

Research paper

From micromachisms to gender inequality: A multivariate analysis of students' perceptions of institutional gender culture in Ecuadorian Universities

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ABSTRACT

Gender inequality in higher education is often reproduced through subtle, symbolic, and institutionalized practices that conventional descriptive approaches may fail to detect. This study examines students' perceptions of micromachisms, harassment, and institutional gender culture in an Ecuadorian public university using a multivariate analytical framework. Data were obtained from two structured surveys: the Gender Harassment and Violence Survey and the Micromachisms and Discrimination Survey. After data cleaning, the analytical sample included 173 valid student cases in the harassment survey and 214 in the micromachisms survey; paired observations were retained for integrative multivariate procedures. The methodological strategy combined exploratory factor analysis, biplot representations, co-inertia analysis, and latent profile analysis. The harassment survey revealed two latent dimensions: Authority Abuse and Peer and Institutional Dynamics. The micromachisms survey also identified two dimensions: Credibility and Exclusion and Sexist Language and Image Pressure. Biplot results visually supported these multidimensional structures by showing differentiated configurations of variables and respondents. Co-inertia analysis showed a weak but statistically significant relationship between both instruments ($RV = 0.068$, $p = 0.023$), indicating that explicit harassment and subtle micromachisms are related but largely distinct dimensions of institutional gender culture. Latent profile analysis did not identify stable differentiated student profiles under the available data and model specifications. The findings demonstrate the value of multivariate methods for uncovering latent structures of gender inequality in Latin American higher education and suggest that institutional interventions should address both overt harassment and subtle symbolic exclusion as distinct but interconnected phenomena within specific and context-sensitive university settings analyzed.

Keywords: micromachisms, gender inequality, higher education, microaggressions, co-inertia analysis, latent profile analysis, ecuador

Gender inequality in higher education persists as a structural issue that transcends formal disparities in access and participation (Flores et al., 2025), revealing itself through nuanced, quotidian manifestations that perpetuate unequal power dynamics within educational institutions. Within this framework, micromachisms serve as a principal mechanism for the symbolic perpetuation of sexism, evident in quotidian interactions, obscured organizational practices, and disparaging messages aimed at women and gender minorities within the university context (Chen, 2025; Morando, 2024).

The empirical evidence examined indicates that micromachisms in higher education encompass verbal and symbolic microaggressions, as well as patterns that render individuals invisible, undermine their competence, and exclude them from decision-making contexts (Crimmins et al., 2026). Smith (2025) argue that these behaviors affect mental health, academic performance, career trajectories, and students' sense of institutional belonging (Thomas et al., 2023). Micromachisms, in particular, tend to build up and create toxic work environments that keep inequalities going (Gast et al., 2025; Onyiego, 2023).

An additional common pattern is that academic work is divided by gender. Women end up doing teaching loads, administrative work, and institutional care. Men are responsible for research, leadership, and decision-making (Bruckner et al., 2024; Huang, 2025). This division has been identified as a factor that helps perpetuate gender inequality within academia. It constrains women's access to professional and symbolic advancement (Ferrari, 2022). Research also agrees that micromachisms are ways in which the unfair distribution of academic labor is made to appear fair and normal (De Simone, 2025; Thomas et al., 2023).

In this context, certain authors underscore the importance of utilizing multivariate methodologies to reveal latent structures, relational patterns, and varied experience profiles within academic communities (Ahmadifard, 2022; Hong, 2022; Quiles, 2024). These approaches are pertinent in Latin American contexts, where scientific literature on micromachismos and gender inequality in higher education is still limited and fragmented, despite the importance of the issue (Gale, 2024; Ibrahim, 2023; Ma, 2022).

To address these gaps, this study examines micromachisms and gender inequality in higher education using a multivariate analytical framework based on two complementary survey instruments. The methodological approach integrates exploratory factor analysis as a preliminary validation step, multivariate representations through biplot techniques, and latent profile analysis to identify differentiated perception patterns among students. Additionally, the structural relationship between the two instruments is explored through multivariate comparison techniques, allowing the identification of shared dimensions in students' perceptions of institutional gender culture.

The remainder of this article is organized as follows: Section 2, theoretical Background, presents the main theories related to the present work. Section 3, method, presents the origin of the data and the proposed empirical model. Section 4, results, presents the metrics from the statistical analysis performed. Section 5, discussion, analyzes the results obtained, interprets the instrument's findings, and validates the proposed hypothesis. Section 6, Conclusion, presents the main findings and implications for future research.

THEORETICAL BACKGROUND

Micromachisms and symbolic gender inequality

The findings indicate that microaggressions constitute the subtle operational practice through which universities reinforce symbolic gender inequality. Like other discriminatory acts, they occur through normalization in beliefs and relationships that shape how students evaluate the roles and abilities of men and women. According to Sinz & Gallego (2022), students reproduce gender-differentiated stereotypes about aptitude and performance in disciplines such as science, technology, engineering, and mathematics (STEM) and the humanities, demonstrating that inequality is perpetuated in our minds, not through active constraints. As noted by Garca-Goi et al. (2023), sexist norms also undermine the perception of equality in academia.

It is this symbolic dimension that is reinforced by ambivalent sexism and functions as a bifurcated system of legitimation; Gonzalez et al. (2026), found that receptive to myths about sexual assault is associated with sexist attitudes and shows how these myths operate to normalize violence. Similarly, according to Garca-Prez et al. (2024), the minimization/justification of violence is organized around cognitions linked to sexism, which impairs the ability to recognize inequality and develop strategies to prevent its reproduction.

In everyday interactions, microaggressions manifest themselves in relatively innocuous educational practices. According to Feijoo-Cid et al. (2025), the classroom exhibits unequal participation, the invisibility of women, and a differential distribution of responsibilities, demonstrating how everyday life reconstitutes symbolic inequality. According to Thum (2021), microaggressions and objectification produce cumulative damage that shapes women's self-image and their capacity for academic engagement.

From a multivariate perspective, microaggressions can be considered latent variables that express beliefs, attitudes, and actions related to the gender culture of these institutions. Therefore, their analysis is relevant to

understanding how symbolic inequality is constructed and manifested in Ecuadorian universities. The persistence of these patterns in other contexts undermines the assumption that higher education (in the abstract) reduces sexism. According to Holmes (2026), microaggressions are extremely common among university students, suggesting that such phenomena depend on sociocultural and contextual factors, regardless of the educational level.

Microaggressions in academic environments

The analyzed evidence supports the argument that microaggressions in academic settings do not constitute isolated events, but rather systematic mechanisms for the reproduction of inequality that operate through subtle and socially normalized interactions. According to Grinshteyn (2022), these practices manifest as everyday expressions of devaluation directed at subordinate groups; this implies that their impact depends not on their individual intensity, but on their accumulation within the academic experience.

Critically, these findings show that microaggressions do not belong to an interpersonal sphere but are part of greater institutional structures. According to van et al. (2024), students from minority groups are confronted by obstacles at every stage of their education, in evaluation processes, access to education, and professional development. This confirms that such dynamics affect the construction of academic identity and limit their performance. In this sense, microaggressions do not reflect inequality; they actively help consolidate it.

At the level of academic interaction, these practices are manifested through specific forms of symbolic invalidation. For instance, it was reported by Brooks et al. (2021) that women more frequently face challenges to their authority, receive inappropriate comments, and have their knowledge delegitimized, thus confining their participation in spaces that are traditionally masculinized. Also, microaggressions are manifested at the environmental level due to factors such as underrepresentation, biased educational content, and pressure to conform to dominant norms that, much later in life, create environments that perpetuate structural exclusion (Mills, 2020).

The evidence shows that these experiences become more complex when multiple dimensions of identity cross paths. According to Endo (2015), microaggressions bring together gender and race, generating processes of sexualization, "othering," and stigmatization that intensify inequality within the educational sphere. This intersectional nature of microaggressions reiterates that they cannot be taken in isolation but as part of interrelated systems of power.

From a multivariate perspective, these results allow for the interpretation of microaggressions as observable indicators of latent constructs associated with the institutional culture of gender. Consequently, its analysis is fundamental to understanding how student perceptions are structured based on everyday experiences that, although subtle, sustain the reproduction of inequality in Ecuadorian universities.

Institutional gender culture in higher education

The analyzed evidence supports the argument that institutional gender culture is not a neutral model, but rather an organizational culture that reproduces inequalities through deeply entrenched norms, practices, and structures. As noted by Dashper et al. (2022), gender-biased organizations are premised on the notion that masculine activities are central, the most prestigious, and those most deserving of support; furthermore, the division of labor, career expectations, tradition, and hierarchy position women in less favorable and less fulfilling roles. Inequality is not merely a relational issue; rather, it is institutionally organized.

In this regard, it is particularly significant that many of the mechanisms underlying these inequities appear to be neutral. According to Culpepper (2025), a "second-order subversion" may occur whereby equity policies inadvertently reproduce asymmetries "if their implementation is embedded within gendered organizational logics." Likewise, according to Michali et al. (2025), equality policies "have a limited scope: their efficacy is inhibited (rather than enabled) by exogenous contextual and cultural factors, thereby generating a non-linear dynamic." This suggests that far-reaching forms of institutional transformation are required—forms that extend beyond mere formal policy design.

