

## Article

# Gender Inequality in Latin America: A Multidimensional Analysis Based on ECLAC Indicators

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**Abstract:** This article analyzes the behavior of gender indicators on the economic, physical, and decision-making autonomy of Latin-American women, based on data compiled and published in 2020 by the Gender Equality Observatory of the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), for 17 countries. Using the HJ-Biplot multivariate technique, it is concluded that the three evaluated areas interact with each other, in such a way that they cannot be interpreted in isolation because their relationships and interdependencies explain the differences in the participation of men and women in the socioeconomic and political environment of the nations in the region. Additionally, it is concluded that in countries such as Guatemala, Honduras, El Salvador, Bolivia, and Ecuador, greater public policy actions are required to seek the economic empowerment of women; while in Brazil, Mexico, and Colombia, laws are necessary to regulate violence against women. It is necessary to continue promoting gender equality in the region as a determinant factor in methodological frameworks and transformational policies to enable moving towards the construction of sustainable societies and economies.

**Keywords:** gender indicators; multivariate analysis; HJ-Biplot; Latin American countries; sustainability



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## 1. Introduction

Why study gender inequality indicators in Latin American countries?

Gender inequality indicators enable measuring the impact of existing inequalities between men and women in several aspects, ranging from physical and economic integrity to participation in decision-making, and their analysis facilitates the development of public social policies that promote equality, the empowerment of women, and the improvement of their living conditions. However, the effective measurement of gender equality and women's empowerment is challenging in low- and middle-income countries, and in environments where inequality has been historically prevalent in different domains [1].

Given that the Latin American population is highly diverse, multi-cultural, and multi-lingual, with numerous indigenous, Afro-descendant and mixed-race (mestizo) communities, discrimination against women takes different forms, which can be studied by means of various indicators and statistics on gender, among which the following are regularly assessed: paid and unpaid work, poverty, use of time, reproductive rights, gender violence, access to decision-making, and political representation. Monitoring these aspects helps to understand the overall status of gender equality in the countries of this region.

According to the Economic Commission for Latin America and the Caribbean (ECLAC) and other institutions that study human development indicators, such as the United Nations Development Program (UNDP) or the Oxford Poverty & Human Development

Initiative (OPHI), achieving gender equality will require achieving transformations in the autonomy of women in three dimensions: economic, physical, and political (decision-making). These three dimensions are consistent with the characteristics that are associated with or that complement the Human Development Index (HDI), and globally they are referenced as determinants of the Multidimensional Poverty Index (MPI) and the Gender Inequality Index (GII).

To understand the meaning of “women’s autonomy” and the types of autonomy, it is useful to contextualize the conditions they reflect and examine why they are used as a frame of reference for the study of gender equality. Autonomy means for women to have the capacity and conditions to freely make decisions impacting their lives. To achieve greater autonomy, different issues must be addressed, including freeing women from the exclusive responsibility of reproductive tasks and care, which implies ensuring the exercise of reproductive rights; ending gender violence; and taking all necessary actions for women to participate in decision-making in equal conditions [2].

Specifically, economic autonomy is associated with being able to control assets and resources and with freeing women from being exclusively responsible for tasks related to reproduction and care. Physical autonomy refers to women’s capacity to freely decide about their sexuality, reproduction, and their right to a life free from violence. Decision-making autonomy consists of the full participation of women in the decisions that affect the lives of women and their communities [3] (p. 24).

Economic autonomy represents women’s capacity to generate income and personal financial resources, based on access to paid work under conditions of equality with men. It also takes into consideration the use of time and women’s contributions to the economy of care [4,5]. In recent literature, different authors have assessed the economic autonomy of women and argue that female empowerment is a determinant for the sustainable development of nations [6–9], because a greater role of women in economic development is vital for achieving progress towards the United Nations sustainable development goals (SDGs).

Historically, it is in this dimension where the greatest differences have existed between Latin American men and women, given that the income of over 50 percent of Latin American women is below the minimum wage [10]. Consequently, it is necessary to study the current situation of women in the region based on indicators that enable measuring their level of empowerment to generate income and access to the labor market (formal or informal), which are the factors that determine the sub-optimal income conditions of many women in the region. This is because women in the region, particularly from lower socioeconomic levels, often engage in informal work, their salaries are lower than men’s (even with the same educational level), and/or because they are under-represented in high public office and senior management positions.

Regarding physical autonomy, in the last decade the World Health Organization (WHO) and United Nations (UN) have argued for the specific need to control the high indicators of maternal deaths and teenage pregnancies found in some Central American, Caribbean, and South American countries, given that women in developing countries are at a high risk of dying during pregnancy, during childbirth, and in the period immediately following childbirth, or due to unsafe interruptions of pregnancy [11] (p. 96).

The physical autonomy of Latin American women can be contextualized through indicators on gender violence, because even though actions have been taken through legislation, strategies, and programs to prevent and eradicate gender violence, the institutional reports from the different states indicate that this problem still persists [12] (p. 261).

All countries in the region penalize sexual harassment and workplace harassment, and currently more than half of the countries in the region have categorized femicide as a crime: 14 countries in the region have passed laws or amendments to the penal code (Brazil, Chile, Bolivia, Colombia, Ecuador, Peru, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and the Dominican Republic) and 2 (Argentina and the Bol. Rep. of Venezuela) have legally classified aggravated homicide for gender

reasons [13] (p. 11). However, gender violence does not only involve physical integrity, but also extends to the social, cultural, political, and economic spheres where strong push factors underlined by patriarchal power systems and hypermasculine spaces have normalized violence against women [14].

Regarding decision-making autonomy, in the region there are wide disparities between men and women in terms of political representation, which point to the existence of genderized political trajectories in Latin America [15]. This is despite efforts made through international cooperation initiatives that seek to increase the presence of women in the public offices that are instrumental for decision-making in each country, and the stated intention of including more women in the boards of directors and executive positions in non-governmental entities. Since the 1980s, in Latin America only six women have been elected as heads of state and three of them have been reelected: Cristina Fernández in Argentina, Dilma Rousseff in Brazil, and Michelle Bachelet in Chile [5] (p. 4). Another three women have held such positions but in an interim or provisional capacity.

The above reflects the fact that historically the Latin American political sphere has been ruled by men and that discrimination against women in the public sphere did not begin to diminish until the late 20th century [16] (p. 86). The female political leaders who have been consolidating in recent years are no longer associated with family political legacies, as was the case of the first female presidents in Latin America [17] (p. 152). It should be noted that most states have taken diligent action in the search for mechanisms for more female political representation, such as laws on quotas in terms of establishing a mandatory percentage of women elected to office and political representation in parliaments and ministries, which help increase the level of protection and opportunities for women in terms of democratic assertiveness [18].

Due to the all the above, governments in the region have made commitments to mitigate and abolish gender inequality, with the aim of strengthening and promoting the different types of women's autonomy. One of the first political efforts to take on this commitment was the Quito Consensus, in the context of the Tenth Session of the Regional Conference on Women in Latin America and the Caribbean in 2007 [19], with the presence of 24 countries. At this meeting the countries recognized that parity was one of the determining drivers for democracy and sustainable development.

One of the commitments made at this meeting was to establish a regional gender observatory, which is currently directed by the ECLAC. This institution plays an active role in gender mainstreaming within regional development, and in monitoring the effectiveness of the equality policies. It works in close collaboration with the national machineries for the advancement of women in the region, involving civil society, the women's movement, feminist organizations, and public policymakers, including national statistics institutes. In recent years, other international public policy actions and strategies to promote gender equality have been implemented in Latin America and the Caribbean, including, for example, the actions adopted under the 2030 Agenda, several of whose objectives refer, to a greater or lesser extent, to goals associated with gender equality [20].

