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GENDER LABOR INCOME GAPS IN COSTA RICA

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Resumen

Las mujeres tienen ingresos laborales promedio inferiores a los hombres en todo el mundo, a pesar de que tienden a tener más años de educación. En los países en desarrollo, esta situación suele ser aún peor. Las mujeres no solo enfrentan brechas salariales en comparación con hombres que tienen la misma productividad y el mismo trabajo, sino que también enfrentan desventajas en cuanto al tipo y condiciones de empleo, la estabilidad laboral, las tasas de desempleo y su carga como cuidadoras. Esta investigación analiza las diferencias en los ingresos laborales por género e informalidad en Costa Rica. Para ello, se utiliza la Encuesta Continua de Empleo del primer trimestre de 2023 para estimar diversas metodologías estadísticas y econométricas. El análisis se realiza estimando tres metodologías econométricas: las ecuaciones de Mincer, la descomposición de Oaxaca-Blinder y la ecuación de Mincer considerando la estimación de regresión de cuantiles semi-paramétrica.

**PALABRAS CLAVE:** Brecha de género, género, mercado laboral, Costa Rica, discriminación laboral.

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**JEL:** C31, J31, J71.

Abstract

Women have lower average labor income than men around the world despite they tend to have more years of education. In developing countries, it is often worse. Women not only face income gaps in comparison with men who have the same productivity and the same job, but they also face disadvantages regarding the type and conditions of jobs, labor stability, rates of unemployment, and caregiver burden. This research analyses the differences in labor incomes by gender and informality in Costa Rica. To do so, we use the Encuesta Continua de Empleo (ECE) of the first quarter of 2023 to estimate several statistical and econometric methodologies. The empirical approach is conducted by estimating three econometric methodologies: the Mincer’s equations; the Oaxaca-Blinder decomposition; and the Mincer’s equation considering the semi-parametric quantile regression estimation.

**KEYWORDS:** Income gaps, gender, labor market, Costa Rica, labor discrimination.

**ACADEMIC RANK**

**JEL:** C31, J31, J71.

**I. INTRODUCTION:**

All over the world, women have increased their participation in the labor force. It is a trend related to the changes in demographic composition, public policies, and cultural and social transformations. Nevertheless, there remains a gap in the labor income between women and men. Although women have, on average, higher years of education, they have systematically lower average earnings.

Gender discrimination is a crucial issue that governments and institutions have tried to address. Many studies and institutional statements have underlined the urgency and importance of eliminating the gender gap, particularly in the labor market (Comisión Económica para América Latina y el Caribe, 2019; Organization for Economic Co-operation and Development, 2019; International Labor Organization [ILO], 2018). It is even one of the Sustainable Development Goals: Gender equality and women’s empowerment, and its first target is to End all forms of discrimination against all women and girls everywhere (United Nations, 2015). Also, the 100th agreement of the ILO on income equity states the necessity to guarantee “equal remuneration for men and women workers for work of equal value”. (ILO, 1951).

In the last decades, Costa Rica has achieved some relevant landmarks in terms of gender equality: according to the OECD gender gap indicator (2023) Costa Rica has the second smallest gender wage gap for all the organization, second only to Belgium. The indicator defined “as the difference between median earnings of men and women relative to median earnings of men” has a value of 1.4% for Costa Rica vs. an average of 11.9% for the OECD. In 2021 Costa Rica was the fifth country of the OECD with the highest share of women in parliament, and second regarding the share of women in Ministerial positions (OECD 2021). Nevertheless, despite the progress archived, the country still faces serious challenges in terms of gender equality, as revealed by the relatively low rate of women´s participation in the labor market: 38% (OECD 2023). These challenges can also be seen in the relatively low percentage that women´s employment represents of total employment: 37.6% in 2021 in comparison with an average percentage of 44.7% for the OECD countries

This research will analyze the income gender gap from a quantitative perspective for Costa Rica. To address the problem three econometric methodologies are applied: The Mincer’s equations; the Oaxaca-Blinder decomposition; and Mincer’s equation considering the semi-parametric quantile regression estimation.

**II. LITERATURE REVIEW:**

Labor discrimination is the different treatment that workers receive based on personal characteristics (gender, race, birthplace, age, etc.). There is labor discrimination if workers with the same characteristics related to productivity have different earnings (Ehrenberg & Smith, 2012). If women have less labor income this can happen because of direct discrimination, but also, because they can have less human capital and work in certain sectors of lower productivity (indirect discrimination). In this research, we analyze the gender income gaps in general, those generated by differences in characteristics (productivity), and gender gaps due to potential labor discrimination.

Different perspectives have studied the role of discrimination in the labor market. The starting point is the fact that a labor market with discrimination is non-competitive, and the workers’ wages do not equal their productivity. Thus, productivity or human capital is not the unique factor that explains labor incomes (Hellerstein, Neumark & Troske, 2002). There is no perfect substitution between workers with the same skills and some arbitrary criteria based on prejudice can be considered when an employer demands labor (Reich, Gordon & Edwards, 1973).