Moreover, institutional culture manifests through exclusionary practices understood here as encompassing both explicit and subtle forms. More specifically, according to Misra et al. (2025), these practices include explicit exclusion, tacit exclusion, and work overload for both women and members of minority groups dynamics that reflect unequal access to opportunities and recognition. Furthermore, Sidelil et al. (2023) assert that institutional structures and academic practices function as barriers, impeding equitable participation—particularly within hyper-masculinized cultures.

Moreover, such disparities are worsened by the lasting impacts of unspoken assumptions on who the "perfect academic" is (Pascale et al., 2024). As shown in Sharafizad (2025), the paths of women's careers are shaped by the conflicts between their professional and family duties, demonstrating how institutional culture also affects

access to personal growth. These impacts are usually worse when the state of being a mother affects academic and professional opportunities (Mirick & Wladkowski, 2023).

In conclusion, these studies make it obvious that institutional gender culture should be analyzed as an emergent interaction of structural, normative, and symbolic dimensions. Therefore, its analysis is fundamental to explain how student and academic perceptions are shaped and how these processes contribute to the reproduction of inequality within Ecuadorian universities.

Research gap and hypothesis development

There is a fragmented literature on gender inequality in higher education because most methodologies have focused on individual dimensions and isolated measurements. Quispe-Callo et al. (2025), show that previous studies prioritized the psychometric validation of relevant concepts in university populations, which has increased consistency and comparability but at the expense of our understanding of how these perceptions are embedded in broader institutional dynamics.

At the organizational level, the literature has established a link between institutional perceptions and gender inequality. As stated by Troncoso et al. (2023), a higher perception of discrimination is related to a lower valuation of organizational democracy, which means that experiences of inequality directly influence how one interprets their academic environment. However, these analyses often study perceptions in a one-dimensional way, ignoring the interactions between different forms of inequality.

Moreover, research on ambivalent gender discrimination would help in understanding its dimensions and its measurement in university settings (Bonilla-Algovia & Rivas-Rivero, 2020). On the other hand, these methodologies still do not provide an integrative analytical framework and do not link these attitudes with contextual and institutional variables. This limitation demonstrates the necessity to construct explanatory models that can overcome the conceptual fragmentation in the existing literature.

The major gap is the absence of a multivariate approach that integrates microaggressions, sexism, and interrelationships to analyze institutional gender culture. Such a gap, therefore, hinders a clearer understanding of how students' cognitions are formed and their relationship with broader organizational structures.

Thus, the purpose of this study is to address the following research question:

What latent structures and perception profiles of micromachisms characterize gender inequality and institutional gender culture in Ecuadorian higher education?

Based on this question, the following hypothesis is proposed:

H1: Gender inequality in higher education can be explained through latent dimensions of micromachisms and differentiated perception profiles that reflect students' interpretations of institutional gender culture.

The hypothesis suggests the application of multivariate approaches to discover latent dimensions and distinct profiles of micromachism experiences that structure gender inequality in higher education and is grounded in the evidence amassed in recent research. Existing research agrees that micromachisms are a complex, multidimensional phenomenon, including symbolic, interactional, and organizational practices that operate simultaneously and nonlinearly within academic environments (Chen, 2025; Flores et al., 2025). The explanatory ability of univariate or bivariate analytical techniques, which have been extensively employed in prior research, is limited by this multidimensional character.

Furthermore, the literature shows that experiences of microaggressions are not evenly distributed among members of the university community, but rather exhibit differentiated patterns according to institutional roles, career paths, and social positions (Bruckner et al., 2024; Crimmins et al., 2026). In particular, a persistent correlation has been demonstrated between microaggressions, the gendered division of labor in academia, and the unequal concentration of power and recognition, suggesting the existence of underlying, unobservable structural configurations (Chow, 2024; Huang, 2025).

Theoretically, feminist theory, microaggression research, and intersectionality all argue that gender inequality results from the interplay of multiple social dimensions. This therefore warrants the identification of hidden structures and empirical typologies that can capture such complexity (Frank et al., 2024; Onyiego, 2023). However, the abstracts analyzed show that most studies rely on qualitative methods or descriptive analyses. This reveals a gap in the application of multivariate methods to identify latent patterns, particularly in the context of Latin American higher education (Ibrahim, 2023).

In this context, the proposed hypothesis is justified by the relevance of a multivariate approach, which allows for both the identification of the latent dimensions of microaggressions and the recognition of differentiated experience profiles within the university population. This approach addresses the methodological limitations identified in previous research and contributes to a more robust structural and empirical understanding of gender inequality in higher education.

METHOD

This study adopts a quantitative research design aimed at identifying latent structures and perception profiles associated with micromachisms and gender inequality within the institutional context of Ecuadorian higher education. Quantitative multivariate approaches are appropriate for examining complex social phenomena because they allow researchers to identify underlying relationships among multiple observed variables and detect latent patterns within multidimensional datasets. This is particularly relevant in studies of gender microaggressions, subtle gender bias, and institutional discrimination, where observed responses may reflect broader latent constructs rather than isolated behaviors (Gartner, 2020; Tran, 2019; Troncoso et al., 2023). The methodological framework is composed of several complementary multivariate techniques that allow the exploration of latent dimensions, structural associations between survey instruments, and heterogeneous patterns of perception among students. The study integrates variable-centered and person-centered analytical approaches in order to examine both the internal organization of gender-related perceptions and the possibility of differentiated perception patterns within the student population.

This analytical strategy combines exploratory factor analysis, multivariate graphical representations through biplot techniques, co-inertia analysis, and latent profile analysis. Exploratory factor analysis was used to identify latent dimensions inside each survey instrument, biplot representations were used to visualize relationships among variables and respondents, co-inertia analysis was used to evaluate the shared structure between the two instruments, and latent profile analysis was used to explore whether differentiated perception profiles could be identified among students. Together, these methods provide a multidimensional framework for analyzing students' perceptions of institutional gender culture in Ecuadorian higher education.

Data and sample

The empirical data used in this study were obtained through two structured surveys administered at a public higher education institution in Ecuador. The surveys were designed to capture perceptions related to microaggressions, gender inequality, and gender-based harassment in the university setting. These instruments offer complementary perspectives that allow for the examination of both subtle forms of gender bias and more explicit manifestations of gender-based aggression in academia.

The first instrument focused on experiences and perceptions related to harassment and gender-based violence in the university context. A total of 180 responses were collected. The second instrument examined attitudes and perceptions related to microaggressions, intolerance, discrimination, and the sexual division of labor in academia, generating a total of 221 responses.

Most of the respondents were university students. In the first survey, it was 173 students and 7 professors. In the second survey, 214 responses came from students, 6 from faculty, and 1 from a service staff member. Since students are the vast majority of participants in both instruments, their perceptions will be the main unit of analysis for this study.

Following the data collection phase, a cleaning procedure was conducted to ensure the reliability and consistency of the dataset. Incomplete responses and records with an excessive number of missing values were removed from the analysis. Because the two survey instruments generated a different number of responses, preliminary analyses for each instrument were performed independently. For multivariate analyses requiring paired observations in both instruments, the datasets were integrated, and only cases present in both surveys were retained.

Using students' perceptions as the unit of analysis is particularly appropriate for examining institutional gender culture, as students experience everyday academic interactions that reflect both formal institutional structures and informal gender dynamics within universities. Consequently, their responses provide valuable empirical evidence for identifying latent structures and differentiated perception profiles associated with microaggressions and gender inequality in higher education.

The resulting dataset provides sufficient variability to apply multivariate analytical techniques aimed at identifying latent dimensions, structural relationships between instruments, and differentiated perception profiles among students within the institutional context of Ecuadorian higher education.

Survey instruments and variables

The empirical analysis was based on two structured survey instruments designed to capture complementary dimensions of gender inequality in the university context. The first instrument, the *Gender Harassment and Violence Survey*, focused on students' perceptions and experiences of harassment and gender-based violence within the academic environment. This questionnaire included 56 items related to definitions of harassment, witnessed or experienced situations, perceived institutional responses, barriers to reporting, and forms of aggression involving peers, faculty members, and institutional actors.

The second instrument, the *Micromachisms and Discrimination Survey*, focused on subtle and normalized forms of gender-based discrimination. This questionnaire included 18 items addressing everyday manifestations of micromachisms, including sexist language, differential credibility assigned to men's and women's opinions, exclusion based on gender roles, pressures related to women's physical image, rejection of LGBTQ+ individuals, and the gendered distribution of academic or organizational tasks.

Both instruments were coded numerically for statistical analysis. The items were treated as observed indicators of broader latent dimensions associated with harassment, micromachisms, discrimination, and institutional gender culture. In this study, institutional gender culture is not considered a separate survey instrument; rather, it is interpreted as an overarching analytical construct emerging from the joint examination of explicit harassment and subtle symbolic exclusion.

In addition to the attitudinal and perception-based items, the surveys included sociodemographic variables such as gender, academic program, year of study, faculty, and age group. These variables provided contextual information for describing the sample, although the main multivariate analyses focused on the student responses to the harassment and micromachisms items. For transparency and replicability, the complete list of survey items used in both instruments is provided in [Table 1](#).