The search for gender equality through monitoring the SDGs and indicators is not only related to promoting the autonomy of women, but is also associated with conditions that promote the sustainable development of countries [21,22], in that it recognizes the contribution of women and the care economy to the national economic systems. Not taking into consideration this latter condition would limit the execution of strategies to promote equality, and if no gender equality action were implemented through the SDGs, it would take at least 100 years to narrow the gap, and specifically 257 years to close the gender economic gap [23].

In view of the above, this article analyzes the behavior of recent gender indicators in 17 Latin American countries, to examine associations between these countries in connection with the indicators and the characteristics that determine them, as well as to explain the interdependencies that exist between the different types of autonomy (physical, economic,

and political) that summarize the gender situation in the region. The aim is to identify opportunities to promote the equality and empowerment of Latin American women.

The analysis is structured as follows: Section 2 presents the materials and method, including the methodological aspects that delimit this study; then, the results are presented in Section 3, first describing the indicators that were used to this effect, then explaining the various interrelationships observed using the HJ-Biplot technique. Lastly, the main findings are discussed in Section 4 from the perspectives of the authors to support their consistency, and the article concludes in Section 5 with the opportunities found to promote gender equality in Latin America and the Caribbean.

## 2. Materials and Methods

### 2.1. Type of Study

The design of this study is quantitative, with an exploratory, descriptive, and correlational scope, because the aim is to explain the current situation of gender in 17 Latin American and Caribbean countries through the analysis of the gender indicators compiled and published by the ECLAC Gender Equality Observatory in 2020 [2]. The objective is to identify associations between countries in the areas of the economic, physical, and political autonomy of women, by means of the HJ-Biplot multivariate analysis technique, to enable reaching conclusions regarding the observed associations and multi-dimensional interdependencies.

Consequently, the main purpose of this study is to assess the multidimensional behavior of the gender indicators in Latin America, in order to identify which of them enable establishing differences and similarities between countries. Additionally, the aim is to assess how the relationships or associations between indicators jointly summarize the gender situation in the region. To this end, the main research questions posed are as follows:

1. Which gender indicators reflect inequalities between the Latin American countries?
2. Which countries in the region display the greatest opportunities in terms of gender equality?

### 2.2. Sample and Data in Analysis

Table 1 displays the studied indicators, grouped under the three types of autonomy. The sample of the 17 countries of interest in this study, on which data are available for all the indicators listed in Table 1, are Mexico (MEX), Guatemala (GUA), El Salvador (SLV), Honduras (HND), Nicaragua (NIC), Costa Rica (CRI), the Dominican Republic (DOM), Panama (PAN), Colombia (COL), Ecuador (ECU), Peru (PER), Bolivia (BOL), Brazil (BRA), Argentina (ARG), Chile (CHL), Paraguay (PRY), and Uruguay (URY).

For the above, the structure of the information that is analyzed in this study using the HJ-Biplot technique is displayed in Figure 1. The individuals are each of the 17 countries (rows) and the variables are the 13 gender equality indicators (columns).

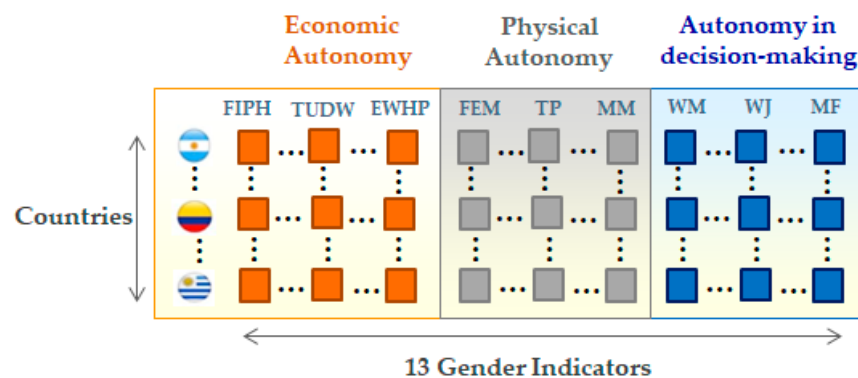


Figure 1. Information structure for the HJ-Biplot analysis.

**Table 1.** Gender equality indicators compiled by the ECLAC Observatory.

Factor	Code	Gender Indicator	Unit of Measurement/Observations
Economic autonomy	FIPH	Feminity index of poor households	Ratio between ((Number of women aged 20–59 years in poor households/Number of men aged 20–59 years in poor households)/(Total number of women aged 20–59 years/Total number of men aged 20–59 years)) × 100
	WITO	Women without incomes of their own	Ratio of the total female population aged 15 and above with no incomes of their own and who are not studying.
	TUDW	Proportion of time spent on unpaid domestic and care work	Indicator 5.4.1 of the Sustainable Development Goals. Women aged 15 and older.
	EWLP	Employed women with low productivity	Percentage of employed women aged 15 and over who work in agriculture, commerce, and services.
	EWAP	Employed women with average productivity	Percentage of employed women aged 15 and over who work in manufacturing, construction, transport, and communications.
	EWHP	Employed women with high productivity	Percentage of employed women aged 15 and over who work in mining, electricity, gas, and water, financial and real estate activities.
Physical autonomy	FEM	Femicides	Homicides of women killed by gender violence. Expressed in absolute number and rate per 100,000 women.
	TP	Teenage pregnancy	Indicator associated with the 3.7.2 Sustainable Development Goal. Total women aged 15 to 19 who report having had at least 1 child born alive, divided by total number of young women of the same age group, multiplied by 100.
	MM	Maternal mortality	Indicator 3.1.1 of the Sustainable Development Goals. Women who die from any cause related to or aggravated by pregnancy. (Ratio per 100,000 live births.)
Autonomy in decision-making	WM	Percentage of women in ministerial cabinet positions	(Number of women holding ministerial portfolios on presidential cabinets/Total number of ministers for a period of a presidential government) × 100
	WL	Percentage of women in the national legislative body	Indicator 5.5.1.b. of the Sustainable Development Goals. Percentage of elected positions held by women in legislative/deliberative bodies of local government.
	WJ	Percentage of women judges in the highest court or Supreme Court	(Number of women judges in office at the highest court or Supreme Court/Number of judges in office at the highest court) × 100
	MF	Elected mayors who are female	(Number of women elected mayors for a period of local government/Number of elected mayors for a period of local government) × 100

Table 2 summarizes the values of the studied autonomy indicators. The first group includes the economic indicators: the percentage of women without incomes of their own (indicator WITO), the proportion of time spent on unpaid domestic and care work (TUDW), and the percentage of employed women in low, average, and high productivity sectors (EWLP, EWAP, and EWHP, respectively). These indicate that in some Latin American countries women make a greater contribution to society than in others, and that, for example, their participation in high productivity sectors is minimal in all countries in the region. The figures for the EWLP indicator indicate that, overall, when women participate with remunerated jobs in the labor market, they are usually employed in low-productivity sectors.

