
Complex household	-0.3115** (0.0011)	-0.2109** (0.0015)	-0.1730** (0.022)	-0.2897 (0.013)
House overcrowding				-0.0790** (0.0013)
Head of household			0.0751** (0.0020)	
<i>Income (H3)</i>				
Log_Income_perc	-0.0652** (0.0006)	-0.0041*** (0.0008)		
Log_Regula_income_perc			-0.0494** (0.0003)	
Log_labor_income_perc				0.0896** (0.0003)
<i>Natural Region. Reference: Sierra</i>				
Coast		-0.0665** (0.0013)	-0.0734** (0.0013)	-0.1107** (0.0013)
Amazon		-0.0569** (0.0031)	-0.0675** (0.0031)	-0.060** (0.0033)
Galapagos		-0.0178 (0.0206)	-0.0661** (0.0195)	-0.1718** (0.0174)
<i>Ethnics. References Others</i>				
Mestizo		-0.3565** (0.0090)	-0.3184** (0.0089)	-0.3502** (0.0090)
Indigenous		-0.2129** (0.0074)	-0.1720** (0.0079)	-0.163** (0.0081)
Afro_descendent		-0.2629** (0.0059)	-0.2838** (0.0053)	-0.2469** (0.0060)
White		-0.3054** (0.0050)	-0.2841*** (0.0053)	-0.2880** (0.0051)
Montuvio		-0.2888** (0.0056)	-0.2645** (0.0060)	-0.2771** (0.0013)
Age		-0.0274** (0.0001)	-0.0253*** (0.0001)	-0.0237** (0.0001)
Gender (women)		-0.2890** (0.0011)	-0.2463** (0.0015)	-0.3015** (0.0012)
Urban_area		-0.2873** (0.0013)	-0.2849** (0.0013)	-0.3341** (0.0013)

Tabla 5 (continuation)

Variables	Model 1	Model 2	Model 3	Model 4
<i>Civil Status</i>				
Marital_Status_Partnership		0.0078** (0.0012)	-0.0596** (0.0015)	-0.0171** (0.0012)
Health_insurance		-0.0860** (0.0013)		-0.0790** (0.0013)
N	1.032.431	1.032.431	1.032.431	1.032.431

Based on the BIC criteria, the preferred model is Model 4, these results reveal the importance of income, education level and family structures on the probability that an elderly person works. The significant and negative impact of education level and complex household on the probability of working suggest that, these variables reduce the probability of working, conversely, the income variable indicate that labor income from the elderly has a positive effect on the likelihood of continuing to work at an advanced age. Thus, providing evidence for hypothesis 1 and hypothesis 2.

It is important to make a difference between the types of income considered in this paper. Model 3 considers the income received from regular transfers as pensions for retirement, orphans, Human Development Bonus, Joaquin Gallegos Lara bonus, familiar financial support, scholarships, money delivered by public or private institutions. The negative and significant effect of this variable indicates that older people who receive this type of income are less likely to work.

On the other hand, labor income from the elderly has a positive effect on the likelihood of continuing to work at an advanced age (Model 4). Aísa, Pueyo, and Sanso (2012) conclude that productive older people stay longer in the labor market, this can be attributed to if the elderly receives higher labor income, and he is motivated to continue working.

The total income includes the primary income, income from property, regular transfers and other non-current income. In Model 1 and Model 2, the total income has a negative and significant effect in the likelihood of continuing to work.

Finally, the results regarding the control variables are interesting as follows: if the elderly has any health insurance, decreases the likelihood of working compared to older people who do not have health insurance. Contrarily if the elderly person is a woman, she decreases the probability of working in comparison with men. Conversely, if the old man has a sentimental partner decreases the probability that he works in contrast to those elderly who have no sentimental partner.

6. DISCUSSION

This article contributes to the on-going literature related to the importance of socioeconomic factors that which may be involved on the decision to work in elderly

persons. Using Ecuadorian elderly people data, we provide evidence of the negative impact of education and income on the probability of working in elderly people. These results suggest that people with higher education level will have better savings programs or have better jobs that allow them to stop working earlier.

The estimations regarding the effect of complex family household on the probability of working emphasize that family household would reduce the probability that an elderly person works. However, the possibility for the elderly people to receive help from their families depends on demographic and social circumstances such as women insertion in the labor market (CEPAL, 2009), and if a family conflict happens the elder would be unprotected.

The progressive aging of population, added to the increasing of life expectancy in last years, motivate this analysis in order to understand the impact of education, complex family structures and income on the decision to work. Elderly population is an important group of population, since its rate of growing is 3% worldwide. Therefore, governments, as well as the society, should be prepared to take care of all elderly people needs.