Table 1

Summary of survey instruments

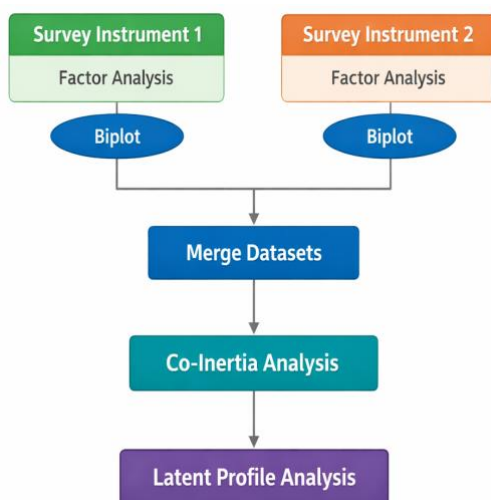
Instrument	Focus	Items	Scale
Gender Harassment and Violence Survey	Perceptions and experiences of harassment and gender-based violence in the university context	56	Likert (1–5)
Micromachisms and Discrimination Survey	Subtle gender bias, symbolic exclusion, discrimination, intolerance, and gendered academic roles	18	Likert (1–5)

Analytical Procedure

To conduct the proposed analysis, a five-phase workflow was followed. The analytical workflow adopted in this study is illustrated in [Figure 1](#).

Figure 1

Analytical workflow of the proposed multivariate framework



Note: The analytical workflow integrates two survey instruments: (1) Survey on Gender Harassment and Violence in the University Environment and (2) Survey on Micromachisms, Intolerance, Discrimination and Sexual Division of Labor.

Phase 1: Data cleaning and integration

The first part of our methodological workflow involved the cleaning, checking, and merging of data collected via our survey of individuals as a preparation for the statistical analysis.

First, the raw responses were exported from the survey instruments and arranged into a database template with each questionnaire being assigned to a unique identifier variable and variables were coded consistently across the datasets. At this stage, we checked carefully that all Likert-type items were transformed to numerical values reflecting the response-category coding scheme we had defined.

Next, we checked for missing and invalid values. In this step, we flagged and removed observations with missing values for many items (so as not to potentially bias the results of statistical calculations). When just a few

answers were missing, we treated the data to minimize the potential effect while still keeping as many valid responses as possible. More checks on data content were for irrational responses in the form of inconsistent issues or those that fall outside the range of allowed answers.

Post-cleaning, variables from each of the two survey instruments were combined into a single analytical dataset. This integration step permitted variables to invoke micromachisms, perceptions of institutional gender culture as well as sociodemographic variables of respondents to be combined. The resulting dataset formed a multidimensional matrix where the rows represented individual respondents, and the columns represented observed variables drawn from the two survey instruments.

Finally, this cleaned and merged database prepared the data matrix to form the basis for the statistical analysis performed in the later phases of the study, including the exploratory and multivariate analysis of how these data would reflect students' perception of the campus climate for women.

Phase 2: Exploratory Factor Analysis

In the second phase, an exploratory factor analysis (EFA) was conducted to identify the latent dimensions underlying students' responses to each survey instrument. This step was included as a preliminary construct-validation procedure and as a dimensionality-reduction strategy before applying subsequent multivariate techniques. The use of factor-analytic procedures is consistent with previous studies that have examined sexism, ambivalent gender discrimination, and gender-related attitudes as multidimensional constructs requiring empirical validation (Aktan & Yalnda, 2024; Bonilla-Algovia & Rivas-Rivero, 2020). Given that the study used two complementary instruments, the EFA was performed independently for each dataset in order to examine the internal structure of the items related to gender harassment, micromachisms, discrimination, and institutional gender culture.

Before factor extraction, the suitability of the data for factor analysis was assessed through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO index was used to see if the correlation patterns among the items were good enough to identify common factors, and Bartlett's test was used to see if the correlation matrix was significantly different from an identity matrix. These were the diagnostic procedures to ensure that the items had enough interdependence to justify the application of factor analysis. Factor extraction was performed through principal axis factoring since this approach is more suitable when one aims to identify underlying latent constructs, as opposed to simply reducing observed variables. The final number of factors was determined based on eigenvalues, the percent of variance accounted for, and the substantive interpretability of the dimensions extracted. When required, parallel analysis was also considered to provide support for the choice of the most appropriate factorial solution.

Because the theoretical constructs were expected to be related rather than completely independent, an oblique rotation method was applied. This allowed the extracted factors to correlate, which is consistent with research showing that sexism, gender microaggressions, institutional discrimination, and subtle symbolic exclusion often operate as interconnected but analytically distinguishable dimensions (Gartner, 2020; He, 2025; Tran, 2019). Factor loadings were later examined to determine the contribution of each item to the latent dimensions, with higher loadings indicating stronger associations between observed variables and the corresponding factor. The resulting factor structures gave two main outputs for the next phases of the analysis. First, they allowed us to identify and name the latent dimensions of students' perceptions of gender-based harassment and micromachisms. Second, we needed the factor scores that resulted from those dimensions as input variables for the rest of multivariate analyses, including the biplot representation, co-inertia between instruments, and latent profile analysis. This way, this phase was a sort of bridge between the cleaned survey data and the broader multivariate framework proposed in this study.

In general, the factor analysis facilitated a transition from the interpretation of individual items in isolation to that of more general latent structures enshrining student perceptions of institutional gender culture. The approach adopted enhanced the internal analytical consistency of the study by availing dimensions based on evidence to facilitate the assessment of how subtle and explicit forms of gender inequality are organized within the context of the university.

Because the initial factor solution for the Harassment Survey produced an ultra-Heywood case in one item, a sensitivity check was conducted. The exploratory factor analysis was re-estimated after excluding the item "Professor belittles female students' ideas," using the same extraction and rotation criteria as in the original model. This procedure was used to evaluate whether the general two-factor interpretation remained meaningful after removing the unstable item from the estimation.

Phase 3: Multivariate structure analysis (biplot)

Biplot: It is a convenient representation of the $N \times M$ matrix by means of a graph, where rows are each represented by individuals and columns by variables. Thanks to its graphical structure, a biplot is able to represent multivariate data. In multivariate analysis, the dimensionality of the space spanned by a data set with N objects and M variables is reduced by projecting those data onto a fitted space, the space represented by the Euclidean space, where the data are fitted. The biplot is said to constitute a convenient mode of representation that can graphically describe the results of a principal component analysis, giving the statistical values and products such as distances to the group of data units toward which they are drawn, the explained variance, and correlations between the variables or between the individuals (Kim & Kim, 2023).

In a two-dimensional example, we have shown people or rows with orange circles, and the blue lines that begin at the origin and end with arrowheads are the variables or columns (Figure 2).

Figure 2

General representation of a biplot graph

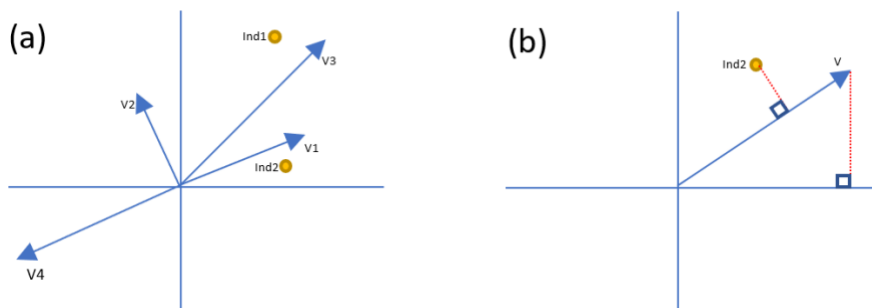


Figure 2, graphs (a) and (b), show the axes of the planes representing the components most representative of the individuals and the variables, respectively, from PCA results. In graph (a), each vector represents a variable in our study, and its graphical interpretation shows the degree of correlation between them. For example, for V1 and V3, the correlation will be strong because the angle they form and are visualized in the vectors is acute; that is, there is a strong positive correlation. The smaller the angle, the stronger the degree of correlation between them in this case. If they are 90° apart, as for V1 and V2, there will be no correlation, but should the angle be something like that between V4 and V1, it is a sign of an inverse correlation. In graph (b), the angle absorbed by the projection of the vector to the axes tells us which component has the greatest correlation with the variable, and the angle absorbed by the projection from the individual to the vector tells us which variable has the greatest correlation with the individual.

Phase 4: Co-inertia analysis between instruments

To investigate the structural relationship between both survey instruments, a co-inertia analysis was conducted. Conceptually, this step was justified by the fact that explicit harassment and subtle micromachisms may form part of the same broader institutional gender culture while still capturing different dimensions of students' perceptions. Previous studies on covert sexism, gender discrimination, and modern sexism suggest that subtle and explicit expressions of inequality may be related without being interchangeable (Dominguez & Glass, 2025; He, 2025). Therefore, co-inertia analysis was used to evaluate whether the two instruments shared a common multivariate structure.

In the current dataset, the two surveys capture complementary aspects of the university gender environment. One survey focuses on perceived harassment and gender-based violence, while the second focuses on micromachisms, discrimination, intolerance, and the gendered division of academic labor. Co-inertia analysis allowed us to assess the degree to which students' perceptions in both instruments showed a shared structure. Before conducting the co-inertia analysis, the datasets for both instruments were put into correspondence using the common respondents to both surveys. This step was necessary because co-inertia analysis requires the same set of observations in both datasets. The factor structures identified for each instrument through exploratory factor analysis formed the matrices submitted to the co-inertia procedure.

Phase 5: Latent Profile Analysis

In the final stage of the analytical process, latent profile analysis (LPA) was used to explore whether differentiated patterns of perception could be identified among students. LPA is a person-centered statistical technique based on finite mixture modeling and is commonly used to examine whether unobserved subgroups exist within a population. This approach is useful when the objective is not only to identify latent variables, but also to explore whether individuals can be grouped according to similar response patterns. In gender studies,

person-centered approaches have been used to examine differentiated configurations of attitudes, beliefs, and gender-related perceptions (Hill et al., 2025).

