

UGII – University Gender Inequality Index.

A proposal from the University of Bologna

by

Gian Piero Mignoli¹

Benedetta Siboni^{2*}

Pasqua Rignanese²

Camilla Valentini¹

Tullia Gallina Toschi³

*Corresponding author, benedetta.siboni@unibo.it

¹ Control and Finance Division, University of Bologna, Bologna, Italy ² Department of Management,

University of Bologna, Campus of Forlì, Forlì, Italy ³ Department of Agricultural and Food Sciences,

University of Bologna, Bologna, Italy

KeyWords: University; Gender Equality; Equal Opportunities; Vertical Segregation; Horizontal Segregation;
Likely pipeline; Ceiling Glass Index; Gender Inequality Index; UGII; Index number; Gender Domains; Male
advantage; Female Advantage; Cramer's V index; Gender Report; University benchmarking; University of
Bologna

21 Abstract

22 While universities have been considered gender neutral, being organisations in which merit should prevail,
23 several reports denounce the under-representation of women worldwide. According to the European
24 Union this current under-representation results in a waste of female talent and, thus, prevents the
25 achievement of the European Research Area's objective of Excellence in Research.

26 Several gender indexes have been proposed to measure "gender equality" in countries, while only one
27 addresses university. However, it primarily focuses on academics, thus neglecting non-academic staff and
28 students.

29 This paper aims to propose a new index formulated to measure and rank "gender inequality" at
30 universities: the University Gender Inequality Index (UGII). This index results from the determination of 9
31 domains and 25 aspects measured by 25 indicators, considering academic staff, technical-administrative
32 staff and students. Domains include both endogenous and exogenous aspects, but UGII builds on
33 endogenous ones that universities can directly influence. All indicators come from existing databases, thus
34 assuring its replicability over different universities as well as its sustainability.

35 Using index numbers, UGII measures the distance between the situation of gender inequality performed by
36 the university and the maximum level of inequality that can be recorded with regard to each domain. This
37 gives the "real" situation of domains with male or female advantage, thus indicating directions in which to
38 intervene to university governing bodies. Finally, synthesising index numbers calculated with reference to
39 each domains, UGII gives a final score of the overall situation of gender inequality at the university,
40 allowing comparisons among different time horizons and with other universities.

41 This paper illustrates the methodology to calculate the UGII and its application with regards to the
42 University of Bologna, and tests it for significance and completeness.

43 Introduction

44 Even if gender equality is a general principle enshrined by several reports [e.g. 1, 2] and generally accepted
45 by most countries in the world, equality between women and men is still far from being reached. Inequality

46 mostly affects women, involving lower employment rates, lower incomes and gender wage gaps, lower
47 empowerment, an unequal distribution of care-giving and family responsibility and scant participation in
48 policy-making, which sometimes borders on violence against women [e.g. 3]

49 Reasons to reduce or eliminate gender inequality have been attributed to two main factors [e.g. 4, 5].
50 Firstly, ethical issues: inequalities must be corrected because it is right, regardless of their possible
51 consequences. Secondly, utilitarian reasons: systems and countries in which gender inequalities are lower
52 are best placed with regards to different socio-economic indicators; therefore, pursuing the goal of gender
53 equality should lead to increase the economic, social and cultural level of the situations considered.

54 In order to encourage gender equality it is essential to identify a measure of the domains producing the
55 current situation of inequality. According to the OECD [6], there is a strong inequality picture in labour
56 participation. In fact, women are 1.4 times more than men more likely to become neither employed nor in
57 education or training. More than half of women ascribe their inactivity to care-giving and family
58 responsibilities, highlighting that women still remain the principal figure responsible for looking after
59 children, elderly parents and people with special needs, as well as housework. Furthermore, the OECD [7]
60 accounts for a gender wage gap of 14.1%, indicating the difference between median earnings of men and
61 women relative to median earnings of men holding a full-time employment contract or a self-employed job.

62 Finally, Jalalzai's [8] study indicates that from 1960 to 2002, just 44 women had held their country's highest
63 political office and of these only 17 women served as their nation's President.

64 A similar inequality situation reverberates in a university context, where one of the main features concerns
65 the increase in women's education with females normally performing better than males [9]. Although
66 females globally enrolled at university have surpassed males in almost all developed countries and in half of
67 developing countries, women academics account for just around 30% of academic staff, thus signalling an
68 increase compared to previous decade, but still far from parity [e.g. 10, 11].

69 Both horizontal and vertical segregation phenomena affect women at university. On the one hand,
70 horizontal segregation indicates that female students typically enrol at degrees in humanities, while very
71 few enrol at Science, Technology, Engineering and Mathematics (STEM) [9], hence influencing their future

72 career. For instance, in Europe, on average, in 2013 female students enrolled in science and engineering
73 account just for 31%, showing no change since the previous data recorded in 2007. In addition, in such
74 fields, women in grade A (full professors) represent only the 13% of the total [11]. On the other hand,
75 vertical segregation contrasts women entering and advancing in career. With regards to Europe, whilst the
76 overall proportion of women enrolled at university in 2013 was 55%, and graduates accounting for 59%, the
77 proportion of female PhDs fell below the proportion of men, at 46%. The decline of women's participation
78 as academic staff further progresses with advances in careers. In fact, women at grade C (researchers)
79 account for 45%, at grade B (associate professors) for 37% and at grade A for only 21% [11]. This
80 circumstance is also known as the "likely pipeline", indicating the progressive loss of women in the
81 transition from lowest to top position. To account for this phenomenon, the Wall Street Journal [12]
82 proposes the Glass Ceiling Index to account for the difference of probability of women and men to reach
83 the highest position of career.

84 The European Union denounced this situation as resulting in a waste of female talents, thus preventing the
85 achievement of the European Research Area's objective of Excellence in Research [13]. Consequently, since
86 the end of the 1990s, the European Union has engaged in several initiative aimed to monitor gender
87 distribution and support the adoption of gender equality plans by universities [14].

88 Drawing from such a context, literature on gender inequality has widely developed, focusing on the analysis
89 of reasons causing this disparity. For instance, several studies report that women do not have the same
90 career opportunities compared to men because they have to combine work with family and life
91 responsibilities [e.g. 15]. In particular, in academia, it was highlighted a gendered effect that the pressure
92 for mobility has on career advancement and work-life interference, and the need for dual career services
93 to respond to the needs of the growing population of dual career couples [e.g. 16, 17]. In addition, Aidis
94 and Weeks [18] stated that business measures worsen the extant gender inequality situation by giving
95 enterprise development supporting actions that are not gender neutral. Moreover, Chiao *et. al* [19]
96 highlight that women in politics are strongly affected by stereotypes.

97 With reference to the university context, according to Thanacoody *et al.* [20] women in academia have
98 been often marginalised since they are a part of a traditional male dominated environment. Moreover,
99 Frattini and Rossi [21] and Santos [22] highlight that in the academic career women encounter more
100 obstacles than men, discouraging them to enter and advance, thus determining their current under-
101 representation.

102 Women's discrimination in academia is often implicit and therefore it remains invisible, and the women
103 who are the victims do not realise it. According to Symonds *et al.* [23], extant indexes to evaluate the
104 quality of research produced by scientists are biased against females. In fact, indexes favour a high number
105 of publication (where men exceed women), although the higher productivity does not necessary mean a
106 higher quality of research performed. To counter this bias, the author suggested considering an adjustment
107 of the total impact factor. Further, Ghiasi *et al.* [24] analyse research outputs of women and men who are
108 engineers, finding that women publishing papers in journals with higher impact factors than males usually
109 receive lower recognition in terms of citations by the scientific community.

110 The issue of gender inequality is important not only for ethical and moral reasons, but also because it is an
111 important economic, business and societal issue with significant impact on the growth of nations [4, 25]. In
112 doing so, Baslevent and Kirmanoglu [5] argue that the more a culture is egalitarian by gender, the greater is
113 its improvement in productivity and economic growth.

