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Quantifying for Qualifying: A Framework for Assessing Gender Equality in Higher Education Institutions

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Abstract: The objective of this study is to present the development of a framework for assessing gender inequality in higher education institutions (HEIs) which reveals how this academic environment is progressing in terms of gender balance. It proposes a multi-dimension-based index comprised by five dimensions—Empowerment, Education, Health, Violence, and Time. The mathematical model used enables the user to assign a weight value to each dimension, customizing the results according to the institution addressed. The paper is based on a post-doctoral research project which analyzed six globally recognized indexes (Gender Inequality Index; Global Gender Gap Index; Women, Business, and Law Index; Gender Equality Index; Social Institutions Global Index; Women Empowerment Principles) to construct a new framework for gender inequality evaluation tailored for HEIs. It used a Laplace–Gauss-based scale. The research included an experiment of concrete application to two instiutions, one in Europe and the other in South America. While the first one had a Gender Equality Plan, the second had not. The analysis was successfully conducted in both institutions. The two institutions presented general results above 60%. These results need to be read in the specific context of each university. The Gender Equality in Higher Education Institutions Index (GEHEI) provides a user-friendly way of checking the existence of gender inequality, summarized into a single number but able to be detailed in several levels and to provide insight into progression over time. The handling of the GEHEI tool is also very straightforward. The proposal is designed to be used in different HEIs; it is recommended that researchers customize the weights of the dimensions according to their relevance in the specific organization. This paper provides a new methodological model to measure gender inequality in HEIs based on easy-to-obtain data, distinguishing itself from global indexes by its ease of application and interpretation.

Keywords: gender equality; higher education institutions; equality index; gender inequalities

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1. Introduction

Inequality between men and women is considered by many to be the most long-standing form of social injustice (Saleiro and Sales Oliveira 2018). Although important changes have occurred in recent decades, the global situation is still far from the ideal situation where all people, despite their sex and/or gender, are free to be and do what they wish, and have the ability and resources to move from one place to another, the right to attend school, to have a bank account, or to own assets (HDR. Human Development Report 2019; Saleiro and Sales Oliveira 2018). Furthermore, big asymmetries remain between countries and regions (European Institute for Gender Equality 2019; World Economic Forum 2020; Cascella et al. 2022). This situation is a main concern in the international political agenda, and justifies the definition of strategic priorities in organizations such as the United Nations (UN) and European Union (EU). For the purpose of promoting gender equality, some instruments of measure of inequalities have been created, one of them being the Gender Inequality Index (Young et al. 1994; Harvey et al. 1990). A gender inequality index is a composite index that measures the inequality between women and

male achievements in several dimensions of life in society. Despite broadly using the term gender to name these mechanisms, in most of them the focus is on the situation of men and women in a certain context. This focus is still the dominant use of the term not only for the general public (Morgenroth and Ryan 2021) but also to experts and especially in the national and international framework of equality and inclusion policies. In this paper, we will use gender in the sense of the man-and-woman dichotomy, despite the authors identifying with a broader conceptualization of gender that includes LGBTQI persons. The reason for this option is the current unavailability of data about diversity. Some projects are already making operational proposals to address gender diversity at workplaces (Pichardo Galán et al. 2019), but it is still far from being frequent and these initiatives tend to face much resistance. In fact, the collection of data disaggregated by sex is still a recent achievement in several HEIs (Clavero and Galligan 2021). Furthermore, as Bonjour et al. (2020) state, without hard data there is no way to address diversity. Therefore, for the time being, we proceed with a binary approach, but we stress the importance of broadening the perspective in which gender is addressed in public policies in general and HEIs in particular.

The debate about the validity of the indicators used to measure gender equality in different contexts has received increasing attention over time. Permanyer (2015), for example, using data from the United Nations, showed that the choice of indicators can have an important impact on the ranking of countries, especially for those that achieved high levels of gender equality (Cascella et al. 2022). In this respect, Sustainable Development Goal (SDG) No. 5 concerns gender equality and aims to "achieve gender equality and empower all women and girls" (United Nations Sustainable Development Goals 2021). However, progress in achieving this goal and its detailed targets has been uneven. While much advancement has been achieved in enrolling girls in primary education, other areas such as discrimination and violence against women, reproductive health, ownership rights, and technology are far from reaching an acceptable level. Promoting change faces several obstacles, one of them being the operationalization of the goals. In this respect, scholars have argued that many SDG targets are so conceptually complex that they cannot be translated into measurable indicators, particularly SDG 5 (Breuer et al. 2019; Eden and Wagstaff 2021).

Prominent international governance institutions have created their own mechanisms to track data on gender equality and thus be able to monitor progress over time: gender equality indexes. Some of the most distinguished are:

- The Gender Inequality Index (GII), created by the United Nations Development Program to assess inequalities between women and men in three important aspects of human development: health, empowerment, and economic status (GII—Gender Inequality Index 2020).
- The Global Gender Gap Index (GGGI), created in 2006 by the World Economic Forum to identify gender disparities and to monitor progress over time (GGGI—Global Gender Gap Report 2020).
- The Women, Business, and the Law (WBL) Index, created by the World Bank in 2009 based on laws affecting women at every stage of their lives (WBL—Women, Business and the Law 2020).
- The Gender Equality Index (GEI), a tool developed by the European Institute for Gender Equality (EIGE) which presents historical data on the advancement of gender equality in the European Union countries, giving more visibility to areas in need of improvement and providing subsidies for more effective gender equality policies to be designed (GEI—Gender Equality Index 2020).
- The Social Institutions and Gender Index (SIGI), created by the Organization for Economic Co-operation and Development (OECD) in 2009 to measure discrimination against women in social institutions in about 180 countries. Its four dimensions cover socioeconomic areas that affect women's lives considering account laws, social norms, and practices (SIGI—Social Institutions and Gender Index 2020).
- Women's Empowerment Principles (WEPs), a joint initiative of the UN Global Compact and UN Women developed in 2010 to provide a holistic framework for empowerment

of women and girls. The WEPs Tool—Gender Gap Analysis Tool of Women's Empowerment Principles, launched in 2017 (WEPs—Women's Empowerment Principles 2020), aims to measure gender equality in the workplace, market, and community by verifying adherence to the WEPs. This tool does not have the word index in its nomenclature; however, it evaluates how companies are promoting gender equality worldwide using surveys (WEPs—Women's Empowerment Principles 2020), constituting an index in practice.

The aim of creating these mechanisms was to provide robust statistical evidence of gender inequality that was at the same time easy to read, illustrative of the transversal nature of the inequalities, and comparable in different geographical realities (Permanyer 2013a). A recent proposal aims to add a longitudinal perspective, claiming that it has the ability to shed new light on gender inequality analysis (Dilli et al. 2019). At the same time, work is being conducted at a more micro-level, with strategies and measures designed and implemented for promoting gender equality in companies and institutions (Jeanes et al. 2012). At this level, gender equality plans are the more used instrument because they present big advantages in terms of operationalizing the change at an organizational level (Sales Oliveira and Augusto 2017; Barros et al. 2018). Nevertheless, both for assessing gender inequality and monitoring its progress at organizational level, statistical evidence is an important asset.

Gender equality indexes are still not usually applied at organizational level, despite the long existent recommendation for their development (Moser 2007). Some companies—especially those that claim to have social responsibility concerns and policies—are disclosing their data to global indexes such as Bloomberg Gender-Equality Index (GEI). From our point of view, this represents an example of how gender equality promotion can be used for brand management. While accepting that these initiatives can have the merit of promoting the public visibility of the theme, we believe that actions that are more profound and deeply embedded in strategic management are required for effective organizational change towards equality. In this sense, individual indexes developed and applied at internal level can be powerful instruments.