In this study, the latent profile models used the factor scores derived from the exploratory factor analyses as input variables. These factor scores represented the main latent dimensions identified in the Harassment Survey and the Micromachisms Survey. Models with one to five profiles were estimated and compared using model convergence, the Bayesian Information Criterion (BIC), log-likelihood values, parsimony, and substantive interpretability.

The purpose of this phase was exploratory. Therefore, the LPA was not used to confirm the existence of predefined student profiles, but to evaluate whether the available data and model specifications supported the identification of stable differentiated perception profiles.

Software and analytical tools

All statistical analyses were conducted in the R statistical computing environment using the wide range of packages available for multivariate analysis and reproducible research therein.

Different specialized libraries were employed for conducting the different multivariate procedures present in our workflow; exploratory factor analysis was done using psychometric-oriented packages, while multivariate graphics were produced using libraries designed for dimensionality reduction and visualisation. Co-inertia analysis was done using packages developed for multivariate ordination and for studying relationships between paired datasets. Latent profile analysis was performed using mixture modelling libraries.

In addition to the R environment, we also used JASP (a free, open-source software) as a complement, as a graphical interface to run exploratory procedures and for an exploratory overview of our descriptive data. Based on R packages for statistics, JASP software allows easy data exploration as well as checking the results of analyses using visual means. **Table 2** summarizes the main software tools and R packages used in the different stages of the analytical workflow.

Table 2

Software and R packages used in the multivariate analytical workflow

Analytical Task	Software / Package	Purpose
Data cleaning and preparation	R (tidyverse, dplyr)	Data manipulation and dataset preparation
Exploratory factor analysis	psych, GPArotation	Identification of latent dimensions
Multivariate visualization	FactoMineR, factoextra	Biplot representation and dimensionality analysis
Co-inertia analysis	ade4	Analysis of shared structure between two datasets
Latent profile analysis	tidyLPA, mclust	Identification of latent perception profiles
Exploratory statistical analysis	JASP	Preliminary descriptive analysis and data inspection
Graphical visualization	ggplot2	Statistical graphics and data visualization

Note: All analyses were conducted using R (version 4.5.3). The scripts used for data preparation and statistical analysis are available upon request to ensure transparency and reproducibility of the results.

RESULTS

Descriptive statistics and data structure

The empirical database comprised two complementary survey instruments administered within the same institutional context at a public university in Ecuador. **Table 3** presents the distribution of participants by role and faculty across both instruments.

A total of 173 students responded to the Harassment Survey and 214 students to the Micromachismos Survey. As shown in Table 3, the contribution of the Faculty of Jurisprudence, Social and Political Sciences was the highest in both instruments (85.0% and 74.3%, respectively). The Micromachismos Survey reached a better representation at the faculty level with 14.0% from Health Sciences, 7.0% from Agricultural Sciences, and 4.2% from Education Sciences, while the Harassment Survey was highly concentrated in Jurisprudence.

In terms of the conceptualization of harassment (**Table 4**), 53.2% of the students selected the option "Constant behavior that seeks to intimidate, humiliate, or generate fear" as the most accurate description. However, 32.4% related harassment to "offensive or inappropriate jokes," which indicates some degree of normalization of the lighter forms of aggression. Only 9.2% and 5.2% thought of academic conflicts and peer misunderstandings as harassment, respectively.

Table 5 gives the frequency of situations of harassment witnessed by the students. 38.2% of the students said that they have witnessed harassment at least one time, 24.3% once or twice, and 13.9% several times. 41.0% of them had never seen it happen, and 20.8% did not know whether what they saw was really harassment or not. In this regard, this is an aspect that needs to be defined so that the institution can come up with better definitions and awareness campaigns.

The most frequently cited reason for not reporting harassment was "Fear of retaliation by the aggressor or authorities" (56.1%), followed by "Lack of confidence that reports will be taken seriously" (30.1%), as shown in **Table 6**. This finding reflects a significant deficit in institutional trust and indicates that, even where reporting mechanisms are in place, students may view them as ineffective or unsafe. Only 6.9% of the respondents felt that their main barrier was either ignorance of the reporting channels or not considering the incident serious.

Table 3

Distribution of student participants by faculty across survey instruments

Faculty	Harassment Survey (n = 173)	Micromachismos Survey (n = 214)
Jurisprudence, Social and Political Sciences	147 (85.0%)	159 (74.3%)
Health Sciences	1 (0.6%)	30 (14.0%)
Agricultural Sciences	1 (0.6%)	15 (7.0%)
Education Sciences	0 (0.0%)	9 (4.2%)
Not specified	24 (13.9%)	1 (0.5%)

Note: Values represent frequencies with percentages in parentheses. The Harassment Survey shows a strong concentration in the Faculty of Jurisprudence (85.0%), while the Micromachismos Survey has broader representation across faculties.

Table 4

Students' perceptions of harassment definition in the university context

Definition	Frequency	Percentage
Constant behavior that seeks to intimidate, humiliate, or generate fear	92	53.2%
Offensive or inappropriate joke	56	32.4%
Academic conflict between professor and student	16	9.2%
Misunderstanding between peers that is quickly resolved	9	5.2%

Note: n = 173 students. The majority of students (53.2%) correctly identified harassment as constant intimidating behavior.

Table 5

Frequency of students having witnessed harassment situations

Experience	Frequency	Percentage
No, never	71	41.0%
Not sure	36	20.8%
Yes, 1–2 times	42	24.3%
Yes, several times	24	13.9%

Note: n = 173 students. A total of 38.2% of students reported having witnessed harassment at least once.

Table 6

Main reasons students do not report harassment situations

Reason	Frequency	Percentage
Fear of retaliation by the aggressor or authorities	97	56.1%
Lack of confidence that reports will be taken seriously	52	30.1%
Unawareness of reporting channels	12	6.9%
Does not consider it serious enough	12	6.9%

Note: n = 173 students. Fear of retaliation was the most frequently cited barrier to reporting.

Table 7 presents the most frequently reported harassment situations. The most common was "Professor belittles female students' ideas" (64.2%), followed by "Inappropriate comments via text messages" (25.4%) and "Professor threatens academic harm" (19.1%). These results show that overt as well as covert forms of harassment are common, with the added note that there seems to be significant contribution by peer dynamics and more so by the authority figure (professor) in the perpetration of this problem.

Table 7*Most frequently observed or experienced harassment situations by students*

Situation	Percentage
Professor belittles female students' ideas	64.2%
Inappropriate comments via text messages	25.4%
Professor threatens academic harm	19.1%
Interrupting women in group discussions	18.5%
Recurrent sexual jokes in common spaces	15.6%
Exclusion of women from work teams	15.6%
Sexual insinuations by professors to colleagues	11.0%
Service staff comments on women's bodies	9.8%
Supervisor assigns cleaning tasks only to women	9.2%
Sharing photos without consent on social media	9.2%

Note: $n = 173$ students. Percentages represent the proportion of students who reported observing or experiencing each situation.

In the Micromachismos Survey (**Table 8**), 43.9% of students chose "Constant behavior that seeks to intimidate, humiliate, or generate fear" as the best definition, just as in the Harassment Survey. Notably, 32.2% said "Comments that reinforce gender stereotypes" would qualify as micromachismos, showing how well they understand subtle forms of gender-based discrimination. Only 12.1% and 11.7% related the concept to misunderstandings or academic discipline, respectively.

Table 8*Students' perceptions of micromachismos definitions*

Definition	Frequency	Percentage
Constant behavior that seeks to intimidate, humiliate, or generate fear	94	43.9%
Comments that reinforce gender stereotypes	69	32.2%
Misunderstanding without gender implications	26	12.1%
Act of academic discipline	25	11.7%

Note: $n = 214$ students. The most selected definition aligns with the traditional conceptualization of harassment, while 32.2% identified stereotype-reinforcing comments as micromachismos.

Table 9 presents the situations in which micromachismos were most frequently observed. The most prevalent were "Sexist comments or jokes" (28.5%), "Sexist language in the classroom" (26.2%), and "Pressure on women regarding physical image" (20.6%). These findings reveal that subtle, everyday interactions are the most common form of gender-based discrimination that students perceive, rather than overt structural exclusion; though lack of female representation in leadership (16.8%) and rejection of LGBTQ+ individuals (15.9%) also featured prominently.

Table 9*Most frequently observed micromachismos situations by students*

Situation	Percentage
Sexist comments or jokes	28.5%
Sexist language in the classroom	26.2%
Pressure on women regarding physical image	20.6%
Lack of female representation in leadership	16.8%
Rejection of LGBTQ+ individuals	15.9%
Expectation that women organize events	15.0%
Exclusion based on gender roles	12.1%
More credibility given to men's opinions	11.7%
Patronizing "let me help you" comments	11.2%
Cleaning tasks assigned only to women	7.0%

Note: $n = 214$ students. The most prevalent micromachismos involve sexist comments and language, followed by pressures on women's physical image.

Table 10 presents descriptive statistics for perceived prevalence. Students rated the perceived prevalence of harassment with a mean of 5.20 (SD = 2.60) on a scale from 1 to 10, indicating a moderate perception slightly above the midpoint. For micromachismos, the mean perceived prevalence was slightly higher at 5.46 (SD = 2.59). The wide range of responses (from 1 to 10 in both surveys) and similar standard deviations suggest

considerable variability in how students perceive these phenomena, with comparable dispersion across both instruments.