114 The starting point in reducing gender disparity is to measure it to increase awareness. For this purpose, a
115 gender index can be useful first to promote the analysis of domains producing inequality and second to
116 summarise them in one number that is easily understandable and interpretable [26]. Accordingly, several
117 indexes have been proposed to account for gender in/equality focusing at the country level. These indexes
118 are increasingly being used to provide comparison among countries and ranks them with reference to
119 general or specific inequality domains [27]. Consequently, countries have been encouraged to adopt
120 measures to address inequality to increase their "prestige" in international ranks. Furthermore, the indexes
121 can suggest specific domains and aspects causing inequality, thus guiding policymakers to make
122 interventions [28].

123 Only two indexes have been proposed to measure gender in/equality at the organisational level. The first
124 refer to firms [29], and the second to universities [30]. However, the latter only takes into account
125 academics, thus neglecting the measurement of gender in/equality with reference to non-academic staff
126 and students.

127 The current paper aims to bridge this gap by proposing a new index, the University Gender Inequality Index
128 (UGII), to measure “gender inequality” at universities, considering the overall domains of this context to
129 both promote awareness about existing gender inequality and to encourage governing bodies to remove its
130 causes. All indicators included to calculate UGII come from existing databases, thus assuring its replicability
131 over different universities as well as its sustainability. A gender index will contribute both to lighten the
132 hard work of drafting gender equality annual reports and to encourage their analysis and comparability by
133 analysts by giving an instrument much more effective that will express in few pages the situation of gender
134 inequality and used as benchmark to other institution.

135 The paper is organised as follows. The following section outlines the gender in/equality indexes proposed
136 by the literature. Section 3 proposes the methodology to calculate the UGII. Section 4 describes the
137 assessment of UGII at the University of Bologna (UNIBO). Finally, Section 5 provide conclusions from the
138 study.

139

140 Gender in/equality indexes

141 Over the last decades the number of gender indexes proposed has significantly increased, demonstrating
142 the importance of this tool to measure inequality. Most indexes address countries, some giving an overall
143 measure of gender gap in the country, with others giving a measure of gender gap with regard to specific
144 domains (e.g. labour market, health, empowerment). Some global indexes compare all countries
145 worldwide, while other indexes compare only countries with similar socio-economic contexts. Table 1
146 shows indexes proposed according to their context of reference.

147

148 **Table 1. Gender Indexes**

INDEX	PROPONENTS	FOCUS
CONTEXT: COUNTRY (Global)		
GGGI <i>Global Gender Gap Index</i>	WEF – World Economic Forum	Overall gender equality
GEI <i>Gender Equity Index</i>	SW – Social Watch	Overall gender equality
GDI <i>Gender Related Development Index</i>	UN – United Nations	Overall gender equality
GII <i>Gender Inequality Index</i>	UN – United Nations	Overall gender equality
GEM <i>Gender Empowerment Measure</i>	UN – United Nations	Overall gender equality
WEOI <i>Women's Economic Opportunity Index</i>	EIU – Economist Intelligence Unit	Politics and economics
GGLMI <i>Gender Gap Labour Market</i>	Castellano and Rocca (2014)	Labour market
Gender GEDI <i>Gender Global Entrepreneurship and Development Index</i>	GEDI - Global Entrepreneurship and Development Institute	Female entrepreneurship
SIGI <i>Social Institutions Gender Index</i>	Branisa et al. (2009)	Societal practices and legal norms
CONTEXT – COUNTRY (Similar Socio-Economic Context)		
EUGEI <i>European Union Gender Equality Index</i>	Plantenga et al. (2009)	European Union's countries
EIGE-GEI (Γ - Gamma) <i>Gender Equality Index</i>	EIGE – European Institute for Gender Equality	European Union's countries
IGGI <i>Italian Gender Gap Index</i>	Bozzano (2012)	Italian regions
CONTEXT - ORGANISATION		
OGGI <i>Organizational Gender Gap Index</i>	Sörlin et. al (2011)	Firms
UNIPD-GEI <i>Gender Equality Index for academic institutions</i>	Badaloni and Perini (2016)	Universities

149

150 Among the overall global indexes, the most mentioned is the GGGI, which was provided by the World
151 Economic Forum to quantify the gender gap for all countries of the world [31]. In doing so, GGGI compares
152 144 countries and accounts for their progress toward gender equality. This index is built on 4 domains
153 (Economic Participation and Opportunity, Educational Attainment, Health and Survival, and Political
154 Empowerment) measured *via* 14 indicators. GGGI is the result of the average of the values obtained using
155 the 4 domains, giving a final number between 0 and 1 (0 = maximum inequality, 1 = maximum equality).

156 The GEI was formulated in 2007 by Social Watch to monitor the evolution of gender inequality worldwide
157 (<http://www.socialwatch.org/taxonomy/term/527>). This index is composed of 3 domains: Education,
158 Economy and Political Empowerment. The value of the index is between 0 and 100 (where 100 represents
159 the ideal situation of perfect equity).

160 The United Nations has established the United Nations Development Program (UNDP) to eradicate poverty
161 and reduce inequalities and exclusion [32]. For the application of this program, 3 gender indexes were
162 formulated to measure human development: GDI, GII and GEM. GDI is composed of indicators measuring
163 the following domains: Long and Healthy Life, Knowledge and Standard of Living. The greater the
164 inequalities the greater the loss in terms of human development. While GDI is more appropriate for
165 underdeveloped countries, the GII is more suitable to developed countries by enquiring the following
166 domains: Health, Empowerment and Labour Market. Finally, GEM focuses on the possibility for women to
167 obtain specific levels of power, analysing the following domains: Political Participation, Economic
168 Participation and Decision Making and Power over Economic Resources.

169 In order to examine inequality gender issues in detail, several indexes devoted to specific domains have
170 been proposed. The WEOI provided by the Economist Group measures the existence of equal opportunities
171 for men and women in politics and economics [33]. This index includes an analysis of labour policy and
172 practice, access to finance, education and training, women's legal and social status and finally the general
173 business environment. The GGLMI compares countries to the participation and condition of labour market,
174 horizontal and vertical segregation, incomes and discriminations [28]. The Gender GEDI analyses the
175 development of female entrepreneurship [34]. Finally, the SIGI proposed by Branisa *et al.* [35] focused on
176 societal practices and legal norms that produce inequalities between women and men in non-OECD
177 countries.

178 According to Plantenga *et al.* [36], the construction of an index for countries with similar socio-economic
179 context gives policy makers more information about the aspects on which to intervene, despite considering
180 an overall index. Accordingly, this study proposes the EUGEI as opposed to global indexes, considering only

181 countries within the European Union. This index is composed of 4 domains: Equal sharing of Paid Work,
182 Money, Decision Making, Power and Time. This information gives policy makers the instruments to
183 intervene with specific policies for reduction of inequality and enables monitoring the results and impact of
184 policies over time. With the same aim, the EIGE-GEI has been developed by the Institute for Gender
185 Equality. It considers the following domains: Work, Money, Knowledge, Time, Power, Health, Intersecting
186 inequalities and Violence [37]. Lastly, Bozzano [26] proposes the Italian Gender Gap Index (IGGI) to
187 evaluate the territorial distribution of gender inequalities among Italian regions. This index drawn from the
188 GGGI, modifying some aspects to adapt them to the Italian context.

189 Only two indexes have been formulated to measure gender equality at organisations. A study by Sörlin *et.*
190 *al* [29] proposes the OGGI, which aims to provide a practical tool to collect parameters related to
191 businesses. OGGI enquires 3 domains (Power and Influence, Economic situation and Unpaid Care and
192 Household Work) using 6 indicators. The study tested this index in two sectors which are computer and
193 grocery production, discussing gender difference emerging. Finally, the study by Badaloni and Perini [30]
194 proposed the UNIPD-GEI which is addressed to universities. This index is derived from the EIGE-GEI, but
195 revised in accordance to the university context. Consequently, the UNIPD-GEI considers the same domains
196 of EIGE-GEI (Work, Money, Knowledge, Time, Power, Health), and adds a new domain represented by
197 Space to detect the place of work. The analysis performed by Badaloni and Perini [30] refers to academic
198 staff members (including full and associate professors, assistant professors, research fellows and post-doc
199 fellows). This index has been tested at the University of Padua, collecting information from both existing
200 databases and from a survey.