Specifically, higher education institutions (HEI), which in recent decades have strongly invested in the implementation of GEPs, do not have an instrument that allows gender equality to be easily measured within these institutions. The existence of an index for HEIs could facilitate procedures, simplify monitoring GEPs, and capacitate them to better target their intervention. It can also facilitate comparison between different HEIs and contexts, following patterns of use of the global indexes that are already widely used and accepted by the international community. In order for each higher education institution to assess and gain a view of gender equality in its environment, it is necessary for data to be collected, used, and understood by this institution with relative ease and constancy, so that the monitoring of progress is not discontinued. Progress in these questions is remarkable, but the availability and quality of data remains an issue at some HEIs (Clavero and Galligan 2021). Gender assessments are usually the first step for developing a GEP (Sales Oliveira and Vilas-Boas 2012; Clavero and Galligan 2021). Monitoring evolution through the years is a current necessity for organizations with a gender equality plan, but this is typically achieved by annual reports based on the initial assessment with more or less detail as is recommended, for example, by GEAR (Gender Equality in Academia and Research) toolkit step 5.[1]

Academia and higher education is a very specific area in terms of work organization culture and power. The prevalence of symbolic power, in the sense of Bourdieu, makes universities strongly hierarchical (Clavero and Galligan 2021) and uneven. To address gender equality in HEIs demands profound attention to a large complexity of more- or less-hidden inequalities such as "glass ceilings" and "glass cliffs," "sticky floors", and a "wheel of precarity" (Clavero and Galligan 2021, p. 1117). The manifestations of these phenomena are deeply connected to the specific cultural context, which is very important to keep in mind when working in international consortiums or conducting cross-national comparisons (Le Feuvre 2009). The current complexity of job formats and career paths in

academia (Kwiek and Antonowicz 2015) presents challenges to developing cross-national comparisons.

The literature presents very few studies related to the construction of indexes for gender equality in higher education institutions—we found just two references: (Addabbo et al. 2019; Mignoli et al. 2018). We were able to find proposals for the evaluation of gender equality organizational interventions, such as the inspiring case of EFFORTI (Schmidt and Graversen 2020), but the purpose of an index is different from that of an evaluation framework.

In this scenario, the aim of this work is to propose a framework for assessing gender equality in higher education institutions, GEHEI—Gender Equality in Higher Education Institutions. The composed index aims to evaluate gender inequalities in these institutions through data that can be provided by the institutions themselves, enabling user-friendly application and understanding by the academic community. An important feature of the index is the possibility of monitoring both the organizational progress in gender equality in a given institution and a comparative ranking of equality between different institutions. Therefore, our GEHEI proposal was built based on a detailed study of the gender equality indexes which are widely accepted by global society. Based on the knowledge about the dimensions and component variables of these indexes, a set of dimensions and indicators that are adequate and can be applied in a practical way in higher education institutions was selected to compose GEHEI.

2. Construction of Framework for Assessing Gender Equality in Higher Education Institutions—GEHEI

2.1. State of the Art for Choosing GEHEI Dimensions and Variables

The proposed GEHEI framework was built using a bibliometric analysis and selection of dimensions (Figure 1).

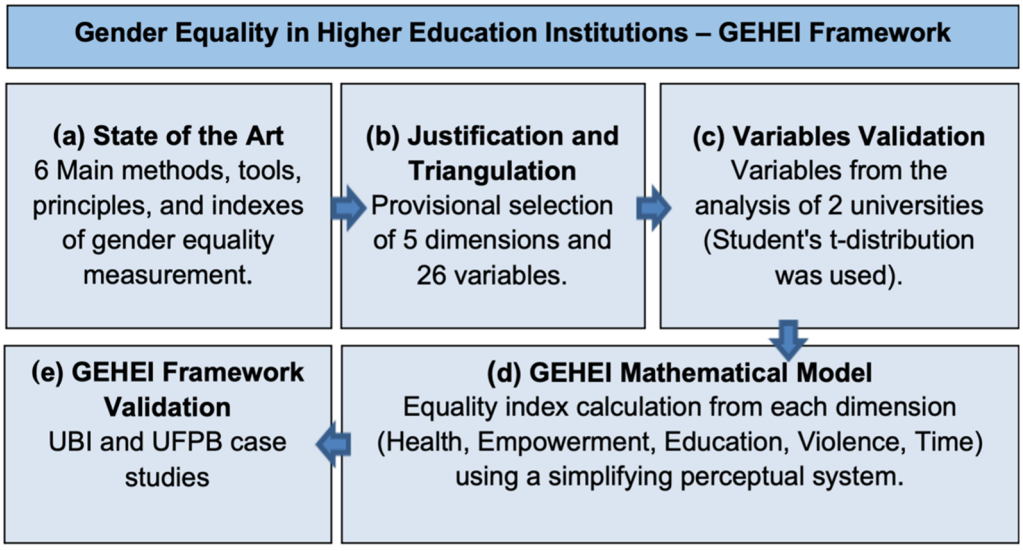

Figure 1. GEHEI Framework methodology and test cases. Source: Prepared by the authors.

A search on the SCOPUS, Web of Science, and Science Direct databases containing the terms "gender", "equality", "index", and "higher education institutions" or "universities" identifies only one paper, "Measuring Gender Equality in Universities" (see Table 1). This paper proposes a measurement system of gender equality based on three dimensions, Academia, Public technical administration (PTA), and Governance. However, it differs from our work, which involves five dimensions and considers aspects such as health, violence, and time in its composition, as we will show later. After the search result, we removed the terms "higher education institutions" and "universities", obtaining the articles shown in Table 1.

Table 1. References about gender equality index.

References	Description
Addabbo et al. (2019)	Presents a gender equality index based on three dimensions, Academia, Public technical administration (PTA), and Governance.
Akbash et al. (2019)	Discusses and adapts the UN GII Index to Ukraine's regions.
Amin and Sabermahani (2017)	Calculates the index for provinces of Iran and studies its appropriateness for comparing different regions, through regression estimations.
Avolio and Luis (2020)	Presents a proposal for a gender equality index for regions of Peru, with four factors (education, health, autonomy, and opportunity) and thirty-two indicators.
Barnat et al. (2019a)	Analyzes and compares important global gender inequality indexes, concluding that while economic participation and empowerment are significant factors of gender equality, they are not fully considered by them.
Barnat et al. (2019b)	This article explains the basis for the most important analytical and conceptual decisions made in constructing the GEI.
Bericat (2012)	Defines a multidimensional measurement model that combines statistical techniques and multicriteria decision-making models.
Blancas Peral et al. (2008)	Presents SIGI, an index constructed by the OECD that evaluates women's deprivation caused by gendered social institutions.
Branisa et al. (2014)	Focuses on the experience of developing gender equality indicators in the UK and Ireland and in gender equality public policies.
Breitenbach and Galligan (2006)	Investigates the association between child mortality rates and gender inequality indexes of 138 countries using the UNDP GII.
Brinda et al. (2015)	Presents the issues related to the United Nations Development Program's Gender-Related Development Index (GDI).
Dijkstra and Hanmer (2011)	Presents HGEI, a composite index of gender equality covering 129 countries from 1950 to 2003 from a historical perspective.
Dilli et al. (2019)	Questions strengths and weaknesses of gender inequality measurement approaches.
Ertan (2016)	Proposes MGII, a non-linear weighted composite index to measure inequalities.
Ferrant (2014)	Discusses the purpose and application of the GII in specific contexts.
Gil-Lafuente et al. (2019)	Develops an index that is modeled in its thinking and implementation on the Consumer Price Index.
Kayser et al. (2019)	Estimates the associations between the labor force participation rate and population with at least secondary education with components of GII.
Kim and Kim (2014)	Discusses women's empowerment to ensure sustainable development and welfare in society during and after times of crisis.
Kişla (2019)	Shows the development of a Norwegian regional gender equality index, based on demographic, welfare, and economic activity variables.
Klasnić (2019)	Correlates a Wikipedia-derived gender inequality indicator (WIGI) with four widespread gender inequality indices in use today.
Klein and Konieczny (2015)	Explores the differences between gender regimes in Europe, Nordic women-friendly welfare states, and the former socialist policies of South-eastern European countries.
Kovačević and Šehić (2015)	Decomposes the GINI inequality ratio into three components (within-group inequality, between-group inequality, and intensity of trans variation between groups to the total inequality).
Larraz (2015).	Presents an alternative formula related to maternal mortality teen pregnancy rate, which modifies the results of GII.
McDonald and Koblitz (2019)	Studies the connections of women's rights to overall homicide rates using cross-national data for almost two-hundred countries.

