



ORIGINAL ARTICLE

Determining factors influencing the educational level of women in Peru 2022

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Abstract

The central objective of the study is to examine the determinants that influence the educational level of women in Peru during the year 2022. The information used comes from secondary sources and was obtained from the Demographic and Family Health Survey of the National Institute of Statistics and Informatics for the year 2022. The hypothetical-deductive method was used with a quantitative approach, using an ordered logit model for the estimation, which was chosen using the information criteria. It is concluded that variables such as age at which the first child was born, literacy, area and mother tongue increase the probability of belonging to the highest educational level categories (higher non-university, university and postgraduate), for example, a woman in the urban area has on average of 1.30% more probability of reaching the postgraduate level compared to a woman from the rural area, a woman whose mother tongue is Spanish is on average 5.90% and 0.76% more likely to reach the higher university or graduate level of education, respectively, compared to women whose mother tongue is native. On the other hand, teenage pregnancy, age and number of children increase the probability of belonging to the lowest educational level categories (initial/preschool, primary and secondary). All are significant at 1% significance.

Keywords: Ordered logit model, information criteria, literacy, education

1. Introduction

Education is a fundamental right of people, regardless of their gender. It is through education that a country's competitiveness is improved and progress is made towards economic and human development (Vergara et al., 2015). Through good quality education, girls and boys can acquire the knowledge and skills necessary to actively participate in society. However, there are still various sources of educational inequality in Peru which are related to the area where one lives, gender and even native language in addition to other factors that can affect the educational level achieved by women (García, 2017).

In this sense, Peru is a multicultural country and therefore the factors that affect the educational level of women are diverse, a key factor to consider is the area of residence where there is a large gap in educational inequality between urban and rural areas (Cuenca & Urrutia, 2019). Likewise, according to figures from the Group of Analysis for Development (GRADE), 20.8% of the Peruvian population is located in rural areas of which 22.7% of women become pregnant between 15 and 19 years of age.

On the other hand, intercultural bilingual education still has great limitations due to there are not enough resources such as trained teachers or infrastructure, although a complete intercultural education should be offered with emphasis on the differences in the native language (Spanish-original), this service should only be offered to a total of 24,553 educational institutions located in rural areas, of which only 11.2 % are being implemented at the initial level, 25.8 % at the primary level and none at the secondary level (Montero & Uccelli, 2020). This shows a significant educational inequality according to native languages, as in Peru, there are a total of 48 native languages where for example Quechua is spoken by 13.9% of the population and Aymara is spoken by 27% of the population from Puno. (Benites & Barnaby, 2020).

In 2021, the net attendance rate in primary education was 97.9 % for girls and 97.6 % for boys and 86.9 % for both in secondary education. Although there are no major differences in the net attendance rate in primary or secondary education, there are differences in the higher levels of education. Additionally, we can observe that the activity rate by primary education level is 62.6% for females compared to 81.7% for males. When it comes to higher education, there is a 13.1% gap in the activity rate between males and females. (National Institute of Statistics and Informatics [INEI], 2021).

According to INEI data (2020a), positive improvements have been observed in education coverage indicators, such as enrollment, completion, attendance and dropout, at the national level in recent years. This is also reflected in gender equality and in the increase in the average years of schooling of young people. However, there are still pending challenges to be addressed in relation to secondary education and rural and indigenous communities. For example, during the 2010–2013 period, the gender gap in the net school attendance rate in secondary education has narrowed, although there is still a significant difference between urban and rural areas. In the urban area, the net attendance rate is 85.7 % for both genders, with 86.6 % for females and 84.7 % for males. However, in the rural area, the attendance rate for females is 71.4% compared to 71.1% for males. Likewise, the INEI report (2020b) "Peru Gender Gaps 2020–Advances towards equality between women and men", indicates that inequalities persist in access, permanence and completion of education for girls. This results in women not being able to develop the same skills as men and being discriminated against in the social, economic and political spheres. In the adult and elderly population, women have not yet reached the same educational level as men.

