

# THE VIOLET ECONOMY, ANALYSIS OF THE FACTORS THAT AFFECT WOMEN'S LABOR FORMALITY IN ECUADOR

**Hugo Nelson Donoso Reinoso<sup>1</sup>**  
**Melanie Cecibel Cevallos Agualsaca<sup>2</sup>**  
**Mayra Alejandra Ruiz Santos<sup>3</sup>**  
**Mario Gómez Correa<sup>4</sup>**

1. <https://orcid.org/0000-0002-4557-5153>  
hdonosor@unemi.edu.ec  
Universidad Estatal de Milagro
2. <https://orcid.org/0009-0003-1426-8913>  
mcevallosa3@unemi.edu.ec  
Universidad Estatal de Milagro
3. <https://orcid.org/0009-0006-5652-2707>  
mruizs@unemi.edu.ec  
Universidad Estatal de Milagro
4. <https://orcid.org/0009-0008-5676-3812>  
mario.gomezco@educacion.gob.ec  
Unidad Educativa Emilio Isaias Abihann

## ABSTRACT

Women have played an important role in the development of society's economic activities, participating in the labor market through their various capacities linked to the production of goods and services. In this way, the study of this reality in a specialized way is of utmost importance, which is why the so-called violet economy fulfills this purpose. The research addresses the study of the variables that influence women in Ecuador to be working in the formal sector of the labor market, using the survey of the Ecuadorian Institute of Statistics and Censuses called the National Survey of Employment, Unemployment and Underemployment ( ENEMDU); which is microdata that can be analyzed at a specific point in time (cross-sectional analysis). The Logit econometric model was used because it is ideal when working with microeconomic variables whose information is obtained through official surveys.

**Keywords:** Violet economy formal sector Logit model microdata.

## INTRODUCTION

The Violet Economy is an economic approach that addresses the economic and social differences between men and women, focusing on reducing the wage, employment and income gaps that have historically affected women. It is important to understand in depth the socioeconomic conditions of both genders, emphasizing wage equity, participation in management positions and the elimination of various obstacles that prevent women from having equal opportunities to men (Crompton, 2019). The Violet Economy Ecosystem arises as a response to gender inequalities in the labor and economic spheres, seeking to eliminate the barriers that limit women's access to equal opportunities. This model not only focuses on reducing wage and employment gaps, but also promotes the participation of women in leadership positions, recognizing their essential contribution to economic growth and social development. The implementation of inclusion and empowerment programs is essential to transform the reality of women in Ecuador, allowing their participation in the labor market to have a positive impact at both the microeconomic and macroeconomic levels.(Moncayo, 2023).Women have faced various difficulties in the labor market due to social, cultural and, above all, family factors that have limited their contribution to the workforce. Therefore, their participation in the labor market not only impacts at the individual level, but also from the microeconomic to the macroeconomic level, contributing women to the economic growth of a nation. As Baker (2019) points out, "women's economic empowerment not only benefits women themselves, but also has positive effects on economic growth and poverty reduction at the community and national levels" (p. 5). This statement highlights the importance of addressing the barriers that limit women's access to economic opportunities, which is essential to promote their participation in the labor market.

The violet economy is an approach to the study of an economic sector of the population, in this case the female population and its comparison with the situation of the male population. In this way, historically it is not a new aspect in the economic study, since there are both analytical and statistical analyses and research on the situation of women, as in the Marxist school where the "double exploitation of women" is pointed out as wage earners and for the fact of being women. From sociology and historical social

analysis it has been indicated that the situation of women is particularly unfavorable in societies such as those of today, which still have discriminatory characteristics in the social, labor and economic spheres; the same ones that are accentuated if we talk about rural areas and if at the same time we consider the sexual division of labor from a classist bias. (Díaz Vazquez, 2020, p. 4). As a result of social struggle and the gradual recognition of rights, women have now been able to enjoy higher levels of participation in the economy.

For the present investigation, it was considered to analyze a specific aspect of the violet economy, such as the labor - economic sector in which women perform in Ecuador, for which the ENEMDU survey of the INEC was used as a source of statistical information, which records information at a national level of various questions corresponding to multiple research variables. In this way, we sought to identify the variables that influence women to access the formal sector of the economy and in turn observe the behavior and characteristics of women in the labor field. The formal sector of the economy includes those economic and labor activities carried out by professionals, employees and workers with high levels of skills, one of its characteristics being job stability, having a social security system and solid income and/or remunerations.

According to official figures, by 2024 the formal sector and per capita income experienced various variations, the results of which express the mood of the economy in general, particularly the contribution of the female segment when it comes to generating income in the country. For the first quarter of that year, the formal sector represents 52.7% of women, so their contribution is relevant in the labor market and the economy in general. On the other hand, the per capita income obtained by women is \$270.00, which will vary positively and will exceed said average when women obtain an adequate level of education (higher), adequate geographic location, among other aspects that allow improving income and living conditions. (National Institute of Statistics and Census, 2024).

Ultimately, the purple economy seeks not only to improve women's economic conditions, but also to contribute to the sustainable growth of society as a whole. As the Global Gender Gap Report 2021 notes, "closing the gender gap in the economic sphere is critical not only for women's well-being, but also for the sustainable growth and prosperity of nations" (World Economic Forum, 2021). This highlights the need for policies that promote the inclusion of women in the formal labor market, which in turn can lead to more equitable and sustainable economic development. Much research focuses on the purple economy contributing to the fulfillment of certain Sustainable Development Goals, in the areas of: education, health, poverty, decent work and economic growth. (Pinargote Moncayo, 2023, p. 368) In this way, women, by joining economic activities and becoming an employed part of the economically active population, are able to have better living conditions not only for their homes but also make a contribution to the improvement of the national economy.