Table 10

Students' perceived prevalence of harassment and micromachisms (scale 1–10)

Statistic	Harassment	Micromachisms
Mean	5.20	5.46
Median	5.00	5.00
Standard Deviation	2.60	2.59
Minimum	1	1
Maximum	10	10
Valid N	168	205

Note: Perceived prevalence was measured on a scale from 1 (very low) to 10 (very high). Both instruments show similar distributions with means slightly above the midpoint.

Exploratory factor analysis

Exploratory Factor Analysis - Micromachisms Survey

An exploratory factor analysis was conducted on the Micromachisms Survey to identify the latent dimensions underlying students' perceptions of subtle gender-based discrimination. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.60, indicating acceptable adequacy for factor analysis, and Bartlett's test of sphericity was significant ($\chi^2(45) = 159.58$, $p < 0.001$), confirming that the correlation matrix was suitable for factor analysis.

Based on parallel analysis and eigenvalue criteria, a two-factor solution was retained, explaining 17.9% of the total variance. **Table 11** presents the factor loadings after oblimin rotation, along with item communalities. Although the percentage of explained variance was modest, the two-factor solution was retained as the clearest balance between statistical evidence and substantive interpretation. Total variance explained was only one consideration. The decision also reflected the parallel analysis, the pattern of eigenvalues, the interpretability of the factor loadings, and the theoretical distinction between symbolic exclusion and verbal or interactional forms of micromachisms. For that reason, the solution is treated as exploratory rather than confirmatory. Its relatively low explained variance may indicate that micromachisms are diffuse and context-dependent, pointing to the need for broader, more sensitive measurement in future studies.

Table 11

Exploratory factor analysis of the Micromachisms Survey: Factor loadings and communalities

Item	Factor 1	Factor 2	Communality (h^2)
	Credibility & Exclusion	Sexist Language & Image Pressure	
More credibility given to men's opinions	0.64	0.02	0.42
Rejection of LGBTQ+ individuals	0.49	-0.08	0.21
Expectation that women organize events	0.42	0.07	0.20
Exclusion based on gender roles	0.29	0.09	0.11
Cleaning tasks assigned only to women	0.19	0.20	0.11
Patronizing "let me help you" comments	0.18	0.35	0.21
Sexist comments or jokes	0.18	-0.30	0.08
Sexist language in the classroom	-0.05	0.48	0.22
Pressure on women regarding physical image	0.06	0.45	0.22
Eigenvalue	1.06	0.73	
Variance explained (%)	10.6%	7.3%	
Cumulative variance (%)	10.6%	17.9%	
Factor correlation matrix			
Factor 1 – Factor 2: $r = 0.37$			
Kaiser-Meyer-Olkin (KMO) and Bartlett's test			
Overall MSA = 0.60			
Bartlett's test of sphericity: $\chi^2(45) = 159.58$, $p < 0.001$			

Note: Extraction method: principal axis factoring with oblimin rotation. Factor loadings above 0.35 are shown in bold. The two-factor solution explains 17.9% of the total variance.

Factor 1, labeled *Credibility & Exclusion*, captured items related to the devaluation of women's contributions, rejection of LGBTQ+ individuals, and expectations about gender roles. The highest loading items were "More credibility given to men's opinions" (0.64), "Rejection of LGBTQ+ individuals" (0.49), and "Expectation that women organize events" (0.42). This factor represents the symbolic exclusion and differential treatment in terms of gender and sexual orientation, accounting for 10.6% of the variance.

Factor 2, labeled *Sexist Language & Image Pressure*, had items on verbal microaggressions and pressures about their physical appearance. The highest loading items were "Sexist language in the classroom" (0.48) and "Pressure on women regarding their physical image" (0.45). This dimension captures the everyday discursive practices that sustain gender inequality within the academic world, explaining an additional 7.3% of the variance. These two factors presented a moderate positive correlation ($r = 0.37$), indicating that they are related but different dimensions of micromachismos perceptions. Item communalities ranged between 0.08 and 0.42, with "More credibility given to men's opinions" ($h^2 = 0.42$) being the best explained by the factor solution.

The two-factor structure reveals that students perceive micromachismos as organizing into distinct but related dimensions: one focusing on institutional and interpersonal exclusion, and the other on verbal and symbolic microaggressions. These findings are in line with theories that make distinctions between structural and interactional forms of gender-based discrimination (Chen, 2025; Onyiego, 2023). However, the relatively low total variance explained (17.9%) points to the fact that micromachismos perceptions are complex and may be influenced by additional factors, perhaps other factors that were not captured in this instrument.

Exploratory factor analysis - Harassment survey

An exploratory factor analysis was conducted on the Harassment Survey to identify the latent dimensions underlying students' perceptions of gender-based harassment. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.60, indicating acceptable adequacy for factor analysis, and Bartlett's test of sphericity was significant ($\chi^2(45) = 272.24$, $p < 0.001$), confirming the suitability of the data for factor analysis.

Parallel analysis indicated the retention of two factors that together accounted for 34.9% of the total variance. Factor loadings after oblimin rotation are presented in [Table 12](#).

Table 12

Exploratory factor analysis of the Harassment Survey: Factor loadings and communalities

Item	Factor 1	Factor 2	Communality (h^2)
	Authority Abuse	Peer & Institutional Dynamics	
Professor belittles female students' ideas	1.23	0.00	1.51
Professor threatens academic harm	0.22	0.43	0.27
Sexual insinuations by professors to colleagues	0.14	0.60	0.41
Interrupting women in group discussions	0.23	0.18	0.10
Service staff comments on women's bodies	-0.08	0.61	0.37
Exclusion of women from work teams	-0.24	0.45	0.22
Supervisor assigns cleaning tasks only to women	-0.18	0.35	0.14
Recurrent sexual jokes in common spaces	-0.16	0.34	0.12
Sharing photos without consent on social media	0.15	0.35	0.16
Inappropriate comments via text messages	0.30	0.28	0.20
Eigenvalue	1.88	1.61	
Variance explained (%)	18.8%	16.1%	
Cumulative variance (%)	18.8%	34.9%	
Factor correlation matrix			
Factor 1 – Factor 2: $r = 0.17$			
Kaiser-Meyer-Olkin (KMO) and Bartlett's test			
Overall MSA = 0.60			
Bartlett's test of sphericity: $\chi^2(45) = 272.24$, $p < 0.001$			

Note: Extraction method: principal axis factoring with oblimin rotation. Factor loadings above 0.35 are shown in bold. The two-factor solution explains 34.9% of the total variance. The high communality for "Professor belittles female students' ideas" ($h^2 =$

1.51) indicates an ultra-Heywood case; therefore, this loading should be interpreted cautiously and may reflect estimation instability, item redundancy, or limited variability in the item response pattern.

The first factor, labeled *Authority Abuse*, was mainly associated with items referring to harassment involving authority figures. The item “Professor belittles female students’ ideas” showed a very high factor loading (1.23) and a communality above 1.00, indicating an ultra-Heywood case. Therefore, this result should be interpreted with caution, as it may reflect estimation instability, item redundancy, limited variability, or the need to test alternative factorial specifications. Despite this limitation, the item suggests that the devaluation of women’s academic contributions by authority figures is a salient element within students’ perceptions of harassment. Other items associated with this factor included “Professor threatens academic harm” (0.22) and “Sexual insinuations by professors” (0.14), although their loadings were comparatively lower. Overall, this factor reflects authority-related forms of harassment and explained 18.8% of the variance.

Factor 2 was named Peer & Institutional Dynamics and included items on interactions with peers and institutional staff. The highest loading items were “Service staff comments on women’s bodies” at 0.61, “Sexual insinuations by professors to colleagues” at 0.60, and “Exclusion of women from work teams” at 0.45. This factor represents the harassment that occurs between peers and through institutional practices, explaining an additional 16.1% of the variance.

These two factors showed a low positive correlation ($r = 0.17$), suggesting that they are relatively independent dimensions of perceptions of harassment. The item communalities ranged from 0.10 to 1.51. Although the ultra-Heywood case prevents a strong substantive interpretation of this loading, the high prevalence of this item in the descriptive results suggests that professor-related devaluation remains a relevant perceived manifestation of harassment within the sample.

The two-factor structure differentiates harassment as perpetrated by authorities and as a function of peer and institutional dynamics. This finding is in line with theoretical frameworks that differentiate between hierarchical and horizontal forms of gender-based violence in academic settings (Chow, 2024; Smith, 2025). The prominence of professor-related items underscores the critical role that authority figures play in shaping students’ experiences of gender inequality.

Sensitivity checks for the harassment Survey

A sensitivity check was conducted to address the ultra-Heywood case observed in the Harassment Survey. The EFA was re-estimated after excluding the item “Professor belittles female students’ ideas,” which had produced a factor loading above 1.00 and a communality above 1.00 in the original solution.

The reduced model showed improved sampling adequacy ($KMO = 0.728$), and Bartlett’s test of sphericity remained significant ($\chi^2(36) = 149.47$, $p < .001$). The alternative two-factor solution explained 22.9% of the total variance, and no communality exceeded 1.00. This indicates that the ultra-Heywood problem was removed after excluding the unstable item.

Substantively, the reduced model remained interpretable. The remaining items continued to distinguish between authority-related harassment and peer or institutional dynamics. Therefore, the item “Professor belittles female students’ ideas” was retained in the descriptive analysis because of its substantive relevance, but it was interpreted cautiously in the factorial analysis. This sensitivity check supports the general interpretation of the Harassment Survey while avoiding an overinterpretation of the unstable loading.