One of the most influential approaches to the study of labor discrimination was proposed by the Nobel Laureate in Economics Gary Becker (1971). According to his analysis, discrimination is the result of preferences. Employers, consumers, and even the same workers can have some reason to treat or be treated in different ways. Therefore, that preference (prejudice) could be more important than the actual productivity of workers: If a worker is discriminated her wage is lower than its productivity.

Nevertheless, discrimination and earnings gaps can also be the consequence of a lack of information from employers about the actual productivity of workers, that approach was called “statistical discrimination” (Arrow, 1972; Phelps, 1972). If there is an idea that some group has less productivity on average than another group, and the employer does not have the ability to check if that hypothesis is correct or not, she could use it to make an idea about the productivity of workers and consequently pay lower wages. The source of discrimination is not a prejudice itself but the imperfect information about productivity.

Finally, labor discrimination has been related to market power and potential segmentation (Fields, 2009; Piore & Sabel, 1993). Workers who belong to a discriminated population group can be hired in a “secondary” market with lower incomes, worse conditions, and higher unstable jobs. If employers have market power in the labor market, it implies that they can pay their workers arbitrarily and consequently, they can get higher profits if they pay the discriminated group lower wages.

This base literature review of earnings gender gaps reveals a consensus about the idea that labor markets are not perfectly competitive, and everyone does not have complete information. Consequently, wages do not depend exclusively on productivity, and one of the reasons why two workers with the same productivity can have different wages is because there is a different treatment between women and men.

The gap between women and men is a topic that applied econometricians and labor economists have analyzed deeply. Plenty of the literature about earnings differentials[[4]](#footnote-4) has considered the gender gap as a reference. Oaxaca (1973) and Blinder (1973) proposed the now classical decomposition of income differentials between women and men, underlying that there are two possible components of the gap: the characteristics of workers and their jobs, and the different treatment in the labor market, potentially associated to discrimination.

In general, there is quantitative evidence that confirms the existence and relevance of an income-gender gap. Weichselbaumer and Winter-Ebmer (2005) summarize the international gender wage gap through a meta-analysis. They found 263 published articles[[5]](#footnote-5) and 1535 different estimations from 1960 to 2000 all over the world. The average earnings gender gap was 33%, and the unexplained component (potential discrimination) was 20% for the total period. However, a decline in the gap has been observed, but because of the increase in the human capital of women. Meanwhile, over the period the measure of potential discrimination[[6]](#footnote-6) has reduced from 23% to 19%. That survey included 8 papers for Costa Rica, with an average gap of 13% against women (Weichselbaumer & Winter-Ebmer, 2005, 502).

Many methodologies have been applied to check the gender earnings gaps. Madalozzo (2010) for Brazil, Couppié, Dupray and Moullet (2014) for France and Fuchs et al., (2021) for Germany, estimate the Oaxaca-Blinder decomposition. The gap is lower for the European countries, but the unexplained component is similar to the figure for Brazil. Those authors coincide with Weichselbaumer and Winter-Ebmer (2005), regarding the decline in the total gap, but in the persistence of the potential discrimination (unexplained differences between women and men).

There is a possible selection bias in the estimation of earnings, due to the fact that some people are out of the labor market when they could potentially be working (Heckman, 1979). That bias can be higher when considering the presentation of women into employment because there is a higher relationship between their participation in the labor market and characteristics associated with higher wages (education, experience, household characteristics) (De la Rica, 2008). Olivetti and Petrongolo (2008) analyzed the role of selection bias in the estimation of earning gaps for the United States and some Western European countries and implementing the two-step Heckman’s method they found a considerable effect of sample selection. On average, the gap rises from 18% to 24% after correcting for selection bias (Olivetti and Petrongolo, 2008). Nevertheless, many studies have questioned the reliability and accuracy of the methodology to correct this potential econometric issue. The seminal article of Angrist & Krueger (1994) concludes that when implementing instrumental variables (quarter of birth as instrument) there is not a statistically significant difference between the conventional OLS estimation. Specifically, for the gender earnings gaps, Bar, Kim, and Leukhina (2015) discuss the actual relevance of selection bias, while Newman and Oaxaca (2004) show the different interpretations that the selection bias could have.

The gap can be different through the wage distribution, which has been estimated with the quantile regression method. The idea is that there are two different situations: glass ceiling when larger gaps are at the top of the distribution, and even though women have high incomes they are not paid as men with the same productivity; and sticky floor, that is the result of exclusion and potential discrimination of women that are in the bottom of the income distribution, situation than can be related in developing countries with maternity and the role within the household (Dah & Fakih, 2016; Xiu & Gunderson, 2014).