In rural areas, females have a higher dropout rate (8.60 %) compared to males (6 %). The main reason why female students in rural areas drop out of school is due to "family reasons" or "domestic responsibilities" (38 %), while this reason is less common for males (7 %). (Peruvian Ministry of Education [MINEDU], 2018).

Despite significant progress in the country's education system, there is still an illiteracy gap between women and men. According to 2019 data, 8.1 % of Peruvian women aged 15 years and older are illiterate, which is almost three times higher than the percentage of men (3 %).

In terms of fertility, according to INEI's Demographic and Family Health Survey-ENDES (2018), it was found that women with primary education, upon reaching the end of their reproductive life, have on average 2.1 times more children than those with higher education (3.5 children compared to 1.7 children); which means a difference of 1.8 children between both educational levels.

1.1 Theoretical framework

Works such as Cruz et al. (2016) show that knowledge is based on and renewed through mother languages. In this regard, Rodríguez (2011) argues that having a minority or native mother tongue presents a communication challenge, which leads to difficulties in understanding academic content and may increase the likelihood that the student will drop out of school; therefore, education that focuses solely on Spanish creates a communication barrier for those whose mother tongue is native, which is often associated with learning difficulties. For its part, UNESCO (2022) indicates that the incorporation of mother tongue education plays a fundamental role in inclusion and in achieving high-level learning that translates into a notable increase in academic performance and school achievement;

moreover, during the primary education stage, this strategy becomes crucial, because it prevents gaps in knowledge and accelerates the content learning process. Finally, Perez & Alieto (2018) claim that the choice of the language of instruction, especially in the early years of education, has a significant impact on academic outcomes since, opting for the right language leads to educational success, while an inappropriate choice can be detrimental to the learning process and achievement.

On the other hand, a number of investigations such as Benavides & Ñopo (2005) have pointed out that gender disparities in access to education are mainly concentrated in the adult population. Importantly, uneducated adults are more likely to undervalue women's education and to have conservative attitudes towards gender. Also, Guadalupe (2002) indicates that the largest gender gap in rural areas is observed mainly at the secondary education level. This is due to the fact that families assign greater responsibilities to adolescent girls in household chores, since they perceive negative returns to the investment in their education. In contrast, Cueto (2004) reveals that girls living in rural areas have a higher propensity to drop out of school before reaching secondary school compared to rural boys. This situation is mainly due to the greater burden of domestic work that falls on girls in households. In addition, Alcazar (2008) argues that adolescent pregnancy is another determinant factor that leads both urban and rural adolescents to drop out of education. Adolescent pregnancy has negative repercussions on the accumulation of human capital, which in turn has long-term consequences in terms of the quality of employment they can access in the future.

According to Mendoza & Subiría (2013), pregnant adolescents have greater difficulties in making the transition to adulthood and in fulfilling their life plans, especially if they come from impoverished backgrounds. The impacts of adolescent pregnancy are also related to the formation of human capital, i.e. quality education and health, which limits educational, employment, personal and family development opportunities. Valenzuela (2020) states that educational attainment has an inverse relationship with the number of children. Also, in a study on Family Planning in Latin America by Castro & Juarez (1995), it is revealed that women with less education tend to have larger families, with around 6 to 7 children, while those with higher educational levels have 2 to 3 children. This indicates that there is an inverse relationship between educational level and fertility, i.e., as education increases, the number of children that women have tends to decrease. Finally, Adelman et al. (2021) and Lechuga et al. (2018) agree that teenage pregnancy is the main source of school dropout and educational inequality, which leads to a lower level of education; they also emphasize that a fundamental contribution of education is that it contributes to economic growth and development.

Therefore, the study question is: What are the determinants that influence the educational level of women in Peru? so, the objective of the study is to examine the determinants that influence the educational level of women in Peru. From the theoretical review and also starting from the theory of human capital that tells us in a general way that skills and knowledge are forms of capital that improve productivity at the individual level as well as at the country level, also highlighting that education can contribute to close the various existing gaps (Pérez & Castillo, 2016). It is hypothesized that mother tongue, area of residence and variables related to teenage pregnancy or number of children are the main determinants of educational level in women, evidently studies add other socioeconomic variables as control variables.