For instance, public programs should take into account that childhood is important in order to have less problems at this stage. In fact, a good early nutrition will reduce health problems in the future, which means less costs for the Government (Wen and Gu, 2011; Palloni and McEniry, 2007). The growing elderly population would increase the demand of those places. Care institutions represents a problem even in developed countries like Finland (Nihtila and Martikainen, 2007). In this context, Ecuador has the responsibility to prepare for the growing elderly population since families remain as a support to elderly people (Ulker, 2008), which could be a problem given the reduction of fertility rate (Shelton Brown *et al.*, 2013).

Finally, limitations of this study must be mentioned, providing direction for further research. First, the empirical investigation is limited by the characteristics of the data, which focuses on a single year. This approach could be complemented with estimations using panel data to highlight evolutions and change in behavior of elderly people. In addition, it would be interesting to have information about the perceived quality of life of elderly people to better understand the choice of staying or coming back to the labor market.

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ONLINE APPENDIX A

Independent variables

Income: It is the income of the elderly person measured in US dollars.

There are several definitions regarding the analysis of the income variable. The INEC considers the recommendations made by the ILO⁶. This organization defines that income is the sum of all revenues (in currency or in kind) (INEC, 2012). In this context, the INEC classifies the income as follow:

Current Income

- **Primary income:** Earned income (dependent and independent jobs)
- **Income from Property:** Income for capital or investment (rents, dividends, royalties, etc.).
- **Regular Transfers:** Income for transfers as: pensions, orphans, Human Development Bonus⁷, Joaquin Gallegos Lara bonus⁸, familiar financial support, scholarships, money delivered by public or private institutions.
- **Other non-current income:** Income for insurance compensation, inheritances, lotteries, etc.

In this paper, we create the different kinds of income and the total income will be the sum of the income described above. Figure A1 illustrates the most representative kind of income at an old age. The Ecuadorian women elderly receive more income for regular transfers than men. However, Ecuadorian men elderly receive more income for dependent and/or independent jobs than women do.

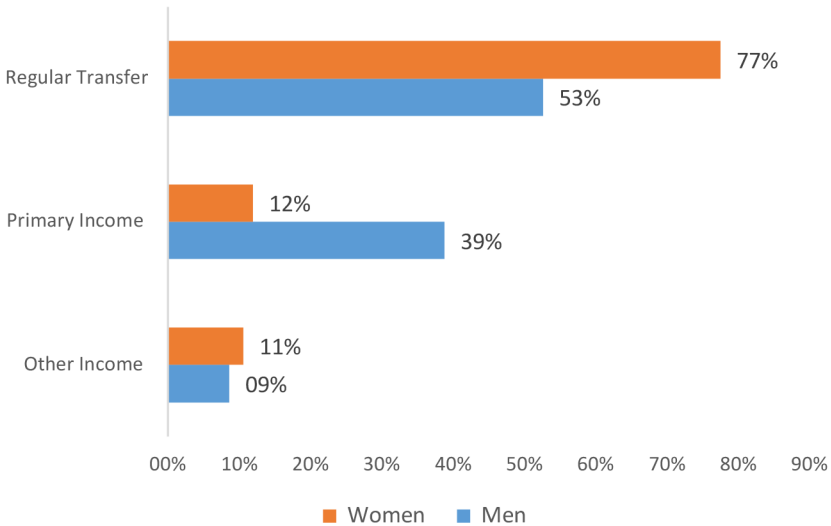
⁶ International Labour Organization.

⁷ Monthly monetary transfer of USD 50 addressed to elderly people, who are in conditions of vulnerability and are not affiliated with a public security system.

⁸ Economic benefit for people with severe disabilities, rare catastrophic diseases or orphans, children under 14 with HIV / AIDS.

FIGURE A1

TYPE OF INCOME



Note: Other income includes income from property and other non-current income.

Source: LCS, INEC (2014).

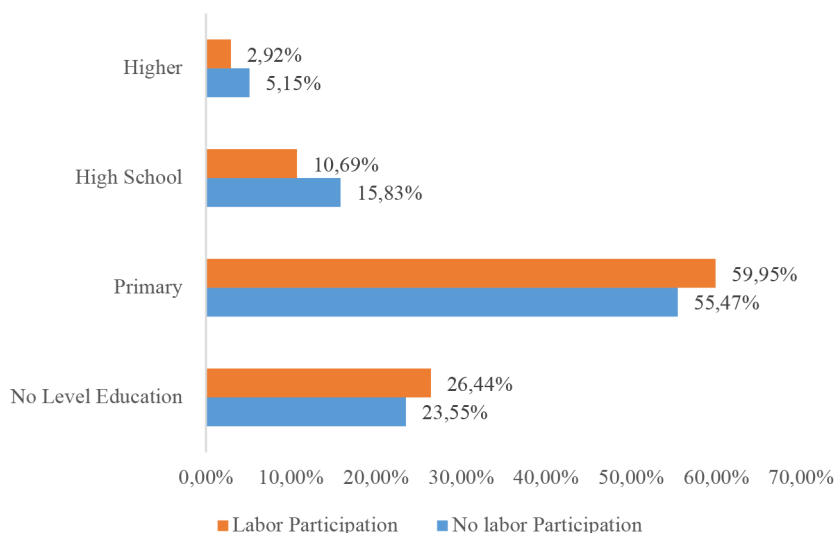
Education: The variable indicates the most advanced level of education that the elderly person attended. It is divided in: i) not education, ii) illiterates, iii) primary, iv) high school and v) higher education. No level education is used as the reference group. Figure A2 shows the education level of Ecuadorian elderly population.