**Table 2.** Gender indicators by autonomy type.

Country	Economic Autonomy						Physical Autonomy				Autonomy in Decision-Making		
	FIPH	WITO	TUDW	EWLP	EWAP	EWHP	FEM	TP	MM	WM	WL	WJ	MF
Argentina	121.9	18.5	22.7	82.9	10.5	5.5	255	13	33.7	13.3	38.9	20	10.2
Bolivia	114.3	32.3	22.5	82.5	11.3	6.2	128	13	160	27.8	53.1	33.3	8.2
Brazil	112.1	29	13.2	77.3	12.1	10.6	1133	12	64.4	4.9	15	18.2	11.6
Chile	130.9	19.6	22.8	78.6	10.7	9.9	55	12	9	35.7	22.6	30	11.9
Colombia	119	27	17.7	71.9	16	12	731	14	53.7	50	18.1	13	12.1
Costa Rica	128.9	32.9	23.7	76	12.2	11.8	24	11	21.2	55.2	45.6	33.3	14.8
Dominican Rep.	124.4	26	20.5	83.9	10.1	5.9	106	20	104.4	14.3	26.8	23.5	13.3
Ecuador	117	33.3	21.4	81.1	13.2	5.7	104	17	39.7	24.7	38	47.6	7.2
El Salvador	106.3	41.6	22.4	76.7	18.8	4.5	232	15	31.1	26.3	31	33.3	11.1
Guatemala	104.4	51	17.8	78.4	17.7	3.9	172	15	108	15.6	12.7	41.7	3
Honduras	106.6	39.3	17.3	75.7	20.8	3.5	235	18	74	26.3	21.1	33.3	7.4
Mexico	108.1	25.5	29.5	74.6	18.2	6.8	898	12	36.7	36.4	48.2	18.2	21.6
Nicaragua	102.6	36.3	22.9	81.7	14.8	3.5	67	20	35.1	56.3	45.7	31.3	42.5
Panama	130	27.1	18.7	76.5	13.1	10.4	20	15	49.2	20.7	18.3	11.1	14.3
Paraguay	114.7	30.6	14.6	84.7	10	5.2	59	12	86.4	23.5	15	22.2	10.4
Peru	108.8	24	21.5	84.1	10.9	5	131	12	69.8	22.6	27.7	21.1	2.9
Uruguay	148	13	18.7	76.1	12	11.9	30	9.5	18.6	33.3	20.2	40	21.4
Average	118	30	20	79	14	7	258	14	59	29	29	28	13
Stand. deviat.	12	9	4	4	3	3	332	3	39	15	13	10	9

Even though this study only considers three physical autonomy indicators, because they are the ones for which published official data are available for the 17 countries of interest in recent years, in the case of femicides (absolute values of the FEM indicator), it is observed that Brazil, Mexico, and Colombia report the highest figures for this manifestation of gender violence; and regarding teenage pregnancy (TP, percentage for women between the ages of 15 and 19) and maternal mortality (MM, ratio per 100,000 live births), countries such as Nicaragua, the Dominican Republic, Honduras, and Guatemala report high indicators, which reflects the effects of the reproductive rights of their women.

Regarding political decision-making autonomy, it is striking to see that none of the values in Table 2 are anywhere near 50%, which implies that Latin America has a major opportunity in terms of consolidating its democracies. None of the branches of government display gender equality, neither in terms of ministerial cabinet positions of the executive branch of current governments (WM indicator for the recent governments in each country), nor in national legislative or congressional bodies (WL), nor in the judicial branch (WJ), nor in popularly elected women mayors (MF percentage). On the contrary, in some countries women do not even have 20% of the political representation positions in their countries in any branch of government, as in the cases of Guatemala and Brazil.

### 2.3. Procedure: The Gender Indicators Analysis from a Multivariate Perspective

Examining the gender indicators through multivariate analysis enables finding various relationships that would not be evident using descriptive, univariate, or bivariate techniques. Consequently, the analysis of multi-dimensional representations is useful in the field of socioeconomic research in general, and in this case in particular, because it is an analytic alternative that facilitates the understanding of strategic indicators related to gender, and facilitates the use of the findings by the competent bodies for the formulation of public policies based on analytic results.

For this reason, we will first explain the technique used to analyze the data and obtain the results, as well as its scope and the type of graphics that the technique is capable of producing. It is also relevant to specify the structure of the data that is required for its use and how the variables, observations, and features of interest are interpreted. Below, we will discuss specifics on the technique and will reference some studies that have used HJ-Biplot to study sociopolitical and economic phenomena.

In the analysis of sociopolitical, economic, and population data, multivariate analysis techniques provide a useful perspective for decision-making by taking into consideration

several characteristics simultaneously, and by assessing their associations, in order to understand the practical implications of the phenomena being studied. Specifically regarding HJ-Biplot representations for the understanding of situations with policy implications, we can cite as references two recent research papers, to make the case for the selection of this technique for the multidimensional analysis of gender indicators in this paper.

Even though these studies [24,25] do not focus on the analysis of gender matters, they exemplify the usefulness of HJ-Biplot for political studies. The first paper analyzes 12 European countries starting out with a latent construction of small dimensionality to extract conclusions for the housing policy issue in Europe, by characterizing their trends over different time periods. In contrast, the second paper uses the technique to analyze perceptions on confidence in congress (the legislative branch), in the government (executive branch), in the political parties, and in the elections institution, compared to the results obtained in 18 Latin American countries.

In terms of use of the biplot method in the economic and development area, it has recently been used to review enterprise sustainability, environmental, and energy indicators [26–28]. It has also been used for the multi-dimensional characterization of corporate social responsibility practices [29,30]. In the area of population analysis, this technique has been used to assess neonatal mortality rates in Ecuador [31].

Based on the understanding that this technique is useful for political, economic, and demographic analysis, we will now provide an overview of the method itself, in order to offer context on the results and their discussion.

#### *2.4. Statistical Analysis: The HJ-Biplot*

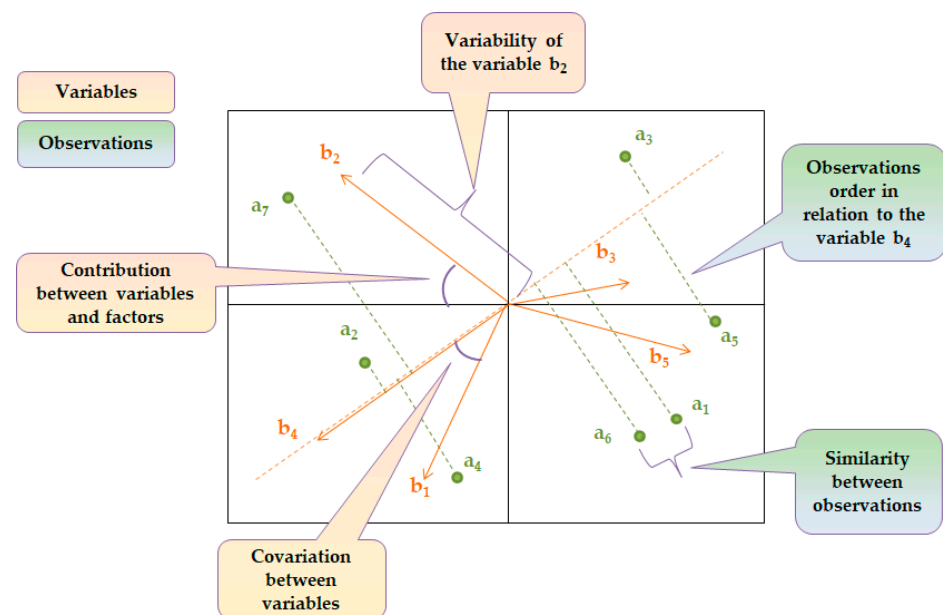
There are numerous multivariate analysis exploratory techniques that summarize numeric data sets, the most traditional of which are factorial analysis and the analysis of principal components; the less common techniques include the so-called biplot technique or method, as proposed by Gabriel [32]. The biplot methods enable the representation of more than two variables by means of an approximation of a multidimensional space into another of fewer dimensions (which are linear combinations of the original variables), generally two, in a manner that provides a combined representation of the individuals and the variables.