2. Materials and methods

The present research is of quantitative approach and non-experimental design given the nature of economic sciences (Mendoza, 2014). The source of information is secondary and was obtained from the Demographic and Family Health Survey (ENDES) for the year 2022 prepared by the INEI, which has a number of 35,847 households interviewed, whose sample results have a confidence level of 95 %. On the other hand, an ordered discrete variable model was used for the estimation in order to subsequently estimate the marginal effects. Table 1 provides the information obtained from each data source.

It should be noted that the Demographic and Family Health Survey (ENDES) indicates that

Tabla 1. Data base

Modules	Information obtained	Label
Module 1 Household characteristics	Id, marital status, sex, age, level of education, area of residence.	RECH1.dta RECH4.dta
Module 3 Housing characteristics	Mother tongue, literacy	RECH0.dta REC0111.dta
Module 4 Birth history Table of method knowledge	Age at first birth, total births, total number of children born	REC91.dta RE223132.dta

Source: Own elaboration

preschool education refers to early education, which is the level of education provided to children at an early age before they enter primary school. In Peru, early education is offered to children who are approximately 3 to 5 years old. For this reason, the INEI in the RECH4 heading of DHS module 1, specifically in the variable SH15N that refers to educational level, excludes all surveyed individuals in the RECH1 heading who do not have an education.

Operationalization of variables

Tabla 2. Operationalization of variables

Variable	Values	Variable Type
Endogenous variable		
Nivest Education level	0: Initial/Preschool 1: Elementary variables 2: Secondary 3: Higher, non-university 4: Higher, university 5: Postgraduate	Ordinal
Exogenous variables		
Lengmat Mother tongue-original language	0: native language 1: english	Dichotomous variable

Source: Own elaboration

2.1 Method of estimation

In the present research, an ordered multiple-choice model is used, since, as Greene (2003) points out, it is a qualitative response (CR) model, where the dependent variable (level of education) is an ordinal variable that takes discrete values, which in turn represent a qualitative outcome. More specifically, it indicates that for the aforementioned reasons, ordered logit and probit models are more frequently used to analyze variables of this type. Additionally, Gujarati & Porter (2010) argue that a clear example of the use of these models is given in cases where the explained variable is the level of education of individuals, such data generally come from surveys. For the reasons already mentioned, the estimation method will consist of using the ordinal logit and probit models. Subsequently, it is necessary to determine which of these two models should be selected to calculate the results that will be contrasted with the hypotheses. For this purpose, the Akaike (AIC) and Schwarz (BIC) information criteria are used to choose between these two models. Thus, the model with the lowest AIC or BIC value is chosen, since it will be the one that best fits the data and is simpler in terms of the number of parameters used (Gujarati & Porter, 2010).

$$AIC = e^{2k/n} \frac{\sum \hat{u}_i^2}{n} = e^{2k/n} \frac{SCR}{n} \quad (1)$$

$$BIC = n^{k/n} \frac{\sum \hat{u}_i^2}{n} = e^{k/n} \frac{SCR}{n} \quad (2)$$

2.1.1 Ordered Logit Model

Some choice variables have the characteristic of being ordered, where the distances or thresholds separating the categories or levels are not equal, so their estimation is required. Their estimation will allow estimating the relationship between independent variables and the probability of belonging to different categories detailed in the dependent variable. According to Greene (2003) the model starts with the following relationship:

$$Y_i^* = x_i\beta + e_i \quad (3)$$

In this model the individual's choices will be given among the alternatives from 0 . . H, and will be reflected in the value of Y_i^* .

$$Y_i = \begin{cases} 0, Si : & Y_i^* \leq 0 \\ 1, Si : & 0 < Y_i^* \leq \mu_1 \\ 2, Si : & \mu_1 < Y_i^* \leq \mu_2 \\ \vdots & \\ H, Si : & \mu_{H-1} < Y_i^* \end{cases} \quad (4)$$