201 In conclusion, it emerged that there is a strong prevalence of global indexes aimed to rank countries in
202 terms of gender equality to provide tools to program and control policy making. On the contrary, only two
203 indexes have been proposed to measure gender equality in organisations. In particular, only one index
204 addresses universities. However, that index focuses on academics, thus neglecting non-academic staff and
205 students which are hardly affected by vertical and horizontal segregations as mentioned in the previous

206 section, causing the same horizontal segregation found in academics. In addition, this index uses part of
207 information from surveys, thus limiting the sustainability of calculation about the future.

208 The current paper aims to bridge this gap by proposing a new index of gender inequality addressed to the
209 context of university, considering the overall domains and aspects of this context to promote awareness on
210 existing gender inequality and encourage governing bodies of universities to remove its causes.

211 UGII methodological notes

212 Methodological approaches of existing gender indexes

213 While existing gender indexes are defined with different aims and methodologies, these are constructed
214 with criteria that can be attributed to a common scheme that involves identification of a conceptual
215 framework for analysis the choices and the method selected that lead to the gender index formulation are
216 detailed. The conceptual framework develops through definition of a hierarchical structure containing the 7
217 main elements illustrated below.

218 Domains

219 Domains define a taxonomy of the aspects subject to detention. In some cases, the classification includes
220 only one level while in other cases the structure also includes sub-domains. For example, the EIGE-GEI
221 analyses 6 domains (Work, Money, Knowledge, Time, Power and Health), structured *via* 12 sub-domains (2
222 for each domain).

223 Selection of elementary variables

224 The gender index is a summary of elementary scores, each of which has the purpose to define the extent of
225 inequality of a single aspect. In the construction of the gender in/equality index, based on the structure
226 described by the domains and potentially by the sub-domains, the elementary variables are selected and

227 used to calculate scores. For example, the definition of the GGGI the domain “Economic Participation and
228 Opportunity” includes participation in the labour market in which the elementary variable is identified in
229 the categories “employed” and “unemployed”, where the population as is the workforce (those over 15
230 years old employed or looking for employment).

231 Definition of the elementary gender gap indicator

232 The elementary indicator is a numeric value selected to represent the gap between men and women with
233 reference to the corresponding variable. The most frequently used instrument adopted to evaluate this gap
234 is the index number “women/men x 100”, which is the ratio (multiplied by 100) between the data collected
235 for women and for men. With regards to the employment ratio included in the GGGI for the 2017, the
236 World Economic Forum shows that in Italy the value of this ratio is 54.3% for women and 73.7% for men.
237 Consequently, the elementary indicator (index number “women/men x 100”) is 73.6% (54.3%/73.7%).

238 Elementary indicator and elementary score

239 In most cases, the elementary score – which is the value used for each aspect for calculation of the final
240 gender index – is not the gender gap elementary indicator, but rather its transformation. In fact,
241 sometimes, the elementary indicator is re-scaled (for example, such that the result of the country with the
242 highest inequality situation corresponds to 0 and the result of the country with the lowest value of gender
243 inequality corresponds to 100).

244 How to consider the female-advantage inequality?

245 The solutions for calculation of the total gender index are related to one of the three following possibilities:

246 1) treating the gender inequalities ignoring their “sign”. For each aspect considered, we measure the
247 extent of the inequality but, in the calculation of the total index, gender penalised in the single aspects is
248 not taken into account;

249 2) calculating the elementary score only for aspects in which women are disadvantaged and equalise
250 female-advantage inequality to cases of perfect gender equality.

251 3) considering the gender advantaged for every aspect and, in calculation of inequality, at the total
252 level or domains level, indicating the measure of both the male-advantage and female-advantage.

253 Measuring equality or inequality?

254 The construction of the total gender index can be structured in a way in which the index increases with the
255 increase of the equality, or alternatively, the index increases with an increase in inequality. In the first case,
256 the index is named with terms like “equity” or “equality” and the perfect gender equality condition
257 corresponds to the maximum possible (1 or 100); in the second case, instead, the name of index contains
258 the terms “inequality” or “gap” and the perfect gender equality condition is represented by the value 0.

259 Total gender index as summary of the elementary scores

260 As stated, the overall result is a summary (average value) of the single elementary scores. The most widely
261 used average value is the arithmetic average, but the geometric and harmonic averages, as well as
262 combinations of different averages, are also used. In some cases, the averages are simple scores but can be
263 also weighted. The weights are selected through different criteria: for instance, the choice adopted for
264 calculation of the EIGE-GEI provides assignment of weights operated by an expert team that proceed
265 through the technique of using weights inversely proportionate to the standard deviation of the scores for
266 the single countries (in this way a same numerical distance between two elementary scores has a higher
267 weight if the countries tend to have similar scores for the aspect taken into consideration).

268 The construction of UGII

269 The common scheme described in the previous section has been maintained to define, *mutatis mutandis*,
270 the construction of the University Gender Inequality Index (UGII) of the University of Bologna.

271 To develop the conceptual framework for the UGII we considered the following mainstreams:

- 272 – recommendations on equal opportunities by gender included in the Italian Constitution (Art. 3) and
273 in the University of Bologna Statute;
- 274 – comparability of information across space and time. In fact, the index uses data available for
275 different Universities that is periodically collected.

276 Both the Constitution and the University Statute, as can be seen in extracts listed below, consider gender
277 equality as a fundamental principle.

278 From the Italian Constitution (Art. 3):

279 *All citizens have equal social dignity and are equal before the law, without distinction of sex, race,*
280 *language, religion, political opinion, personal and social conditions. The responsibility of the*
281 *Republic is to remove the economic and social obstacles, which, by limiting the freedom and*
282 *equality of citizens, prevent the full personal human development and the effective participation of*
283 *all workers in political, economic and social organization of the country.*