The purple economy is an economic approach that addresses the economic and social differences between men and women, focusing on reducing the wage, employment and income gaps that have historically affected women. It is important to understand in depth the socioeconomic conditions of both genders, emphasizing wage equity, participation in management positions and the elimination of various obstacles that prevent women from having equal opportunities to men (Crompton, 2019). Women have faced various difficulties in the labor market due to social, cultural and, above all, family factors that have limited their contribution to the workforce.

For this research, we considered analyzing a specific aspect of the purple economy, such as the economic sector in which women work in Ecuador, for which the ENEMDU survey of the INEC was used as a source of statistical information, which records information at a national level on various questions corresponding to multiple research variables. The study focuses on assessing the role of women in the country's economy. Specifically, it is of interest to know the presence of women in the labor market, and especially the formal sector of the economy. The formal sector is understood as those jobs where women have a certain stability, have social security, generally manage income from a basic salary. Being part of the formal sector of the economy could imply that women have adequate employment, with acceptable working conditions. The participation of women in adequate employment is studied, assessing which are the variables that influence them to be in such conditions. In this way, we sought to identify the variables that influence women's access to the formal sector of the economy and, in turn, to observe the behavior and characteristics of women in the economic and labor sphere.

According to official figures, by 2024 the formal sector and per capita income experienced various variations, the results of which express the mood of the economy in general, particularly the contribution of the female segment when it comes to generating income in the country. For the first quarter of that year, the formal sector represents 52.7% of women, so their contribution is relevant in the labor market and the economy in general. On the other hand, the per capita income obtained by women is \$270.00, which will vary positively and will exceed said average when women obtain an adequate level of education (higher), adequate geographic location, among other aspects that allow improving income and

living conditions. (National Institute of Statistics and Census, 2024).

In the context of the purple economy, it is crucial to consider the legal framework that affects women's participation in business. According to the World Bank (2023), "laws and regulations that affect women in business are key determinants of their ability to access economic opportunities and contribute to economic growth" (p. 12). This analysis underscores the need to review and reform policies that limit women's participation in the labor market, which is essential to foster a more equitable and sustainable environment. As Kabeer and Natali (2021) point out, "gender equality and women's economic empowerment are critical to sustainable economic growth as they enable women to fully contribute to the economy" (p. 5).

When analyzing the variables that determine the incorporation of women into the formal economic sector, the application of the logit econometric model has been considered pertinent because it facilitates the treatment of microdata, such as the ENEMDU survey, and in this way makes an assessment of the importance of the violet economy in Ecuador. As Benería (2019) points out, "under various theoretical perspectives, gender development has become a crucial approach to understand power dynamics and inequalities in the economic sphere." This perspective is essential to analyze how women in Ecuador face various barriers that limit their access to formal and quality jobs. The study is oriented to determine the variables that influence women to work in the formal sector of the economy, considering that these results will have particular relevance in the development of subsequent studies in the violet economy, as well as in those government institutions that seek to guarantee equal access and participation in the labor market and in the economic sphere in general. As the World Bank (2018) points out, "gender equality at work is not only a moral imperative, but is also a driver of economic growth and sustainable development." This could contribute to reducing these gaps and fostering economic growth, social inclusion and sustainable development. This study also aims to provide useful information and tools for decision-making both at the government level and in the private sector and civil society, based on a more equitable economy in Ecuador, where the contribution of women is recognized and valued.

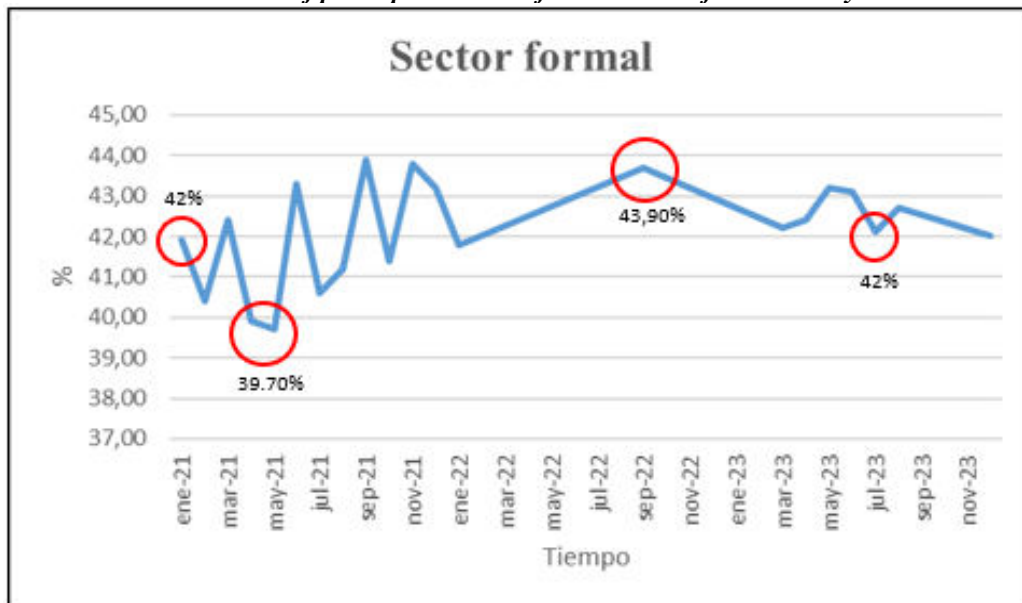
**LITERATURE REVIEW**

**Formal Employment of Women**

This variable indicates whether a woman is employed in the formal sector of the economy. The formal sector includes all jobs with official contracts, employment benefits (such as insurance and pensions), and compliance with labor regulations (ENEMDU, 2023). "Global employment trends indicate that, despite progress in labour inclusion, significant challenges persist that affect vulnerable groups, including women" (International Labour Organization, 2020). The variable "whether the woman works in the formal sector or has a formal job" is crucial to understand gender dynamics in the labour market and its impact on the overall economy. Its inclusion in the logit model will allow the assessment of the influence of formal employment on economic stability and the reduction of the gender gap, providing a solid basis for the formulation of policies that promote gender equality and sustainable economic growth.