The results are noticeably different depending on the features of the labor market. Developing countries have higher gender income gaps at the bottom of the distribution (Dah & Fakih, 2016; Xiu & Gunderson, 2014), while European countries have higher gaps at the top, verifying the existence of glass ceiling (Arulampalam, Booth & Bryan, 2007). However, there is no deterministic rule, Chzhen and Mumford (2011) found that there are no significant changes in the gap for different points of the distribution in the British case, and Sakellariou (2004) concludes that Singapore presents sticky floor and no glass ceiling.

For Costa Rica, several studies have addressed the gender wage gap. Jiménez and Morales (2012) applied the Oaxaca-Ransom method to evaluate the gender wage gap during the nineties and declined to use the 2 stage Heckman correction method. They describe how the share of women taking part in the labor market increased from 30% in 1990 to 34% in 2000. The authors concluded that the wage gap estimated by the Oxaca-Ramson technique decreased from 11.6% in 1990 to 1.6% in 2000. However, the authors also found that during the whole period, there was an unexplained component of the gap (attributable to discrimination) that oscillated between 0.2% and 0.15%

Rodríguez and Segura (2015) applied the Oaxaca-Blinder decomposition without the Heckman selection method for the year 2013. The authors calculated the decomposition using the quantile regression method and concluded that the gender gap is negative (women have lower wages) for women in the percentiles 10 and 25, while the gap becomes positive in favor of women for percentiles 50, 75, 90, and 95. In contrast, they found that the non-explained component of the GAP is negative in general for women with values between 3% and 9% for the different percentiles.

Torres and Zaclicever (2022) applied the Oaxaca-Blinder decomposition with the Heckman correction method for the years 2001 and 2019. They found some particular results, with the explained gap being 24% and 25% against women for 2001 and 2019 respectively, while the unexplained gap was positive in favor of women with 30% and 34% of the hourly wage in 2001 and 2019.

Blanco (2023) realizes an analysis of the gender wage gap for the employees of the University of Costa Rica and finds that men´s hourly wage is 7.8% greater than women´s. After reviewing the nature of the University´s wage scale and structure, Blanco concludes this can be explained by differences in the accumulation of human capital.

In synthesis, there is a well-known and established methodology to analyze the income gaps between men and women. The methodology has been applied to countries all around the world with robust results, including the country of analysis. In Costa Rica, the results vary. Most of the studies find the existence of an explained gender gap, but in terms of the unexplained gender gap, some studies found a positive unexplained gender gap and others a negative one.

The current study analyzes the gender wage gap for 2023 and tries to provide a new approach to the problem by estimating several Mincer equation specifications and by applying the quantile regression method to understand the changes in the gender wage gap across the income distribution.

**III. METHODOLOGY**

Applied studies that estimate the gender income gaps usually regress labor income over a set of variables that do not necessarily explain productivity but affect labor earnings. Some of those variables are gender, relationship with the head of household, children in the household, non-labor income, labor contract, informality, and so on. Given our objective, we will analyze the effect of gender[[7]](#footnote-7) on earnings and how it interacts with other explanatory variables.

Empirically, the earnings difference between women and men can be the result of endowments (human capital, better employment conditions, different household microfeatures) or different retribution for those endowments, the latter is called[[8]](#footnote-8) “potential discrimination” (Xiu & Gunderson, 2014).

It is important to underline that there is always potential bias in the estimation of the gender gap because there are omitted variables that are not available and can be related to the gender but also and more importantly there is a sample selection bias that is related to the gender. After all, women who are out of the labor market have different endowments than women working and men who do not work (Bar, Kim, and Leukhina, 2015). Nevertheless, most of the applications to this topic have recognized that the ways to correct sample selection bias are still in discussion, and many times that bias is not statistically significant (Angrist & Krueger, 1994; Newman & Oaxaca, 2004; Yun, 2009). Consequently, this research does not take that issue into account in the econometric estimations.

In terms of the subsample selection, we use the approach proposed by Juhn, Murphy, and Pierce (1993), we take a subsample of the survey to apply the analysis. The criteria for the subsample are: Paid workers between 18 and 55 years old, who have worked at least 12 hours per week and have daily labor income at least equal to one dollar (567.17 colones per dollar in the first quarter of 2023).

The rest of this section will briefly summarize the three econometric methods applied.

**Mincer Equations**

The fundamental econometric approach is called “Mincer equations” (Mincer, 1974). The equation [Eq. 1] takes the hourly labor income (natural logarithm) as explicated variable and a set of independent variables are included (vector X) considering that they can affect the variability of income. Gender is included as an independent (dummy) variable and its coefficient indicates the level and significance of the average earning differential between women and men (ceteris paribus).

=ln()= ; 𝐸()=0 [𝐸𝑞.1]

It is needed to guarantee unbiased estimations, so we need to assume that the conditional mean of errors is zero, 𝐸(|)=0.