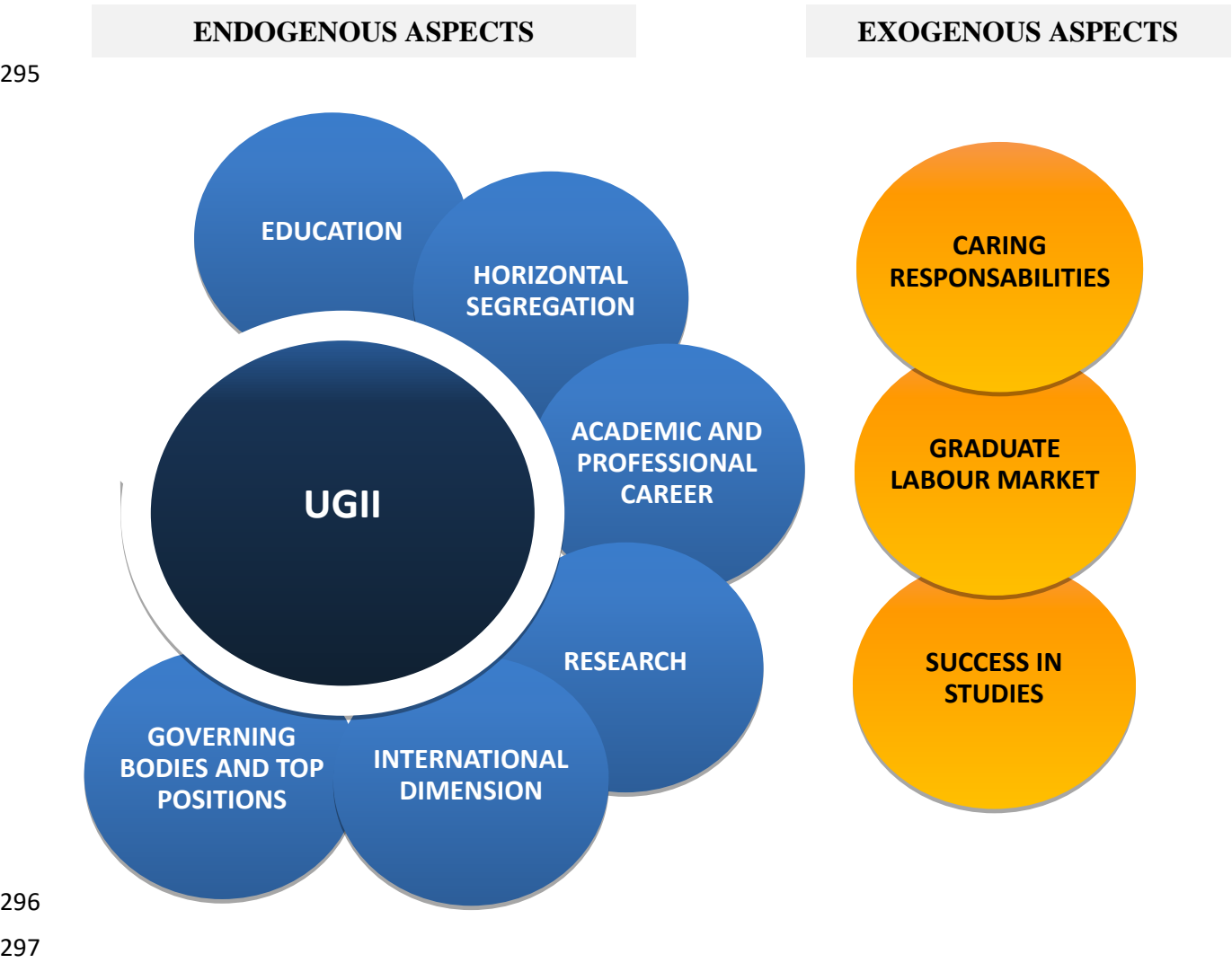
284 From the University of Bologna Statute (Art. 2.6, First Part):

- 285 *a) The University commits to guarantee respect for the constitutional principle of equal*
286 *opportunities in access to studies, staff recruitment and career progression and balance gender*
287 *representation in candidacies and collegial bodies, as well as in every other aspect of academic life.*
- 288 *b) The University works, also through appropriate tools and initiatives, to strengthen the sensitivity*
289 *on the issues and problems of equal opportunities in order to generate a widespread and shared*
290 *awareness among all the members of the university community.*

291 Domains

292 UGII considers the following 9 domains to measure inequality with reference to all members of academic
293 community (students, faculty members and technical-administrative staff) (Fig 1).

294 Fig 1. Domains of UGII



298 The index considers 6 endogenous and 3 exogenous domains. The former includes those aspects on which
299 the University has the possibility to directly intervene. The latter relates to aspects in which the university
300 can intervene only indirectly. In particular, exogenous domains include “Success in studies”, which refers to
301 acquisition of credits and the average grade of students earned in tests. The reason why the inclusion of

302 this domain in exogenous aspects is that the gender differences that occur in terms of educational
 303 performance are already widely identifiable in the pre-university school career and also depend on
 304 motivational factors. As will be seen, the results about exogenous domains will be calculated; however,
 305 they will not contribute to the determination of the UGII.

306 Selection of elementary variables (aspects)

307 The 9 domains are measured via 25 aspects shown in Table 2. Of the 25 aspects, 19 have positive meaning
 308 (represented by positive sign), reflecting a desirable condition, 3 have neutral meaning and 3 have negative
 309 meaning (represented by negative sign), referring to potentially critical situations.

310 **Table 2. Aspects of UGII**

DOMAINS	Indicators (Reference Population)	Indicators (Total Population)
ENDOGENOUS ASPECTS		
EDUCATION		
<i>Access to University</i>	Students enrolled in bachelor's and single cycle degree in UNIBO 2017/18	18-year-old students in 1° January 2017 residents in Region Emilia-Romagna
<i>Dropping out of studies at the end of the 1st year</i> ⬇️	Students enrolled in bachelor's and single cycle degree in UNIBO 2016/17 who drop out the studies at the end of the 1st year	Students enrolled in bachelor's and single cycle degree in UNIBO 2016/17
<i>Continuing studies (master level) after bachelor's degree</i>	Students graduated in bachelor's degree in UNIBO 2016 interviewed and enrolled in a master's degree 1 year after graduation	Students graduated in bachelor's degree in UNIBO 2016 interviewed
<i>Access to PhD</i>	Students enrolled at the 1st year of PhD courses in UNIBO cycle XXXIII (2017/18)	Students graduated in bachelor's degree and single cycle degree in Italy in 2016
HORIZONTAL SEGREGATION		
<i>Degree courses</i>	Students enrolled in bachelor's and single cycle degree in UNIBO 2017/18 – STEM fields	Students enrolled in bachelor's and single cycle degree in UNIBO 2017/18
<i>PhD</i>	Students enrolled in 1 year of PhD courses in UNIBO cycle XXXII (2017/18) – STEM fields	Students enrolled at 1st year of PhD courses in UNIBO cycle XXXII (2017/18)
<i>Professors</i>	Professors in UNIBO 2017 Area STEM	Professors in UNIBO 2017
ACADEMIC AND PROFESSIONAL CAREER		
<i>Full Professors</i>	Full professors in UNIBO 2017	Professors in UNIBO 2017
<i>Managers/High Profession Levels (EP)</i>	Managers and TA staff in high profession levels (EP) at UNIBO 2017	Managers and TA staff in UNIBO 2017
RESEARCH		
<i>Responsible of funded competitive</i>	Professors in UNIBO as responsible of projects	Professors in UNIBO 2017

<i>research projects</i>	2017	
<i>Amount of funds of competitive research projects</i>	Professors in UNIBO as responsible of projects with amount of funding greater than the median amount	Professors in UNIBO as responsible of projects 2017
<i>Professors with publications</i>	Professors in UNIBO 2017 with publications greater than the median number of area	Professors in UNIBO 2017
INTERNATIONAL DIMENSION		
<i>Studies abroad – ‘exit mobility’</i>	Students enrolled in UNIBO who participated in the programs in 2016/17	Students enrolled in UNIBO 2016/17
<i>Professors with international publication</i>	Professors in UNIBO with international publications in 2017	Professors in UNIBO in 2017
GOVERNING BODIES AND TOP POSITIONS		
<i>Members of governing bodies – students</i>	Students as members of bodies in UNIBO 2017	Students enrolled in UNIBO 2017/18
<i>Members of governing bodies – professors</i>	Professors as members of bodies in UNIBO 2017	Full and associate professors in UNIBO 2017
<i>Dean of schools and directors of departments</i>	<i>Dean of schools and directors of departments</i> in UNIBO 2017	Full Professors in UNIBO 2017
<i>Members of governing bodies – TA staff</i>	TA staff as members of bodies in UNIBO 2017	TA staff in UNIBO 2017
EXOGENOUS ASPECTS		
SUCCESS IN STUDIES – degree courses		
<i>Acquisition of credits</i>	ECTS obtained in the 1st year by students enrolled in master’s and single cycle degree in UNIBO 2016/17 and still enrolled in 2017/2018	ECTS expected in the 1st year by students enrolled in master’s and single cycle degree in UNIBO 2016/17 and still enrolled in 2017/2018
<i>Grade point average</i>	Students enrolled in bachelor’s and single cycle degree in UNIBO 2016/17 with exams in the 1st year with a grade point average greater than the median grade in degree courses	Students enrolled in bachelor’s and single cycle degree in UNIBO 2016/17 with exams in the 1st year
GRADUATE LABOUR MARKET – 5 years after the graduation		
<i>Occupation</i>	Students graduated in master’s and single cycle degree in UNIBO 2012 who work	Students graduated in master’s and single cycle degree in UNIBO 2012
<i>Use of skills acquired with the degree</i>	Students graduated in master’s and single cycle degree in UNIBO 2012 who use in a high extent the skills acquired with the degree	Students graduated in master’s and single cycle degree in UNIBO 2011 who work
<i>Part-time job</i> ↓	Students graduated in master’s and single cycle degree in UNIBO 2012 with part-time job	Students graduated in master’s and single cycle degree in UNIBO 2012 who work
<i>Income</i>	Students graduated in master’s and single cycle degree in UNIBO 2012 who work for net monthly earns > 1500€	Students graduated in master’s and single cycle degree in UNIBO 2012 who work
CARING RESPONSABILITIES – TA staff		
<i>Absence from work for caring responsibilities</i> ↓	Days for caring responsibilities by TA staff in UNIBO 2017	Total days of TA staff in UNIBO 2017

↓ Categories indicative of a potential disadvantaged situation.