*Figure 1.*

*Evolution of participation in the formal sector of the economy.*



**Fountain:** National Institute of Statistics and Census

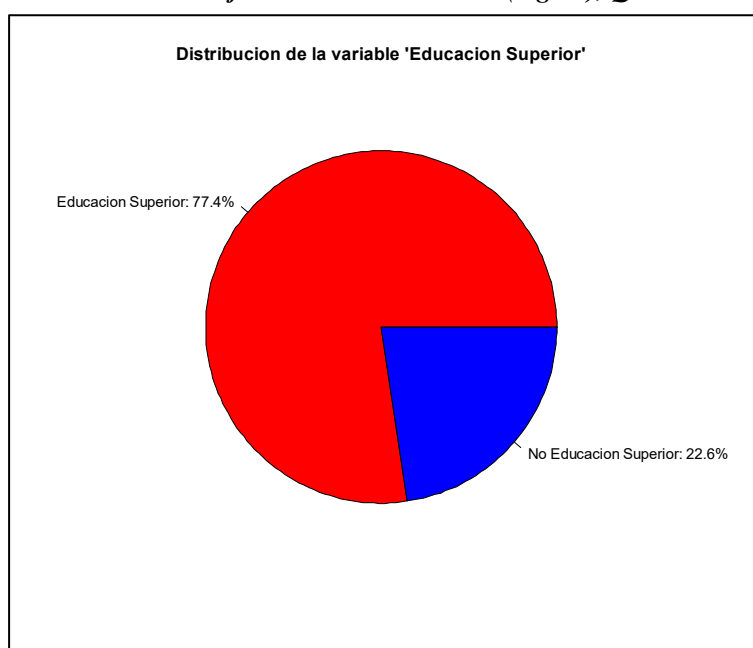
**Elaboration:** The authors

At the beginning of 2021, the values fluctuate, starting with 41.90% in January and dropping to 39.70% in May. In June 2021, there is a significant spike to 43.30%, followed by a slight decline and subsequent fluctuations, reaching its highest point in September 2021 at 43.90%. For the rest of 2021, the trend remains stable, but maintains a relatively high range, closing the year at 43.20% in December. In 2022, the data are less complete, with values only in January and September, recording 41.80% and 43.70% respectively. This suggests a trend towards stability, although with a slight rise in September. For 2023, the values show a slight decrease and a tendency towards a reduction in the participation of women in the formal sector of the economy. Since March, the formal sector has remained at around 42.10% with small increases and decreases, ending the year with a value of 42.00% in December. These data indicate a slight downward trend for the last period, affecting the percentage participation in the formal economy.

**Variable: Women's Higher Education**

This variable indicates whether a woman has completed higher education studies, which includes college degrees, technical degrees, and other post-secondary studies. The variable "has higher education" is fundamental to understanding the impact of education on the purple economy.

**Figure 2.**  
**Distribution of educational attainment (higher), Q1 2024.**



**Source:** National Institute of Statistics and Census  
**Prepared by:** The authors

Figure 2 shows that 74.4% of the female population surveyed has higher education, while 22.6% does not. This high percentage of people with higher education indicates significant access to advanced education, reflecting a well-developed educational system and effective government policies. High qualification of the workforce is beneficial to the economy, improving competitiveness and attracting investment.

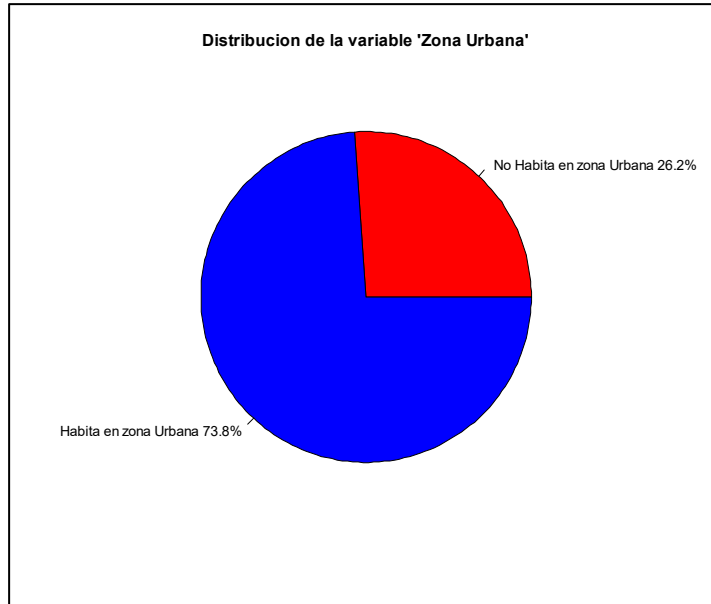
However, the 22.6% without higher education highlights the presence of economic, social or geographic barriers that limit access for certain groups. This disparity suggests the need for policies to expand educational access, such as scholarships and distance learning programs, as well as vocational training initiatives to improve the skills of those without higher education. These measures can reduce inequalities and promote more inclusive and equitable economic development.

**Variable: Residence in Urban Area of Women**

An urban area refers to a densely populated and developed geographic area, characterized by the presence of advanced infrastructure, such as commercial, residential and industrial buildings, transportation networks, public services and a variety of economic activities. These areas are typically centers of economic, cultural and social activity, with a high concentration of businesses, jobs and services. The urban economy tends to be diversified, with a wide range of industries and sectors, and offers employment opportunities and access to a variety of resources and services for its residents (RUESGA, 2020).

This variable indicates whether a woman resides in an urban area. Urban areas are characterized by higher population density, more developed infrastructure, and greater availability of services compared to rural areas. The variable "whether living in an urban area" is essential to understand geographic disparities and their impact on the economy and female labor force participation.