The mentioned author proposed two methods, the GH-Biplot and the JK-Biplot, which enable the representation of both the individuals and the variables in a space of reduced dimensions (usually in two to three dimensions) while seeking to minimize the loss of information from the original data. The GH-Biplot enables a high-quality representation of the columns (variables), whereas the JK-Biplot enables a high-quality representation of the rows (individuals).

For her part, Galindo [33] proposed the HJ-Biplot as an alternative to simultaneously represent rows and columns (individuals and variables) in a single system of coordinates, obtaining a maximum quality of representation for both. Consequently, an HJ-Biplot is an approximation of the distribution of a multivariate sample in a space of fewer dimensions, where the variables are usually represented by means of vectors and the observations or individuals are represented by dots, enabling in this way a simple interpretation of the relationships between individuals, between variables, and between individuals and variables. Specifically, in an HJ-Biplot, the reduction of dimensions is achieved when the variables are related to each other and their representation on a plane is based on the decomposition of singular values and vectors of the matrix of the analyzed data [34], in a manner that enables finding the space of fewer dimensions that represents both the variables (usually represented by vectors) and the individuals (usually represented by dots).

In order to adequately interpret the graphic results, a series of rules must be followed, as well as the study of a series of indicators obtained from the analysis. Based on the theoretical aspects of the technique, which are available in [33], the interpretation of the biplot graphic elements is based on the geometric properties of the scalar product between

the row vectors and column vectors. The elements for interpretation of the HJ-Biplot representation are specified in Figure 2.



**Figure 2.** Interpretation of the elements in the HJ-Biplot representations.

The elements in HJ-Biplot representations can be interpreted as follows:

1. Angle between the vectors and the factorial axes: It indicates which gender indicators comprise the main dimensions, axes, or components. The smaller the angle, the more the indicator contributes to the dimension.
2. Angle between vectors: It indicates the correlation that exists between the gender equality indicators. When the vectors representing two indicators form an acute angle, it means they are highly correlated; if they run perpendicular to each other, it means they are approximately independent, and if they run in opposite directions, it means that they are strongly negatively correlated.
3. Length of the vectors: It indicates the importance of the gender indicators in explaining the behavior represented in the plane; the longer the vector, the greater the variability, and therefore the more information, and vice-versa.
4. Distances between the dots representing the countries: It enables observing associations between countries. Two countries will appear close to each other in the representation when the values of the studied indicators are similar.
5. Projections of the dots representing countries onto the vectors that represent the variables: They explain which specific indicators are associated with which countries, and their position is interpreted in association with the direction of the gender indicator vectors. If the projection is near the vector area in which the arrow is pointing, it means that the indicator value for that country is above the mean, and that it is lower than average if the projection is on the opposite side. Therefore, if all the countries are projected onto a vector that represents an indicator, it would display the countries' ranking for that indicator.
6. The interpretations for points 1–4 should only apply to the elements (rows and/or columns) that are well represented in the corresponding factorial plane. To this effect, we need to take into consideration what is called the contribution and quality of representation, which consists of a series of measurements obtained from the analysis that enable distinguishing between the elements that can, or cannot, be interpreted in each factorial plane.



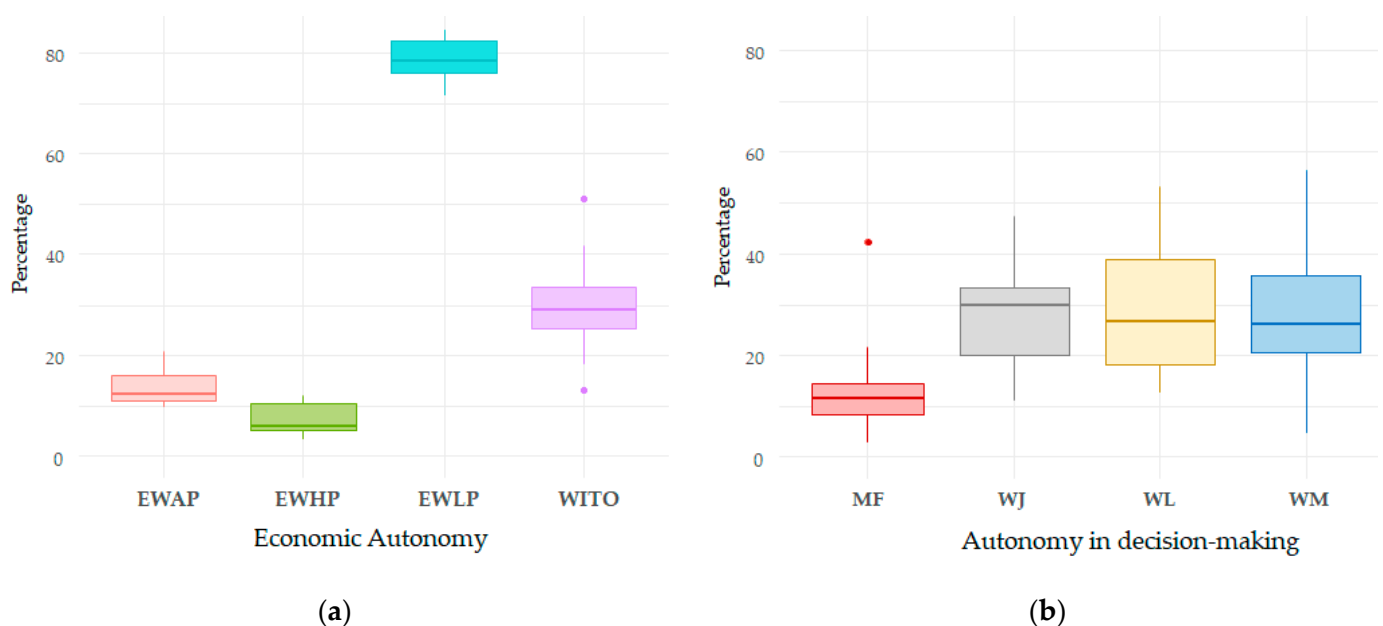
The statistical package R (open access) offers a number of tools, libraries, and functionalities that enable performing HJ-Biplot analysis. These include, among others, the MultBiplot program [35] and its respective package in R (MultBiplotR), which was used to obtain the results and graphic representations of this study. Other functions developed in recent years to perform this analysis in R include biplotbootGUI and dynBiplotGUI [36,37].

### 3. Results

The results displayed below explain the existing associations between the most recent indicators (for the year 2020) on the economic, physical, and political participation autonomy of women in Latin American countries. We start out by presenting the observed variability of the gender indicators, then describe the structure of bivariate correlations between the indicators and between the countries of interest, and finally present the observations on the multivariate associations of the factorial planes 1–2 and 3–4 in the HJ-Biplot.

#### 3.1. Descriptive Results

In order to assess the existing variability between countries in terms of the indicators, Figure 3 displays comparative box plots that summarize the measures of central tendency for all Latin America, for the specific case of the gender indicators measured on a percentage scale.



