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Poverty trends and their determinants in Peruvian households

Julio Cesar Quispe-Mamani[1*], Miriam Serezade Hancco-Gomez[2], Santotomas Licimaco Aguilar-Pinto[3], Nelly Jacqueline Ulloa-Gallardo[4], Lucas Ponce-Quispe[5]

[1]*Faculty of Economic Engineering, National University of the Altiplano, Floral Avenue 1153, (051) 352206, Puno, Peru.*
[2]*Faculty of Health Sciences, National University of the Altiplano, Floral Avenue 1153, (051) 352206, Puno, Peru.*
[3]*Faculty of Administrative Sciences, Andean University Nestor Caceres Velasquez, Taparachi Urbanization Km 4.5 exit to Puno, Juliaca 322213, Peru.*
[4]*Faculty of Engineering, Amazon National University of Madre of Dios, Puerto Maldonado 17001, Peru.*
[5]*Faculty of Education Sciences, National University of the Altiplano, Floral Avenue 1153, (051) 352206, Puno, Peru.*

Corresponding author: Julio Cesar Quispe-Mamani (*Email: jcquispe@unap.edu.pe*)

Abstract

The objective was to analyze the trend behavior of poverty and its main determinants in Peruvian households, between the periods 2019-2023. The Lobit-Binomial type regression model was considered, with a quantitative, non-experimental and correlational approach; data from the National Household Survey was used. During the analysis period, a trend towards increasing poverty in Peruvian households was shown; where the determinants towards the decrease in poverty were the monthly per capita income, the water and sewage service at home, the electricity service at home, the age of the head of the household, the primary educational level, secondary educational level, non-university higher educational level, university higher educational level, has a formal job, location of the home in the natural region of the jungle and the location of the home in the natural region of the mountains; who showed a significant change in these periods. Therefore, before the pandemic (2019), the age of the head of the household explained the decrease in poverty; in the pandemic period (2020-2021), access to the water and sewage service at home determined the decrease in poverty; and in the post-pandemic period (2022 and 2023), the university and non-university higher educational level of the head of the household determined the decrease in poverty.

Keywords: Covid-19, Economic income, Households, Political conflicts, Poverty, Social conflict.

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1. Introduction

Economic and social theory explains the existence of poverty in the household as a phenomenon that negatively affects families, their members and households, which dates back to ancient times; but its behavior changed over time and its decline occurred in countries where the approach, economic policies and social policies were adequately implemented [1-8].

That is why, currently it is part of the economic and social development process, becoming an inevitable situation; where a gap is generated thanks to the existence of inequality of opportunity to access in the production process of goods and services, accompanied by the existence of insufficient opportunities to access public services provided by the State ; in addition, demand grows more and more complex every day, due to the high rate of population growth in the world, thus affecting the level of quality of life of human beings, with required standards [2, 9-16].

Worldwide, 8% of the population (600 million inhabitants) is in a situation of extreme poverty, seeking to survive in different ways with less than $2/day; of which, the continents of Asia and Africa are those that concentrate, on average, the largest number of extreme poor, since 32 and 26 million people in extreme poor situations are found in those continents; and the most important causes for this phenomenon are inequality and marginalization, the existence of social, political, economic, and cultural conflicts, the existence of malnutrition in household members, the existence of deficient medical care, lack of access to basic services at household, absence and limited access to education, health and employment, among others [3, 7, 8, 17-25].

Latin America is no stranger to this current problem, given that, from 2000 to 2012, poverty was reduced from 50% to 30%, remaining constant until 2018, with slight variations; but in 2019 it increased to 28.3%, mainly affecting the countries of Honduras, Colombia and Ecuador, where poverty represented values of 49%, 29% and 25%, above the regional average and were below $5.50/ diaries; but also the countries of Uruguay, Chile and Costa Rica showed lower poverty indicators at the regional level, reaching average values of 3%, 4% and 11%, thus showing the two extremes of countries where poverty indicators are recorded by above or below your threshold. Additionally, countries such as Cuba, Nicaragua and Venezuela did not show statistics related to poverty, but it is presumed that their indicators reached 95%; therefore, on average at the region level, the existence of poverty can be considered below the threshold of $2, which was represented by 3.7%, and below the threshold of $6, which was represented by 22.5%, showing a decline. of poverty, which on average is equivalent to 12 years and 20 years in extreme poverty [2, 19, 25-30].

The global health crisis generated since the end of 2019 in the world (COVID-19), strongly affected Latin America and the Caribbean, which accompanied by the poor social and economic conditions of its countries, made it a very vulnerable region to the poverty and extreme poverty; since on average, the poverty rate in 2021 increased to 30.3%, with an extreme poverty rate of 14%, translating into a setback of 27 years, increasing from 81 to 86 million people who found themselves in the condition of poor extreme. Poverty was very critical in countries like Peru, since the poverty rate increased from 28.9% in 2019 to 43% in 2020, Colombia went from a poverty rate of 34.8% to 42.2% and Costa Rica went from a rate of poverty from 13.7% to 19.9%; while extreme poverty increased mainly in Argentina, Colombia and Peru, where the extreme poverty rate exceeded 7% [31-36].

Poverty in Peru decreased considerably from 59% to 20% between 2004 and 2019, due to the boom in economic growth; But due to the effects of COVID-19, poverty in 2021 increased to 26%, since people who were leaving the situation of poverty and extreme poor were in a vulnerable situation; Although this rate was lower by 4.2% compared to 2020 (30.1%), it was still the highest compared to 2019 [37-42].

The health crisis (COVID-19) accelerated the urbanization of poverty in Peru; Considering that, seven out of ten poor people lived in urban areas, but despite this case, the people who live in rural areas are the ones who are in the extreme poor situation; That is, poverty in the urban area was 22.3% and in the rural area it was 39.7%, respectively. In addition, of the total of 25 regions that Peru has, the poverty level was above the average in 15 regions, since they could not access the purchase of a basic basket of $102; The regions of Ayacucho, Cajamarca, Huancavelica, Huánuco, Loreto, Pasco and Puno were where a negative indicator was recorded that ranges between 36.7% and 40.9% of their population. By 2022, poverty reached 27.5% of the population of Peru, increasing by 1.7% compared to the previous year and the extreme poverty rate was 5% [39-48].

Therefore, poverty in Peru is a current problem and despite the years passing, it persists, which is why households in urban and rural areas are affected and even more so those in the Andes area, in the north and south zone; which is explained and determined by various factors such as monthly per capita income, access to water and sewage service at household, access to electricity service at household, married marital status, age of the head household, primary educational level, secondary educational level, non-university higher educational level, university higher educational level, public educational training, whether the head of the household has a formal work, the number of children in the household between ages from 6 to 14 years old, the number of children in the household between the ages of 0 to 5 years, the location of the household – jungle, the location of the household – mountains, among others [44, 49] in this sense, the question arises: How was the behavior of the determinants of poverty in households in Peru, between the period 2019 to 2023? The objective was to analyze the behavior of the determinants of poverty in households in Peru, considering the analysis period from 2019 to 2023.

2. Literature Review

2.1. Poverty

Defining the word poverty is quite complex and very relative due to its multidimensional and subjective characteristics. Consequently, the present study is limited to monetary poverty. According to this approach, a person is

considered poor when his or her economic income or consumption expenditure (valued in currency) fails to exceed a certain measure or poverty line; the calculation of which is carried out considering the cost of basic needs (such as the calories necessary to guarantee a lifestyle according to the demands of the context) [47].