Table 1. *Cont.*

References	Description
Mignoli et al. (2018)	Presents a gender equality index based on six endogenous domains (Education, Horizontal segregation, Academic and professional career, Research, International dimension, and Governing Bodies and top positions) and three exogenous domains (Caring responsibilities, Graduate labor market, and Success in studies)
Narvey et al. (2021)	Critically reviews the new GEI proposed by the European Institute for Gender Equality and proposes adjustments
Permanyer (2013b)	Critically investigates the suitability of the United Nations' composite indices and other related measures, among which is the GII.
Permanyer (2015)	This work suggests constructing a new version of the GEI—denoted as GEI*, where lower-income countries tend to rank in better positions.
Plantenga et al. (2009)	Evaluates gender equality in primary and secondary schools, considering both enrolment and dropout of boys and girls.
Psaki et al. (2018)	Aims to compare the indicators most used to analyze gender equality.
Riobóo and Riobóo (2009)	Applies GII in eight ASEAN countries, focusing on macroeconomic aspects (gross domestic product per capita, foreign direct investment).
Sangaji and Kurnia (2018)	Proposes the Patriarchy Index, which combines a range of variables related to degrees of sex- and age-related social inequality.
Szołtysek et al. (2017)	Analyses the empowerment indexes related to women's economy and proposes a new conceptual model of empowerment, based on the WBL index.
Taner (2019)	Presents the Swedish approach to gender equality in organizations.

Source: Created by authors.

Therefore, by analyzing this set of articles, we were able to point out that most articles use or cite indexes created by internationally respected organizations; therefore, we adopt this approach as the key strategy. The choice of indexes to be included as the baseline for our proposal also considers aspects such as relevance, acceptance in the global community, and current application by different countries.

We highlight two aspects:

- Only one global index mentions gender equality in higher education institutions, and in this proposal HEIs are just one dimension of the index, not the main target (Addabbo et al. 2019).
- The two proposals of frameworks for HEIs analyzed are focused on education and management realms (Addabbo et al. 2019; Mignoli et al. 2018). We believe that a broader approach that frames the global indexes is central for community representation and public acceptance of the index.

Explaining the rationale for selecting dimensions to compose the GEHEI index, we believe that knowledge about the world's main indexes on gender equality is essential to proposing a new index for higher education institutions that is in line with the key concerns of contemporary global society. The study of the dimensions and indicators is necessary to gain knowledge and understanding about the importance of each of the variables that make up the indexes. The six global indexes and dimensions selected to make up the state of the art are presented in Table 2.

In general, indexes are formed at the macro-level by a set of dimensions. This is the most important level and aggregates a set of sublevels which are composed of indicators (also called variables). An indicator can be of the numerical type, usually dealing with a proportion or percentage, or of the question type, which has several possible answers. Below, we detail each of the indexes, explaining their dimensions, indicators, and applicability.

Table 2. Dimensions of the global indexes that make up the state of the art.

Index	Dimensions	Who	Link
Gender Inequality Index—GII	Health; Empowerment; Labor Market	United Nations Development Program	http://hdr.undp.org/en/content/gender-inequality-index-gii (accessed on 10 July 2021).
Global Gender Gap Index—GGGI	Economic Participation and Opportunity; Educational Attainment; Health and Survival; Political Empowerment	World Economic Forum	https://www.weforum.org/reports/gender-gap-2020-report-100-years-pay-equality (accessed on 10 July 2021).
Women, Business, and the Law—WBL	Mobility; Workplace; Pay; Marriage; Parenthood; Entrepreneurship; Assets; Pension	World Bank	https://wbl.worldbank.org/ (accessed on 10 July 2021).
Gender Equality Index—GEI	Work; Money; Knowledge; Time; Power; Health	European Institute for Gender Equality	https://eige.europa.eu/gender-equality-index/2020 (accessed on 10 July 2021).
Social Institutions and Gender Index—SIGI	Discrimination in the family; Restricted Physical Integrity; Restricted Access to Productive and Financial Resources; Restricted Civil Liberties	Organisation for Economic Co-operation and Development	https://www.genderindex.org/ (accessed on 10 July 2021).
Women's Empowerment Principles Tool—WEPs	Leadership; Workplace; Marketplace; Community.	UN Women	https://www.weps.org/ (accessed on 10 July 2021).

Source: Created by the authors based on the links indicated.

2.2. Dimensions and Variables: Justification and Theoretical Data Triangulation

The study of global indices is highly important for the creation of a new proposal, because they are established in the literature, already tested and approved, as well as being respected worldwide. However, why not use them directly for the verification of gender equality in a higher education institution?

Although the components of those indexes are highly important and representative for our proposal, their data are collected from international organizations such as ILO, UNESCO and WHO, which have very complex calculations and estimates, and it is difficult to implement them for a higher education institution. Except for the WEPs tool, which obtains data directly from companies through surveys, global indices work at a fairly macro-level; therefore, it is not plausible to apply them to a given institution. In order for each higher education institution to assess and gain a view of gender equality in its environment, the data need to be acquired, used, and understood by this institution with relative ease and constancy, so that the monitoring of progress is not discontinued.

Thus, the creation of the proposed index must meet the premises:

1. Possibility of higher education institutions obtaining data
2. Possibility of periodic longitudinal (annual) monitoring of progress in relation to gender equality
3. Possibility of application in a wide range of higher education institutions
4. Ease of obtaining and manipulating statistical data
5. Possibility of summarization of results and ease of understanding.

Considering the triangulation of the data between indexes, the variables that most appeared in each one were considered. Two approaches were used: (i) quantitative: the importance attributed to a given dimension by the global indexes of gender equality, evaluated through the explicit or implicit existence of this dimension in a given index, and (ii) qualitative: the relevance of a given dimension in the environment of higher education institutions.

In the quantitative aspect, the inclusion criteria of a given dimension were used according to the presence of this dimension in the global indexes. Let us take as an example the Health dimension. This dimension is explicitly included in three of the global indexes

studied (GII, GGGI, GEI) and implicitly in two of them (SIGI and WEPs). Explicitly because it contains a dimension exactly with the nomenclature health, and implicitly because it contains health-related variables, but in one dimension with different nomenclature. The WEP index does not contain a dimension called Health, but has a variable related to women's health as measured by the indicator "Does your company have an approach to address the specific health, safety and hygiene needs of women at work and while moving to work?", which is included in the "Workplace" dimension. Thus, it is consideredthat the WEPs index has the Health dimension implicitly. Figure 2 shows the composition of the proposed index.