To obtain a broader approach, interpret different relationships, and check robustness, six different specifications are estimated, changing control variables, quadratic (non-linear) relationships, and including interaction terms. The explained variable is always the natural logarithm of hourly wage, and the vector of independent variables changes over the specification. The set of explanatory variables are:

i. Specification 1: gender (dummy variable equals 1 if the worker is a woman), education (years of education), experience (years of experience, calculated as the age of worker minus years of education minus five), informal (dummy variables equals to 1 if the worker has informal employment, given the official definition for Costa Rica) and regional controls (n-1 dummy variables: 6 for Costa Rica).

ii. Specification 2: The same specification 1 including household controls. There are three characteristics of households that potentially can affect the wage and at the same time are correlated with gender: marital status (4 dummy variables: living together, single, widowed, and divorced or separated, taking “married” as a base variable/category), relationship to the head of household (4 dummy variables: spouse or partner, child, grandchild, and other, taking “head of household” as a base variable/category), and number of children in the household (under the age of 16).

iii. Specification 3: The same specification 1 including square education and square experience (checking non-linear relationships with wages).

iv. Specification 4: The same specification 3 including household controls explained in specification 2.

v. Specification 5: The same as specification 2, including two interactions: gender and education, and gender and experience (exploring differences in the returns of education and experience between women and men).

vi. Specification 6: The same specification 5 including square interactions.

There are some features of the specifications that need to be explained:

• Interpretation of the gender coefficient: This is our primary data collected because it quantifies the average earning gap between women and men. Given that the base group is men (gender=1 if woman), the gap will be equal to:

If the coefficient is negative, the expected average wage is lower for women than men. For instance, a coefficient of -0.15 means that the earning of women is, on average, and ceteris paribus, (−1 = 0.8607−1= 0.1393), 13,9% lower than the earnings of men.

• Experience variable: Although experience is an essential variable to explain productivity, it is not available in most microdata. Hence, many empirical applications have calculated it as age minus years of education minus 5 and we adopt this approximation. Some assumptions can be weak. For example, there are no unemployment periods or periods out of the labor market, and there are no differences by gender in that situation. The likely bias that this approach can have is recognized, however, that discussion is beyond our scope. Regan and Oaxaca (2009) discuss extensively this issue.

• Categorical variables: There are categorical variables in some specifications. To avoid misspecification, they are included as dummy variables. To do so, one category is considered the reference and is not included (avoiding multicollinearity).

• Household controls: They are included to avoid probable bias for omitted variables because those variables can affect the wages and are correlated with the gender of the worker.

• Square terms: There are square variables of education and experience in some specifications because it is conventionally recognized probable non-linearity between education and wages, and experience and wages. The marginal effect of years of education (experience) is different when the worker has basic, secondary, or professional education.

• Interactions: This is a preliminary approach to quantify differences in the return of education and experience between women and men. If there is potential discrimination the market returns of those variables can be different. An extension of this is done in the Oaxaca-Blinder decomposition.

**Oaxaca-Blinder Decomposition**

One of the most used methodologies to split up the gap between the component related to characteristics and the one that is explained by differences in remuneration is the decomposition proposed by Oaxaca (1973) and Blinder (1973). Gender earnings gaps can be the result of lower levels in variables that are positively correlated to productivity (education, experience), but they can also be the product of different treatment (remuneration) to workers with some personal distinction (gender, ethnic group, nationality). Consequently, women can have lower incomes because they have lower years of education and experience (explained gap), but there can be an unexplained component and that is the potential discrimination that they face. There are two Mincer’s equations estimated by gender, but in this case, the dummy variable that identifies gender is excluded:

[𝐸𝑞.2]

Equation 2 is the same Mincer estimation, where is the variable data vector, is the coefficient vector, is the error, and ℓ is a group sub-index for women [F] and men [M]. Thus, the average gap between women and men is given by the mean difference in the expected value of the linear predictions:

[𝐸𝑞.3]

If we add and subtract on the right-hand side in equation 3, we obtain the Oaxaca-Blinder decomposition (Oaxaca, 1973), considering men as the reference group:

Endowments

Total gap

[𝐸𝑞.4]

Unexplained gap

The first right-hand side term measures the component of the gap that can be explained by differences in the endowments like education or experience. A negative value indicates that women have lower endowment when the variable is positively correlated to wages (>0). The second term quantifies the difference in the level of remuneration between women and men that is not explained by endowments (unexplained gap), if there is a negative difference is because women are treated in such a way that they receive lower wages even though they have the same potential productivity.

This division of the gender income gap, allows us to understand what part of the gap can be explained by differences in factors such as experience or education (endowments) and which part is unexplained and therefore can be attributed to potential discrimination.