According to National Institute of Statistics and Informatics [48] the "Poverty" is a condition in which one or more people have a level of well-being below the socially accepted minimum; that is, monetary poverty is associated with the difficulty or inability of people to satisfy their basic needs for food, housing, clothing, education, health, etc.

2.2. Approaches to Poverty Measurement

In this regard, they are summarized in three approaches that propose measuring poverty, which are [50]:

Absolute poverty: According to this approach, people who have incomes that do not exceed the cost of the basic family basket are considered poor.

Relative poverty: According to this approach, people whose income is below a specific level are considered poor; for example, in some countries, people are considered poor if their salary is less than the average income; this approach is used in countries where monetary or absolute poverty has been eliminated.

Social exclusion: This approach is currently in force on the European continent, and consists of focusing on people who do not have a job, or cannot access services such as their own housing, higher education, etc.

2.3. Poverty Measurement Methods

According to Alfani [51] in Peru, several methods are used to estimate poverty levels; and each of these methods focuses on different aspects of poverty, for example, some methods focus on economic aspects, others are more oriented towards social aspects; for this reason, their results are different.

2.3.1. The Poverty Line Method – LP

According to Alfani [51] the poverty line method focuses on the economic dimension of poverty and uses a person's income and expenditure as indicators to measure well-being; that is, it compares the value of the basket's cost (poverty line) with the quantitative value of per capita income or household expenditure. Likewise, when this poverty line method by consumption is used, the cost or value of what a household consumes is included and not what it could consume, that is, it is an indicator that serves to measure well-being; another advantage is that it allows consumption to be quantified, which is more fixed, unlike income, which facilitates the measurement of poverty.

2.3.2. Determination of Poverty Based on Income

Income is made up of people's wages; it is also made up of money income from donations, transfers and property rents; and income from rentals of homes and property. According to this method, the poverty rate in Peru has a decreasing trend [52].

2.3.3. Determination of Poverty Based on Expenditure

According to this criterion, consumer spending is made up of all goods and services that have been consumed, regardless of the manner of their acquisition; that is, all purchases, transfers and social programs [53].

2.4. Theories of Poverty

2.4.1. Multidimensional Poverty Theory

This theory considers that poverty is not only measured by income, but also by other aspects such as education, health and access to basic services [14].

Currently, a new concept of poverty is from a multidimensional approach, it is not only guided by economic income but also other aspects of the human and social development of people in conditions of poverty. This multidimensional approach allows for the correct identification of those population groups with deprivation of rights, as well as the application of appropriate public policies for this population segment and the optimization of resources that are destined to combat this social problem [53].

2.4.2. Theory of Labor Segmentation

This theory suggests that the existence of different types of employment (formal, informal) can influence people's vulnerability to poverty [54]. The term labour market segmentation theory (LMS) is often used to refer to a set of approaches, quite diverse in origin and content, that began to emerge in the late 1960s, driven by discontent with the neoclassical explanation of the labour market. Orthodox economics, from its equilibrium perspective, found it difficult to explain phenomena such as the persistence of poverty, unemployment, discrimination and, above all, wage inequalities between similar individuals.

In particular, for human capital theory, wage differences should reflect differences in productivity (measured in terms of qualifications); in the short term there could be transitory inequalities or phenomena such as involuntary unemployment, but in the long term the search for profit and utility maximization, in a context of perfect information and mobility, should lead to market emptying and the disappearance of inequalities [55].

2.4.3. Social Stratification Theory

This theory explores how an individual's social position in society can affect their access to economic resources and opportunities. It is in the so-called classical approaches to stratification and class structure, that is, in Marxist, Weberian and functionalist theories, that one can find the first analytical references for a conceptualization of the middle classes. These approaches do not provide a complete or systematic approach to these classes, but rather, within the general framework of a theory of stratification and classes, one can trace some references and indications for their identification and description [3].

3. Materials and Methods

3.1. Research Approach, Type and Design

The quantitative approach was considered, of a non-experimental type, with a correlational design, since it sought to analyze the behavior of the determinants of poverty, considering the application of theories and approaches that analyze poverty [52, 54].

3.2. Source of Information

The source of secondary information was considered, because the database of the National Household Survey (ENAHO) of the National Institute of Statistics and Informatics (INEI) was used; for which module 100 “Characteristics of Housing and Household”, module 200 “Characteristics of Household Members”, module 300 “Education”, module 500 “employment and income” and module 34 “Summaries (Calculated Variables) were considered.)”, from which the information was extracted according to the variables under study, for the periods 2019 to 2023.

3.3. Population, Sample and Sample Design

According to the National Institute of Statistics and Informatics (INEI); The study population of this research includes all of the people who are heads of households, and are classified by type of residents in urban and rural areas, socioeconomic conditions and particular characteristics that they have, at the level of all districts, provinces and regions of Peru.

As a study sample, 34,542 heads of household were considered for 2019, 34,471 heads of household for 2020, 34,230 heads of household for 2021, 34,183 heads of household for 2022 and 33,857 heads of household for 2023; all of these with ages over 14 years.

In addition, the sample considered from the ENAHO survey for said periods was with a probabilistic, area, stratified, multi-stage and independent sampling design in each study region at the level of Peru, at a level of confidence in the sample results of the 95 percent [55].

3.4. Variable Analysis

The dependent variable poverty was determined considering the poverty line established by the INEI; whose value considers a household's expenses as the basis, since it quantifies the standard of living based on what “people and households buy, acquire and consume”; furthermore, it is equivalent to the cost of a basic consumption basket of food and non-food, which shows that the group of households that have a monthly expense greater than said amount are considered non-poor and less than the same amount are considered poor.

In this sense, for 2019 the person is considered poor when their monthly expenditure is less than $95/person/month; For 2020, the person is considered poor when their monthly expenditure is less than $97/person/month; For 2021, the person is considered poor when their monthly expenditure is less than $102/person/month; for 2022, the person is considered poor when their monthly expenditure is less than $112/person/month; while by 2023, the person is considered poor when their monthly expenditure is less than $119/person/month. The description of the variables and their characteristics that were included for this research are shown in the following table:

Table 1.
Operationalization of variables.

Variables	Factor	Indicator	Category	Type of data	Source
Dependent					National household survey (ENAHO) - Survey of living conditions and poverty, 2019-2022
Poverty	Economic-social	Poverty line	1=Poor 0=Not poor	Qualitative	
Independent					
Natural logarithm of monthly per capita income	Economic	Economic income	Logarithm of income	Quantitative	
Household water and sewage service	Social	Household service	1=Has access 0=Does not have access	Qualitative	
Household electricity service	Social		1=Has access 0=Does not have access	Qualitative	
Married Marital Status	Social	Social conditions	1= Yes, you are married	Qualitative	

Variables	Factor	Indicator	Category	Type of data	Source
			0=Not married		
Age of head of household	Social	Years of the head of household	Number of years	Quantitative	
Primary educational level	Social	Educational level of the head of household	1=Reached level	Qualitative	
			0=Did not reach level		
Secondary educational level	Social		1=Reached level	Qualitative	
			0=Did not reach level		
Non-university higher educational level	Social		1=Reached level	Qualitative	
			0=Did not reach level		
University higher educational level	Social		1=Reached level	Qualitative	
			0=Did not reach level		
Public educational training	Social	Public educational training	1=Yes you had educational training	Qualitative	
			0=Had no educational training		
Has a formal work	Social	Work of the head of household	1=Yes counts	Qualitative	
			0=Does not count		
Number of children in the household between the ages of 6 and 14 years	Social	Number of children	Number of children between the ages of 6 and 14 years	Quantitative	
Number of children in the household between the ages of 0 and 5 years	Social	Number of children	Number of children between the ages of 0 and 5 years	Quantitative	
Household Location - Jungle	Social	Place of residence	1=Yes, it is part	Qualitative	
			0=Not part		
Household location - Mountain	Social		1=Yes, it is part	Qualitative	
			0=Not part		

3.5. Approach to the Econometric Model

There are different ways to explain the trend behavior of poverty and its determinants, but the binomial econometric model was considered to simplify the way of explaining the behavior of the determinants of poverty in the household. Therefore, the econometric model was applied for each period of analysis, since by having the database of the National Household Survey for each period, a syntax was built that allows obtaining the results for each period.