311 Definition of the gender gap elementary indicator

312 It should be noted that the 25 aspects examined are two-mode category variables and consequently those
313 cases counted by gender together with the elementary variable considered on a case-by-case basis, leads
314 to two-to-two joint frequency distribution. In other words, for the calculation it is sufficient to know the
315 number of women and men included in the reference population and the number of women and men
316 included in the corresponding total population.

317 The elementary indicator chosen to represent the gender gap is index number “women/men X 100”. For
318 example, since the percentage of female full professors among the total of women professors is only 16%,
319 whereas male full professors are 31.5% of all male professors, the index number “women/men X 100”,
320 relatively to the presence of full professors is 51, i.e. $16.0\%/31.5\% \times 100$. The elementary indicators for
321 each aspect considered in the gender analysis are shown in Table 2.

322 The interpretation of the index number “women/men X 100” is quite smooth. The value “100” represent
323 the perfect situation of gender equality: the percentage of individuals of the reference population,
324 compared to the total population, is the same for men and women. There is a value less than 100 when
325 women are relatively less present than men in the reference population, whereas there is a value greater
326 than 100, conversely, in the situation of overrepresentation of women. The greater the value of the index
327 deviating from 100 – in one direction or other – the greater the gender inequality will be.

328 Obviously, the “valence” of the reference category should be considered in interpretation of results.
329 Indeed, an index number value greater than 100 means a male advantage only if the reference population
330 corresponds to an advantage situation (such as the full professor case), whereas if the reference has
331 “negative” valance (such as the case of university school dropout) a value greater than 100 means that men
332 are penalised.

333 Elementary indicator and elementary score

334 The index number “women/men X 100” is a good measure to describe the gender gap relative to each
335 aspect and allows immediate comparisons of both time (how the gender gap varies, for the same aspect

336 over the years) and space (how the gender gap varies between universities). The indicator has some
337 limitations in comparison of the level of gender inequality in response to changes in the aspects
338 considered. For example, regarding the unemployment rate of graduated students at 5 years after
339 graduation, the University of Bologna (survey 2017) measures an unemployment rate of 87% for women
340 and 91% for men. Consequentially, the index “women/men X 100” is 96 and therefore there is a only slight
341 gender gap as it is very close to 100. Nevertheless, if we consider the complementary situation, the gender
342 gap appears greater because women unemployed graduated students are 13% in contrast to 9% for the
343 men with an index “women/men X 100” very distant from 100 (i.e. 144). The apparent ambiguity results
344 from the fact that the index number considered suffers from the relative dimension of the reference
345 population compared to the total population and, consequently, the result obtained depends on the choice
346 of the collective (in this case employed and unemployed graduated).

347 Because of these methodological considerations, in calculation of the total gender index we preferred to
348 include another measure rather than the elementary indicator “women/men X 100”: the percentage of the
349 highest possible inequality which assumes the role of the elementary score. Nonetheless, in the overall
350 explanation of the gender gap, this measure does not replace the elementary indicator, but adds to it. It
351 should be noted that the indicator “women/men X 100” and the elementary indicator are necessarily
352 concordant in the identification of the gender who is disadvantaged.

353 The percentage of the highest possible inequality used to calculate the University gender index results from
354 the instruments adopted in *statistical association* analysis. In this context, we measured the association
355 between gender and the elementary variable considered on a case-by-case basis. The result shows the
356 value of the gender inequality in the specific situation compared to the highest inequality that could
357 theoretically take place.

358 The example of the association between gender of the professor and professor’s category group, shown in
359 Fig 2, makes the meaning of the elementary score clear. The first three bars of the figure refer to the
360 effective distribution of professors in the University of Bologna by gender and profession level: men are

361 advantaged because they are more present than women (32% vs. 16%) in the category of full professors.

362 The second pair of bars shows how professors would be distributed if the relation of gender and

363 professional category was a statistically perfect independence relation (i.e. equity): the full professor would

364 be 25% of total professors between both women and men. Finally, the last pair of bars refers to the

365 opposite situation, the case of highest possible inequality, that would happen if all the 691 full professor

366 titles were assigned to men and the women would occupy only lower level professional categories. In

367 particular, there are two situations of highest gender inequality because, theoretically, all the 688 full

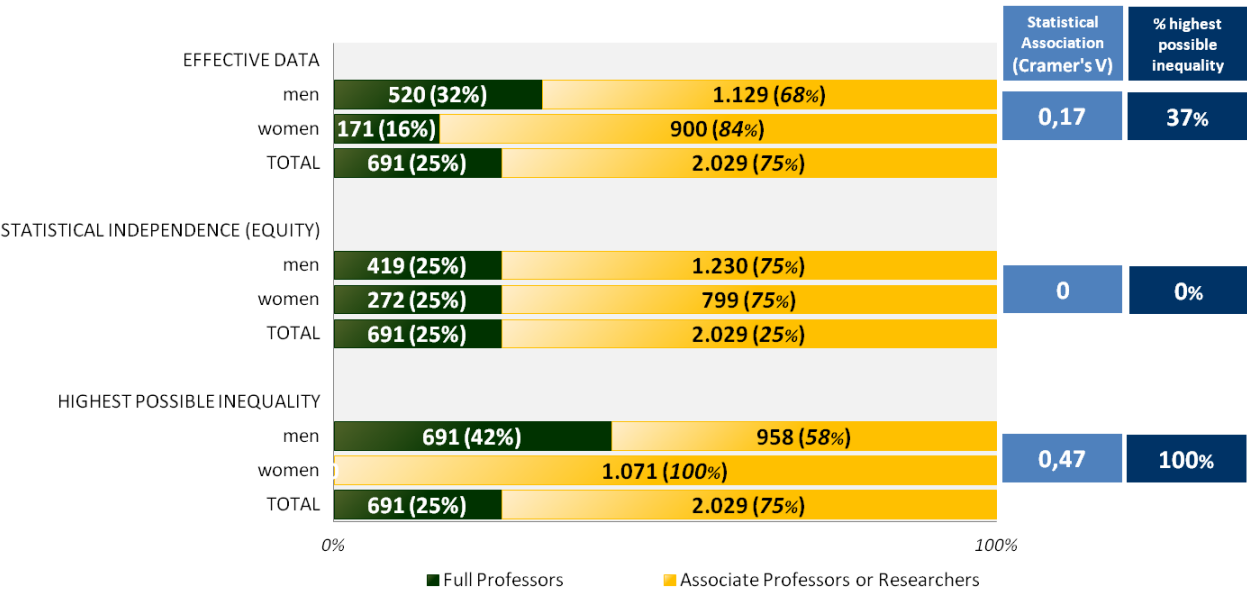
368 professor titles would be exclusively attributed to men but also to women. In this study, we considered,

369 between the two possible cases, the highest gender inequality situation that advantages the gender

370 effectively advantaged for the variables under consideration.