**Figure 3.**  
**Percentage of women by place of residence I Quarter 2024.**



**Source:** National Institute of Statistics and Census

**Prepared by:** The authors

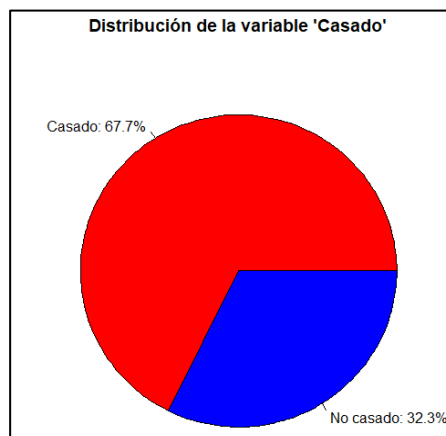
The analysis of the "Urban Zone" variable for the year 2024 reveals that 73.8% of individuals live in urban areas, while 26.2% do not. This marked urban predominance suggests a continuing process of urbanization and may indicate the existence of economic opportunities and access to basic services in these areas. However, it also raises the need to consider the challenges faced by rural areas in terms of employment, access to services, and infrastructure development. These data are essential to inform public policies that seek to address the specific needs of each type of community and ensure an equitable distribution of resources.

**Variable: Marital Status (Married)**

This variable indicates whether a woman is married. Marital status can have various implications for women's economic and work life, influencing their labor market participation, income, and other socioeconomic variables.

The variable "is married" is crucial to understanding the interactions between family and economic life, and how these affect women's labor force participation and income.

**Figure 4.**  
**Marital status of women I Quarter 2024**



**Source:** National Institute of Statistics and Census

**Prepared by: Authors**

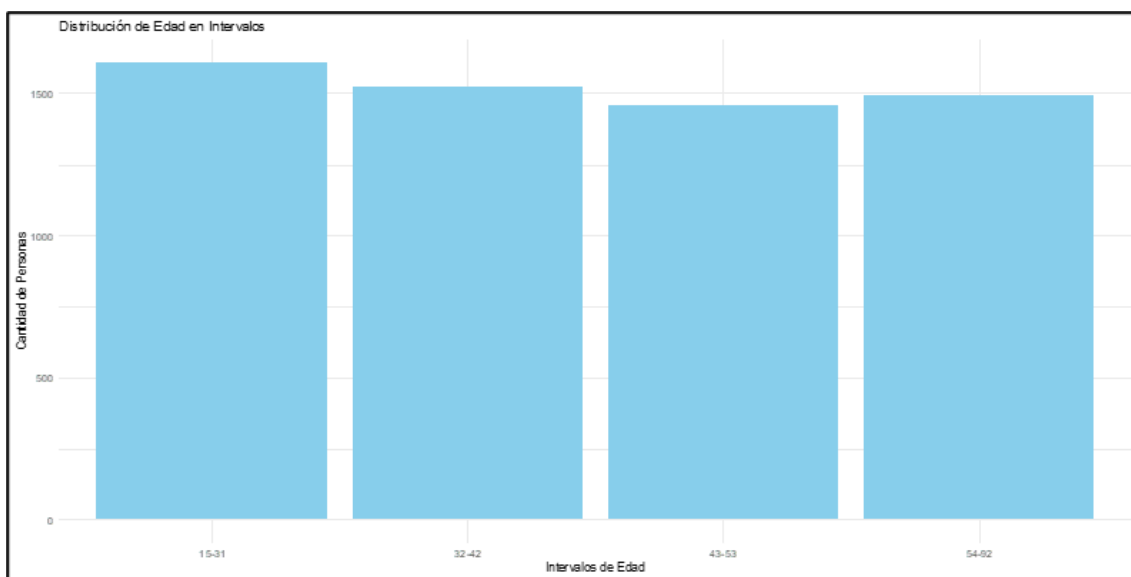
The majority of the surveyed population (67.7%) is married. This can be interpreted as approximately two-thirds of the people in the database having formalized their relationship through marriage. This high percentage may reflect several things about society in 2024, such as the importance of the institution of marriage, the cultural and social norms that favor marriage.

On the other hand, more than a third of the population (32.3%) is not married. This category includes singles, divorced, separated and widowed. This percentage may reflect more recent social trends, such as an increase in the average age at marriage, greater acceptance of different types of relationships and lifestyles, and a possible increase in divorce or separation rates.

**Variable: Age**

This variable indicates a woman's age. Age is a determining factor in various economic and labor aspects, and can influence labor participation, income, educational opportunities, and economic stability of women.

**Figure 5.**  
*Age of women by age groups I Quarter 2024.*



**Source: National Institute of Statistics and Census**

**Prepared by: The authors**

Each age interval comprises a specific range, from 15 to 92 years, divided into four categories: 15-31, 32-42, 43-53, and 54-92. The numbers represent the number of people in each age group. For example, there are 1,612 individuals between the ages of 15 and 31, 1,524 individuals between the ages of 32 and 42, 1,457 individuals between the ages of 43 and 53, and 1,493 individuals between the ages of 54 and 92.

Therefore, if we plot this distribution on a graph, it might reveal the shape of a population pyramid, with a broad base (15-31 years) and a narrower top (54-92 years). This suggests that the population tends to be younger, with fewer people at older ages. Therefore, the prevalence of people in the youngest age group (15-31 years) might indicate a steady flow of young people entering the labour market. This might relate to the informal sector, as young people often engage in formal jobs due to a lack of formal opportunities or work experience. Thus, a higher proportion of people in the youngest age group might mean greater participation in the formal sector.