The Logit-binomial econometric model was considered, which corresponds to the maximum likelihood method; where the poverty variable is considered as a dependent variable and represents the probability of being poor P (Poor=1, Not poor=0), whose model used for the periods 2019 to 2023 is the following:

$$P(Poor = 1) = 1/(1 + e\text{^}(-(\beta_0 + \beta_1 * \text{Natural logarithm of monthly per capita income} + \beta_2 * \text{Household water and sewage service} + \beta_3 * \text{Household electricity service} + \beta_4 * \text{Married Marital Status} + \beta_5 * \text{Age of head of household} + \beta_6 * \text{Age of head of household\^2} + \beta_7 * \text{Primary educational level} + \beta_8 * \text{Secondary educational level} + \beta_9 * \text{Non} - \text{university higher educational level} + \beta_{10} * \text{University higher educational level} + \beta_{11} * \text{Public educational training} + \beta_{12} * \text{Has formal work} + \beta_{13} * \text{Number of children in the household between the ages of 6 and 14 years} + \beta_{14} * \text{Number of children in the household between the ages of 0 and 5 years} + \beta_{15} * \text{Household Location} - \text{Jungle} + \beta_{16} * \text{Household location} - \text{Mountain} + e_i)))$$

4. Results

4.1. Behavior of Poverty in Peru

Analyzing the behavior of poverty at the household level in Peru, the existence of an increase in poverty from 2019 to 2023 is verified; in 2019, household poverty reached an average of 17.20%; in 2020 it increased to 22.39% due to Covid-19, which remained at 18.51% in 2021; but for the periods 2022 and 2023, poverty increased to 20.53% and 21.54% respectively, this due to macroeconomic factors such as the low economic growth that the country had (2.7%) and an average inflation rate of 7.97% annually; in addition, this was accompanied by the social and political conflicts generated in these last two periods, which directly affected the family basket (Figure 1).

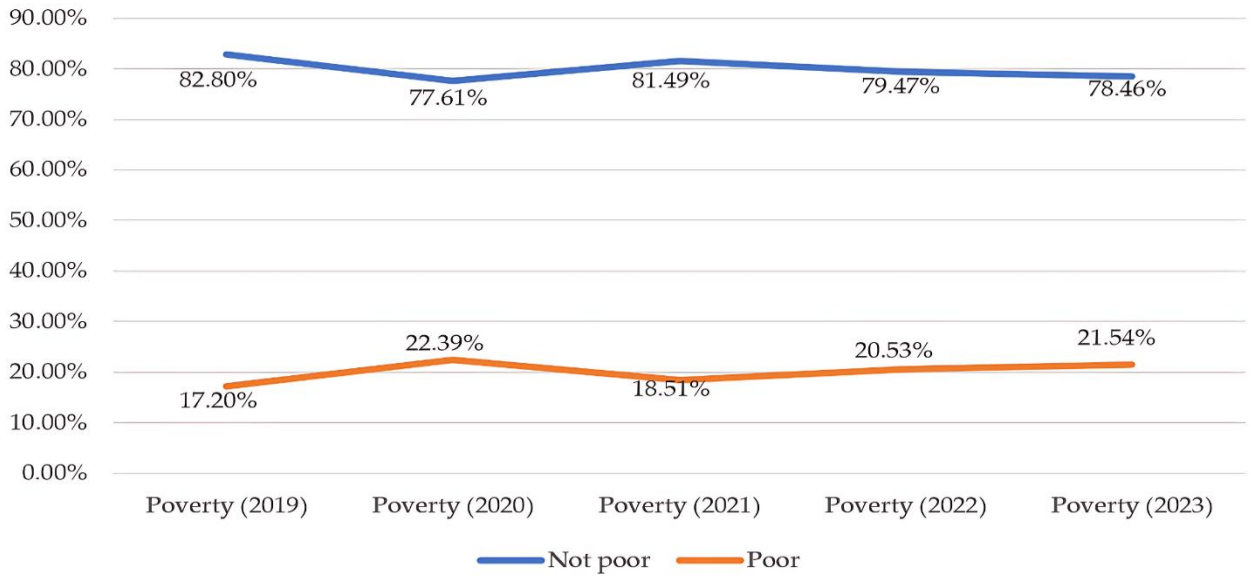


Figure 1.
Behavior of poverty in households in Peru, 2019-2023.

When analyzing poverty at the level of residence areas (Rural and urban), it was critical, given that poverty in households in the urban area in 2019 was on average 9.25%, by 2020 this increased to 15.67%, for the 2021 remained at 12.59%, but for 2022 and 2023 it increased to 14.62% and 16.56%. In addition, in households in rural areas, poverty in 2019 was an average of 30.26%, in 2020 it increased to 34.03%, in 2021 it was 29.26% and for 2022 and 2023 poverty increased to 31.48% and 30.88%. Therefore, carrying out an evaluation, in the urban area, poverty in households had an increase of 0.62% from 2019 to 2023 and in households in the rural area, poverty increased by 7.31%, which shows that the effects of Covid-19, accompanied by economic instability and social and political conflicts, strongly affected households in rural areas and at the same time in urban areas (Figure 2).

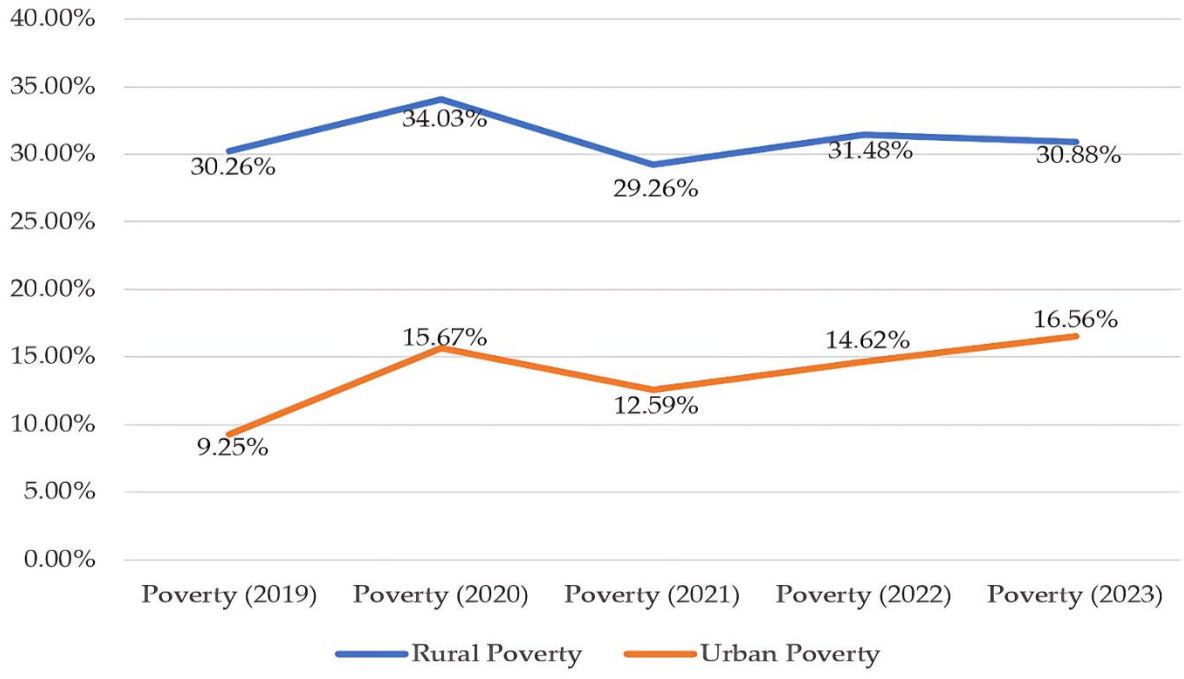


Figure 2.
Behavior of poverty in Peruvian households, by area; 2019-2023.