**Quantile regression**

This methodological approach lets us explore the gender earnings gaps beyond the conditional mean (Mincer OLS) and it estimates the potential heterogeneity that can be found when different points of the distribution are considered. Koenker and Bassett (1978) proposed the following conditional quantile function:

[𝐸𝑞.5]

Here is the 𝜃𝑡ℎ quantile of variable 𝜔 (natural logarithm of labor income) conditional to the vector of variables X, and 𝛽(𝜃) is the vector of estimated coefficients, but in this case as a function of 𝜃 (𝜃 ∈ [0,1]), quantile in the distribution. Koenker and Bassett (1978) proposed that 𝛽(𝜃) is the result of the minimization of the weighted sum of the absolute value of the residuals in the regression equation:

[𝐸𝑞.6]

It can be re-written as:

[𝐸𝑞.7]

[𝐸𝑞.8]

Here, 𝜀 is the error term, as usual, is assumed that the conditional mean of errors is equal to zero. Based on this estimate a set of gaps are going to be found for every point of the conditional distribution and we will be able to discuss the possibility of ceiling glass and sticky floor. 𝛽(𝜃) has the same meaning as in the Mincer equation just that in this case is for a specific point of the distribution, and its interpretation is also the same as mentioned in the first part of this section. Finally, it is important to underline that this approach is going to consider only the third specification which includes the squared term of education and the squared term of experience.

**IV. DATA AND DESCRIPTIVE STATISTICS:**

The data used for the analysis corresponds to the Costa Rican Continuous Employment Survey, First Quarter 2023 (Instituto Nacional de Estadística y Censos, 2023). From the total survey data, we extract a subsample using the next criteria: we kept only paid workers between 18 and 55 years old, who have worked at least 12 hours per week and have daily labor income at least equal to one dollar (567.17 colones per dollar in the first quarter of 2023). This subsample criteria are based on the criteria proposed by Juhn, Murphy, and Pierce (1993) Next, we present descriptive statistics for the full survey data and for the subsample.

Table 1: Descriptive statistics of the main variables of the Continuous Employment Survey: First Quarter 2023

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Mean | Standard deviation | Min | Max |
| Age | 35.5 | 22.3 | 0 | 99 |
| Years of education | 8.8 | 4.23 | 0 | 24 |
| Informality | 0.45 | 0.49 | 0 | 1 |
| Income | 416,620 | 371,832 | 3,330 | 6,541,667 |
| Hours worked per week | 42 | 15 | 1 | 105 |
| Hourly income | 2,501 | 2,284 | 20 | 45,139 |

Source: Own elaboration based on the *Encuesta Continua de Empleo* first quarter 2023 (INEC, 2023)

Table 1 provides an aggregated summary of the data: an average age of 35.5, 8.8 mean of years of education, average income of 416 620 CRC (Costa Rican Colones), 42 hours worked per week on average, and an hourly income of 2 501 CRC (Costa Rican Colones).

Some valuable insights can be extracted from Table 2. The disaggregation of the data by gender allows us to identify that despite having a higher hourly wage and more years of education on average, women have a lower monthly income and work fewer hours per week than men, something related to the unequal distribution of care and home responsibilities

Table 2: Descriptive statistics of the main variables of the Continuous Employment Survey: First Quarter 2023

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Males | | | | Females | | | | |
| Mean | Standard deviation | Min | Max | | Mean | Standard deviation | Min | Max | |
| Age | 34.73 | 22.45 | 0 | 99 | | 36.18 | 22.08 | 0 | 99 | |
| Years of education | 8.57 | 4.12 | 0 | 24 | | 9.029 | 4.32 | 0 | 24 | |
| Informality | 0.44 | 0.49 | 0 | 1 | | 0.47 | 0.49 | 0 | 1 | |
| Income | 419,180 | 366,775 | 4,167 | 6,541,667 | | 412,602 | 379,663 | 3,330 | 3,000,000 | |
| Hours worked per week | 46 | 14 | 2 | 105 | | 37 | 16 | 1 | 105 | |
| Hourly income | 2,343 | 2,202 | 43 | 45,139 | | 2,748 | 2,388 | 20 | 20,000 | |

Source: Own elaboration based on the *Encuesta Continua de Empleo* first quarter 2023 (INEC, 2023)

Graph 1: Kernel distribution for men´s and women´s hourly income

  
Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

Graphs 1 and 2 present the Kernel density for men’s and women’s hourly and monthly income distribution. In both cases, they allow us to identify a bigger concentration of men in the mean income, while for women we have a bigger concentration in the extreme values. This reflects a reality that will be present in the rest of the analysis: the gender income gap is not constant along the income distribution.