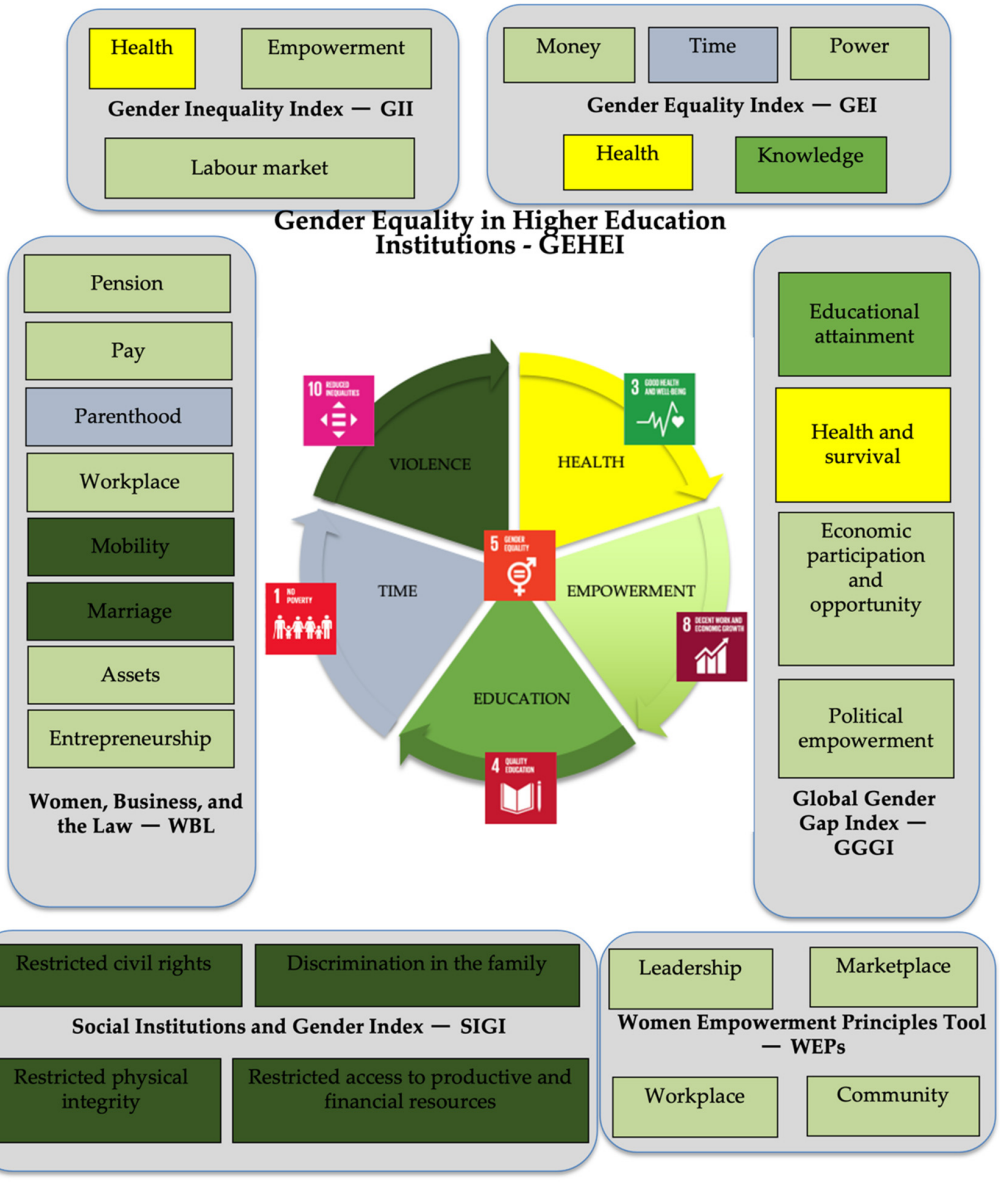

Figure 2. Triangulation in the Framework's construction for Gender Equality Assessment in Higher Education Institutions—GEHEI Source: prepared by the authors.

The dimensions chosen to make up the proposed GEHEI are those described in the central (circular) block of Figure 2: (i) Health, (ii) Empowerment, (iii) Education, (iv) Violence, and (v) Time.

All five dimensions had their basic conceptions derived from the already-established models of measurement of (in)equalities at the macro-level (i) GII; (ii) GGGI; (iii) WBL; (iv) GEI; (v) SIGI; (vi) WEPs (which translates into a solid scientific basis, already discussed,

tested, and approved); however, the selected items apply to a microscale measurement to be implemented in a higher education institution.

These dimensions should apply to three categories of individuals who are present in the institutional environment: students, academics, and staff.

The next step was to proceed to the validation of GEHEI dimensions and variables. Dimensions chosen for the new GEHEI index consider (i) the presence of a given dimension in the main global indexes, and (ii) its importance in the environment of higher education institutions. This last measure was obtained from the literature review and documental analysis looking at the realms of intervention on Gender Equality in HEIs. These realms were visible in the GEPs where the institutions have one, institutional projects, or activities developed. Table 3 presents the proposed dimensions and the frequency at which they are present in the existing global indexes.

Table 3. Frequency of the dimensions in the global indexes.

Dimensions	GII	GGGI	WBL	GEI	SIGI	WEPs	Frequency
Health	1	1	0	1	1	1	83%
Empowerment	1	1	1	1	1	1	100%
Education	1	1	0	1	0	0	50%
Time	0	0	1	1	0	1	50%
Violence	0	0	1	1	1	1	66%

Source: Prepared by the authors based on GII, GGGI, WBL, GEI, SIGI, and WEPs.

3. GEHEI Dimensions

3.1. Health Dimension

The health dimension appears in 83% of the already-established indexes and is extremely important in the higher education environment, as it affects the well-being of all those involved in the academic community, especially students and academics, both in mental and physical aspects. Until recently, it was much more frequent to find studies addressing health that focus on students rather than academics. Several studies on the emotional strain of the student population have been conducted by researchers showing the pressure that students suffer along the journey of acquiring a higher education degree, as well as others that show the occurrence of burn-out syndrome in academics and researchers during their academic performance. In the aspect of physical health, the World Health Organization (WHO) recommends 150 min of physical activity weekly but indicates that 23% of adults and 81% of adolescents are not physically active (WHO 2020). This indicator will be included in GEHEI, based on information about the engagement of students in physical activities.

Suárez-Colorado et al. (2019) shows that student stress is associated with school dropout and major mental illness problems. This stress is often caused by the need to travel from their country/city of origin, by altered workload and work requirements, and by the difficulty of reconciling the new reality with personal life and extra-curricular projects, as well as the economic difficulties that most students face when staying away from home.

A recent project tracks data on the mental health of students in 29 countries. Through questionnaires applied to first-year students in 19 higher education institutions covering 13,984 full-time students, 31% had at least one episode of disorder in the last 12 months, including severe depression, anxiety disorder, and panic syndrome, as well as alcohol and other substance abuse (Auerbach et al. 2018). Additional studies show that 20% to 45% of university students experienced at least one type of mental disorder during some year of their studies. The causes of stress are academic tasks, personal problems, difficulties related to career choice, and economic problems. When associated with poor academic performance, they lead to the abandonment of courses, depression, and suicidal behaviors (Amanvermez et al. 2020).

A study conducted in Germany with 723 medical students showed that women had a higher prevalence of depression and cognitive burn-out; they declared their quality of life

significantly lower (Burger and Scholz 2018). The index proposed here will consider the gender aspect to typify how women's and men's mental health is affected during academic life in higher education institutions. García-Arroyo's meta-study (García-Arroyo et al. 2019) with data from 36 countries taken from 156 articles found that 38% of academics suffered from emotional exhaustion, 29% suffered from depersonalization (also called cynicism), and 69% showed problems when evaluating their personal achievement, feeling unmotivated and having a low perception of self-realization.

In the COVID-19 pandemic, more studies were produced concerning mental health of the working population in general. Interesting hints about women academics emerged from these studies (Guan et al. 2022; Becegato et al. 2022; França et al. 2021) that have an important role fighting the trend of higher education to remain "silent or complicit in perpetuating stigma towards mental illness" (Grubner 2021).

3.2. Empowerment Dimension

The empowerment dimension is assessed in global indices through indicators showing the rate of women participation in the labor market, equal pay between women and men, the rate of occupation of management and senior management functions, and the participation of women in parliament.

The global gender pay gap is estimated at 23%; maintaining the current trend, it will take 70 years for it to be eliminated; in addition, gender inequalities in employment and quality of work cause limited access to employment-related social protection. As a result, almost 65% of people who are over retirement age but have no access to any regular income are women (ILO. International Labour Organization 2019).

Part of the gender inequalities in the labor market are explained by the areas of activity. The under-representation of women in sectors such as ICT points to a great waste of human resources and loss of economic potential by nations (EIGE 2019b). A large percentage of women remain in low-income jobs or in unpaid tasks such as household work and childcare.