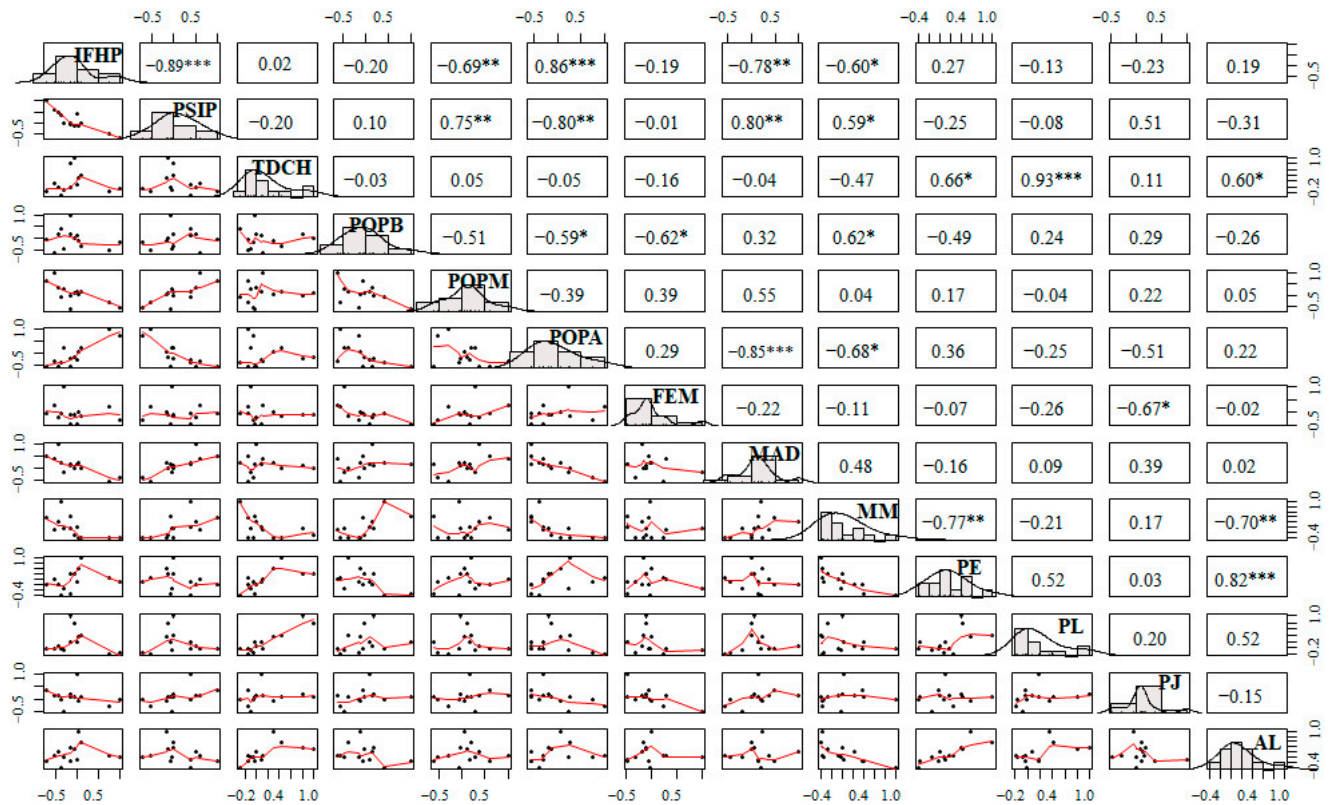
**Figure 3.** Box plot of gender indicators for Latin American and the Caribbean countries. (a) Percentage indicators of economic autonomy. (b) Indicators of women's political representation.

Figure 3a shows that the indicator with the greatest variability among the variables represented is the percentage of women without incomes of their own (WITO). It includes the effect of two atypical values: that of Uruguay, which reports only 13% of women without incomes of their own, and on the other side that of Guatemala, with 51%.

In Figure 3b it can be seen that the indicator that reflects the low political participation of women in the region is that of elected mayors who are female (MF), because the median is 12%, even though it includes atypical data from Nicaragua, where 43% of mayoralties are led by women. In the case of the other branches of government, similar variability and central values of close to 30% for women in leading political representation positions are observed.

In terms of the bivariate associations between indicators, Figure 4 displays the correlation matrix of the studied gender indicators, where the numeric values indicate whether or

not they are statistically significant. In this figure we can see that some of the autonomy indicators display correlations with each other, reflecting association, though it is important to keep in mind that correlation does not imply causality.



**Figure 4.** Bivariate correlations between gender indicators. Significance levels are denoted as  $\alpha = 0.05$  (\*),  $\alpha = 0.01$  (\*\*), and  $\alpha < 0.01$  (\*\*\*)

Figure 4 shows a high positive correlation between the indicators TUDW and WL. This means that when a country's indicator for the proportion of time spent by women on domestic and care work is high, the proportion of women who participate in the legislative branch of government is also high. Similarly, it shows that when a high percentage of women over the age of 15 have no income of their own (WITO indicator), the teenage pregnancy percentage (TP) is also high, and the participation of women employed in high productivity industries (EWHP) is low.

Regarding the negative correlations observed, it is particularly striking to see the negative relationship between feminicides and the participation of women in the judicial branch, with a negative correlation between the variables FEM and WJ of  $-0.46$ , which, even though it is not extremely high, is nonetheless significant. No explanation for this correlation is found in recent literature, and this begs the question of why the Latin American countries with a high occurrence of feminicides do not have a substantial representation of women in the judiciary, considering that it would be positive to have diverse judicial environments that incorporate the gender equality perspective for the effects of decision-making.

### 3.2. HJ-Biplot Analysis

Tables 3 and 4 display the quality of representation of the row and column elements based on the HJ-Biplot analysis. In each case, they highlight the values that enable knowing which indicators and which countries are best represented in the four top axes of factors resulting from the analysis. Table 3 indicates that the variables that contribute most to the analysis of total variability are associated with the percentages of women employed

depending on productivity, in such a manner that the best representation of the high productivity sector is viewed in axis 1, whereas the low and medium productivity sectors have a greater contribution in axes 3 and 4.

**Table 3.** Representation quality of the assessed indicators.

Indicator	Total Variability	Relative Contributions								
		From Element to Factor				From Factor to Element				
		Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4	
Economic autonomy	FIPH	91	198	7	28	95	759	20	72	149
	WITO	86	199	4	37	48	809	12	99	79
	TUDW	76	1	201	45	65	3	739	136	123
	EWLP	94	31	42	292	34	114	123	711	52
	EWAP	91	65	65	207	19	249	199	523	30
	EWHP	88	225	1	32	11	897	3	83	17
Physical autonomy	FEM	86	3	1	220	241	13	2	587	399
	TP	50	127	17	0	6	886	96	1	18
	MM	60	90	80	9	30	527	370	33	70
Autonomy in decision-making	WM	73	17	230	0	23	81	874	0	45
	WL	82	2	168	91	97	10	569	253	168
	WJ	71	33	16	37	324	162	63	120	655
	MF	52	9	169	3	6	63	908	12	17

**Table 4.** Representation quality of the assessed countries.

Country	Total Variability	From Element to Factor				From Factor to Element			
		Axis 1	Axis 2	Axis 3	Axis 4	Axis 1	Axis 2	Axis 3	Axis 4
Argentina	33	12	8	62	85	124	66	438	373
Bolivia	40	30	2	102	41	263	13	579	145
Brazil	93	14	142	159	80	53	428	395	124
Chile	40	93	1	16	26	811	4	91	94
Colombia	70	48	2	228	2	239	7	749	5
Costa Rica	57	69	91	7	44	420	444	26	111
Dominican Republic	32	11	36	74	11	116	312	523	50
Ecuador	25	24	3	35	55	329	37	323	311
El Salvador	35	54	28	30	13	534	220	194	52
Guatemala	98	190	36	35	97	675	101	83	141
Honduras	69	119	0	85	51	608	0	286	107
Mexico	101	4	178	54	260	14	493	124	369
Nicaragua	108	52	297	31	2	167	765	65	3
Panama	19	35	17	8	3	632	248	99	20
Paraguay	40	3	121	24	0	24	840	136	0
Peru	29	1	38	43	53	11	375	348	267
Uruguay	112	243	0	7	175	762	0	14	223