Graph 2: Kernel distribution for men´s and women´s monthly income

  
Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

As mentioned in section III, we use a subsample for the analysis based on the criteria proposed by Juhn, Murphy, and Pierce (1993). We selected paid workers between 18 and 55 years old, who have worked at least 12 hours per week and have daily labor income at least equal to one dollar (567.17 colones per dollar in the first quarter of 2023). Some of the interest variables have slightly different behavior for the subsample than for the whole survey sample. The basic descriptive statistics for the subsample are presented as follows:

Table 3: Descriptive statistics of the main variables for the subsample selected.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Population | | | |
|  | Mean | Standard deviation | Min | Max |
| Age | 37.38 | 9.80 | 18 | 55 |
| Years of education | 10.10 | 4.20 | 0 | 24 |
| Informality | 0.37 | 0.48 | 0 | 1 |
| Experience | 22.29 | 11.29 | -1 | 50 |
| Income | 440,101 | 356,254 | 4,167 | 5,960,350 |
| Hours worked per week | 45 | 12.84 | 12 | 105 |
| Hourly income | 2,529 | 2217.31 | 74 | 45,139 |

Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

Table 4: Descriptive statistics of the main variables for the subsample selected.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Males** | | | | **Females** | | | |
| Mean | Standard deviation | Min | Max | Mean | Standard deviation | Min | Max |
| Age | 37.27 | 9.95 | 18 | 55 | 37.55 | 9.55 | 18 | 55 |
| Years of education | 9.33 | 3.95 | 0 | 24 | 11.32 | 4.31 | 0 | 24 |
| Informality | 0.37 | 0.48 | 0 | 1 | 0.38 | 0.49 | 0 | 1 |
| Experience | 22.95 | 11.44 | 1 | 50 | 21.24 | 10.98 | -1 | 48 |
| Income | 434,707 | 347,212 | 4,167 | 5,960,350 | 448,627 | 370,009 | 5,800 | 2,985,367 |
| Hours worked per week | 47.80 | 11.93 | 12 | 105 | 40.59 | 13.00 | 12 | 105 |
| Hourly income | 2,363 | 2,137 | 74 | 45,139 | 2,790 | 2,314 | 75 | 19,375 |

Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

The use of the subsample allows us to calculate the descriptive statistics for the experience variable. With a mean experience of 22.29 years, men have slightly more average experience than women with 22.95 years against 21.24 for women. In terms of hours worked per week, men tend to work on average 7 hours more per week than women.

Despite these last 2 differences, women´s income and women´s hourly income are higher than men's. This result reflects some of the progress made by Costa Rica in terms of gender earnings gap and can be partially attributed to the differences in the average years of education between men and women. This educational breach is reflected on the fact that women have on average 2 more years of education than men on the subsample.

**V. RESULTS AND ANALYSIS:**

This section will analyze the main results of the estimations, focusing on the gender gap. The analysis will be organized sequentially as in the previous section: first the results of Mincer equations and some extensions; secondly, the results of Oaxaca-Blinder decomposition; and lastly, the semi-parametric approach of quantile regression.

**Mincer equations**

Graph 3 presents the gender gap measured by the equation , where is obtained from the estimation of each specification. The results reveal that there is a clear gender wage gap in Costa Rica: Women have an hourly wage that is on average between -8.77% and -10.22% lower than men keeping all other factors constant.

Graph 3: Estimated gender gap coefficient for the first 4 specifications of the Mincer equation for the first quarter of 2023

****Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

The general results of the 6 specifications are presented in Table 3

First, we compare the 6 different specifications using the Akaike and Bayes information criteria. The results show that specifications 4 and 6 have the best results in terms of the information criteria and the best fit according to the R square, we will also comment on specification 5, as the interaction terms provide rich results for the analysis. Therefore, our analysis will be focused on those 3 specifications.

As explained in section III, specification 4 regresses hourly wage as a dependent variable over years of education, years of education squared, years of experience, years of experience squared, and informality as independent variables (additionally, regional and household controls). The results show that the 6 parameters are statistically significant with 99% confidence, except for the years of education parameter, which is statistically significant with 95% confidence.

The estimation for specification 4 indicates that women earn on average 8.768% less than men keeping all other factors equal. Informality has a heavy weight on the determination of the hourly wage, as informal workers earn on average 36.52% less than formal workers. It is a worrisome result given that around 45% of workers in Costa Rica are informal.

In the case of education, the estimation is done with a quadratic specification, revealing that the average marginal effect of one additional year of education increases with the number of years of education. In the case of the experience variable, the estimation also uses a quadratic form, however, the results are different and indicate a decreasing marginal effect of experience in the hourly wage, this is consistent with the literature.