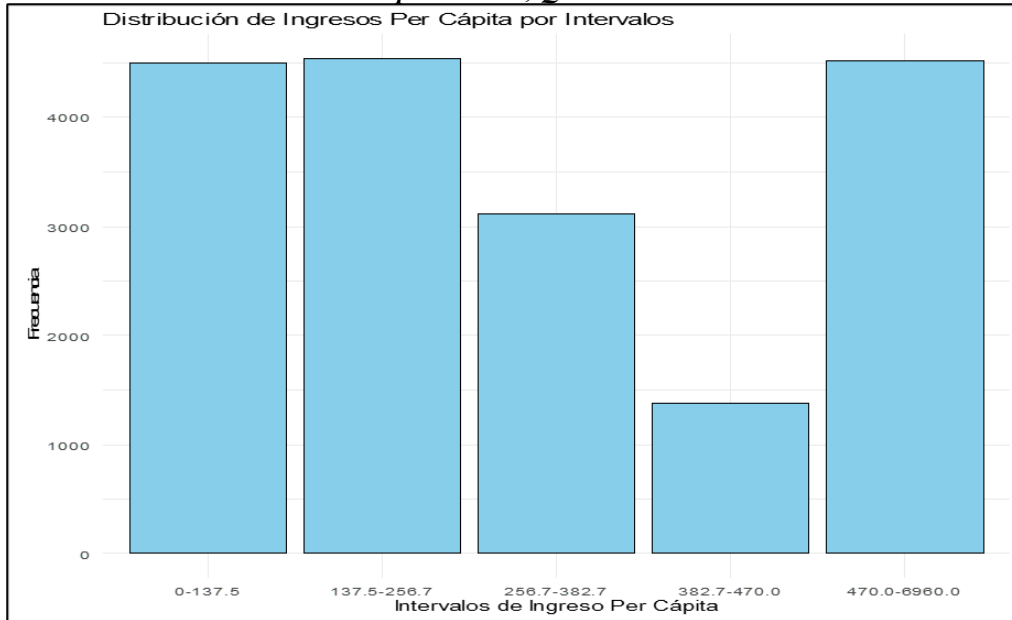
**Variable: Per Capita Income**

This variable measures the average income per person in a household. It is calculated by dividing the total household income by the number of household members. Per capita income is a key indicator of people's economic well-being and quality of life. The variable "per capita income" is essential to understanding the economic well-being and quality of life of women and their families.

Thus, within the formal sector, composed of economic activities not regulated or protected by the government, there is a direct relationship with per capita income. Per capita income tends to be lower due

to the lack of job stability, social protection, and access to basic services. Improving the conditions of the formal sector is crucial to raising per capita income and reducing economic inequality, requiring policies that encourage formalization, provide support to entrepreneurs, and promote access to financial and educational services (Celín, 2023).

**Figure 6.**  
**Per capita income, Q1 2024**



**Fountain:** National Institute of Statistics and Census

**Elaboration:** The authors, based on the ENEMDU survey

The highest concentration of individuals is found in the first two income intervals (0-137.5 and 137.5-256.7), with 4497 and 4535 individuals respectively. This indicates that a large part of the population has relatively low per capita incomes. These two intervals combined represent approximately 60% of the population, suggesting low incomes in this group.

The third interval (256.7-382.7) has 3117 people, showing a considerable decrease in frequency. This could indicate that fewer people are in an intermediate economic position. The fourth interval (382.7-470.0) has only 1381 people, the lowest frequency among all intervals, suggesting that few people reach this income level, possibly due to a significant barrier in increasing income after a certain point. Finally, the highest interval (470.0-6960.0) again shows a high frequency with 4519 people. This suggests that although there are a large number of people with low incomes, there is also a sizable group with significantly higher per capita incomes, possibly indicating a notable economic disparity.

**Methods and Instruments**

This research is of an empirical-quantitative type. This approach is characterized by the collection and analysis of numerical data to understand observable phenomena, allowing to establish causal relationships and quantify the impact of different variables on a specific result (Kabeer, 2005). In this case, the result to be explained is to determine the factors that favor the fact that a woman has formal employment (dependent variable). The data for this research was collected from reliable secondary sources, such as national surveys, censuses and statistical databases that contain detailed information on the sociodemographic and economic characteristics of women in Ecuador. For the case of this research, the ENEMDU survey of the INEC of the first quarter of 2024 was used, which turns out to be a reliable document that will be evaluated by the International Labor Organization. The number of observations used was 18,049, which was the result of selecting the women who participated in the survey.

This research, using an empirical-quantitative model based on binary logistic regression, seeks to understand the factors that determine the probability of a woman having a formal job in Ecuador (Wooldridge, 2010). This approach will allow quantifying the impact of key variables such as education, residence, marital status, age and per capita income, providing valuable information to promote gender equality and sustainable economic development (Greene, 2012).

A binary logistic regression model will be applied to analyze the relationship between the independent variables and the probability of having a formal job. This model is suitable because it allows estimating

the probability of a binary event and evaluating how each independent variable affects this probability (Hosmer et al., 2013).

The binary logistic regression model that was proposed for the research is based on what was mentioned by Ostrovski (2022), where logistic regression models aim to explain the correlation that exists between a dichotomous qualitative dependent variable and one or more independent predictive variables. The empirical-quantitative approach is essential to provide an objective and quantifiable basis to analyze how independent variables influence formal employment. Therefore, it allows the generalization of the results to the female population of Ecuador, given a representative sample size and reliable data and for the estimation the R-Studio software was used, with the SPSS statistical program highlighting the variables that were used, since the main objective is to model how the presence or absence of various variables and their level of incidence influences the probability of the appearance of an event, generally dichotomous.