According to the GGGI, the greatest gender disparities are found in political representativeness. In 153 countries assessed by the GGGI index in 2020, only 25% of seats are held by women. In 56% of the countries evaluated, there has never been a woman as head of state, including economies such as Japan, the United States, and Spain (WEF—World Economic Forum 2020).

The literature highlights persistent gender inequalities in HEIs (Kahlert 2018; Pereira 2017). To address this problem, GEPs are one of the more used tools, strongly encouraged by international institutions that work on gender mainstream and with positive results. Nevertheless, there is still a long path to be navigated (Clavero and Galligan 2021; Humbert and Huber 2021), and to provide clear evidence of inequalities in work and participation is essential. We will include the dimension empowerment through the indicators employment rate, salary, positions of leadership, composition of the HEI board, and representativeness in research. This dimension focuses only on workers in HEIs.

3.3. Education Dimension

This dimension shows gender inequalities in relation to the academic areas of activity for both academics and students, as well as the qualifications of the administrative and management staff. Even with better performance in elementary school, women have worse employment and income outcomes. On average, in all OECD countries, women with higher education earn 26% less than men with this level of education. This is directly related to the areas and occupations where women predominate, which are poorer-paid (OECD 2019). Therefore, education will influence empowerment since levels of education condition employment and participation opportunities (Wahl 2017).

According to (Santos et al. 2019, p. 7232), "In European countries the percentage of women entering universities in the areas of technology, engineering and science is low and, consequently, their participation in the labor market in these areas is also very low". In the European Union, the proportion of women in high-tech sectors and associated

services is around 32% only (HESA—Higher Education Statistics Agency 2020). The *US National Center for Education Statistics* shows that although a high percentage of women have completed bachelor's degrees between 2015 and 2016 (58%), only 36% of STEM bachelor's degrees have been awarded to women, while 64% are awarded to men (NCES. National Center for Education Statistics 2020).

In Japan, only 14.5% of engineering students are women; they are the majority in humanities (65.2%) and education (59.1%). In Canada, they are 22.3% of computer and information systems professionals and 13% of civil, mechanical, and chemical engineers. While 25% of men complete an engineering course, only 6% of women obtain this diploma (OECD 2019). These statistics show the low women presence in technology, comprising the areas of STEM.

In this sense, the index proposed here intends to portray the reality of higher education institutions regarding the choices Of courses and areas by students, as well as the occupation of the areas by women and male academics portraying professional performance. The education dimension will be evaluated separately for the institution's students, academics, and staff, giving us the present situation and future prospects. Within the students, the predominance of women and men enrolled in different courses and areas will be ascertained in order to observe how the choice of careers between the sexes is carried out; the data will be collected in undergraduate, master's, doctorate, and specialization courses, if any. Data will be collected on (i) the presence of women and male students in the different courses of the institution and (ii) the presence of women and men who act as academics in these courses. Additionally, data will be collected on women and men attending courses in STEM, as it is an area where globally there is a great gender disparity. For academics and staff, the data analyzed will be their qualifications (level and scientific area) by sex.

3.4. Violence Dimension

Violence in the university environment is a difficult problem to deal with. Starting with the fact that it is difficult to perceive HEIs as gender neutral in general and safe environments, there are limitations in the process of receiving complaints and information that can support actual data about these occurrences (Anitha and Lewis 2018). Although there are already occurrences of sexual violence against women in the university context, research in the area argues that the claims presented are a drop in the ocean (Sales Oliveira 2021). Still, from the #Metoo movement that began on social networks in 2017 (Migiro 2017), and from Mayo Feminista in Chile, the theme is becoming more comprehensive in recent years, reaching the university environment, and showing the magnitude of the problem.

In March 2017, the British newspaper the Guardian began coverage of sexual harassment at universities; in the United States, movements of complaints of academics who committed harassment were initiated through online lists (List of Sexual Harassers in Academy (LoSHA)), with responses of continuity from India and several countries around the globe. Although there were already some study initiatives on the theme of harassment in universities, these intensified after these global occurrences (Chatterjee 2018).

Research shows that much of this category of violence is exercised through a combination of power and superiority which originates in the academic environment itself; most cases occur between male faculty (aggressor) and women students (victims). The combination of age, level at work, and gender creates the conditions for power to be used to commit harassment against students. Women are more vulnerable to this type of harassment (Akazawa and Aono 2018).

Few universities collect data on these occurrences both for students and workers. A systematic review of literature about sexual harassment in HEIs highlights the prevalence of sexual harassment among students. However, the problem still lacks social visibility, and the existent protocols for evaluation and resolution of cases needs to be improved (Biglia et al. 2017).

For the index, we propose to measure this dimension based on the number of complaints of sexual, physical, and psychological violence reported by women and men. Al-

though there are still few institutions that have them, the tendency is to grow. Portugal is currently at a turning point and several HEIs are trying to implement complaint procedures. However, the existence of resistance and difficulties in this process is clear. In both cases, complaints came from students and were presented to the Student Ombuds Person. In the case of UBI, the Psychological Support Office also received complaints. The UBI Equality Commission considers it urgent to develop a specific mechanism/procedure to receive these complaints to ensure neutrality and expertise in violence and harassment situations (Sales Oliveira and Vilas Boas 2020).

3.5. Time Dimension

The dimension of time concerns how men and women manage their activities daily in order to achieve a life with higher quality and balance. Women handle double and often triple working hours because they are the ones who mostly care for the elderly, disabled, and children after formal work. Around the world, most housework is performed by women, even when having a paid job at the same time. In 2019, women in the European Union spent 13 h more per week than men in unpaid care and housework, and 79% of women perform housework such as cooking and cleaning the house, compared to 34% of men only (EIGE 2019a).

The unparalleled burden of care and domestic work does not limit only the social and personal development of women or career; this is the major reason for economic inactivity or work outside the home, even part-time. About 10% of women, compared to 0.5% of men, either do not work or work part-time outside the home. They also have less time for leisure and are less dedicated to sports (EIGE 2019b).

How is the higher education community balancing academic and family and personal time? Literature shows us that for women academics, time management is highly demanding and often impacts on their productivity (Araújo et al. 2021), with women tending to develop micro-strategies for coping with the problem such as giving up leisure time and extra work activities (Naz et al. 2017) and not questioning organizational structures (Lendák-Kabók 2022).

This is a difficult topic to evaluate, due to the lack of information; even for global indexes, the indicators in this area are taken mainly through surveys and specific questionnaires on time use that are not usually applied on a regular basis. However, to ensure the applicability of the index we need data that are regularly collected. Therefore, we will use the existent institutional data on childcare, family care, and study activities as the basis for assessing this dimension in both institutions. In this dimension, we will focus exclusively on workers, because data on time use of students are still rarer. Some studies focus on PhD students (Araújo et al. 2021). This information is usually more connected with paid and non-paid absences from work. It would be important to develop regular indicators about the daily routines of all HEIs workers in the context of working conditions of the personnel.

Table 4 shows the dimension components of GEHEI.

Table 4. GEHEI dimension components.

Dimension	Negative Indicator
Health	H1—Number of psychological consultations from women and men
	H2—Number of absences of women and men registered in the institution
	H3—Number of complaints from women and men registered at the institution
	Positive indicator
	H4—Number of women and men performing physical activity in facilities offered by the institution

Table 4. *Cont.*

Dimension	Negative Indicator
Empowerment	Positive indicator
	EP1—Employment (number of job positions held by women and men)
	EP2—Salary range (average salary of women and men)
	EP3—Leadership positions (number of women and men in leadership positions)
	EP4—Rectors (number of women and men who have held rectors' positions in the last 20 years)
	EP5—Researchers (number of women and men)
	EP6—Research Groups (number of research groups led by women and men)
Education	Positive indicator
	ED1—Number of women and men enrolled in undergraduate courses
	ED2—Number of women and men enrolled in graduate courses
	ED3—Number of women and men teaching in undergraduate courses
	ED4—Number of women and men teaching in post-graduation courses
	ED5—Number of women and men teaching in STEM courses
Violence	Negative indicator
	V1—Number of complaints of sexual violence reported by women and men
	V2—Number of complaints of physical violence reported by women and men
	V3—Number of complaints of psychological violence reported by women and men (sexual harassment and moral siege)
Time	Negative indicator
	T1—Number of women and men who work paid or voluntary jobs and study at the same time
	T2—Amount of time spent on housework and family care by women and men
	T3—Amount of time spent on housework and family care by women and men

Source: Prepared by the authors based on GII, GGGI, WBL, GEI, SIGI, and WEPs.