Table 5: Mincer equations estimated by OLS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Specification 1 | Specification 2 | Specification 3 | Specification 4 | Specification 5 | Specification 6 |
| gender (1=women) | -0.1021755\*\*\* | -0.0909636\*\*\* | -0.0997513\*\*\* | -0.0876823\*\*\* | -0.4635401\*\*\* | -0.4560407\*\*\* |
|  | (0.0137) | (0.0146) | (0.0135) | (0.0145) | (0.0603) | (0.1007) |
| Education (years) | 0.0969677\*\*\* | 0.0941222\*\*\* | 0.018486\*\* | 0.018217\*\* | 0.083921\*\*\* | 0.0100632 |
|  | (0.0019) | (0.0019) | (0.0064) | (0.0065) | (0.0024) | (0.0079) |
| Education square | - | - | 0.0032248\*\*\* | 0.0031123\*\*\* | - | 0.0031702\*\*\* |
|  | - | - | (0.0003) | (0.0003) | - | (0.0003) |
| Interaction (education and gender) | - | - | - | - | 0.0252672\*\*\* | 0.0363242\*\* |
|  | - | - | - | - | (0.0036) | (0.0136) |
| Interaction square (education and gender) | - | - | - | - | - | -0.0007569 |
|  | - | - | - | - | - | (0.0005) |
| Experience (years) | 0.0120857\*\*\* | 0.0086497\*\*\* | 0.0227613\*\*\* | 0.0168144\*\*\* | 0.0068481\*\*\* | 0.0151005\*\*\* |
|  | (0.0007) | (0.0008) | (0.0024) | (0.0025) | (0.0009) | (0.0031) |
| Experience square | - | - | -0.0002915\*\*\* | -0.0002291\*\*\* | - | -0.0002208\*\* |
|  | - | - | (0.0001) | (0.0001) | - | (0.0001) |
| Interaction (experience and gender) | - | - | - | - | 0.0045749\*\* | 0.0028461 |
|  | - | - | - | - | (0.0014) | (0.0049) |
| Interaction square (experience and gender) | - | - | - | - | - | 0.0000256 |
|  | - | - | - | - | - | (0.0001) |
| Informal (1=informal) | -0.3599674\*\*\* | -0.3637265\*\*\* | -0.363155\*\*\* | -0.3651828\*\*\* | -0.3580581\*\*\* | -0.360638\*\*\* |
|  | (0.0142) | (0.0141) | (0.0140) | (0.0140) | (0.0141) | (0.0140) |
| Regional controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Household controls | No | Yes | No | Yes | Yes | Yes |
| R square | 0.4167 | 0.4274 | 0.4328 | 0.4412 | 0.4318 | 0.4435 |
| AIC | 9282.375 | 9185.643 | 9112.597 | 9037.371 | 9141.216 | 9019.623 |
| BIC | 9349.718 | 9313.596 | 9193.41 | 9178.793 | 9282.639 | 9187.983 |

Source: Own elaboration based on the Encuesta Continua de Empleo first quarter 2023 (INEC, 2023)

Specification 5 introduces interaction terms between the variable gender and the number of years of education of education and experience, this allows us to understand if women experience higher returns of education than men. The results show that women experience an average return 2.53% higher than men for one additional year of education. Graph 4 presents the different returns of education for men and women.

Graph 4: Expected return of education for men and women using Specification 4

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Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

Using this difference in the education return, we can model the behavior of the gender gap for different education levels. As seen in Graph 5, this difference in the return of education implies that the gender earning gap is reduced as women have a higher level of education.

Graph 5: Expected gender earning gap according to the education level

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Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

Specification 6 has introduced interaction terms between gender and the squares of education and experience. This allows us to enrich the analysis by introducing different decreasing factors to the marginal effect of education on men and women. Graph 6 represents this result, as seen, men obtain on average a higher return of an additional year of education. However, there is a point between 15 and 20 years where the relationship changes and women begin to obtain a higher return.

Graph 6: Expected return of education for men and women Specification 6

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Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

We use the values of specification 6 to simulate the gender gap as a function of the number of years of education. The results are presented in Graph 7. In contrast with the results obtained for specification 5, the results show that even when the gender earnings gap is reduced with the years of education, it is never reduced to zero.

Graph 7: Expected gender earning gap according to the education level specification 6

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Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

**Oaxaca-Blinder decomposition**

The Oaxaca-Blinder decomposition allows us to divide the gender gap into 2 parts: one explained by the difference in endowments like education and experience, and the second one that can be attributed to gender discrimination. The first result we obtained is that the overall gender gap is positive, this means that on average women have higher hourly wages than men. This result is consistent with the descriptive statistics of section IV, according to which women have a mean hourly wage 15.3% higher than men for the subsample.

However, more important than the overall gap, the main focus of this study is its decomposition. As explained in section III this gap can be decomposed into 2 factors: endowments that refer to elements like qualifications or experience, and an unexplained component that can reflect the existence of gender-based discrimination. All four specifications analyzed indicate that women have a higher level of endowments. This is consistent with the data exposed in section IV, according to which women have on average 2 years more of education than men.