Where: $\mu_1 \dots \mu_H$, are unknown thresholds or also called cut-off points between each category, β is the parameter vector and e_i is the error.

$$P(Y_i = 0) = F(-x_i'\beta) \quad (5)$$

$$P(Y_i = h) = F(\mu_h - x_i'\beta) - F(\mu_{h-1} - x_i'\beta), h = 1, 2, \dots, H-1 \quad (6)$$

$$P(Y_i = H) = 1 - F(\mu_{H-1} - x_i'\beta) \quad (7)$$

$$F(\mu_{h-1} - \beta'x_i) = \wedge(\mu_h - \beta'x_i) = \frac{e^{\mu_h - \beta'x_i}}{1 + e^{\mu_h - \beta'x_i}}, h = 1, 2, \dots, H-1 \quad (8)$$

The estimation is performed by the maximum likelihood method and the marginal effects are found as follows:

$$\frac{\partial P(Y_i = 0)}{\partial x_{im}} = -F(x_i'\beta)\beta \quad (9)$$

$$\frac{\partial P(Y_i = h)}{\partial x_{im}} = [F(\mu_{h-1} - x_i'\beta) - F(\mu_h - x_i'\beta)]\beta_m, h = 1, 2, \dots, H-1 \quad (10)$$

Based on what has been presented, the model to be estimated has the following form.

$$Prob(nivest_i = 1, 2, \dots, 6) = \beta_0 + \beta_1 embadol_i + \beta_2 tothij_i + \beta_3 primhij_i + \beta_4 residencia_i + \beta_5 edad_i + \beta_6 alfabet_i + \beta_7 dionat_i + \epsilon_i \quad (11)$$

In the model, the variable *nivest* represents the level of education attained; *embadol* means whether the woman had a pregnancy during adolescence; *tothij* refers to the total number of children; *primhij* refers to the age at which the first child was born; *residencia* is the area where the woman lives, whether rural or urban; *edad* is the number of years of age of the woman interviewed; *alfabet* refers to whether the woman can read or not; and finally *idionat* refers to whether the mother tongue is Spanish or an indigenous language.

3. Results

3.1 Model selection

Table 3 presents the information criteria that seek to obtain an adequate balance between an accurate fit to the data and the simplicity of the model. Firstly, according to the Akaike criterion (AIC), when comparing the corresponding values, it is observed that the Logit model exhibits a value of 51781.7, which is lower than the value of the Probit model, which reaches 51975.5.

Also, according to the Schwarz criterion (BIC), the Logit model presents a value of 51879.3, lower compared to the value of 52073.1 of the Probit model. Therefore, it is evident that the Logit model provides a superior fit or explanation of the data compared to the Probit model, taking into consideration the penalty for the number of parameters involved in the model.

Tabla 3. Comparison of ordered logit probabilistic models

(1) Ologit		
Nivest		
Embadol	-0.402***	(-0.0378)
Tothij	-0.281***	(-0.0134)
Primhij	0.155***	(-0.00389)
Residencia	1.196***	(-0.0312)
Edad	-0.0308***	(-0.00224)
Alfabet	6.850***	(-0.584)
Lengmat	0.693***	(-0.0334)
N	25227	
Pseudo R ²	0.210	
AIC	51781.7	
BIC	51879.3	
Standar errors in parentheses,*p<1,**p<05,***p<0.01		

Source: Own elaboration

4. Discussion

According to the estimation of the ordered logit model presented in Table 4, all parameters were found to be significant at 1% significance. Thus, a woman with teenage pregnancy, on average, increases the probability of reaching preschool, primary or secondary school level by 0.03 %, 3.90 % and 2.4 % respectively, while the probability of obtaining a higher non-university, higher or postgraduate level decreases by -2.50 %, -3.40 % and -0.40% respectively, keeping everything else constant. These results agree with Mendoza & Subiria (2013), Lechuga et al. (2018) and Adelman et al. (2021) since in their studies they conclude that a teenage pregnancy causes a series of difficulties to form human capital related to education and health which limits them in their educational, labor and development opportunities and also that a teenage pregnancy is the main source of school dropout and educational inequality.