Complex household: This variable indicates whether the person lives in a nuclear household plus other relative (uncles, cousins, siblings, in-laws, etc.). Latin American families are diverse in structure, so there is not a single model of family composed of mother, father and dependent children (Martinez, 2015). In Ecuador, 158.491 elderly people live in a complex household, which represents 15% of the elderly population. Nowadays, various factors influence the adoption of new housing modalities (single-family houses) and settlement patterns, (Sistema Integrado de Indicadores Sociales del Ecuador, 2014), which can lead to the formation of overcrowded homes. In Ecuador 13% of the elderly population live in these conditions. In this study, the *housing overcrowding* was also included to check robustness of results. Following the Economic Commission for Latin America and the Caribbean (CEPAL, 2013), we consider a housing overcrowding when the number of people living in the same

house divided by the number of bedrooms available is greater than three. Finally, *Head of household* indicates if the elderly person is head of household. According to LCS, 62% of Ecuadorian population is considered by the members of his family as head of household.

FIGURE A2

EDUCATION LEVEL



Source: LCS, INEC (2014).

Control variables

Age: It represents the age of the people in the sample. It is measured in years.

Gender: This variable indicates if the elderly is a woman or a man. The reference category is man.

Ethnic: It is a categorical variable that presents information about the ethnic self-identification of the elderly people. The reference category is Others that include: Asians, Indians, Turks, etc. and the other possible options are Indigenous, Mestizo, White, Montuvio, Afro-descendants that include Blacks and Mulatos. The distributions of the different ethnic groups in Ecuador is as follows:

TABLE A1

DISTRIBUTIONS OF THE ETHNIC GROUPS

Ethnics	Percentage (%)
Mestizo	74.74
Others	0.36
White	5.37
Afro-descendent	4.18
Indigenous	8.61
Montuvio	6.74

Source: Survey of living conditions, 2014.

Civil Status: It is a categorical variable that represents the civil status of the elderly people. It is 1 when the elderly has a partner (married, free union) and 0 when he does not have it. The category of reference is if the elderly persons do not have a partner (separated, divorced and widowed).

Health insurance: 62% of the elderly population is not covered by any health insurance. In addition, it is also observed that people receiving health insurance such as IESS⁹ (general or voluntary), ISSFA¹⁰, ISSPOL¹¹ or private health insurance do not continue working except of those who receive Rural Social Security. Health is a key factor in the decision to continue working at an advanced age. Consequently, the institutions that provide health services are essential in this study. A weaker health could increase disincentives the return of work since health problems could reduce life expectancy, which leads to an earlier retirement (Roberts *et al.*, 2010). However, poorer health increases the consumption of medications, and higher incomes are required therefore the elderly are motivated to continue working to satisfy this need. In addition, Eggleston and Fuchs (2012) claim that better health in terms of survival and reduced morbidity tend to increase age rates in the workforce.

Region: It is a categorical variable that collects information about the geographical region in which the elderly person lives. Sierra is the category of reference and the other possible options are Coast, the Amazon and Galapagos. Sierra region concentrates 49% of elderly population, the Coast region 48%, followed by the Amazon with 3% and finally the 0, 1% corresponding to Galapagos Island (Ministerio de Inclusión

⁹ Ecuadorian Institute of Social Security.

¹⁰ Social Security Institute of Ecuadorian Armed Forces.

¹¹ Social Security Institute of the National Police.

Económica y Social, 2013). Agriculture and livestock activities characterize *Sierra*, itself comprised of very different Indigenous group (De Vos, 1998). Considering that this region concentrates the majority of elderly of the country, we expect a greater elderly labor participation in the Sierra (mountain region) compared to other regions.

Area: It is a categorical variable that collects information about the area of residence of the elderly people. Rural area is the category of reference. It is important to control this aspect because the rural area has worse socioeconomic conditions than the urban area, and older people with lower cognitive functioning inhabit in neighborhoods with lower socioeconomic levels (Worne *et al.*, 2017). In this context, Singh and Das (2015) found that elderly persons from the poorer sections in rural areas are compelled to work for higher number of days per week in comparison to the richer elderly persons.