For the effect of interpretation of the graphs, the indicators that receive a high relative contribution of the factor to the element are the ones that enable characterizing each axis. Thus, for example, we observe how the indicators FIPH, WITO, EWHP, and TP are characteristic elements of axis 1, and will consequently be useful for interpreting and discriminating between the positions of the countries on this axis. The indicators TUDW, WM, and MF are characteristic for axis 2, while EWLP is characteristic for axis 3 and WJ is characteristic for axis 4. Some indicators receive medium-level relative contributions from two axes, which means that they must be interpreted on the plane of those axes; this is the case, for example, of MM (planes 1–2), EWAP (planes 1–3), FEM (planes 3–4), and WL (planes 2–3).

Given the contributions observed in Table 3, for the effects of interpretation it can be said that axis 1 represents the gender characteristics and indicators that determine the ranking of Latin American countries in terms of the phenomenon of the “feminization of poverty” in the region. Meanwhile, axis 2 represents a multi-dimensional dimension that summarizes the political participation of women and the time they devote to the “care economy”, i.e., home and family maintenance activities. For their part, axes 3 and 4 summarize the gender indicators associated with “acts of violence against women” and their possibility of participating in decisions at the judiciary level.

In Table 4 we can observe that the countries that contribute the least to explaining the total variability of the information are Panama, Ecuador, and Peru, in that order, whereas Uruguay, Nicaragua, and Mexico are the countries that contribute the most. It can also be seen that in terms of the relative contribution of the factor to the element, Chile, Uruguay, Guatemala, Panama, and Honduras are characteristic countries of axis 1, while Paraguay and Nicaragua are characteristic of axis 2, and Colombia, Bolivia, and Argentina are characteristic of axis 3. By planes, with medium relative contributions of two axes, we find Costa Rica (planes 1–2), Brazil (planes 2–3), and Mexico (planes 2–4).

The plane in Figure 5 displays the multivariate representation of the gender equality indicators along with the ranking of the countries on the plane formed by the first two dimensions resulting from the HJ-Biplot analysis. The indicators (vectors) are displayed by color to differentiate the type of autonomy they belong to, and the countries are represented by their flags and abbreviations.

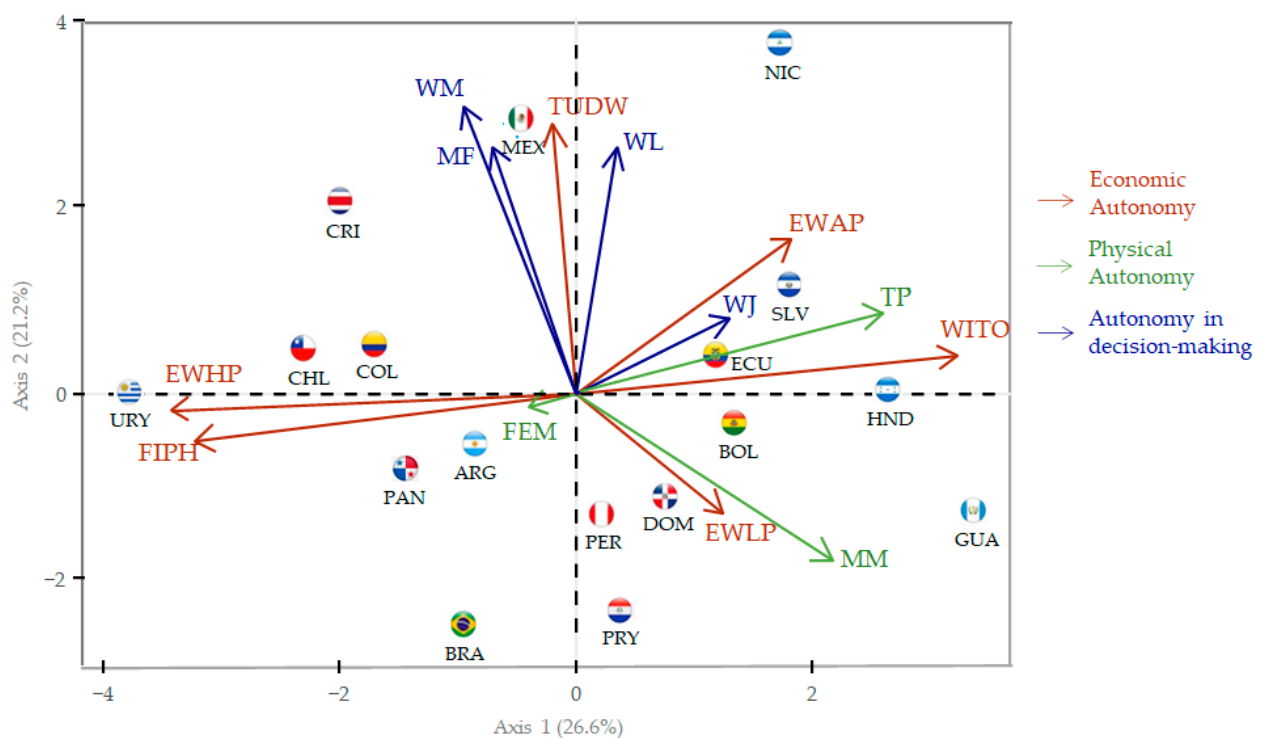


Figure 5. HJ-Biplot of gender indicators in Latin America (planes 1–2).

From the results of this first plane, we can conclude that axis 1 encompasses poverty, because the greatest contributions of the axes are received by the percentage of women over the age of 15 without income of their own (WITO), which characterizes the positive section of axis 1, and in contrast, on the left side of the graph are the vectors that represent the proportion of women in high productivity sectors (EWHP) and the femininity index of poor households (FIPH).

Also regarding axis 1, Figure 5 shows a particular ranking of countries: on the right of the graph we find Central American countries such as Guatemala, Honduras, and El

Salvador, and therefore they display higher values for the indicator of the percentage of women without incomes of their own (WITO) and lower values for the indicators of the percentage of employed women with high productivity and the femininity index of poor households (EWHP and FIPH). To the left are the South American countries (where the opposite is true), particularly those from the southernmost tip of the continent. This behavior indicates heterogeneity in the way gender inequality is reflected, both within and between the countries.

Axis 2 appears to be explanatory of the variables on women's political representation, with an especially high contribution of axis 2 to the variable TUDW, which represents the time devoted to caring for the home, as well as high positive correlations with the vectors WL, WM, and MF, which are related to the percentages of women represented in legislative, ministerial, and mayoralty offices and which characterize the top section of the axis. This indicates that countries with high TUDW values (above average) also have high values in these three other indicators, and vice-versa. Also in this plane, we observe a high participation of Mexican women in political office, and that the opposite is true in Brazil, Paraguay, Peru, and the Dominican Republic, which display in the graph low percentages of female participation in national politics.