Once we isolated the effect of women´s higher endowments, we obtained the unexplained component of the gender earnings gap, which can be attributed to gender-based discrimination. All 4 specifications arrive at the same conclusion: assuming the same levels of endowments, women have on average lower hourly wages than men. As seen in Table 6, all 4 specifications indicate the existence of an unexplained gap superior to 10%, with a gap of -11.89% for specification one, -11.42% for specification two, -11.11% for specification three, and a lower -10.75% for specification 4.

Table 6: Gender earning gaps measured by the Oaxaca-Blinder decomposition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Specification 1 | Specification 2 | Specification 3 | Specification 4 |
| Endowment | 0.1352 | 0.1218 | 0.1375 | 0.1226 |
| Coefficients | -0.1189 | -0.1142 | -0.1111 | -0.1075 |
| Gap | 0.0468 | 0.0468 | 0.0468 | 0.0468 |

Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

Therefore, the data analyzed with the Oaxaca-Blinder decomposition provides evidence of an income gender gap against women in Costa Rica once we isolate the effects of women´s higher endowments.

**Quantile regression**

Once we analyze the existence of the gender earning gap using the Mincer equation and the Oaxaca-Blinder decomposition, we will use the quantile regression method to understand if the gap is homogeneous for all the different income levels, or if it changes according to the income level. This means that we will analyze the value for every point of the conditional distribution.

First, we run the quantile regression using specification 4 to obtain the parameter of the gender variable for the different points of the distribution.

Graph 8: Gender parameter measured by quantile regression



Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023)

The results indicate that the parameter is statistically significant between the first and the fifth decile and for the last one, which means that women from those deciles experience a gender earnings GAP. In the case of the parameter for women between the fifth and ninth deciles, the confidence interval does not allow us to discard the hypothesis of the parameter being equal to 0.

However, the previous result does not provide the gender earnings gap, as the parameter must be adjusted with the formula . Once we have made this adjustment, we obtain the following results:

Graph 9: Gender earning gap measured by quantile regression



Source: Own elaboration based on the *Encuesta Continua   
de Empleo* first quarter 2023 (INEC, 2023

The values obtained by this adjustment are valid only for the deciles with parameters that are statistically significant: deciles between the first and the fifth and for the last decile.

The results of the estimation show that the gap experiences important changes according to income level. From the third to the ninth decile the gender coefficient experiences a reduction. This reduction is such that for deciles between fifth and ninth there is no statistical evidence of the gender coefficient being statistically significant. However, for the first 5 deciles and the last one, there is evidence to conclude that the coefficients are lower than 0, and therefore women experience a gender earnings gap in those groups.

This allows us to analyze the gender earning gap from the perspective of 3 groups: low-income women who experience gender earning gaps and discrimination, middle and middle-high-income for whom we did not find statistically significant evidence of gender earnings gap, and a final group of high-income women in the right margin of the distribution who, again experience negative values for the gender income gap.

The existence of systematic gender barriers for women of lower income has been named in the literature as “sticky floor”, while the existence of sustained gender gaps for women of high-income levels has been called as “glass ceiling”. The results of the quantile regression confirm the existence of both phenomena in Costa Rica.

**VI. CONCLUSIONS:**

The Mincer equations analysis and the Oxaca-Blinder decomposition confirm the existence of a gender income gap against women in Costa Rica. In the case of the first 4 specifications, this gap goes from -8.77% to -10.22%. In the case of the Oaxaca-Blinder analysis, the 4 specifications confirm the existence of an unexplained gender earning gap, and therefore discrimination against women: considering women and men with the same endowments, women tend to earn on average between 10.75% and 11.89% less than men.

The Quantile regression indicates that the gender earnings gap changes with income level. Evidence indicates that women with lower income (first 5 deciles) experience gender earning gaps. This gap is reduced as income grows until it reaches a group of middle and middle-high-income women for whom the gender gap is not statistically different from 0. Finally, data shows that high-income women from the last decile also experience a significant gender earning gap in comparison with men. The quantile regression confirms the existence of glass ceiling and sticky floor for high and low-income women in Costa Rica.

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4. Earnings differentials can be considered with several comparative groups, but by far the most studied is the gender gap. Perhaps because the political and social relevance, but also because it is a binary category available in many data sources [↑](#footnote-ref-4)
5. One interesting data is that only 28% of the authors were women. [↑](#footnote-ref-5)
6. There is called “potential discrimination” to the unexplained gap. It could be the result of different treatment for women, reducing their labor income, but it also could be “the effect of unobservable factors that can lead to males and females receiving different returns for the same characteristics” (Xiu & Gunderson, 2014, 308). [↑](#footnote-ref-6)
7. We consider a restricted approach to gender based on the availability of information: the conventional male-female identification of gender. [↑](#footnote-ref-7)
8. It is called “potential” at least for two reasons: first, the source of information is given by workers, who are discriminated; second, there are not enough information to verify if the gap is the result of discrimination or because of omitted variables. [↑](#footnote-ref-8)