**Table 1. Study variables**

VARIABLES	DIMENSIONES	INDICADORES
Sector Formal (Variable Dependiente)	Sector formal	1 = Sector Formal 0 = Sector Informal
Variables Explicativas del Sector Formal (Variables independiente)	Nivel de instrucción (Superior)	1= Si tuvo nivel superior 0= No tuvo nivel superior
	Zona Urbana	1 = Si recibe en el area urbana 0 = No recibe en el area urbana
	Casado	1 = Si es casado 0 = No es casado
	Edad JH	Variables cuantitativas
	Ingpc	Variables cuantitativas

**Elaboration:** The authors

**RESULTS**

For this econometric model, it was established that most of the variables are dichotomous, that is, that values between 0 and 1 are identified, therefore, it is essential to use the binary choice method, which is important to evaluate the probabilities that the control variables influence the explanatory variables. Therefore, the dependent variable of the formal sector is 1 and 0 represents the non-formal sector, in turn with the independent variables the level of education (higher), urban, married are also qualitative variables with dichotomous values, while the variables ageJH and per capita income are quantitative variables that are not dichotomous.

**The model equation implies as a result of:**

$$Sector\ formal_1 = -1,388 + 1,385(superior_1) + 0,985(urbana_1) + 0,246(casado_1) - 0,025(edadJH) + 0,004(ingpc)$$

The results of the econometric model:

- Estimates
- Marginal effects
- Goodness of fit

*Table 2. Modelestimates*

Dependent variable:	
sectorformal	
superior1	1.385*** (0.045)
urbana1	0.985*** (0.044)
Casado1	0.246*** (0.042)
edadJH	-0.025*** (0.001)
ingpc	0.004*** (0.0001)
Constant	-1.388*** (0.059)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Elaboration:**By authors, through the R-Studio program

It is indeed negative that the probabilities if the other variables such as superior, urban, married, age, INGPC had not existed, the probabilities are lower, that is to say the negative constants indicate that the probability of the woman being part of the formal sector would be minimal, lower, so it does have a great impact. It has a confidence level of 95%, if there is a significant level of significance.

The negative sign of the intercept can be expressed that when the other variables are at 0, there is less probability that women are actually part of the formal sector. The upper variable with its positive sign indicates that women who have higher education are more likely to work in the formal sector, women who live in the urban sector are more likely to work in the formal sector, this implies that there are better job opportunities in the urban sector than in the rural sector. The married variable with its positive sign shows that women who have a married marital status are more likely to work in the formal sector of the economy; on the other hand, in the female head of household, the variable with a negative sign indicates that it is an inverse relationship, that is, there is less probability that women are heads of households who can access the formal sector of economic employment. Per capita income is positive, which implies that there is a greater probability that women in the formal sector of the economy have better per capita income, considering that women with higher incomes will have a high probability of belonging to the formal sector of the economy.

The size of the error is not significant, it is small, therefore it can be assessed that there is a greater precision of the model. P-value indicates that all are less than 0.05, therefore there is a high level of significance, the variables are explanatory in relation to the dependent variable. The important thing is that Z is greater than 1.96 because the level of significance is 5%, how do we transfer it to the table za 1.96 is significant, therefore if they are greater than 5%, it is in the acceptance area with a high probability and according to its significance depending on the sign, it is positive or negative.

*Table 3. Marginal Effects*

Marginal Effects:				
	dF/dx	Std. Err.	z	P> z
superior1	3.1065e-01	8.9312e-03	34.7821	< 2.2e-16 ***
urbana1	2.4075e-01	1.0453e-02	23.0321	< 2.2e-16 ***
Casado1	5.9390e-02	1.0060e-02	5.9035	3.559e-09 ***
edadJH	-6.0771e-03	3.0008e-04	-20.2514	< 2.2e-16 ***
ingpc	9.2183e-04	2.3548e-05	39.1469	< 2.2e-16 ***
---				
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				

**Elaboration:**By authors

The variable *df* is dependent on the independent variable *dx*. The probability of the formal sector is that the event *f* of the dependent variable occurs as a function of the events *x* that are independent. These are minimum values, therefore there is a high probability that the event will occur since the standard error is reduced, the *z* is greater than 1.96 and the *p* value is less than 0.05, so it can be observed that there is a high occurrence of the event happening. However, it is necessary to highlight the variable female head of household, since its increase will affect women being part of the formal sector of the economy.

**Table 4. Odd ratios estimation**

Odd ratios		
	Odd ratios	
superior1	3,994	***
	0,181	
urbana1	2,679	***
	0,117	
casado1	1,279	***
	0,054	
edadJH	0,975	***
	0,001	
ingpc	1,004	***
	0,000	

**Elaborated:**By authors

The exponent of each coefficient provides the odds ratio, which quantifies the change in the probability of having a formal job for each unit of change in the independent variable (Agresti, 2018). In the odd ratios it can be observed that they are greater than 1 in almost all the variables, which shows the increase in the statistical possibility that the event occurs. In this way it is an adjustment test that validates the reliability of the econometric model, in turn it is observed that the projected standard errors of the test are minimal, there being a slight data dispersion. Within the dependent variable there is an increase in the independent variable is associated with an increase in the possibility of the event greater than 1, that is, it increases, which are greater than 1 the variables married, urban, higher education level, per capita income, while ageJH the estimate is negative in the odd ratios and will be below 1 (fulfilled) and the standard error is minimal and *z* greater than 1.96 *p* value less than 0.05 which are relevant significant.

**Table 5. Goodness of Fit**

<b>Significancia global</b>			
$\chi^2(5)$	7560.33	p = 0.00	
<b>Bondad de ajuste</b>			
Pseudo-R <sup>2</sup> (McFadden)	0.30		
Capacidad predictiva	0,767	Log Likelihood	-8,726.469
		AIC	17,464.940
ROC	0,851	Muestra (personas)	18049,00

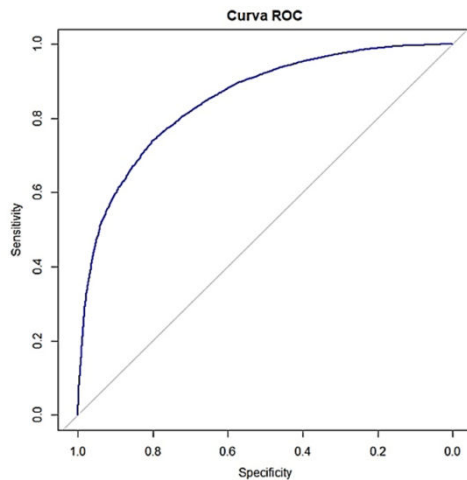
**Elaboration:**By authors

It indicates that the goodness of fit is medium with an *r* square of 0.30 and we see it reflected in predictive capacity highlighting the confusion matrix that predicts the result 76% of the time which is expressed in an area of the accepted model, that is, all these variables affect the formal sector, whether positive or negative, the majority are positive, only 1 is negative in ageJH.