Planes 3–4 of the HJ-Biplot in Figure 6 offer a clearer view of the similarity between Brazil, Mexico, and Colombia (which appear close to each other and form a group around the vector FEM) due to the high number of feminicides they report, and at the same time this characteristic is seen to be on the opposite end of indicators of women's participation in the countries' judiciary (vector WJ). Currently, at least in the Latin American countries with the highest prevalence of feminicides, women do not have a high level of participation in the political bodies that ensure that justice is made in connection with domestic violence and murders arising from discrimination against women.

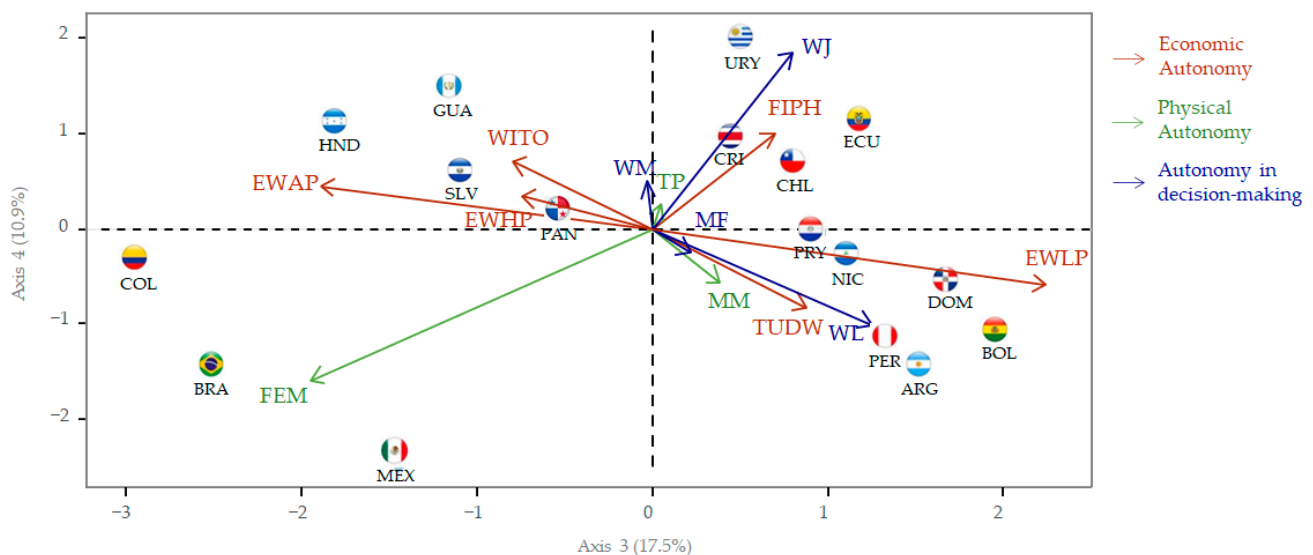


Figure 6. HJ-Biplot of gender indicators in Latin America (planes 3–4).

In Figure 6, axis 3 offers a visual representation of the rankings of countries in terms of the percentage of women employed in low and medium productivity sectors, while the size of the EWHP vector means that the employment of Latin American women in high productivity sectors should be interpreted using Figure 5, where it is better represented. Specifically, Guatemala, Honduras, and El Salvador, located in quadrant II of the plane, appear characterized by values above the mean in the indicators of women employed in average productivity sectors (EWAP vector); while Bolivia, the Dominican Republic, Argentina, and Peru, located in quadrant IV of the graph, are countries with higher percentages of female employment in low productivity sectors (EWLP vector).

#### 4. Discussion

This paper's approach enables discussing findings regarding the types of autonomy assessed in terms of the behavior of specific patterns observed in the gender indicators, the countries, and their repercussions for the analysis of the implementation of public policies on gender equality. It also highlights the usefulness of the HJ-Biplot technique for the analysis of data in the areas of socioeconomic policy and gender analysis. To this end, below we discuss the results compared to the studies, views, or reflections of other authors that support or dispute the relationships found in this study, in order to point out from an interpretive perspective the opportunities that arise in Latin America to promote gender equality.

Regarding autonomy, based on the multiple associations found we can say that the Latin America and Caribbean region faces challenges in terms of promoting gender equality in the three spheres that were assessed, which are interrelated with each other and are heterogeneous across countries. Such non-homogeneity implies that efforts to mitigate the different forms of discrimination against women should be made by increasing their opportunities to contribute to society, to the economy, and to sustainable politics, both within each country and across the countries.

Inequality in the Latin American region is a complex and multi-dimensional phenomenon that is strongly associated with the heterogeneity of the production structures of its economies. The socioeconomic inequality (the clearest manifestation of which is inequality in income and in the ownership of physical and financial resources) overlaps with gender, ethnic-racial, age, and territorial inequalities [38] (p. 10). In this study it was found that the greatest contrasts in terms of the productive structure of Latin American women are between countries such as Uruguay, Chile, and Colombia, which report the highest percentages of women in high productivity sectors, and the Central American countries: Honduras, Guatemala, and El Salvador, where high percentages of women report no income of their own or employment in low-productivity sectors.

Regarding economic autonomy, the findings of this study are consistent with the facts that women are rarely found in the top positions in the business world, their incomes are generally lower than men's, even in identical jobs, and they tend to face discrimination in the labor market [39]. Economic autonomy is a central pillar for women, and, by definition, it is necessary for them to earn income in order to overcome poverty and to be able to use their time freely to receive training, access the labor market, and achieve professional and personal development [40] (p. 182).

The analysis of employment indicators by sector indicates that there are opportunities to improve the employment performance of Latin American women in higher and medium productivity sectors and to achieve parity with men in terms of opportunities to access better remunerated jobs and jobs associated with the digital world. "If women were employed at the same rate as men, the gender digital gap in these countries would be reduced by at least a quarter" [41] (p. 51).

In Latin American and Caribbean countries, women are often employed in low-productivity sectors and are over-represented in informal jobs. This was observed with greater prevalence in countries such as Bolivia, the Dominican Republic, Argentina, and Peru, where there is a significant relationship between the level of formality of jobs and productivity levels [42] (p. 22). This represents a limitation for women, because the divides between formal and informal employment are huge in Latin America, which weakens the pre-distributive process itself, as a huge contingent of workers are left out of the protection system [43] (p. 59).

To this effect, it would be desirable for these countries and the entire region to establish policies that promote greater gender equality in the labor market, to enable the formalization of women's jobs and facilitate their professional hiring in high productivity sectors, with access to social security benefits, or else to promote female entrepreneurial ventures. Favoring these conditions would enable sustainable economic development.

Additionally, it continues to be necessary to promote policies aimed at reducing the time women devote to non-remunerated activities at home in order to mitigate gender stereotypes in the care economy. The view that the labor market is the preserve of men and that the home is the place for women is a gender barrier that can be modified, for example, through greater participation of women in work outside the home [44] (p. 29). Specifically, in this study it was found that Mexico and Costa Rica are the countries where women report the most amount of time devoted to home care activities.

These actions are necessary, even more so in the current regional context of recovery from the economic recession produced by the COVID-19 pandemic, which has further exacerbated the already existing economic and gender inequalities produced by a patriarchal and capitalist economy that for centuries has undervalued care, has assigned more prominence to work by men (both remunerated and non-remunerated), and has undermined women's rights [45].

In Latin American countries, even pre-pandemic, one in four women compared with one in ten men lacked an income of their own [46]. Additionally, the COVID-19 crisis has reinforced the invisibility of gender inequalities in domestic and care work, and in turn has made women even more vulnerable to the impact of the pandemic and its resulting economic recession [47].