4. GEHEI Mathematical Model

Each dimension has an equality index calculated individually, and the results in this step indicate at the level of the respective dimension in the GEHEI evaluation. The user assigns a percentage value to each variable, according to the scale shown in Figure 3.

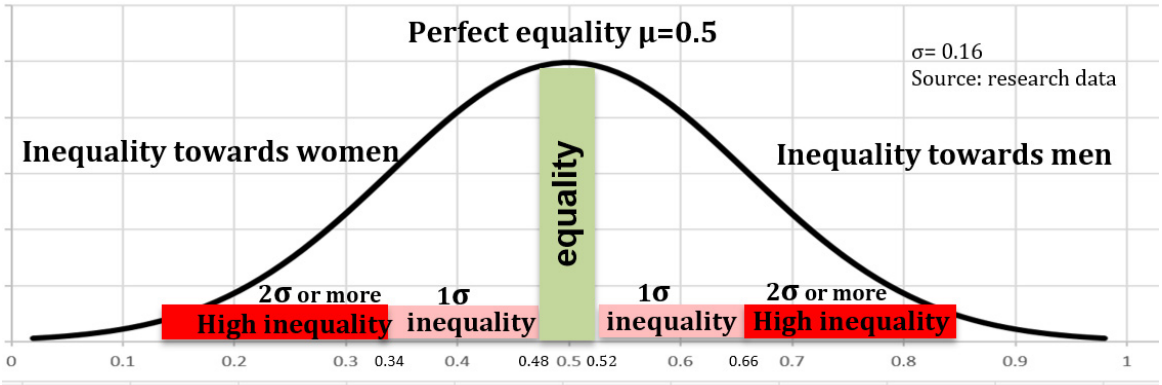

Figure 3. Equality Scale. Source: created by the authors.

For GEHEI calibration, we consider (i) a Laplace–Gauss distribution with the parameter media μ = 0.5 and standard deviation (σ = according to research data), and (ii) error of

2%. The validation took place from the survey completion and analysis of two universities (in Brazil and Portugal).

(a) Perfect equality is reached when the parameters are 50:50%
(b) First Quartile: 48% < GEHEI < 52% represents equality; the variation comes from the 2% error
(c) Second Quartile: 34% $\leq$ GEHEI $\leq$ 48% (inequality toward women) or 52% $\leq$ GEHEI $\leq$ 66% (inequality toward men) represents inequality, with probability p = 11.2%
(d) Third Quartile: 34% $\leq$ GEHEI or GEHEI $\geq$ 66% represents high inequality, with probability p = 87.2%

This assumption is incorporated in the description of each variable from Table 5.

Table 5. GEHEI mathematical model.

Dimension	Measurement	
Health	$IgH = (\alpha 1H1 + \alpha 2H2 + \alpha 3H3 + (1 - \alpha 4H4)\ )/4$	(1)
Empowerment	$IgEp = \left(\sum_{n=1}^{6} \beta_n Ep_n\right)/6$	(2)
Education	$IgEd = \left(\sum_{n=1}^{5} \rho_n Ed_n\right)/5$	(3)
Violence	$IgV = 1 - \left(\sum_{n=1}^{3} \theta_n V_n\right)/3$	(4)
Time	$IgT = 1 - \left(\sum_{n=1}^{3} \delta_n T_n\right)/3$	(5)
$GEHEI = (IgH + IgEp + IgEd + IgV + IgT)/5$		(6)

Source: Created by the authors.

This type of perceptual system is especially used when it is needed to quantify a complex problem with simple numerical information, facilitating the application of parametric tests.

In practice, the use of dichotomous systems easily summarizes data and can help in the decision-making process, especially regarding the next path to take. After calculating each dimension, a unique GEHEI index is determined.

From Equations (1)–(5), all the variables H, Ep, Ed, V, and T will have a value assigned between 0 (zero) and 1 with α, β, ρ, θ, and δ being weight factors between 0 (zero) and 1 according to the user's priorities towards specific dimensions.

This freedom allows each entity/specialist/user to prioritize each dimension. If the user wishes all dimensions to have the same significance, their weight factors will be assigned with "1".

6. GEHEI Framework Application

To validate the GEHEI framework, two universities from different countries were chosen and evaluated, and they are used in the present work as examples of the application of the GEHEI framework model. These universities were selected primarily because the authors are based in them. It is not easy to obtain institutional data from HEIs, so to be insiders was a clear advantage. Additionally, we consider that they represent good case studies since they are organizations situated in very different contexts and characterized by much-differentiated structures and cultures. This enable us to test the index in two very specific contexts and to validate if it can be successfully applied to both cases.

Presenting the two case studies used to test our framework, University of Beira Interior (UBI) is a public institution of higher education founded in 1986 and located in the center of Portugal. It is dedicated to integral education, which means that in addition to the objectives of academic teaching and research, it assumes the responsibility of contributing to the development of culture, citizenship, and social development in the local community. It has an academic community currently composed of 9509 people, of which 8479 are students, 762 are teaching staff, and 268 are non-teaching staff integrated in 5 faculties and 18 research units (Sales Oliveira and Vilas Boas 2021). It is a small and young university,

bubeen increasingly gaining visibility due to specific expertise in research areas such as management and economics, cinema, and health sciences. It has also been undertaking strategic investment in internationalization. UBI was the first Portuguese university to develop a gender equality plan in 2011.The project to develop a GEP for the University of Beira Interior surged in 2009 as an outcome of a research project funded by funding from the strategic framework (through the QREN-POPH). It was a groundbreaking initiative in Portugal that inspired the former development of GEPs in Portuguese HEIs. Currently, all but one of the public Portuguese universities (13 universities) have a GEP, most of them developed in the context of international projects in partnerships funded by EU funds. UBI remains a pioneer in gender equality promotion at HEIs, because after the end of the funded project in 2013 the university maintained its commitment with Gender Equality. Since 2018, it has a dedicated commission for equality organizational promotion. CI UBI is embedded in the organizational structure and reports directly to the rectory. Since 2011, UBI produces annual reports on the UBI Gender Equality situation and the last two editions have introduced a barometer. All these initiatives were developed without external funding. UBI assumes Gender Equality as its own mission. The availability of all these data created very good conditions for testing our index.

In Portugal, the development of gender studies was a late, scattered, and somewhat conservative process (Augusto et al. 2018). As a result of the constraints of the dictatorship and other reasons linked to the delay in the development of higher education in the country, only at the end of the 1980s did an area of studies begin to emerge. This emergency was greatly driven by the existence of a so-called State Feminism (Monteiro 2013). In Portugal, the existence since 1977 of a Commission for the feminine condition enabled the creation of this field of studies that until then had only the isolated work of a few social scientists carving gender issues within the framework of their own disciplinary area. It was only from the end of the 1990s on that we can refer to gender studies as an area in Portugal (Augusto et al. 2018). Some landmarks include, in 1999, the creation of APEM (Portuguese Association of Women Studies) and the publication of a journal (Ex Aequo) which remains the only existent journal in the country that is entirely devoted to gender research. In 1995, the first gender studies program was created in Portugal and only in 2012 the first and, thus far, only interdisciplinary research center on gender was born—CIEG (Centre for Interdisciplinary Gender Studies). As one could expect from this background, there is a certain degree of conservatism about Portuguese gender studies (Augusto et al. 2018). For a long time linked mainly to family studies, gender research in Portugal is currently more interdisciplinary, but a strong tendency towards some dominant areas still remains. Work and employment is a good example. In the last decade, the fight against domestic violence has generated a proliferation of research in this area. Nevertheless, this research is closely related to the work of state organisms and to the elaboration of public policies. This tendency presents advantages, such has a strong applicability of scientific research. Yet, at the same time, this determines the main lines of research and funding. Thus, for example, unlike what happened in Brazil, in Portugal gender studies do not much connect with the fields of body and sexuality studies. One other important feature of Portuguese gender studies is the influence of EU research frameworks. Gender mainstreaming arrived later than in other European countries but it is now dominant in what concerns gender research (Pereira 2016).