As a sample, it indicates 18,049 observations that we have worked with where they are estimates of the goodness of fit of the model, the Log likelihood indicates the relationship of the dependent variable with

the independent variables, so the AIC is adjusted to the data by the number of coefficients due to the complexity of the model, therefore, both the AIC and the Log likelihood indicate that the model is adequate.

**Figure 7.**  
**ROC curve**



**Elaborated:**By authors

The ROC indicates that the econometric model has a high degree of reliability, which is a regular model being higher than 0.5 obtaining a 0.85 which indicates that it has a very good and acceptable performance. The ROC evaluates the model's capacity as an econometric logit model and in the range of 0.8 to 0.9 is the value that has been obtained which is 0.85.

**Table 6. Summary probabilities**

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	Probabilidad de ser sector formal	
0.0290	0.2441	0.4527	0.5105	0.8048	1.0000	<b>Promedio</b>	<b>51%</b>

**Elaborated:**By authors

There is a value of 51% of the event occurring, that is, that women are part of the formal sector of the economy according to the independent variables studied, showing that there is an acceptable percentage that the econometric model considers when estimating the degree of relationship of the independent variables.

**DISCUSSION**

The logit econometric model has been suitable for the study of the violet economy in Ecuador, since it corresponds to the analysis of a research instrument such as the ENEMDU survey, which provides broad and varied information on some relevant aspects, such as the subject of this research, the factors that influence women to be part of the formal economy.

According to the logit model formula:

$$P(t) = \frac{1}{1 + e^{-t}}$$

$$Y_i = \frac{1}{1 + e^{-\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 - \beta_4 X_4 + \beta_5 X_5}} + u_i$$

This formula of the logit model reflects an exponential, since it indicates an Euler to the X of each of the estimated values that we have obtained, then when applied we obtain a value of the number of times that the event can occur.

Women living in urban areas have a coefficient of approximately 0.98, which is raised to the Euler number, resulting in a 2.67 times greater probability of belonging to the formal sector of the economy. This implies that women with a higher education level indicate 0.25 times the probability of belonging to the formal sector of the economy. Those who are married are 1.28 times more likely to be part of the formal sector of the economy.

In age, the coefficient is -0.025, expressing an inverse relationship, since women who are heads of household will have a lower probability of being part of the formal sector of the economy. This implies -

0.98 times of not being part of the formal sector of the economy. Likewise, the higher the per capita income obtained by women, this is reflected in their probability of 1 times at the time of belonging to the formal sector of the economy.

Regarding the qualitative variables that are dichotomous such as higher level, married, urban and the quantitative variables that are not dichotomous such as ageJH and per capita income due to their sign whether positive or negative, all are significant and the estimates, marginal effects, odd ratios reflect that the variable ageJH is less likely to be part of the formal sector of the economy. It has an R square 0.30, being a good measure within the dependent variable, due to the adjusted value of predictive capacity highlighting the confusion matrix that predicts the result 76% of the time which is expressed in a scope of the accepted model, analyzing the ROC curve that indicates that as long as it is close to 1 it is accepted, as long as it is far away it is not, and in this case it reflects that it is acceptable for the logit model establishing a 0.85.

According to the results, the urban area of women is fundamental when determining whether they are in the formal sector of the economy, since it is one of those variables that has the greatest impact according to the results obtained. This is followed by the married variable, then per capita income, then higher education level and finally the age of the head of household. From this perspective, in Ecuador, geographic location is determining the development opportunities of people and particularly of women.

The estimated coefficients in the logistic regression will indicate the logarithm of the odds ratio of the probability of having a formal job. A positive coefficient suggests that an increase in the independent variable is associated with an increase in the probability of having a formal job. According to the econometric model, it is assessed that per capita income affects the economic sector in which women participate, that is, a higher income means that women are located in the formal sector of the economy, therefore, a lower income means that women are located in the non-formal sector of the economy.

By obtaining 51% within the sample 1849 for women to be part of the formal sector of the economy, they express a relevant fact for the analysis of the violet economy by the type of economic participation of women, which is a contribution to the set of research that has been developed and that has dealt with this subject in a very limited way. Therefore, the present study can be considered as the starting point for future research where the economic and social contribution is evaluated through the empirical application of econometric models, as well as the continued use of surveys from statistical institutes not only in Ecuador but in other countries whose study is of interest, being able to approach valid comparative research for the analysis and deepening of the subject.

"In addition to economic challenges, the COVID-19 pandemic has exacerbated violence against women, creating what has been termed the 'shadow pandemic', affecting millions of women around the world" (UN Women, 2020). This context highlights the need for policies that not only promote women's economic inclusion, but also ensure their safety and well-being.

## **CONCLUSIONS**

This theme is focused on the analysis of the violet economy, which has a microeconomic perspective, the validity of the use of the Logit econometric model, and the use of the ENEMDU survey provided by INEC, which has allowed us to assess how the variables affect the subject of study. The results indicate that women living in urban areas are approximately 2.67 times more likely to be employed in the formal sector of the economy, which shows that geographic location is a determining factor in access to formal jobs. This strong relationship suggests that urban development policies can play a crucial role in promoting formal employment among women.