Multivariate structure analysis (biplot)

A biplot of principal components scores from each survey instrument was used to determine relationships between variables and respondents. In other words, the biplot shows a two-dimensional picture of the relationships between respondents and variables.

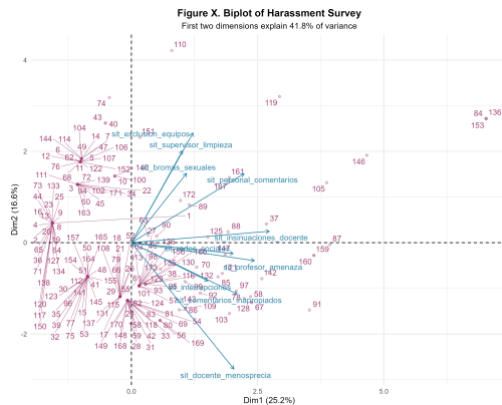
Harassment survey biplot

Figure 4 presents the biplot for the Harassment Survey. The first two dimensions explained 41.8% of the total variance (Dim1: 25.2%, Dim2: 16.6%).

In **Figure 4**, variables associated with authority figures—such as *sit_docente_menosprecia* (professor belittles female students), *sit_profesor_amenaza* (professor threatens academic harm), and *sit_insinuaciones_docente* (sexual insinuations by professors)—cluster together in the upper quadrants, forming acute angles that indicate strong positive correlations among these items. This clustering aligns with Factor 1 (Authority Abuse) identified in the exploratory factor analysis.

Figure 4

Biplot representation of the harassment survey. Vectors represent variables; points represent individual respondents. The angle between vectors indicates correlation (acute angles indicate positive correlation, right angles indicate no correlation, obtuse angles indicate negative correlation).



Note: The first two dimensions explain 41.8% of the total variance. Variables associated with authority figures cluster in the upper quadrants, while peer-related variables distribute across lower quadrants.

Variables related to peer and institutional dynamics—including exclusion from work teams, comments by service staff, and recurrent sexual jokes—distribute across the lower quadrants, with some showing orthogonal relationships to authority-related variables. The nearly orthogonal orientation between these clusters (angles approaching 90 degrees) suggests relative independence between authority-perpetrated harassment and peer-mediated forms, consistent with the weak factor correlation ($r = 0.17$) observed in the EFA.

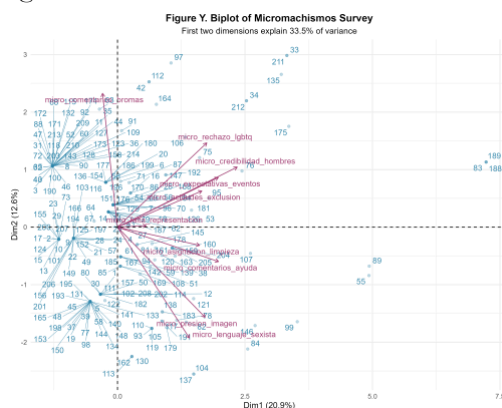
The distribution of respondents in the biplot suggests visual variability in the reduced-dimensional space. However, this graphical pattern should be interpreted cautiously and should not be taken as evidence of stable latent subgroups. The subsequent latent profile analysis was therefore used only as an exploratory procedure to evaluate whether such subgroup structures could be statistically supported.

Micromachismos survey biplot

Figure 5 presents the biplot for the Micromachismos Survey. The first two dimensions explained 33.5% of the total variance (Dim1: 20.9%, Dim2: 12.6%).

Figure 5

Biplot representation of the Micromachismos Survey. The first two dimensions explain 33.5% of the total variance. Variables associated with credibility and exclusion cluster on the left, while those related to sexist language and image pressure distribute on the right.



Note: The separation between Factor 1 (Credibility & Exclusion) and Factor 2 (Sexist Language & Image Pressure) dimensions confirms the multidimensional structure of micromachismos perceptions.

The biplot for the Micromachismos Survey (Figure 5) shows a clear separation between the two factors identified in the EFA. Variables tied to Factor 1 (Credibility & Exclusion)—like *micro_credibilidad_hombres* (more credibility given to men's opinions), *micro_rechazo_lgbtq* (rejection of LGBTQ+ individuals), and *micro_expectativas_eventos* (expectation that women organize events)—cluster in the left quadrants, forming acute angles that indicate strong internal consistency.

The Variable of Factor 2 (Sexist Language & Image Pressure) that makes it up, which are *micro_lenguaje_sexista* (sexist language in the classroom), *micro_presion_imagen* (pressure on women regarding physical image), and *micro_comentarios_ayuda* (patronizing "let me help you" comments), are located in the right quadrants. Variables associated with *Credibility & Exclusion* and those associated with *Sexist Language & Image Pressure* appear in different regions of the reduced-dimensional space. This separation suggests that the two sets of items contribute

differently to the first two dimensions of the biplot. However, this graphical pattern should not be interpreted as contradicting the moderate positive factor correlation observed in the EFA ($r = 0.37$), because biplot angles are approximations based on the first two dimensions and are not equivalent to the rotated factor correlation matrix.

The positions of individual respondents suggest visual variation in the reduced-dimensional space, but this pattern should not be interpreted as evidence of stable latent subgroups. A cluster of respondents appears in the left quadrants near the vectors of Credibility & Exclusion. This would indicate that these students are particularly attuned to structural and exclusionary forms of micromachismos. Another cluster occupies the right quadrants near the vectors of Sexist Language & Image Pressure, pointing to their sensitivity to verbal and symbolic microaggressions. A third group clusters near the origin; these would be students with more moderate or mixed perceptions.

Summary of biplot findings

The biplot analyses provided a visual representation of the multidimensional structures identified through the exploratory factor analyses. In the Harassment Survey, the graphical configuration suggested a distinction between authority-related and peer or institutional forms of harassment. In the Micromachisms Survey, the biplot visually differentiated items associated with *Credibility & Exclusion* from those associated with *Sexist Language & Image Pressure*.

However, these graphical patterns should be interpreted cautiously. Biplots are exploratory visual tools based on reduced-dimensional representations and should not be treated as confirmatory evidence of stable latent subgroups. Therefore, the biplot results were used to describe visual tendencies in the data, while the latent profile analysis was used separately to evaluate whether differentiated student profiles could be statistically supported.

The variance explained by the first two dimensions (41.8% for harassment and 33.5% for micromachismos) indicates that the biplots captured relevant but incomplete portions of the total data structure. For this reason, the visual findings are interpreted as complementary to the exploratory factor analyses, rather than as definitive validation of the factor structure or of the existence of differentiated profiles.

Co-inertia analysis between instruments

To examine if the two survey instruments are related in structure and if they have dimensions in common for capturing gender inequality, co-inertia analysis is applied. This technique maximizes the covariance between two datasets by identifying a common multivariate structure measured on the same observations (Dominguez & Glass, 2025; He, 2025).

A total of 173 students had complete data on both instruments and were included in the analysis. The main results of the co-inertia analysis are presented in [Table 13](#).

Table 13

Co-inertia analysis results: Shared structure between instruments

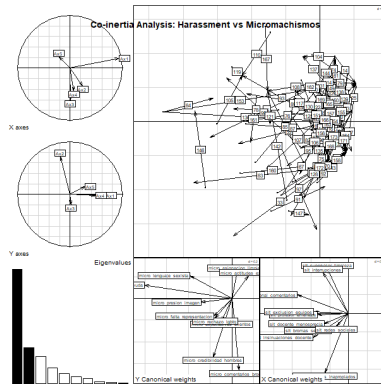
Measure	Value
RV coefficient	0.068
p-value (permutation test)	0.023
First axis eigenvalue	0.445
First axis variance explained	52.6%

Note: The RV coefficient measures the similarity between the two datasets, ranging from 0 (no similarity) to 1 (perfect similarity). Permutation test based on 999 replicates.

Co-inertia analysis revealed a significant but weak structural relationship between the two instruments (RV coefficient = 0.068, $p = 0.023$). As shown in Table 13, the RV coefficient indicates that about 6.8% of the multivariate structure is shared between the Harassment Survey and the Micromachismos Survey. This means that, although both instruments cover some aspects of gender inequality in higher education, it seems they mainly capture different dimensions of students' perceptions.

The first co-inertia axis explained 52.6% of the shared variance (eigenvalue = 0.445), showing that the common structure between instruments is quite concentrated in one dimension. But RV of this low level pretty much means that the shared dimension does not explain much of the total variance in each of the instruments. In total, the low RV coefficient overall suggests that this shared dimension accounts for only a small portion of the total variance in each of the instruments.

Figure 6 shows the co-inertia results. The plot shows the projection of the two datasets onto the common co-inertia axes, giving a view of how well the variables from each instrument are aligned in the shared space. The modest alignment between the two configurations is reflected in this relatively low RV coefficient.

Figure 6*Co-inertia plot showing the shared structure between instruments*

Note: The plot displays the co-inertia axes representing the maximal covariance between the two datasets. The projection shows how the instruments align in the shared multivariate space.

Interpretation of findings

The co-inertia analysis indicated a statistically significant but weak shared structure between the two instruments ($RV = 0.068$, $p = 0.023$). This result suggests that students' perceptions of explicit harassment and micromachisms are related at the multivariate level, but the magnitude of the RV coefficient indicates that the two instruments largely capture distinct dimensions of institutional gender culture.