Regarding poverty in Peruvian households by political regions, it had a very variable behavior, given that the regions with the least poor in 2019 were Ica with 1.41%, Madre de Dios with 6.08%, followed by Lambayeque with 6.86% and Arequipa with 7.70%; On the contrary, among the poorest regions the Ayacucho region was considered with 34.99%, followed by Cajamarca with 32.59%, Puno with 31.28% and Huancavelica with 29.55%. By 2020, just when Peru entered the stage of social confinement, household poverty increased considerably, since the regions with the least poverty were Ica with 4.52%, Madre de Dios with 6.71%, followed by Lambayeque with 10.54%, Moquegua with 13.37% and Arequipa with 14.84%; on the contrary, among the poorest regions in this period were the Huancavelica region with 38.91%, followed by Ayacucho with 35.53%, Puno with 35.24%, Cajamarca with 34.14% and Huánuco with 33.91% (Figure 3).

In the 2021 period, in the middle and final stage of the social confinement process due to Covid-19, household poverty showed a slight decrease, since the regions with the least poor were Ica with 3.24%, Madre de Dios with 4.03%, followed by Lambayeque with 8.51%, Moquegua with 8.57% and Arequipa with 10.69%; but, among the poorest regions in this period were considered the Puno region with 33.71%, followed by Cajamarca 33.59%, Huancavelica with 29.44%, Ayacucho with 28.43% and Pasco with 27.43%. By 2022, in the post-pandemic stage, household poverty showed a slight increase, since all regions were affected in some way by the social, economic and political events indicated above, since the regions with less poor at household were Ica with 2.96%, Madre de Dios with 7.33%, Lambayeque with 9.42%, Moquegua with 11.96%, Arequipa with 12.13%, San Martin with 15.84%, Tumbes with 15.91%, Ucayali with 16.10%, Junín with 16.63%, Ancash with 17.03%, Tacna with 17.48%, Lima with 17.51% and Cusco with 18.51%; on the contrary, the regions with the poorest at household were Apurímac with 21.14%, Callao with 21.89%, La Libertad with 22.49%, Piura with 22.70%, Amazonas with 24.35%, Huánuco with 29.53%, Pasco with 29.58%, Huancavelica with 30.38%, Loreto with 30.45%, Ayacucho with 33.80%, Puno with 35.14% and Cajamarca with 40.76% (Figure 3).

But for the year 2023, a stage where the political and social conflicts caused by the political actors of the central government and with reaction by society will continue, accompanied by the behavior of the international economy that directly affected economic instability, poverty in households showed a considerable increase, since a large part of the regions were affected, since the regions with the least poor at household were Ica with 3.90%, Madre de Dios with 9.41%, Lambayeque with 11.82%, Moquegua with 12.88%, San Martin with 14.38%, and Cusco with 16.75%; on the contrary, the regions that showed an increase in poverty at household were Lima with 19.38%, Callao with 25.80%, Arequipa with 13.65%, Piura with 223.77%, Huánuco with 28.88%, Pasco with 31.07%, Huancavelica with 34.01% , Loreto with 31.72%, Puno with 34.05%, Ucayali with 19.00% and Cajamarca with 39.35% (Figure 3).

Therefore, analyzing the regions that managed to reduce poverty between the periods 2019 to 2023, they were Amazonas with a decrease of 4.25%, Apurímac with a decrease of 4.88%, Ayacucho with a decrease of 3.13%, Cusco with a decrease of 1.64%, The Libertad with a decrease of 0.20% and San Martin with a decrease of 2.40%. On the contrary, the regions that were greatly affected by Covid-19, due to problems of social and political conflicts; decrease in the economic growth of the country and due to the increase in the inflation rate were, Ancash with an increase in poverty of 4.05%, Cajamarca with an increase in poverty of 6.76%, Callao with an increase in poverty of 16.19%, Huancavelica with an increase in poverty of 4.45%, Huánuco with an increase in poverty of 4.60%, Ica with an increase in poverty of 2.50, Junín with an increase in poverty of 0.67%, Lambayeque with an increase in poverty of 4.95%, Lima with an increase in poverty of 10.05%, Loreto with an increase in poverty of 6.48%, Madre de Dios with an increase in poverty of 3.32%, Moquegua with an increase in poverty of 4.33%, Pasco with an increase in poverty of 9.24%, Piura with an increase in poverty of 3.10%, Puno with an increase in poverty of 2.77%, Tacna with an increase in poverty of 6.87%, Tumbes with an increase in poverty of 8.44% and Ucayali with an increase in poverty of 9.12%. Which shows that the increase in poverty in households in Peru between the periods 2019 to 2023 was on average 4.34% (Figure 3).