Regarding the study's findings on the physical autonomy of women, the observed trend in terms of the phenomenon of feminicides in countries such as Brazil, Mexico, and Colombia, and its high contribution to the third dimension of the HJ-Biplot analysis, demands further reflection on how to eradicate this trend, and to consider that fairly discharging justice in the cases of violent death of women is vital for sending a message to society as a whole that violence against women and feminicide must no longer be normalized [48] (p. 270).

In connection with the penalties for the crime of feminicide, it should be noted that Mexico is the only Latin American country that punishes with imprisonment any authorities that fail to comply with or hinder the performance of investigations and/or legal proceedings, while the other countries in the region only penalize the feminicides as such, i.e., the men who commit these crimes for gender-related reasons [49] (p. 29). Greater public policy action is needed not only to promote non-violence against women in general, but also to continue working on strategies such as the one proposed in 2017 in Montevideo, in the framework of the 2030 Regional Agenda [50].

This strategy structured the implementation of action plans to mitigate the various manifestations of violence against women: private, public, symbolic, institutional, cybernetic, economic, obstetric, political, in situations of conflict, natural disasters, deprivation of freedom, workplace harassment, sexual harassment, sexual abuse and exploitation, illegal migrant trafficking, women trafficking, forced prostitution, rape, and feminicide. This also requires greater efforts to ensure the comprehensive preparation of the health care professionals involved in identifying and addressing gender-based violence [51].

In the sphere of physical autonomy, it is also necessary to talk about the high maternal mortality and teenager pregnancy rates reported in countries such as Bolivia, Guatemala, the Dominican Republic, and Nicaragua, given that sustainable development refers to the phenomena of developing interventions that are able to be maintained over long-term periods of time without significant risk [52]. Reducing the risk to women's health that both situations pose forms part of the actions required to achieve SDG 3. Particularly, these countries require health strategies that contemplate actions such as family planning, antenatal care, safe abortion care, skilled birth delivery, emergency obstetrics care, and postnatal care that should be tied to the social and economic empowerment of women [53].

Regarding the behavior of the indicators on the political participation of women in Latin American governments, the results of this study show that the greatest inequalities in the plane of female political representation are found in Guatemala and Brazil. Guatemala is considered one of the most unequal countries in the world, given that 60% of its population lives in poverty, which is highly concentrated in rural areas (76.1%) and in indigenous

populations (79.2%) [54] (p. 127). This situation may be the reason for the low participation of women in the country's public policy decisions.

Brazil, even though it is one of the most developed economies in the region and has managed to reduce poverty in recent decades, continues to be among the most unequal countries in the world, due to factors such as an unfair tax system, low social investment, shortcomings of the educational system, and discrimination against females and Blacks. This could be the cause of the inequality found in terms of political office held by Brazilian women.

For this reason, it is necessary to indicate that in these two countries in particular, and in all Latin America, additional research is required to determine the reasons for the low rates of political participation by women in presidencies, ministerial cabinets, state legislatures, high courts of justice, and municipalities or mayors' offices, and in particular on the reasons why limitations persist, which must be studied and intervened to prevent, for example, sociocultural prejudice regarding female political representation [55].

The political leadership of women is necessarily linked to research on the causes of their restricted access to political life, and especially to top level political positions. Women are often faced with invisible barriers, known as the "glass ceiling", that affect their professional careers and limit their possibility of reaching high level positions within organizations. The existence of such limitations represents not only a deficit in democracy, but also a waste of talent in facing the complex challenges of leadership [56] (p. 54).

Additionally, it is necessary to consider that throughout the Latin American region further social transformations are required, beyond laws on quotas, rules, or agreements that declare gender equality in the political leadership sphere [57] (p. 16). This is because despite the efforts made to achieve progress in fulfillment of the SDG 5.5.1.b goal (WL indicator in this study), in Latin America and the Caribbean currently only 16 countries have implemented laws on quotas, and only 6 have established gender parity (50%).

Due to all the above, and regarding the implied suggestions of this study for the implementation of public policies, it is necessary to take into consideration that the Latin American countries are developing economies, and as such they continue to face major political challenges to overcome and reduce inequality. The historical times, processes, transformations, ruptures, and continuities have made inequality a persistent feature in the countries of the region [58].

It is therefore necessary to continue undertaking actions that promote collective awareness of the importance of gender equality, in order to seek to abolish the barriers that produce discrimination and prevent advancement toward the consolidation of sustainable nations and fulfillment of the goals of the 2030 agenda related to SDG 5. For this reason, it is necessary to strengthen public policies aimed at reducing gender inequality and promoting greater autonomy for all women, including the various intersections with aspects such as race, ethnicity, and age, among others [59] (p. 4).

## 5. Conclusions

Concluding in terms of the proposed research questions, in this study it was found that two of the gender indicators studied display the greatest inequalities between Latin American countries: the percentage of women without incomes of their own (WITO) and the percentage of female mayors (MF). The first indicator is associated with the status of female economic autonomy and leads to reflection on the need to continue implementing public policy strategies to reduce the feminization of poverty in the region [60,61]. This is a particularly pressing need for Central American countries, given the prevalence of women's economic dependence and their employment in low productivity sectors.

For its part, the second indicator reflects the empowerment of women in senior and municipal public offices. Even though attempts have been made to regulate this aspect through laws on quotas, it continues to be limited by cultural barriers produced by a political environment that has been historically considered the preserve of men. In the region, progress has been made through international agreements on the adoption of legislation



with a gender approach; however, these do not guarantee the real political empowerment of women, because patriarchal practices continue to restrict both government institutions and Latin American societies [62,63], and hinder the advance towards gender equality.

Another conclusion of this study is related to the need to continue implementing legislation on comprehensive protection from violence against women, and laws to regulate domestic or intra-family violence. This study observed a high prevalence of feminicides, especially in countries such as Brazil, Mexico, and Colombia. This is a pressing need in the current context of the lock-down produced by the pandemic, because during the emergency the risk of violence against women and girls has increased, particularly in terms of domestic violence, due to increased tensions at home [64].

Even though this study was proposed as descriptive and correlational, it reflects the usefulness of analyzing gender equality indicators in Latin America and the Caribbean, where in recent decades the study of these indicators has occurred at the same time as growing interest in the topic in the countries' societies and public policies [65] (p. 214), because promoting gender equality and female empowerment enables the social, economic, and sustainable development of nations [66–68].

For this reason, in future academic studies that assess gender indicators in the Latin American region, it would be useful to use inferential techniques to enable the determination of, for example, the statistical significance of the evolution observed in the gender indicators of the 2030 Agenda, as well as data analytics studies that enable understanding of the Feminist Mobilization for the SDGs [69] and how it influences the assessment of the countries' sustainability policies.

Studies of this type will help understand the progress made over the decade since the Action for the Sustainable Development Goals [70], where in terms of SDG 5, the countries of Latin America and the Caribbean report a similar level of progress to that of the countries that belong to the Organization for Economic Cooperation and Development (OECD): “Moderately increasing” and “Challenges remain”. For this reason, the region continues to face the challenge of understanding gender equality as a determining condition for progress in the construction of sustainable societies and economies.

Lastly, it should be noted that from a methodological standpoint the HJ-Biplot statistical technique is useful for the analysis of sociopolitical, economic, and sustainability information, because it offers options for the representation and interpretation of associations between multiple observations and variables. This specific study focused on countries and gender equality indicators, but in future studies the technique may be applied to demographic analysis, the quality of life of people or cities, community sustainability indicators, and ethnic groups and indicators that reflect their cultural characteristics, among many other possibilities.

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