The Federal University of Paraíba (UFPB) is a Brazilian federal public higher education institution located in the state of Paraíba. Its headquarters is in the city of João Pessoa, having also three campuses in the inner country and two neighborhood units in the metropolitan area of João Pessoa. UFPB is recognized for its excellence in teaching and technological research and is currently among the best universities in Latin America. It is composed of a community of about 48,655 people, of which 39,000 are students, 2700 are teaching staff, and 3055 are non-teaching staff, integrated in 5 faculties and 18 research units (UFPB 2021). The UFPB does not have a plan or body directed at promoting gender equality.

Obtaining the necessary up-to-date data was a time-consuming process, made possible due to the strategic position of the researcher.

We can say that in the Brazilian context, the development of gender equality initiatives for HEIs is still in its very early beginning. We were able to identify only four cases (in 302 public universities in the country) that we briefly present in Table 6.

Table 6. Gender equality initiatives at Brazilian universities.

University	Initiative
USP (University of São Paulo)	Created in 2016, the USP Women's Office aims to propose and implement initiatives and projects aimed at gender equality within the University of São Paulo.
UFF (Federal Fluminense University)	In March this year, an internal ordinance was published announcing the intention to develop measures such as "(1) discuss and implement policies to support maternity; (2) raise awareness in the academic community about implicit bias and the construction of gender stereotypes; and (3) increase the representativity of women in science with policies to encourage women participation, especially in leadership positions."
UFMS (Federal University of South Mato Grosso)	Program "Sou Mulher UFMS" (Being Women UFMS) launched in 2021 based on three axes of the university Action plan for 2021–2024 which are: (a)Promoting women's entry, retention, and success; (b) Encouraging Women Teaching, Research, Extension, Entrepreneurship, and Innovation, and (c) Creating a Welcoming environment for women.
UNIPAMPA (Federal UNiversity of Pampa)	Creation of an Institutional Committee on Gender and Sexuality in 2021, which has representatives in the 10 campuses of UNIPAMPA and also in the rectory.

Source: Created by the authors.

In Brazil, the emergence of gender studies was relatively early because the country suffered important societal changes with the entry into dictatorship, which curiously gave public space to women (Rodrigues and Assis 2018). In the 1980s, many women entered the academy and developed the gender studies area. This trend was concentrated in the Humanities and Social Sciences. It was inspired by the American model of women studies but not following exactly the same model due to other influences such as the French (Zirbel 2007). Despite some tensions, the relation between activism, academics, and scientific departments was less conflictual than one might expect, since "the university was understood as a place for the formation and development of feminist action" (Nuernberg et al. 2011, p. 115). There was a rapid creation of feminist studies centers or groups all over the country because social changes had made research more important than teaching (Zirbel 2007). The basis for the development of these institutions were working groups. However, several study programs also emerged. Two interesting features of these groups were being composed only by women—which has raised some critics of ghettoization—and the existence of an interdisciplinary approach, albeit within the social sciences and humanities (Nuernberg et al. 2011). Parallel to the development of gender studies, sexuality studies have also developed, and they too are strongly linked to activism—feminism, Queer, and LGBT movements. They had a big boom in the 2000s (Simões and Carrara 2014). Thus, we can say that Brazil has a tradition of research and reflection on gender based on civil society and academia. The action at the level of HEIs has been more at this level than at a top-down level. However, in recent years, there has been an increasing presence of Brazilian HEIs in European projects in consortia in line with the EU claim of being a role model in what concerns gender equality promotion (Woodward and van der Vleuten 2014).

The GEHEI calculated for UFPB in 2019 was 63.3% of unbalance in favor of men and in 2020 it was 63.7%, which places the University in the second quartile: 52% < GEHEI < 66% (inequality towards men). In other words, in the general context of the dimensions considered, there is an inequality favoring men. Additionally, the values obtained are close to the lower limit of the third quartile (66%), indicating greater inequality (Figure 4).

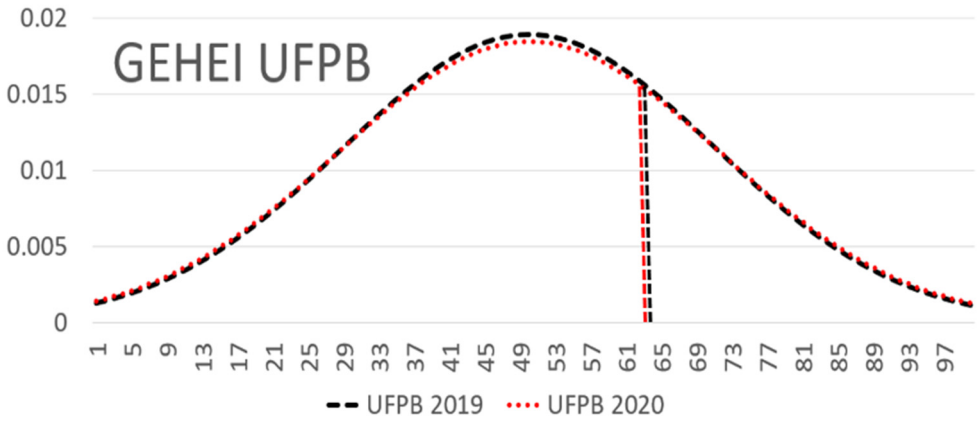

Figure 4. GEHEI UFPB (Brazil). Source: survey data.

The GEHEI calculated for UBI in 2019 was 60.6% in unbalance in favor of men, and in 2020 it was 64.8%, placing the institution in the second quartile: 52% < GEHEI < 66% (inequality towards men). Both values obtained indicate inequality, but surprisingly also reveal that inequality was higher in 2020. The value obtained for 2020 is closer to the lower bound of the third quartile (66%), indicating greater inequality (Figure 5).

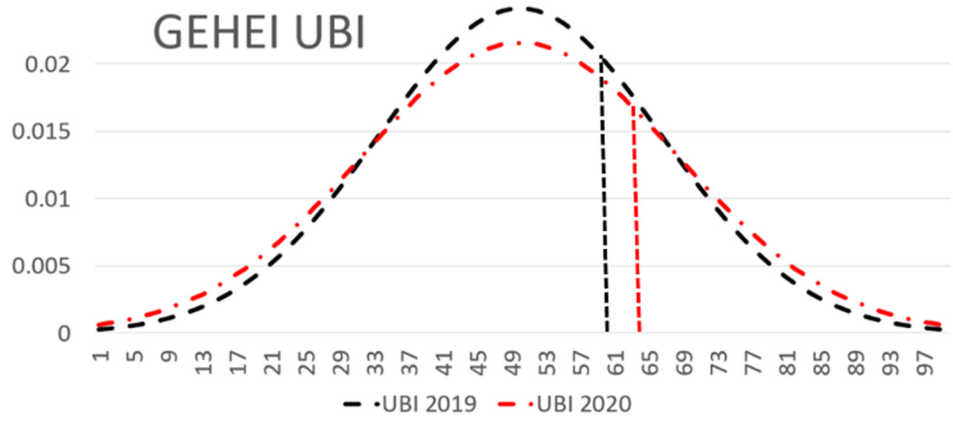

Figure 5. GEHEI UBI (Portugal). Source: survey data.

Table 7 presents the results for each dimension calculated for the two institutions.

Table 7. Results for the Universities: UBI (Portugal) and UFPB (Brazil).