This finding should not be interpreted as evidence of strong convergence between the instruments. Rather, it indicates a limited but non-random association between students' perceptions of overt gender-based harassment and their perceptions of subtle, everyday micromachisms. In this sense, the two instruments appear to measure related but analytically distinguishable aspects of gender inequality within the institutional context analyzed.

The relatively low RV coefficient also supports the decision to analyze the two instruments separately before examining their shared structure. While both instruments address gender inequality in higher education, the Harassment Survey captures more explicit and recognizable forms of gender-based aggression, whereas the Micromachisms Survey captures more subtle symbolic and interactional forms of exclusion. Therefore, institutional interventions should consider both dimensions without assuming that strategies designed to address explicit harassment will automatically address micromachisms.

Latent profile analysis

To identify differentiated patterns of perception among students, latent profile analysis (LPA) was conducted using the factor scores derived from the exploratory factor analysis as input variables. Models with one to five profiles were estimated and compared using model convergence, the Bayesian Information Criterion (BIC), log-likelihood values, parsimony, and substantive interpretability.

Table 14 presents the fit statistics for the different models tested.

Table 14*Model fit statistics for latent profile analysis*

Number of profiles	BIC	Log-likelihood	Parameters
1 profile	-1991.07	-959.46	14
2 profiles			
3 profiles			
4 profiles			
5 profiles			

Note: Models with two to five profiles did not converge under the specified estimation conditions. Therefore, the available data did not provide stable statistical evidence for multi-profile solutions. The one-profile model was retained only as the sole estimable solution.

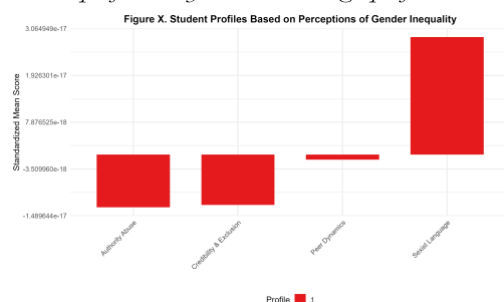
As shown in **Table 14**, models with two to five profiles failed to converge under the specified estimation conditions. Therefore, the available data did not provide stable statistical evidence for multi-profile solutions. The one-profile model was retained only because it was the sole estimable solution under the specified model conditions. **Table 15** presents the characteristics of the single identified profile. All factor scores are located at the standardized mean of zero. This result describes the central tendency of the sole estimable model and should not be interpreted as evidence that students' perceptions are homogeneous. The mean perceived prevalence was 5.2 for harassment and 5.5 for micromachisms, consistent with the overall sample means reported in Table 10.

Table 15*Characteristics of the single latent profile*

Measure	Value
Number of students	173
Proportion of sample	100%
Mean factor scores (standardized)	
Authority Abuse (Acoso Factor 1)	0.00
Peer Dynamics (Acoso Factor 2)	0.00
Credibility & Exclusion (Micro Factor 1)	0.00
Sexist Language (Micro Factor 2)	0.00
Mean perceived prevalence (1–10)	
Harassment	5.2
Micromachismos	5.5

Note: All factor scores are standardized to mean = 0, describing the central tendency of the sole estimable model across the analyzed dimensions.

Figure 7 visualizes the one-profile solution, showing the factor scores at the standardized mean. This figure should be interpreted only as the graphical representation of the sole estimable model, rather than as evidence that differentiated profiles are absent in the broader student population.

Figure 7*Latent profile analysis results: Single profile solution*

Note: The one-profile solution was the only estimable model under the specified conditions. This result indicates that stable differentiated profiles could not be identified with the available data and model specifications.

Interpretation of findings

The latent profile analysis did not provide stable evidence of differentiated perception profiles. Models with two to five profiles failed to converge under the specified estimation conditions; therefore, the available data did not support reliable multi-profile solutions. This result should not be interpreted as definitive evidence that students' perceptions are homogeneous. Rather, it indicates that differentiated profiles could not be identified with the available data, sample structure, selected indicators, and model specifications.

The one-profile model was retained only as the sole estimable solution. This result suggests that the factor scores used as input variables did not contain enough stable separation to classify students into distinct latent subgroups. Several methodological and contextual factors may explain this outcome, including the concentration of respondents in one faculty, the sample size available for paired analyses, and the limited sensitivity of some items to capture fine-grained differences in perceptions.

Consequently, the LPA findings are interpreted cautiously. They do not invalidate the multidimensional structures identified through exploratory factor analysis, but they indicate that these dimensions did not translate into statistically stable student profiles in the present institutional sample.

Limitations and considerations

Several methodological and contextual factors may have limited the ability of the latent profile analysis to identify stable differentiated profiles.

Faculty concentration: The high concentration of students from the Faculty of Jurisprudence, Social and Political Sciences may have reduced variability in perception patterns. Students from the same faculty may share similar disciplinary experiences, academic environments, and institutional references.

Sample size: The paired dataset used for the latent profile analysis included 173 students. This sample size may have limited the statistical power needed to detect subtle differences between latent subgroups, particularly if the true differences between students are small.

Instrument sensitivity: Several indicators were coded as categorical or binary variables, which may have reduced the granularity required to capture fine-grained differences in students' perceptions. Future studies should consider using broader Likert-type scales to improve measurement sensitivity.

Institutional specificity: The results are specific to the institutional context analyzed and should not be generalized to all Ecuadorian universities. Future research should include multiple institutions, faculties, and academic programs to evaluate whether differentiated profiles emerge in more diverse samples.

DISCUSSION

Summary of main findings

This study examined students' perceptions of micromachisms, harassment, and institutional gender culture in an Ecuadorian public university through a multivariate analytical framework. Overall, the findings provide partial support for the proposed hypothesis. The exploratory factor analyses identified meaningful latent dimensions in both survey instruments, suggesting that students' perceptions of gender inequality are not organized around isolated situations, but around broader patterns of authority, exclusion, language, and institutional interaction. However, the latent profile analysis did not identify stable differentiated student profiles under the available data and model specifications. Therefore, while the variable-centered component of the hypothesis was supported, the person-centered component was not confirmed in this sample.

Three findings are particularly relevant. First, the Harassment Survey showed two dimensions: *Authority Abuse* and *Peer & Institutional Dynamics*. Second, the Micromachisms Survey also produced two dimensions: *Credibility & Exclusion* and *Sexist Language & Image Pressure*. Third, the co-inertia analysis showed a statistically significant but weak shared structure between both instruments ($RV = 0.068$, $p = 0.023$). Taken together, these findings suggest that explicit harassment and subtle micromachisms are related within the broader institutional culture of gender, but they should not be treated as the same phenomenon.

Interpretation of the factor structures

The two-factor solution obtained for the Harassment Survey suggests that students distinguish between situations linked to authority figures and those embedded in peer or institutional dynamics. The first dimension, *Authority Abuse*, reflects perceptions associated with hierarchical relations in the academic environment. The high descriptive prevalence of the item "Professor belittles female students' ideas" (64.2%) indicates that professor-related devaluation is a relevant issue in the sample. However, this item also produced an ultra-Heywood case in the factor solution. For that reason, its interpretation should remain cautious. Rather than treating this loading as strong factorial evidence, the item is better understood as a descriptively important indicator that requires further methodological examination.

The second dimension, *Peer & Institutional Dynamics*, captures perceptions related to interactions involving peers, institutional staff, and everyday academic practices. This distinction is important because it suggests that students do not perceive harassment only as an individual or interpersonal act. Instead, some situations appear to be interpreted as part of a broader institutional environment where gender-based inequalities may be reproduced through routine interactions.

The two-factor solution of the Micromachisms Survey also requires careful interpretation. Although the factors were theoretically meaningful, the percentage of explained variance was relatively low (17.9%). This does not invalidate the solution, but it does suggest that micromachisms are difficult to capture through a limited set of observed items. Subtle discrimination often appears in fragmented, normalized, and context-dependent ways, which may explain why the factor structure is less concentrated than in the Harassment Survey. The retained dimensions remain useful because they distinguish between symbolic exclusion, credibility denial, sexist language, and pressures related to women's physical image. Even so, future studies should refine the instrument by incorporating additional items and more sensitive response scales.

Relationship between harassment and micromachisms

The co-inertia analysis showed that the Harassment Survey and the Micromachisms Survey share a weak but statistically significant multivariate structure. This result suggests that students who perceive explicit harassment may also show some sensitivity to subtle micromachisms, but the relationship between the two instruments is limited. In other words, both instruments are connected through the broader issue of gender inequality, but they capture different aspects of students' perceptions.

This finding is theoretically relevant because it supports the idea that gender inequality in higher education operates through multiple mechanisms. Some of these mechanisms are more visible, such as harassment, intimidation, or fear of retaliation. Others are more subtle and normalized, such as sexist language, denial of credibility, exclusion based on gender roles, or expectations that women perform organizational or care-related

tasks. The weak shared structure between the instruments suggests that these manifestations should be studied together but not collapsed into a single undifferentiated construct.

From a practical perspective, this also means that institutional responses should be diversified. Policies focused only on formal harassment may not be enough to address everyday micromachisms. Likewise, awareness campaigns about subtle discrimination cannot replace clear reporting mechanisms, accountability procedures, and institutional protections against explicit harassment. Both dimensions require attention, but each one demands specific strategies.