Women with higher education are 0.25 times more likely to belong to the formal sector, while married women are 1.28 times more likely to be in formal employment; these results highlight the importance of the educational level as well as the relevance of marital status. The age of the head of household shows an inverse relationship with formal employment (-0.025 coefficient), indicating that older women, especially those who are heads of household, are less likely to be in the formal sector, due to several factors such as having less support from their partner, being single mothers, and real difficulties in career development. These findings underline the need for specific policies to improve the labor inclusion of women at different stages of their life and with different family responsibilities.

Per capita income is positively related to formal employment, with a coefficient of 1, meaning that the higher the income, the more likely women are to be in the formal sector of the economy. This result highlights the importance of economic well-being in formal labor inclusion and suggests that improving women's income can be an effective strategy to increase their participation in formal employment.

The relationship between the variables observed in the econometric model allows us to estimate the dynamics of the purple economy, particularly when studying the economic participation of women. It is necessary to establish policies for improving infrastructure and services in urban areas to create more formal employment opportunities. In addition, rural development policies must be implemented to improve conditions in these areas, thus facilitating a more equitable distribution of job opportunities.

It would also be important for the State to promote scholarship and distance education programs to increase access to higher education. This involves carrying out continuing education and professional training programs for women of all ages, focusing especially on those who are heads of household. As a society, we need to promote work-life balance policies, such as accessible childcare and flexible working hours, to support married women and those with family responsibilities. This could increase their participation in formal employment and improve their economic stability.

### 1. References

- Agresti, A. (2018). *An Introduction to Categorical Data Analysis* (3rd ed.). Wiley.
- Gago, V. (2019). *The neoliberal reason: Baroque economies and popular pragmatics*. Tinta Limón.
- Crompton, R. (2019). *Gender Inequalities in the 21st Century: New Barriers and Continuing Constraints*. Routledge.
- Celín, Y., Torres, E., & López, M. (2023). Historical approach to the interrelation between informality and development.
- Sen, A. (2000). *Development and freedom*. Editorial Planeta.
- Folbre, N. (2001). *The Invisible Heart: Economics and Family Values*. The New Press.
- Creswell, J.W., & Creswell, J.D. (2017). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). Sage Publications.
- Díaz Vázquez, R. (2020). The work of women artisans in rural Mexico and the approach to community economies. *Journal of Social and Human Sciences*, 9(18), 1 - 20. doi:<https://doi.org/10.23913/ricsh.v9i18.215>
- Hosmer, D.W., Lemeshow, S., & Sturdivant, R.X. (2013). *Applied Logistic Regression* (3rd ed.). Wiley.
- Greene, W. H. (2012). *Econometric Analysis* (7th ed.). Prentice Hall.
- Kabeer, N. (2005). *Gender Equality and Women's Empowerment: A Critical Analysis of the Third Millennium Development Goal 1*. Gender & Development
- Lavado, P., & Yamada, G. (2021). Employment and labor informality in the new normal. Available [online] [https://www.cies.org.pe/sites/default/files/investigaciones/15.\\_dp\\_empleo.pdf](https://www.cies.org.pe/sites/default/files/investigaciones/15._dp_empleo.pdf).
- Ostrovsky, V. (October 2022). Testing equivalence to binary generalized linear models with application to logistic regression. *Statistics & Probability Letters*.
- RUESGA, SM, PEREZ, L., & DELGADO, JL (2020). Informal sector in Ecuador: Perspective from the econometric scenario. *Espacios Magazine*, 41(14).
- Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data* (2nd ed.). MIT Press.
- National Institute of Statistics and Census, (2024). Obtained from <https://aplicaciones3.ecuadorencifras.gob.ec/BIINEC-war/index.xhtml?jsessionid=dA+eR1ANlzbA+iKuLuHmDzu.undefined>
- World Economic Forum. (2021). *Global Gender Gap Report 2021*. <https://www.weforum.org/reports/global-gender-gap-report-2021>
- UN Women. (2020). *The Shadow Pandemic: Violence Against Women During COVID-19*. <https://www.unwomen.org/en/news/in-focus/in-focus-gender-equality-in-covid-19-response/violence-against-women-during-covid-19>
- International Labor Organization (ILO). (2020). *World Employment and Social Outlook: Trends 2020*. <https://www.ilo.org/global/research/global-reports/weso/2020/lang--en/index.htm>
- Benería, L. (2019). Gender and Development: Theoretical Perspectives and Policy Implications. *Feminist Economics*, 25(1), 1-20. <https://www.tandfonline.com/doi/full/10.1080/13545701.2018.1490660>
- Moncayo, M. (2023). Violet Economy Ecosystem. Challenges and challenges in Ecuador. *Multidisciplinary Peer-Reviewed Scientific Journal PENTACIENCIAS*, 5(5), 364-378. [[https://www.researchgate.net/publication/372361840\\_Ecosistema\\_de\\_Economia\\_Violeta\\_Retos\\_y\\_desafios\\_en\\_el\\_Ecuador](https://www.researchgate.net/publication/372361840_Ecosistema_de_Economia_Violeta_Retos_y_desafios_en_el_Ecuador)]
- Baker, S. (2019). Women's Economic Empowerment: A Review of the Evidence. *Journal of Economic Perspectives*, 33(1), 1-24. <https://www.aeaweb.org/articles?id=10.1257/jep.33.1.1>
- World Bank. (2023). *Women, Business and the Law 2023*. <https://www.worldbank.org/en/publication/women-business-and-the-law>
- Kabeer, N., & Natali, L. (2021). Gender Equality and Economic Growth: The Role of Women's Economic Empowerment. *Journal of Economic Perspectives*, 35(1), 1-24. <https://www.aeaweb.org/articles?id=10.1257/jep.20210101>
- World Bank. (2018). *Gender equality at work: A moral imperative and an engine of economic growth*. Retrieved from [<https://www.worldbank.org/es/topic/gender/overview>]