Dimension	UBI 2019		UBI 2020		UFPB 2019		UFPB 2020	
	M	F	M	F	M	F	M	F
Health	57.4%	42.6%	76.0%	24.0%	60.1%	39.9%	60.2%	39.8%
Empowerment	69.2%	30.8%	66.2%	33.8%	57.4%	42.6%	57.7%	42.3%
Education	54.6%	45.4%	58.1%	41.9%	69.7%	30.3%	71.2%	28.8%
Violence	50.0%	50.0%	50.0%	50.0%	70.0%	30.0%	70.0%	30.0%
Time	72.0%	28.0%	73.5%	26.5%	59.3%	30.0%	59.3%	40.7%
GEHEI	60.6%	39.4%	64.8%	35.2%	63.3%	36.7%	63.7%	36.3%
Std Dev	0.1653		0.1848		0.2107		0.2107	

Source: survey data.

When we analyze the GEHEI components individually, we realize that the greatest inequalities found in UFPB (Brazil) were in the dimensions Violence, which reached 70%

in both 2019 and 2020, and Education, which was 69.7% in 2019 and 71.2% in 2020, both unbalanced in favor of men. These results for Violence are in line with what we know of the national context, where gender-based violence presents itself as a serious problem and disproportionately affects women (Maito et al. 2019). Regarding Education, it is worrying to note a worsening, and therefore it is urgent to identify what is at its root.

On the other hand, the dimension that reveals greater equality is Empowerment, where in 2019 the value calculated for men is 57.4%, and in 2020, 57.7%. As the definition of the index establishes, the ideal situation is 50%/50% meaning power is equal for both sexes; however, from 52% it is already possible to consider relative equality, due to the standard deviation of 2% to be considered in the calculation. Thus, the value calculated for Empowerment is the closest to equilibrium for this institution. A possible justification for this fact is that salaries are fixed in this public institution in Brazil (component EP2, Table 4); the other justification is that, while men occupy more leadership positions in the technology areas, women do so in the humanities and social sciences, bringing some balance to this dimension. If is reason is the latter, it means UFPB faces gender horizontal segregation, and that demands intervention. The situation changed very little in each of the dimensions analyzed between 2019 and 2020.

When analyzing the individual dimensions for UBI, we realize that the greatest inequalities in 2019 are concentrated in the dimensions Time (72%) and Empowerment (69.2%), both disadvantaging women. In what concerns empowerment, this situation reflects the later entrance of women into an academic career. Only now, with the existence of a second and third generation of women in academia, are Portuguese women academics reaching the top levels of the career hierarchy (Associate and Full professor). In 2020, while the Time dimension revealed an increase, reaching 73.5%, the Empowerment dimension fell to 66.2%, revealing that the situation has become a little more balanced. We can see in more detail in the institutional data that this corresponds to cases of career progression of women (Sales Oliveira and Vilas Boas 2020).

The Time dimension worsening at UBI is concerning. The existent data do not allow us to strictly identify the causes of this worsening situation, but it is probable that the pandemic context and the confinement requirements in terms of child and family care were important factors, since we can see in the institutional data that the propositions of leave taken by women workers increased. Unfortunately, data on the number of workers in telework were not made available (Sales Oliveira and Vilas Boas 2021).

On the other hand, the Health dimension, which stood at 57.4% in 2019, went to 76% in 2020; that is, this was the dimension where there was the greatest setback in terms of gender equality. Moreover, the figures reveal that the institution went from median inequality in 2019 to high inequality in 2020, as it is in the third quartile, which starts from 66%.

The dimensions that showed greater balance in UBI were Violence (50%–50%), both in 2019 and 2020, and Education, 54.6% (2019) and 58.1% (2020).

However, it is important to remember that, as we discussed before, violence is still a rather invisible phenomenon at HEIs. In fact, the number of complaints at UBI have increased in the recent years, due to greater internal and national awareness of the problem. These complaints are probably a drop in the ocean of the real situation of violence and harassment (Sales Oliveira and Vilas Boas 2021).

We can see that the index makes it possible to reveal inequalities in various ways, either within the same period, where it makes it possible to evaluate its components and thus focus on which to address in order to obtain improvements, or in the sense of allowing a longitudinal follow-up, making it possible to follow progress from one period to the next.

5. Final Remarks

GEHEI is a framework that can easily assess gender inequality disparities in higher education institutions. It is a pioneering methodology, and it is an innovation in this area of studies because although nowadays several HEIs have defined gender equality policies,

there is no register in the literature of experiences of using a specific tool for measuring inequality in universities and only two recent proposals of indexes are available.

The GEHEI tool has a very strong theoretical basis in its conception because its dimensions and variables were incorporated from a bibliometric analysis about the more relevant gender equality indexes that resulted in a base of 37 papers.

These papers indicated that the main indexes used in the area are the Gender Inequality Index—GII; the Global Gender Gap Index—GGGI; Women, Business, and the Law—WBL; the Gender Equality Index—GEI; the Social Institutions and Gender Index—SIGI; and the Women's Empowerment Principles Tool—WEPs. From these indexes, the dimensions and variables of the proposed framework were captured using the technique of importance of use and triangulation of the data. In order to properly contextualize our instrument, we carefully reviewed the main references about the specific challenges of measuring gender inequality in academia. Later, we incorporated this knowledge into the design of our proposal.

The GEHEI frames five central dimensions: Health, Empowerment, Education, Violence, and Time with 21 variables, and is markedly different from the indexes from which it originated:

(1) Despite the GII indexes GGGI, WBL, GEI, SIGI, and WEPs being consecrated, they are not the best choice for measuring gender inequality in higher education institutions due to their complexity; instead, they are adequate for nations and require a large and complex number of measurements, with a lot of research time;
(2) The GEHEI shows in a user-friendly way if there is inequality in higher education institutions, because all research is summed up in a single number;
(3) The GEHEI allows a longitudinal follow-up, making it possible to follow the progress from one period to the next;
(4) The very way of handling the GEHEI tool is very simple because it is an assignment of percentage values to the variables.

It is also very different from the two existent proposals of gender inequality indexes for HEIs, since its scope goes beyond the narrower and more specific approach of educational and management dimensions, choosing to address university community from a holistic perspective.

In the test cases that were performed, the application of GEHEI in UBI (Portugal) and UFPB (Brazil) showed the efficiency and ease of the tool, where it pointed out that both universities present gender inequality in the first instance.

However, when the results are analyzed variable by variable, UBI presented high inequality in the dimensions Health, Empowerment, and Time, and UFPB shows high inequality in the dimensions Education and Violence. It is important to keep in mind that these results must be read in the specific context of each institution. The GEHEI index aims to be a user-friendly instrument to inform what is the point of situation of both men and women in the five dimensions.

The instrument cannot show the determinants of inequality, it simply points out what is the situation for both sexes and where inequality is more present. Then, once the GEHEI is used, the possibility of further investigations in the institutions for the analysis of causes and possible solutions should be conducted. In the two case studies conducted, the application of GEHEI raised the existence of several points of deterioration from 2019 to 2020 that need to be addressed internally.

Understanding the meaning of the index needs to be emphasized in the academic community where it is applied, so that its results can be shared in the community and inform action for strategic change. The index needs to make sense in the specific organizational context, including dimensions that faithfully represent the multiple aspects of the institutions and are able to promote the construction of equality. Only in this way can it effectively show where problems and inequalities exist and where it is necessary to intervene. The existence of and access to organizational data is a key point for the success of the instrument. In the cases where fewer data are available, the results will necessary be statistically weaker. This

has conditioned the authors to introduce only data that are available more frequently in the academic context. Improving availability of HEI organizational data in the future will allow improvement of the index.

In future research, new case studies will be necessary to perform a finer measurement of the limits measured in this research. The obstacles and impacts of concrete experiences of introducing this tool will also bring central contributions to improving the index framework.

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Notes

[1] Available online: For more information, see https://eige.europa.eu/gender-mainstreaming/toolkits/gear/step-step-guide/step-5 (accessed on 8 August 2021).

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