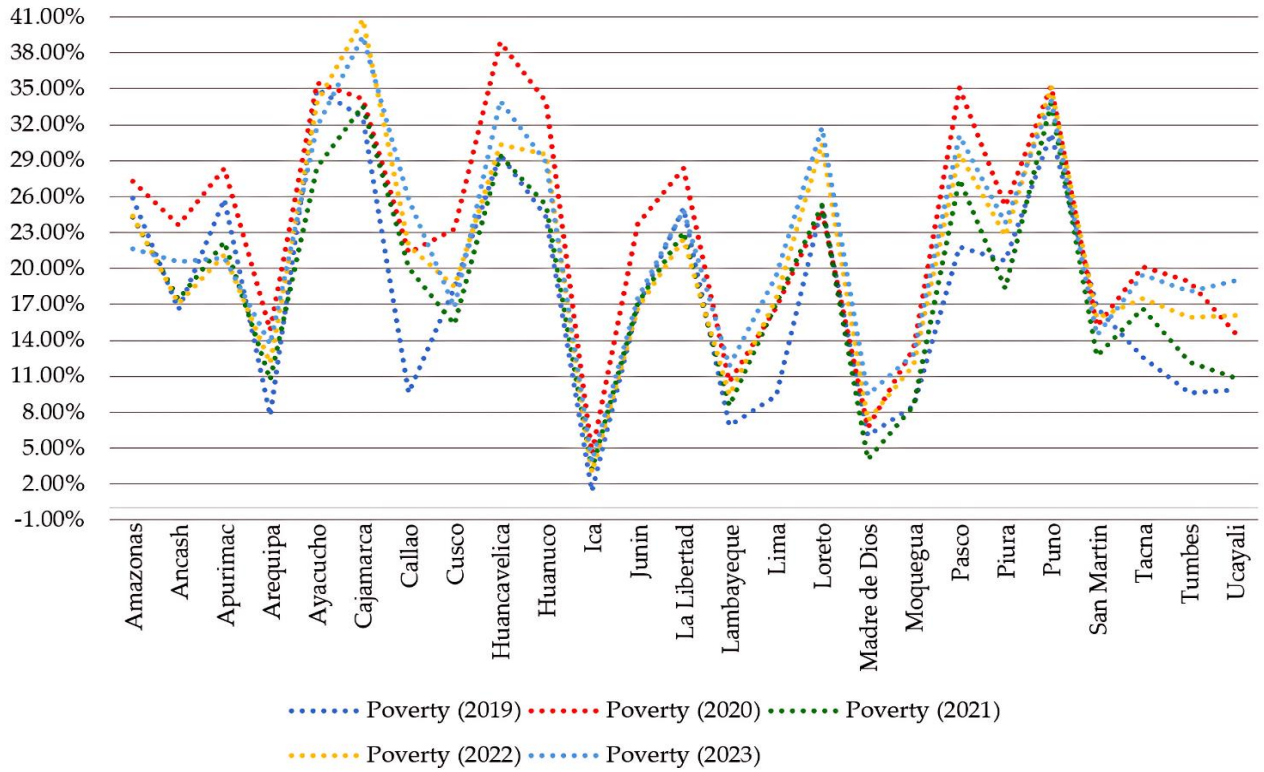


Figure 3.
Behavior of poverty in households in Peru, by political regions, 2019-2023.

When analyzing poverty by natural regions in Peru, for 2019, the North Coast region reached a level of poverty in the household of 12.08%, the Central Coast region 4.82%, the South Coast 7.38%, the Northern Mountain the 37.00%, the Central Mountain region 24.80%, the Southern Mountain region 21.26%, the Selva region 18.52% and metropolitan Lima 8.36%. Regarding the year 2020, the North Coast region reached a level of poverty in the household of 18.14%, the Central Coast region 10.58%, the South Coast 15.01%, the North Mountain 36.48%, the Central Mountain region 32.28% , the Southern Mountain region 25.67%, the Selva region 20.80% and metropolitan Lima 17.43%. For the year 2021, the North Coast region had a household poverty of 12.93%, the Central Coast region 9.93%, the South Coast 11.81%, the Northern Mountain 34.62%, the Central Mountain region 25.99%, the Southern Mountain region 20.68%, Selva region 17.36% and metropolitan Lima 16.31%. For the period of 2022, which period was already a post-pandemic stage, the North Coast region had a household poverty of 16.04%, the Central Coast region had a household poverty of 8.59%, the South Coast had a poverty in the household of 12.70%, the Northern Mountain had a household poverty of 35.71%, the Central Mountain region had a household poverty of 27.91%, the Southern Mountain region had a household poverty of 22.36%, the Selva had a household poverty of 21.47% and metropolitan Lima had a household poverty of 18.04%. However, for the year 2023, the North Coast region had a household poverty of 17.79%, the Central Coast region had a household poverty of 10.71%, the South Coast had a household poverty of 14.69%, the Mountain Norte had a household poverty of 36.10%, the Mountain Central region had a household poverty of 28.88%, the Southern Mountain region had a household poverty of 21.97%, the Selva region had a household poverty of 21.71% and metropolitan Lima had a household poverty of 20.40% (Figure 4).

In this sense, it is shown that the number of poor people in the household increased considerably between the period 2019 to 2023 (post-pandemic stage and accompanied by the stage of social and political conflicts), since the North Coast shows an increase in household poverty of 5.72%, the Central Coast region had an increase in household poverty of 5.89%, the South Coast region had an increase in household poverty of 7.31%, the Central Mountain region had a increase in household poverty of 4.09%, the Southern Mountain region had an increase in household poverty of 0.71%, the Jungle region had an increase in household poverty of 3.19% and the region Metropolitan Lima had an increase in household poverty of 12.04%. On the contrary, only the Northern Mountain region had a decrease in household poverty of 0.90%; thus, demonstrating that the natural region of metropolitan Lima, followed by the north coast, central coast, and south coast were the ones that showed an increase in poverty (Figure 4).

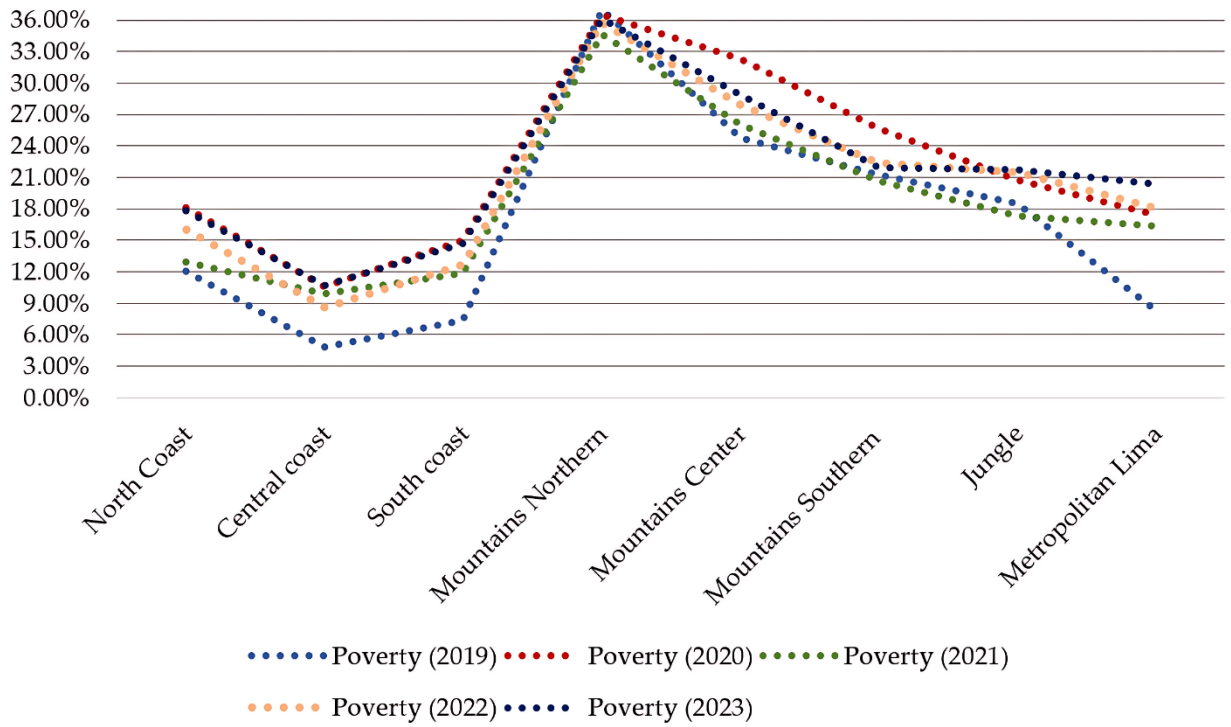


Figure 4.
Behavior of poverty in households in Peru, by natural regions, 2019-2023.