371 **Fig 2. Faculty staff of UNIBO by gender and role. Effective data, statistical independence hypothesis and**

372 **highest possible inequality hypothesis – 2017**



373

374

375 We can therefore consider two extreme situations: statistical independence, which is the perfect equity,

376 and the highest possible inequality; in both theoretical hypotheses, the total number of professors by

377 gender and the total number of professors by role correspond to the effective number.

378 Obviously, the level of gender inequality in reference to the presence of full professors is placed in an

379 intermediate position between the two extreme theoretical situations. To establish which of the two

380 hypotheses is closer to the concrete data Cramer's V index was used, which derives from calculation of chi-
381 square.

382 V index will assume a 0 value in the case of statistical independence and increases with an increase in the
383 the level of association as one moves away from the situation of independence. In the effective situation V
384 it is 0,17. Considering the numbers of professors by gender (1649 men, 1071 women) and by role (691
385 full professors, 2029 associate professors and researchers), the highest possible V index is 0.47, which
386 results if all 691 full professor roles would be assigned to male professors – so in the highest possible
387 inequality case (male advantage). The ratio between the effective V index (in this case: 0.17) and a value of
388 0.47 is 0.37: in other words, in reference to the possibility to gain the full professor position, the inequality
389 is 37% of the highest possible inequality for the male advantage. As detailed below, this is one of the
390 aspects that create the greatest disadvantage for women.

391 The highest inequality percentage enables comparison of the level of gender in/equality in the different
392 aspects considered. Cramer's V index assumes values between 0 and 1 and is a normalised index. The
393 reason for the gender analysis, of the choice of the percentage of the highest possible inequality rather
394 than the V index, is questionable. For simplicity, in this study we considered only the statistical association
395 between two dichotomous variables. The value index is 1 if and only if there is a perfect statistical
396 dependence, so if for each variable mode is associated only one of the other variable mode. In the case of
397 professors this means that:

- 398 - all men are full professors and all women are associate professors or researchers, or
- 399 - all women are full professors and all men are associate professors or researchers.

400 This means that the number of full professors coincides with the number of professors for one of the two
401 genders, that is that the marginal distributions of the two variables involved are perfectly superimposable.
402 Obviously, this is the case of none of the aspects considered in this study. Accordingly, we assumed perfect

403 dependence as an extreme situation for the purposes of analysing gender inequality. It was preferred to
404 refer to the highest possible inequality, which identifies the highest degree of inequality compatible with
405 the two effective marginal distributions. Note that if perfect statistical dependence occurs, there is also
406 maximum possible inequality, while the contrary is not true.

407 These considerations led us to the choice of this index as an elementary score for calculation of the final
408 gender index for the University.

409 How to consider the female-advantage gender inequality?

410 For each of the 25 aspects considered, the tool for measurement of gender inequality includes which
411 gender is advantaged and treats men and women in a symmetrical way.

412 Measuring equality or inequality?

413 The indicators grow with growth in the level of disparity, so that inequality is measured.

414 Total gender index as a summary of the elementary scores

415 The gender inequality analysis applied to the University of Bologna uses 25 scores, which represents the
416 entity of the gender inequality for each aspect. Largely (20 cases), the inequality is male-advantage, only in
417 5 cases is female-advantage. The average values of these scores thus needs to be defined, distinguishing
418 the results according to the advantaged gender.

419 The choice of the average value, between the possible values, to summarise the gender inequality
420 measures for each indicator implies:

421 1) identify which domains and aspects to compute;

422 2) establish the average value to adopt;

423 3) determine the weighting of each single score.

424 As noted above, the calculation of the measure of the UGII considers 6 endogenous domains, including 18
425 aspects. The 3 exogenous domains including 7 aspects are not taken into account in calculation of the UGII
426 because the gender inequality relative to these aspects are hardly attributable to the activities of the
427 University. The average adopted for the calculation is the arithmetic average; in this study, we calculated
428 both single inequality indexes – male-advantage and female-advantage indexes – for each domain and two
429 total inequality indexes – male-advantage and female-advantage. For the 3 domains excluded in the overall
430 calculation, we show the gender inequality on a domain level. In the weighting, the elementary scores are
431 considered equivalent. Therefore, both the gender inequality by domains and total gender inequality index
432 are the arithmetic average (not weighted) of the respective indicators associated to the aspects.

433 The determination of UGII at UNIBO

434 Meaning of the tool and interpretative guidelines of the results





435 Once the methodological aspects are explained, it is possible to illustrate the application of the UGII in a
436 case study referred to UNIBO. As stated, we have analysed the existence of the gender gap by comparing
437 the actual results with the (totally theoretical) situation of highest possible gender inequality. The greater
438 the percentage of the highest possible inequality realised, the greater the level of gender gap for the aspect
439 considered. The direction and intensity of this inequality are represented, in Table 3, through colour shades
440 (in red the female-advantage and in blue the male-advantage).


441


442

443

444 **Table 3. Gender Inequality at UNIBO: index number “men=100” and percentage of the highest possible**
445 **inequality**

DOMAINS Aspects	In percentage			women / men X 100	% of the highest possible inequality	
	men	women	TOTAL		Male advantage	Female advantage
Endogenous Aspects						
EDUCATION						
Access to University (for 100 18-year-olds in Emilia-Romagna)	32.1	44.5	37.9	139	–	15
Dropping out of studies at the end of the 1st year 	13.0	10.6	11.6	81	–	9
Continuing the studies after bachelor’s degree	63.9	54.7	58.6	85	13	–
Access to Doctorate (for 1000 graduated in Italy)	4.8	3.1	3.8	65	18	–
HORIZONTAL SEGREGATION						
Degree course	39.7	15.6	26.4	39	41	–
Doctorates	53.5	40.9	47.5	76	14	–
Professors	44.3	37.4	41.6	84	10	–
ACADEMIC AND PROFESSIONAL CAREER						
Full Professors	31.5	16.0	25.4	51	37	–
Managers/High Profession Level (EP) 	8.2	6.5	7.1	79	8	–
RESEARCH						
Responsible of funded competitive research projects 	13.2	11.4	12.5	86	9	–
Amount of funds of competitive research projects 	50.9	48.4	50.0	95	3	–
Professors with publications	47.4	43.3	45.8	91	5	–
INTERNATIONAL DIMENSION						
Studies abroad – ‘exit mobility’	3.6	4.7	4.2	129	–	14
Professors with international publication 	47.2	43.8	45.9	93	5	–
GOVERNING BODIES AND TOP POSITIONS						
Members of governing bodies – students (for 10.000 enrolled) 	6.3	3.9	5.0	63	21	–
Members of governing bodies – professors 	3.7	3.4	3.6	92	5	–
Dean of schools and directors of departments 	7.9	4.1	6.9	52	41	–
Members of governing bodies – TA staff 	14.2	8.4	10.4	59	19	–
Exogenous Aspects						
SUCCESS IN STUDIES – degree courses						
Acquisition of credits	69.7	75.5	73.0	108	–	9
Grade point average	46.2	51.1	49.0	110	–	6
GRADUATE LABOUR MARKET – 5 years after the graduation						
Occupation	90.8	86.8	88.5	96	20	–
Use of the skills acquired with the degree	50.5	44.7	47.2	89	6	–
Part-time job 	10.1	21.6	16.6	215	39	–
Income (more than 1.500 € net earns per month)	52.0	24.8	36.5	48	32	–
CARING RESPONSABILITIES – TA STAFF						
Absence from work for caring responsibilities 	1.1	2.8	2.2	259	51	–

 Categories indicative of a potential disadvantaged situation.

 male-advantage inequality

 female-advantage inequality

● Inequality with no statistical significance

446 As part of each aspect examined, the UGII is the result of a purely two-dimensional analysis that considers
447 only two variables (gender and the two-category variable which corresponds to the aspect of interest). In
448
449

450 each single situation, however, an in-depth study could be done including the other factors involved to
451 better clarify the causal process of the gender relationships below. A simple bi-dimensional comparison
452 shows, for example, that a male-advantage gender inequality of 20% of the highest possible gap occurs
453 between professors with regard to the chance to be responsible for research funded and competitive
454 projects. In this case, a refined analysis can be useful in considering the subject area, the role of the
455 professor and if all of these factors are explained, at least in part, the overall differences identified between
456 men and women.