Interpretation of the latent profile analysis

The latent profile analysis did not provide stable evidence of differentiated perception profiles. Models with two to five profiles failed to converge under the specified estimation conditions. This result should not be interpreted as proof that students' perceptions are homogeneous. Rather, it indicates that, with the available data, selected indicators, sample structure, and model specifications, it was not possible to identify reliable latent subgroups.

This result places a clear limit on the person-centered part of the study. The factor analyses identified meaningful dimensions, but these dimensions did not translate into stable student profiles. Several factors may explain this outcome. The sample used for paired analyses was relatively limited, and the respondents were highly concentrated in one faculty. In addition, some indicators may not have captured enough variation to distinguish subtle differences among students. For these reasons, the LPA findings should be understood as a methodological boundary of the present analysis, rather than as definitive evidence about the absence of heterogeneity in students' experiences or perceptions.

Theoretical implications

The findings contribute to the literature on gender inequality in higher education by showing that explicit harassment and micromachisms can be analyzed as related but distinct dimensions of institutional gender culture. The study supports multidimensional interpretations of gender inequality, especially in university contexts where formal equality may coexist with subtle forms of symbolic exclusion.

At the same time, the results show the value of combining variable-centered and person-centered approaches. Exploratory factor analysis helped identify latent dimensions within each instrument, while latent profile analysis showed the limits of classifying students into differentiated groups with the available data. This combination is useful because it prevents the interpretation from depending on a single statistical technique and encourages a more cautious reading of complex social phenomena.

The findings should also be understood within their institutional context. The study was conducted in one Ecuadorian public university, and the sample was concentrated mainly in the Faculty of Jurisprudence, Social and Political Sciences. Therefore, the results should not be generalized to all Ecuadorian universities. Instead, they provide context-specific evidence that can serve as a basis for future comparative studies across institutions, faculties, and academic programs.

Practical implications

The results suggest several implications for higher education institutions. First, institutional interventions should distinguish between explicit harassment and subtle micromachisms. Although both are part of gender inequality, the weak shared structure between the instruments suggests that they may require different forms of prevention, training, and institutional response.

Second, the high descriptive prevalence of professor-related devaluation points to the need for faculty training and accountability. This implication should be based mainly on the descriptive finding, because the corresponding factor loading produced an ultra-Heywood case and should not be interpreted as definitive factorial evidence. Even with this caution, the descriptive result indicates that respectful academic interaction and the recognition of women's contributions should be central elements of institutional policy.

Third, the descriptive results on reporting barriers show the importance of strengthening institutional trust. Fear of retaliation and lack of confidence that reports will be taken seriously suggest that formal protocols are insufficient if students do not perceive them as safe, confidential, and effective. Institutions should therefore evaluate not only whether reporting mechanisms exist, but also whether students trust them.

Finally, because differentiated profiles could not be reliably identified, interventions should not assume the existence of clearly separable student subgroups in this sample. A more appropriate approach would be to design broad preventive strategies for the student population while collecting more detailed data in future studies. This would make it possible to determine whether specific groups require targeted forms of support in more diverse institutional contexts.

STUDY LIMITATIONS

This study has several limitations that should be considered when interpreting the findings. First, the data were collected in a single Ecuadorian public university, and the student sample was highly concentrated in the Faculty of Jurisprudence, Social and Political Sciences. For this reason, the results should be understood as context-specific evidence and should not be generalized to all Ecuadorian higher education institutions.

Second, the study relied on self-reported perceptions. Although students' perceptions are central to understanding institutional gender culture, responses may be influenced by recall, social desirability, previous personal experiences, or differences in students' willingness to recognize and report gender-related situations.

Third, the paired dataset used for the integrative multivariate analyses included 173 students. This sample size may have limited the statistical power of the latent profile analysis, particularly for detecting subtle differences between possible student subgroups.

Fourth, some indicators were categorical or binary, which may have reduced the sensitivity of the instruments to capture nuanced differences in students' perceptions. Future studies should consider broader Likert-type scales and additional items to better represent the complexity of micromachisms and harassment in higher education.

Finally, the ultra-Heywood case observed in the Harassment Survey indicates that the corresponding factor loading should be interpreted cautiously. This issue highlights the need for future validation studies using larger and more diverse samples, alternative estimation methods, and refined measurement instruments.

CONCLUSION

This study examined students' perceptions of gender inequality in an Ecuadorian public university through a multivariate analytical framework. The analysis focused on the relationship between explicit harassment and subtle micromachisms, as well as on the identification of latent dimensions and possible differentiated perception profiles. By combining exploratory factor analysis, biplot representations, co-inertia analysis, and latent profile analysis, the study offered an integrated view of how students perceive different expressions of institutional gender culture.

Summary of key findings

Three main findings emerged from the analysis. First, the exploratory factor analyses showed that both harassment and micromachisms are multidimensional phenomena. The Harassment Survey identified two dimensions: *Authority Abuse* and *Peer & Institutional Dynamics*, which together explained 34.9% of the variance. The Micromachisms Survey also produced two dimensions: *Credibility & Exclusion* and *Sexist Language & Image Pressure*, which explained 17.9% of the variance. Although the percentage of explained variance was lower for the Micromachisms Survey, the factor structure was theoretically meaningful and suggests that subtle gender-based discrimination may be more diffuse and context-dependent than more explicit forms of harassment.

Second, the co-inertia analysis showed a weak but statistically significant relationship between the two instruments ($RV = 0.068$, $p = 0.023$). This indicates that explicit harassment and subtle micromachisms share a limited part of their multivariate structure. Therefore, these phenomena should be understood as related, but not interchangeable, dimensions of institutional gender culture. This finding supports the need to examine them jointly while also recognizing their specific characteristics.

Third, the latent profile analysis did not identify stable differentiated perception profiles under the available data and model specifications. Models with two to five profiles did not converge, and the one-profile model was retained only as the sole estimable solution. This result should not be interpreted as evidence that students' perceptions are homogeneous. Rather, it indicates that the available data did not provide enough statistical separation to identify reliable latent subgroups in this institutional sample.

Evaluation of the hypothesis

The hypothesis proposed that gender inequality in higher education could be explained through latent dimensions of micromachisms and differentiated perception profiles. The results provide partial support for this hypothesis. The identification of latent dimensions in both instruments supports the idea that students' perceptions of gender inequality are organized around broader underlying structures. However, the expected differentiated profiles could not be reliably estimated. For this reason, the study supports the multidimensional component of the hypothesis, but not its person-centered component.

This partial support is important because it shows both the usefulness and the limits of the proposed analytical approach. The multivariate framework helped identify meaningful dimensions of harassment and micromachisms, but the available data did not allow the construction of stable student profiles. This suggests

that future research should use larger and more diverse samples, as well as instruments with greater measurement sensitivity, to examine whether differentiated profiles emerge in other institutional contexts.

Implications for practice

The findings have several implications for higher education institutions. First, institutional responses should distinguish between explicit harassment and subtle micromachisms. Although both are linked to gender inequality, the weak shared structure between the instruments suggests that they may require different forms of prevention, training, and institutional intervention.

Second, the descriptive prominence of professor-related devaluation highlights the importance of strengthening respectful academic interaction, faculty training, and accountability mechanisms. This implication should be interpreted cautiously because the corresponding item produced an ultra-Heywood case in the factor analysis. Even so, its high descriptive prevalence suggests that the way authority is exercised in the classroom deserves institutional attention.

Third, the results related to reporting barriers point to the need to strengthen students' trust in institutional procedures. Fear of retaliation and lack of confidence that reports will be taken seriously suggest that formal protocols are not enough by themselves. Institutions need mechanisms that students perceive as safe, confidential, accessible, and effective.

Finally, since differentiated profiles could not be reliably identified, institutional interventions should not assume the existence of clearly separable student subgroups in this sample. A more appropriate strategy would be to develop broad preventive actions for the student population while collecting more detailed evidence to determine whether specific groups require targeted support.

Directions for future research

Future studies should expand this line of research in several directions. Comparative studies across universities, faculties, and academic programs would help determine whether the patterns observed here are specific to this institutional context or whether they are also present in other settings. Longitudinal designs would also be useful for examining whether students' perceptions change over time, particularly after institutional interventions or awareness campaigns.

Further research should also refine the measurement of micromachisms and harassment. Instruments with broader Likert-type scales and more detailed items may capture subtle differences that were not fully detected in this study. In addition, qualitative approaches could complement the statistical findings by exploring how students interpret, normalize, resist, or report gender-related situations in everyday academic life. Finally, future research could incorporate intersectional perspectives and multi-actor samples, including students, faculty, administrative staff, and institutional authorities.

Concluding remarks

This study shows that gender inequality in the analyzed university context is expressed through multiple and partly distinct dimensions. Explicit harassment and subtle micromachisms are related, but they do not appear to operate as a single unified phenomenon. The findings also show that multivariate methods can contribute to the study of gender inequality in higher education by revealing latent structures that are not easily observed through descriptive analysis alone.

At the same time, the results should be interpreted within the limits of the study. The sample was concentrated in one public university and mainly in one faculty, and the latent profile analysis did not support stable differentiated profiles. Therefore, the findings should be understood as context-specific evidence rather than as a general description of Ecuadorian higher education as a whole.

Overall, the study highlights the need for institutional responses that address both visible and subtle forms of gender inequality. Building more equitable universities requires not only formal policies, but also sustained attention to everyday academic interactions, reporting practices, institutional trust, and the ways in which students experience and interpret gender relations in their educational environment.

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