Poverty in households in Peru analyzed by natural regions and geographic zones; In 2019, it showed very relevant results, given that the urban Coast region reached a poverty level of 7.52%, in the rural Coast it reached a household poverty level of 14.44%; In the urban Mountain, household poverty was 11.16% and in the rural Mountain, household poverty was 35.63%; In addition, in the urban jungle poverty reached 11.37% and in the rural jungle it was 26.26%; However, in Metropolitan Lima household poverty was 8.36%. For 2020 and 2021 (Pandemic Stage), these results had a behavior towards an increase in poverty at household, given that, on the urban Coast, poverty at household was 14.26% and 11.01%, on the Coast rural increased to 19.49% and 15.68%, in the urban Mountain it increased to 17.54% and 13.75%, in the case of the rural Mountain it increased to 39.58% and 33.91%, in the urban Jungle poverty increased to 14.38% and

10.77%, but in the rural jungle the increase reached 28.50% and 25.62%; but in Metropolitan Lima it increased to 17.43% and 16.31% respectively. On the contrary, for 2022 and 2023 (Post-pandemic stage), these results had a behavior towards an increase in household poverty, given that, on the urban Coast, household poverty was 12.02% and 14.18%. , in the rural Coast it increased to 18.17% and 18.72%, in the urban Mountain it increased to 16.10% and 17.24%, in the case of the rural Mountain it increased to 35.17% and 35.02%, in the urban Jungle poverty increased to 14.95% and 16.95%, but in the rural jungle the increase reached 30.02% and 27.99%; and in Metropolitan Lima it increased to 18.04% and 20.40% respectively (Figure 5).

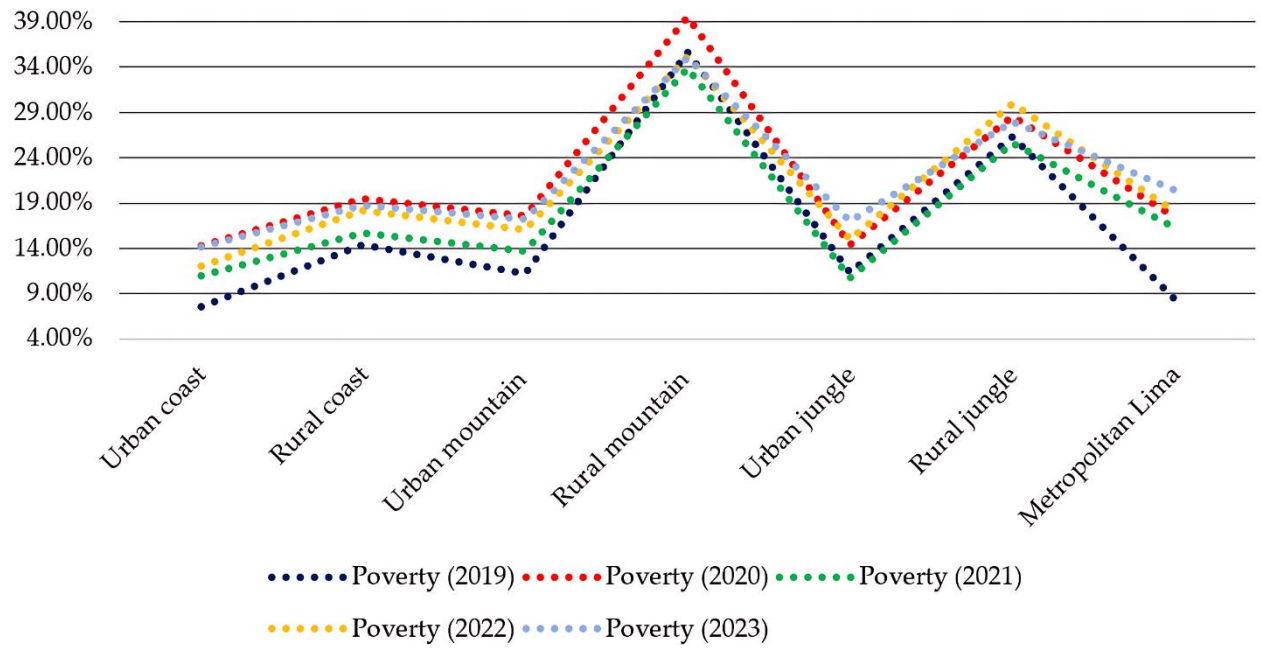


Figure 5.
Behavior of poverty in households in Peru, by geographic zones and areas, 2019-2023.

4.2. Correlation Analysis of Poverty and its Determinants in Households in Peru

After evidencing the behavior of poverty according to its characteristics in the case of Peru, these were determined by the monthly per capita income of the household, access to water and sewage service in the household, electricity service in the household, married marital status, age of the head of household, primary educational level, secondary educational level, non-university higher educational level, university higher educational level, public educational training, if the head of household has a work formal, the number of children in the household between the ages of 6 to 14 years, the number of children in the household between the ages of 0 to 5 years, the location of the household – jungle and the location of the household – mountains, whose correlation detailed below (Table 2).

Table 2.
Correlation between poverty and its determinants in Peru, 2019-2023.

Determining variables	Poverty in the household				
	2019	2020	2021	2022	2023
Natural logarithm of monthly per capita income	-0.5246	-0.5241	-0.5099	-0.5247	-0.5168
Household water and sewage service	-0.2662	-0.2304	-0.2136	-0.2093	-0.1994
Household electricity service	-0.1608	-0.1135	-0.1309	-0.1304	-0.1247
Married Marital Status	0.1185	0.1630	0.1473	0.1330	0.1366
Age of head of household	-0.0590	-0.1360	-0.0894	-0.0573	-0.0675
Primary educational level	0.1790	0.1438	0.1357	0.1400	0.1380
Secondary educational level	-0.0469	0.0298	0.0155	0.0087	0.0183
Non-university higher educational level	-0.1163	-0.1071	-0.1000	-0.1055	-0.1063
University higher educational level	-0.1562	-0.1660	-0.1522	-0.1584	-0.1642
Public educational training	0.0480	0.0934	0.0813	0.0695	0.0721
Has formal work	-0.1987	-0.1953	-0.1764	-0.1825	-0.1755
Number of children in the household between the ages of 6 and 14 years	0.2298	0.2862	0.2644	0.2434	0.2374
Number of children in the household between the ages of 0 and 5 years	0.2069	0.2355	0.2124	0.2200	0.2255
Household Location - Jungle	0.0176	-0.0193	-0.0152	0.0121	0.0022
Household location - mountain	0.1775	0.1531	0.1370	0.1239	0.1089

The correlation of poverty with its determinants shows a negative correlation between the monthly per capita income of the household, access to water and sewage service in the household, electricity service in the household, the age of the head of the household, the non-university higher educational level, the university higher educational level, if the head of the household has a formal work; that is to say, given a trend of increase in these variables, poverty in the household decreased considerably between 2019 and 2023. The variables, married marital status, primary educational level, public educational training, number of children in the household among the ages from 6 to 14 years, number of children in the household between the ages of 0 to 5 years and the location of the household – mountains, have a positive relationship with poverty in the household in Peru, given that the correlation that these have is direct (Table 2).

However, the relationship shown between the secondary educational level and household poverty in 2019 had an inverse relationship, but for the next few years it is positive, showing atypical behavior; in the case of the relationship between the location of the household - jungle with poverty at household, a positive relationship can also be indicated in 2019 and 2023, but a negative relationship in 2020 and 2021, which shows that these variables were considerably affected by the Covid-19 effect and the public policies implemented in said periods, whether efficiently or deficiently.

4.3. Behavior of the Determinants of Poverty in Households in Peru

To explain the behavior of the marginal effects of the determinants on household poverty in Peru, the Logit-Binomial type econometric model was considered, where according to the statistical tests, the efficient model was found; given that according to the Pseudo R2 statistic, for 2019, the independent variables explain 41.13%, for 2020, they explain 36.39%, for 2021, they explain 38.04%, for 2022, they explain 37.31% and by 2023 these explain 34.75%. Additionally, according to the Correctly classified statistical test, it can be indicated that; The model in 2019 correctly classifies 88.22% of the cases presented; For 2020, the model correctly classifies 84.83% of the cases presented; for 2021, the model correctly classifies 86.96% of the cases presented; By 2022, the model correctly classifies 85.91% of the cases presented and by 2023, the model correctly classifies 84.99% of the cases presented (Table 3).