In addition, having an additional child, on average, increases the probability of reaching preschool, primary or secondary level by 0.02 %, 2.70 % and 1.60 % respectively, while it reduces the probability of achieving higher non-university, higher or postgraduate level by -1.80 %, -2.40 % and - 2.40 % -0.30 % respectively, holding everything else constant. These results are consistent with the findings of Valenzuela (2020) who states that as a family has more children, educational attainment tends to

gradually decrease. On the other hand, Castro & Juárez (1995) affirm that those families with more children with around 6 to 7 children have less educated women, thus finding a negative relationship between educational level and fertility.

Also, if the age at which the first child was born increases by 1 year, on average the probability of reaching preschool, primary or secondary school decreases by -0.01% , -1.50% and -0.90% respectively, while the probability of obtaining higher non-university, higher or postgraduate education increases by 0.90% , 1.30% and 0.10% respectively, keeping everything else constant. In contrast, in the research by Adelman et al. (2021) they conclude that, if the age at which a woman has a child is higher, this reduces the dropout and dropout that would be caused by having the first child in the adolescent stage.

Likewise, with respect to geographic area, the fact of belonging to the urban area compared to women living in rural areas, on average reduces the probability of obtaining preschool, primary or secondary education by -0.01% , -11.9% and -7% respectively, while the probability of reaching higher non-university, higher or postgraduate level increases by 7.60% , 10.20% and 1.30% respectively, all other things remaining constant. In the works of Cueto (2004) and Guadalupe (2002), it was found that women in rural areas are more likely to drop out of school, and that the education gap is larger than in urban areas. With respect to age, an additional year, on average, increases the probability of having reached preschool, primary or secondary level by 0.0027% , 0.3% and 0.1% , respectively. On the other hand, it decreases the probability of having attained higher non university, higher or postgraduate level by -0.10% , -0.20% and -0.03% respectively, holding all else constant.

Likewise, if a woman can read, on average, the probability of reaching preschool, primary or secondary level decreases by -0.60% , -68.1% and -41.1% respectively, while the probability of obtaining higher non-university, higher and postgraduate levels increase by 44% , 58% or -41.1% 7.50% respectively, keeping everything else constant. This result can be compared with Torres (2006) who states that in order to reach an adequate educational level, it is necessary for people to be literate, which implies knowing how to read, in addition to their real and social use of the written language.

Finally, women whose mother tongue is Spanish, compared to those whose mother tongue is native, on average decrease their probability of reaching preschool, primary or secondary level by -0.06% , -6.80% and -4.10% respectively, while they increase their probability of reaching higher non-university, higher or postgraduate level by 4.40% , 5.90% and 0.76% respectively, keeping everything else constant. This result is related to the findings of Garavito (2011) who argues that there are differences not only in income but also in levels of education or productivity between those whose mother tongue is Spanish and those who have a native language.

5. Conclusions

Mother tongue and place of residence are elements that significantly influence the educational level of women. It is observed that women whose mother tongue is Spanish are more likely to have a higher level of education. Likewise, it was found that women residing in urban areas have a higher probability of accessing a higher educational level compared to those living in rural areas. Furthermore, it is necessary to take into account that these two factors are beyond the control of the individual, reflecting evidence of educational inequality in the Peruvian context.

On the other hand, aspects such as the number of children, teenage pregnancy, and age at which the first child was born have a negative influence on the probability of attaining a higher level of education (higher and postgraduate). This highlights the importance of carrying out awareness and education actions on adequate family planning and sexual education. Finally, the ability to read and write positively influences the probability of women reaching a higher level of education, as literacy becomes a prerequisite for progressing to higher levels of education effectively.

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