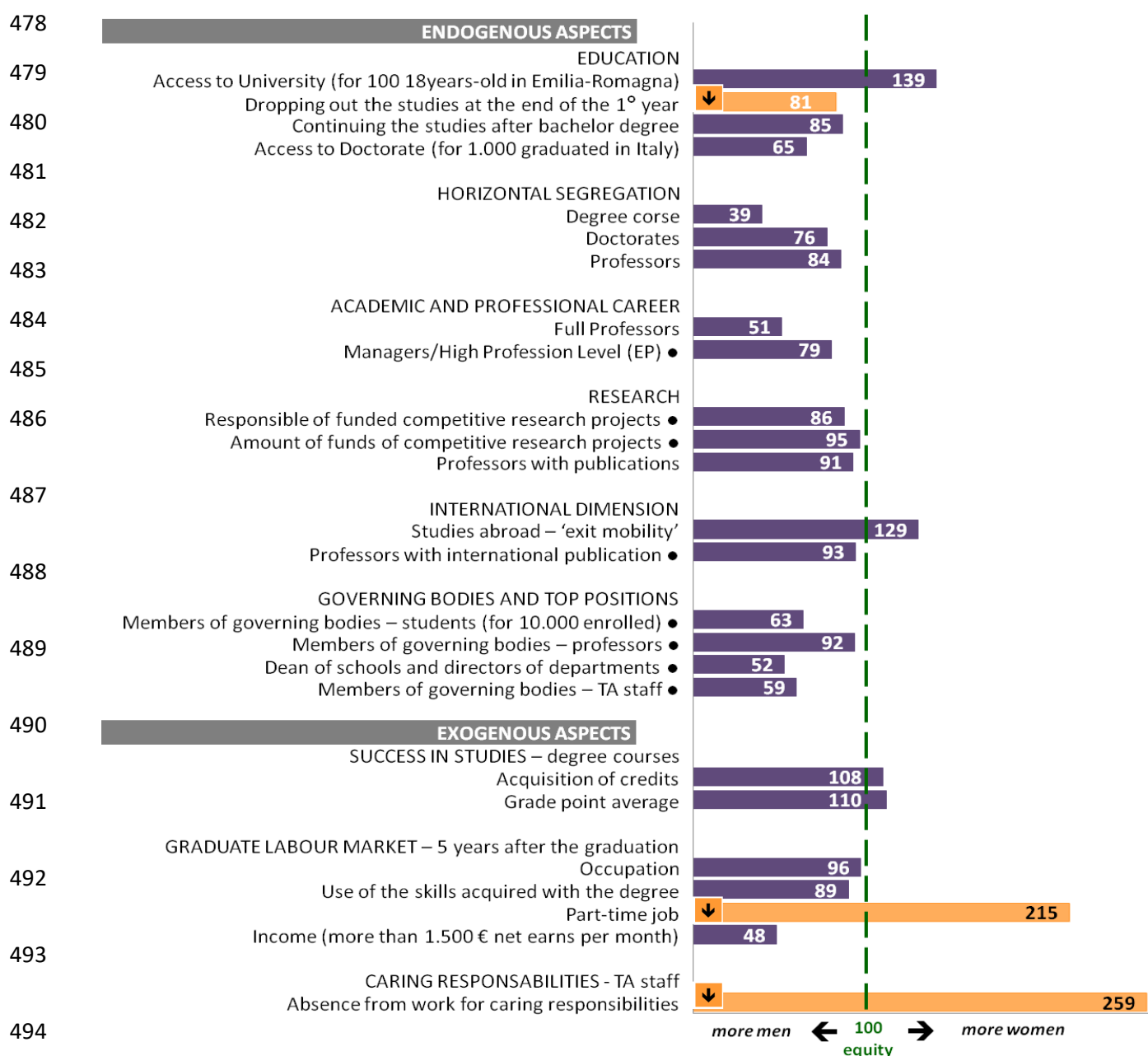
457 In the interpretation of results, the total population and the reference population, which is a subset of it,
458 should be taken into consideration. For example, for professors in the governing bodies of UNIBO, the total
459 population includes, in this case, full and associate professors. In percentage, faculty staff included in
460 governing bodies are 3.7% for men and 3.4% for women; the male-advantage is relatively low and
461 corresponds to 5% of the highest possible gender inequality. This does not mean that in the governing
462 bodies professors are close to numerical gender equality (in fact, there are 42 men and 21 women).
463 Instead, this means that the great male-advantage disparity in the high level of professor career also
464 remains in the governing bodies of the University.

465 In some cases, the relation with gender is not statistically significant. In other cases, there are minor
466 differences between men and women and the differences resolve no clear trend. This situation concerns,
467 for example, the domain “research”, for the aspect “amount of funds of competitive research projects”. In
468 other situations, indeed, there is a substantial gender gap but it does not reach statistical significance
469 because of the low number of cases; if the same phenomenon is detected in a longer temporal reference,
470 significant results would be obtained. This is the case of the domain “governing bodies and top positions” in
471 the aspects “students in governing bodies” or “technical and administrative staff in governing bodies” or
472 “Dean of schools and directors of departments”.

473 Main findings

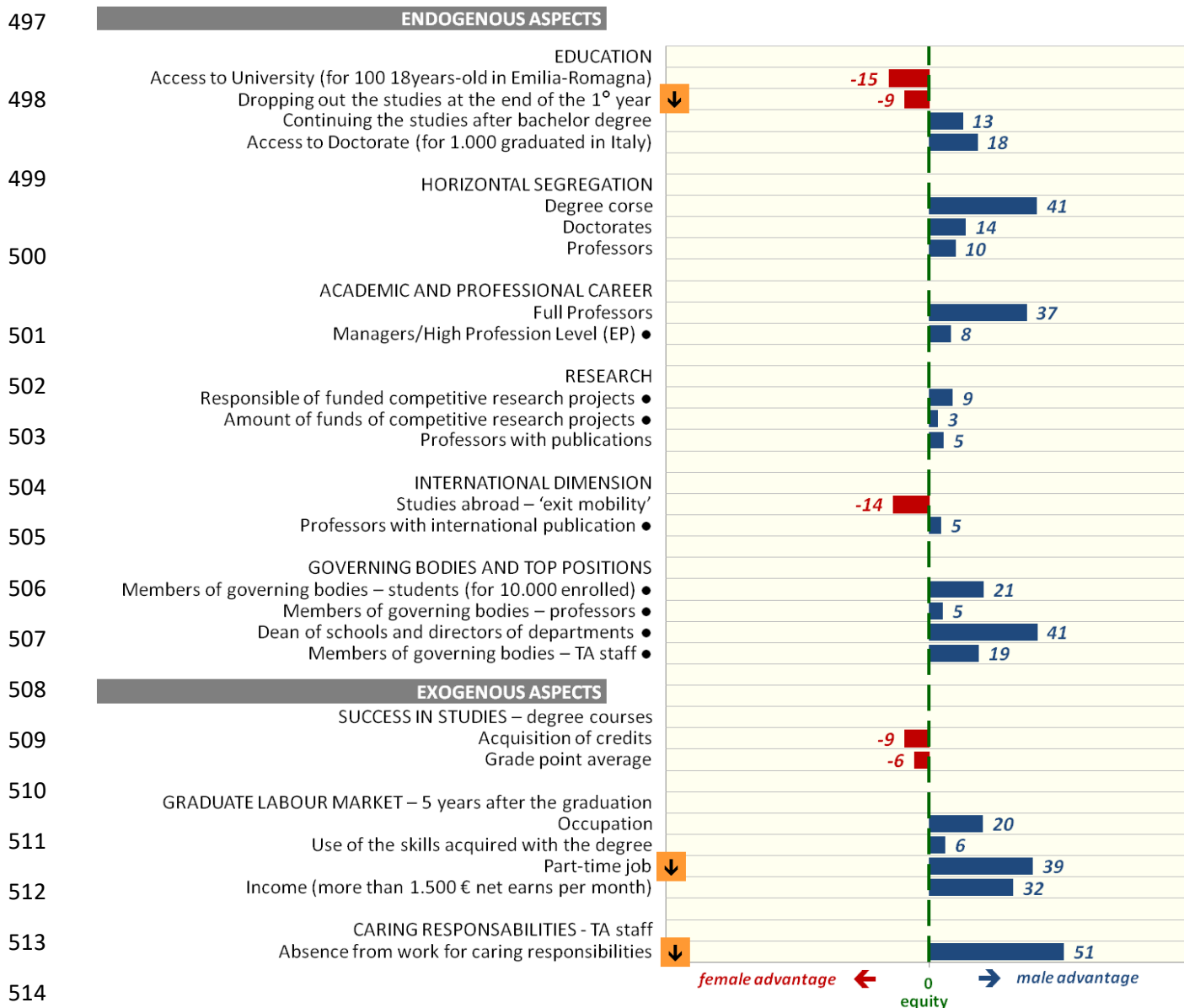
474 The UGII with regards to UNIBO (Table 3 and Figs 3-5), but also in the Italian university context (S1
475 Appendix), shows a tendency to a greater investment in the first stages of the University studies for women
476 compared to men.