Table 3.
Regression model of the determinants of poverty in Peru.

Variable	2019		2020		2021		2022		2023	
	Coefficient	Marginal effects	Coefficient	Marginal effects	Coefficient	Marginal effects	Coefficient	Marginal effects	Coefficient	Marginal effects
Natural logarithm of monthly per capita income	-2.5579377***	-0.2140	-1.9813892***	-0.2115	-2.5144769***	-0.2323	-2.5100632***	-0.2506	-2.2661515***	-0.2428387
Household water and sewage service	-0.07147653	-0.0060	-0.29200422***	-0.0312	-0.11209257**	-0.0104	0.01080552	0.0011	0.03788063	0.0040593
Household electricity service	-0.17491698**	-0.0146	-0.18425759**	-0.0197	-0.13170675*	-0.0122	-0.21016744***	-0.0210	-0.20058319**	-0.0214943
Married marital status	0.42378833***	0.0355	0.44671013***	0.0477	0.49462909***	0.0457	0.40405344***	0.0403	0.42330645***	0.0453611
Age of head of household	-0.01773973*	-0.0015	-0.0012459	-0.0001	-0.00117784	-0.0001	-5.35E-06	0.0000	-0.00784589	-0.0008408
Age of head of household squared	0.0002104**	0.0000	0.00003574	0.0000	0.0000736	0.0000	0.00008328	0.0000	0.00014421*	0.0000155
Primary educational level	-0.7311165***	-0.0612	-0.64002794***	-0.0683	-0.5150861***	-0.0476	-0.57307876***	-0.0572	-0.25997374*	-0.0278585
Secondary educational level	-1.042485***	-0.0872	-0.94920097***	-0.1013	-0.65307485***	-0.0603	-0.70160298***	-0.0701	-0.41996329***	-0.0450029
Non-university higher educational level	-1.3256859***	-0.1109	-1.3172372***	-0.1406	-0.90903961***	-0.0840	-0.93044591***	-0.0929	-0.83457001***	-0.0894317
University higher educational level	-1.7405257***	-0.1456	-1.7344628***	-0.1852	-1.2650152***	-0.1169	-1.2983076***	-0.1296	-1.1306909***	-0.1211638
Public educational training	.35434646**	0.0296	0.29760544**	0.0318	0.30991882**	0.0286	0.18064399	0.0180	0.00330256	0.0003539
Has formal work	-.27359706**	-0.0229	-0.15009051*	-0.0160	-0.28791128***	-0.0266	-0.02521103	-0.0025	0.04188847	0.0044887
Number of children in the household between the ages of 6 and 14 years	0.27329725***	0.0229	0.38505194***	0.0411	0.40343319***	0.0373	0.35131705***	0.0351	0.34074684***	0.0365141
Number of children in the household between the ages of 0 and 5 years	0.50076602***	0.0419	0.51460428***	0.0549	0.4322274***	0.0399	0.46477794***	0.0464	0.4897662***	0.0524829
Household location - Jungle	-0.81484937***	-0.0682	-0.76155704***	-0.0813	-0.95745636***	-0.0885	-0.72367406***	-0.0723	-0.83518299***	-0.0894974
Household location - mountain	-0.09779086*	-0.0082	-0.05519966	-0.0059	-0.29033651***	-0.0268	-0.29265626***	-0.0292	-0.40437184***	-0.0433321
Constante	14.478251***	-	10.894546***	-	13.970749***	-	14.443481***	-	13.314362***	
Aic	18,703.51		23,356.91		20,356.93		21,788.95		23053.936	
Bic	18,847.16		23,500.52		20,500.43		21,932.42		23197.244	
Correctly classified	0.88		0.85		0.87		0.86		0.8499	
Log pseudolikelihood	-9,334.75		-11,661.45		-10,161.47		-10,877.48		-11509.968	
Wald chi2(16)	5,615.47		6,277.77		5,553.34		5,624.67		5770.04	
Prob > chi2	0.00		0.00		0.00		0.00		0.00	
Pseudo R2	0.4113		0.3639		0.3804		0.3731		0.3475	
N	34,542		34,471		34,230		34,813		33,857	

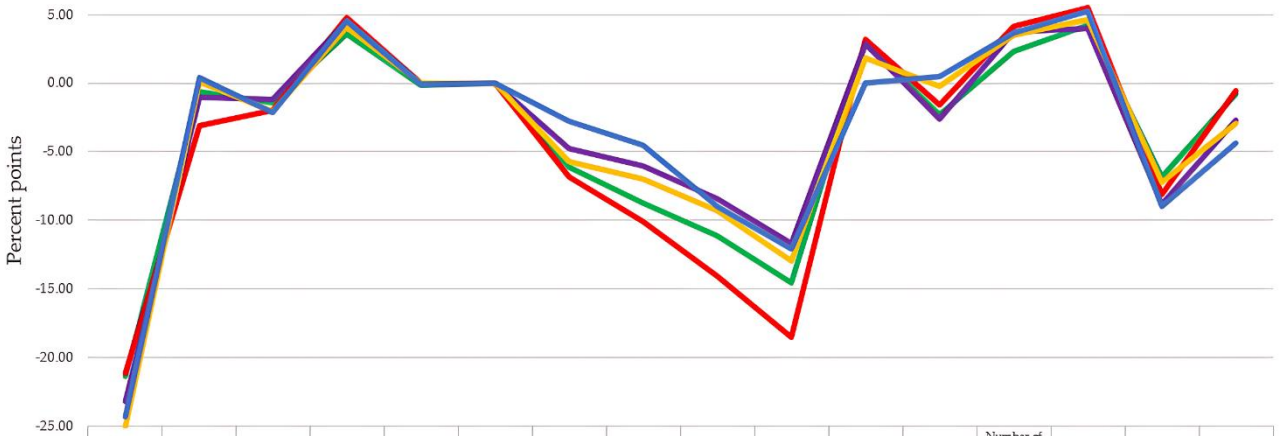
Note: Legend: * p<0.05; ** p<0.01; *** p<0.001.

The determinants that had the greatest impact on the reduction of poverty in Peruvian households, first of all, is the monthly per capita economic income, which explained the decrease in poverty by 21.40 percentage points in 2019, by 21.15 percentage points. in 2020, 23.23 percentage points in 2021, in 25.06 percentage points in 2022 and in 2023, in 24.28 percentage points; It is also at the university higher education level, since in 2019 it contributed to the reduction of poverty by 14.56 percentage points, in 2020 it contributed to the reduction of poverty by 18.52 percentage points, in 2021 it contributed 11.69 percentage points, In 2022 it contributed 12.96 percentage points and in 2023 it contributed 12.12 percentage points; Similarly, the non-university higher educational level in 2019 contributed to the reduction of poverty in Peruvian households by 11.09 percentage points, but in 2020 it is explained by 14.06 percentage points, in 2021 it also explains the decrease in 8.40 percentage points, in 2022 it explains towards the decrease in 9.29 percentage points and in 2023 it explains towards the decrease in 9 8.94 percentage points. Additionally, the primary and secondary educational level explained the decrease in household poverty in Peru in a less rigorous way, given that in 2020 they explained the decrease in poverty by 6.83 and 10.13 percentage points, in 2021 these explained by 4.76 and 6.03 percentage points; In 2022 they explained the decrease in poverty by 5.72 and 7.01 percentage points and in 2023 they explained the decrease in poverty by 2.71 and 4.70 percentage points (Table 3).

Likewise, the household location variables, whether in the jungle of Peru or in the mountain, also explained the decrease in poverty in the household, in 2019 these explained the decrease by 6.82 and 0.82 percentage points. , in 2020 these explained towards the decrease in 8.13 and 0.59 percentage points, in 2021 they explained towards the decrease in 8.85 and 2.68 percentage points, in 2022 they explained towards the decrease in 7.23 and 2.92 percentage points and in 2023 they explained towards the decrease by 8.95 and 4.33 percentage points. The other determinants that explained the decrease in poverty in households in Peru were access to electricity service and having a formal work; since in 2019 these explained in 1.46 and 2.29 percentage points, in 2020 they explained in 1.97 and 1.60 percentage points, in 2021 this was 1.22 and 2.66 percentage points and in 2022 and 2023 it explained in 2.10, 0.25, 2.15 and 0.45 percentage points respectively; Access to water and sewage service at household explained the decrease in poverty in 2019, 2020 and 2021 by 0.6, 3.12 and 1.07 percentage points (Table 3).

On the contrary, married marital status, public educational training, the number of children in the household between the ages of 6 to 14 years and the number of children in the household between the ages of 0 to 5 years determined towards the increase in poverty in households in Peru, since an increase in the age of the respondent by 1 year or in marital status led to being married or studying at the public education level or having a child in the household between the ages of 6 to 14 or between the ages of 0 to 5 years, then the probability that household poverty will increase is considerable, and increases below 5.00 percentage points in said periods (Table 3).

Therefore, the monthly per capita income played an important role in the period of analysis, since it explains in greater proportion for the decrease in poverty, followed by the university higher educational level, in third order is the non-higher educational level. university and have the location of household – jungle. The other variables such as electricity service in the household, age of the head of household, having a primary educational level, secondary educational level, and having the location of the household - mountain range contributed to the reduction of poverty, but did not have a very prominent effect (Figure 6).



	Natural logarithm of monthly per capita income	Household water and sewage service	Household electricity service	Married Marital Status	Age of head of household	Age of head of household squared	Primary educational level	Secondary educational level	Non-university higher educational level	University higher educational level	Public educational training	Has formal work	Number of children in the household between the ages of 6 and 14 years	Number of children in the household between the ages of 0 and 5 years	Household Location - Jungle	Household location - mountain range
Year 2019	-21.40	-0.60	-1.46	3.55	-0.15	0.00	-6.12	-8.72	-11.09	-14.56	2.96	-2.29	2.29	4.19	-6.82	-0.82
Year 2020	-21.15	-3.12	-1.97	4.77	-0.01	0.00	-6.83	-10.13	-14.06	-18.52	3.18	-1.60	4.11	5.49	-8.13	-0.59
Year 2021	-23.23	-1.04	-1.22	4.57	-0.01	0.00	-4.76	-6.03	-8.40	-11.69	2.86	-2.66	3.73	3.99	-8.85	-2.68
Year 2022	-25.06	0.11	-2.10	4.03	0.00	0.00	-5.72	-7.01	-9.29	-12.96	1.80	-0.25	3.51	4.64	-7.23	-2.92
Year 2023	-24.28	0.41	-2.15	4.54	-0.08	0.00	-2.79	-4.50	-8.94	-12.12	0.04	0.45	3.65	5.25	-8.96	-4.33

Figure 6.
Behavior of the marginal effects of the determinants of poverty in Peru, 2019-2023.

5. Discussion

The behavior of the determinants of poverty in Peruvian households showed a reality that truly affected Peruvian households, in rural and urban areas, since the variables analyzed showed a strong decline with respect to the stage before pandemic, which harmed the normal development towards the fight against poverty. By applying a binomial logit type econometric model, and obtaining its elasticities, I help to demonstrate the development of the main determinants that contributed to the reduction of poverty, such as the economic income generated by the head of household, the level of education you may have to access the labor market in a more timely manner; which could deduce that the variable education and basic household services became decisively important; which is confirmed by Quispe and Garay [56] who in their research also determined that access to basic services such as drinking water and drainage and electricity service, contribute to reducing the probability of being poor.

Likewise, the results found are consistent with what was determined by Reyes and López [57] since by investigating the period before the pandemic, it was also possible to determine in Argentina that the demographic, educational and work characteristics of household members more efficiently explain the behavior of poverty and these categorically contribute to the reduction of poverty. poverty; which is also demonstrated in our case, since the educational level of the head of the household is a very important variable to reduce poverty.

The aforementioned is reinforced by Koudjom, et al. [58] since, by studying poverty at the level of the 52 African countries, it was possible to determine the existence of a direct and very significant relationship between poverty and COVID-19, turning its population into vulnerable households, which for the coming years requires be intervened with the implementation of social support programs to reduce poverty that has increased in recent years.

In addition, applying the Logit-binomial regression model, they coincided with what was found by Reyes and López [57] since in the results found by these authors, economic income, educational level and access to housing services showed a negative relationship with poverty. These results also coincide with Rosero and Mideros [59] since, they consider that the effect that the pandemic had on poverty occurred through the gender gap and the issue of employment.

In the same way, it is consistent with the research carried out by Idrovo and Moscoso [60] since it determined that the factors responsible for the appearance of poverty in Ecuador are employment, geographic location of the household, the level of education of the head of the household, among others; which requires carrying out a better participation strategy on the part of the State, through the design and implementation of public policies in the health, education, business, and private sectors, which would generate better employment opportunities, and promote public investment and private, thus guaranteeing an improvement in the social and economic conditions of the regions and the country, which will allow reducing the conditions of poverty that it is currently facing.

Additionally, the results obtained are very consistent with what was found by Ariza and Retajac [10] since it was able to determine the existence of significant changes in the marginal effects of education and economic income on poverty in Colombia, evidencing an increase in poverty in times of COVID-19, which affected the entire society as a whole.

Finally, the results found agree with what was found by Maloma and Dunga [61] since poverty in South Africa after the (COVID-19) pandemic managed to reach 62% of households, who lived below the poverty line, an issue that in Peru is around 20.53% and 21.54 in 2022 and 2023. Furthermore, comparing with the results obtained in the regression models, the economic income of the head of household is one of the most important predictor variables that explain the poverty situation. What also suggests that the government in power, to reduce poverty, must invest in education and the development of skills, must promote the creation of more employment, expanding access to social programs and improving access to basic services. such as drinking water, sanitation, transportation, electricity, among others.

6. Conclusions

Poverty in Peru from 2019 to 2023 had a tendency to increase, since it increased from 17.20% before the pandemic, to 18.51% in the pandemic stage, managing to increase after the pandemic to 21.54%; of which, the most critical increase occurred in the urban area of the country, since poverty in 2019 reached 9.25%, but due to COVID-19 problems and the social, political and economic conflicts caused after the pandemic, it allowed poverty to increase to 16.56%; affecting the regions of Lima, Collao, Pasco, Tumbes, Tacna, among others, more; that is, poverty after the pandemic strongly affected Lima, which is the capital of the country, and the coast of Peru.

In additions, before the pandemic, the age of the head of the household, the secondary education level, and the university higher education level strongly determined the decrease in poverty in Peruvian households; In the pandemic period, the monthly per capita income of the head of household, access to water and sewage service at household and the secondary educational level determined more optimally towards the reduction of poverty; However, in the post-pandemic period, the secondary educational level and the university higher educational level determined more adequately towards the reduction of poverty. In addition, the married marital status of the head of household, having a public educational background, and having children in the household between the ages of 6 to 14 years and 0 to 5 years did not contribute significantly to the reduction of poverty. between 2019 and 2023 in households in Peru.

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