477 **Fig 3. Gender inequality at UNIBO: index number “women/men X 100”**



495 Categories indicative of a potential disadvantaged situation

496 **Fig 4. Gender inequality at UNIBO: percentage of the highest possible inequality***



515 **↓ Categories indicative of a potential disadvantaged situation**

516 *The maximum score is 100 in both sides

517

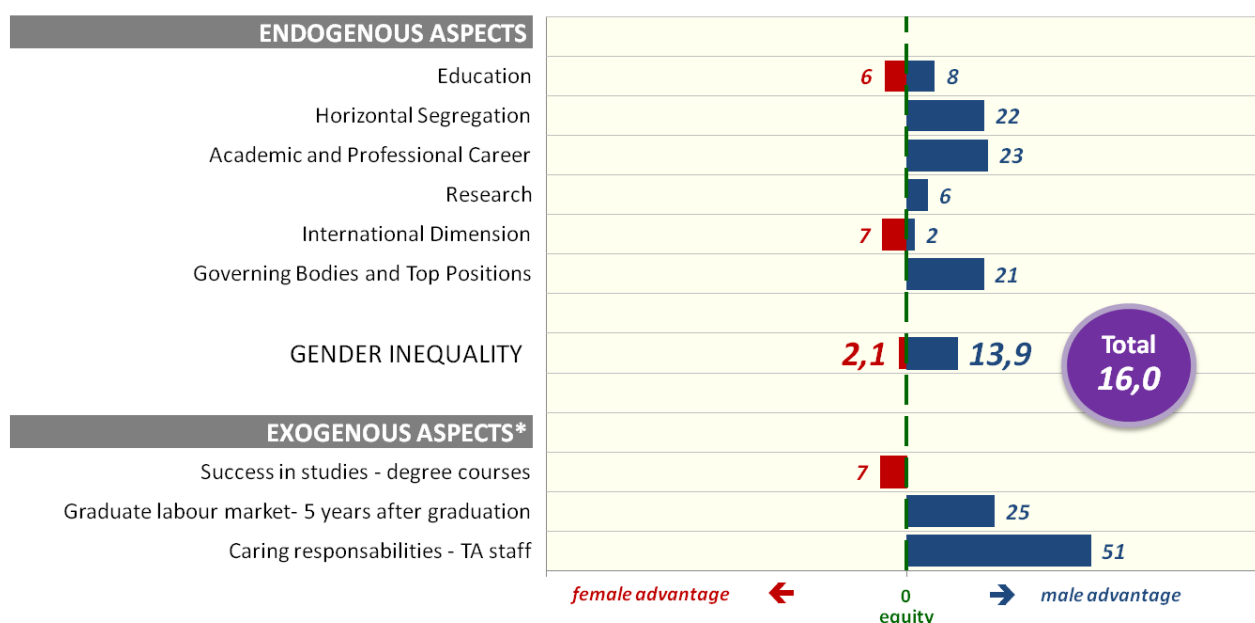
518

519

520

521

522 **Fig 5. Gender Inequality at UNIBO: percentage of the highest possible inequality in the domains and in**
 523 **the overall gender inequality index***



524

525 *The maximum score is 100 in both sides

526 The number of students enrolled compared to the 18-year-old population in Emilia-Romagna, significantly
 527 higher for women than for men, corresponds to a gender inequality of 15% of the possible highest
 528 inequality. This phenomenon is seen over the last five years (2013/2014 – 2017/2018) and it reflects the
 529 tendencies of the national university system. Furthermore, women drop out a degree course to a lesser
 530 extent than men: at the end of the first year, among enrolled students of UNIBO in 2016/2017, 10.6% of
 531 females and 13% of male students drop out of University studies, with a female-advantage gender
 532 inequality of 9% of the highest possible value. The regularity of the acquisition of credits (ECTS - European
 533 Credit Transfer System) and the results in the university exams confirm this female-favourable scenario, in
 534 which, for the cohort 2016/17, the female advantage is respectively 9% and 6% of the theoretical higher
 535 gap. In addition, the participation of study abroad program is in favour of women, with an inequality of 14%
 536 - in this case explicable by the higher female presence in linguistic area courses, in which the participation
 537 in mobility is particularly widespread.

538 In the following stages of studies, the sign of gender inequality is reversed. First of all, men pass more
539 frequently than women from bachelor's degree to enrollment in master's courses; the gap (64% for men
540 and 55% for women) corresponds to 13% of the highest inequality. Here too, the results are not limited to
541 UNIBO, but capture a national trend that is stable in the last five years (graduated in 2012-2016). The men-
542 advantage gender gap is even more evident in the case of access to doctoral studies. In relation to the
543 possible basin (for simplicity, those graduated in master's degree and single cycle degree programs in 2016
544 in the Italian university system), the number of actual accesses to doctorate courses (4.8 per thousand vs.
545 3.1 per 1000) involves 18% of the highest inequality, a gender gap value that has intensified in UNIBO since
546 2014/2015.

547 The national school and university systems remain characterised by horizontal segregation by fields of
548 study that is the form of inequality in which women, in comparison with men, are more present in
549 Humanities and less present in the area STEM. This is a horizontal segregation because we do not assume
550 any hierarchies among fields of study. This segregation does not result only from the actual attitudes and
551 motivation of students, but also from stereotypes, consuetude and environmental factors [14]. To quantify
552 the level of horizontal segregation we consider students enrolled in a first cycle or single cycle degree
553 program in the STEM area (Science, Technology, Engineering, Mathematics). The inequality is clear and
554 evident: in UNIBO (Matriculation 2017/18), men in STEM are 39.7% rather than women who are only 15.6%
555 with a gender gap of 41% of the highest possible. The segregation would be even higher (56%) if we
556 referred to a circumscribed area of STEM which include only the Science and Engineering areas. In the last
557 five years, (Matriculation 2013/2014 – 2017/2018) gender inequalities remain almost constant, which is
558 more evident for UNIBO than in the national context. Horizontal segregation by area of study can be
559 measured in a similar way through presence of degrees in Humanities. With reference to the two
560 categories ISCED F-2013 Education and Arts and Humanities, the highest female presence in these
561 disciplines amounts to the enrolment of UNIBO in 2016/17 to 33% of the maximum possible inequality.

562 The horizontal segregation per field of study is also present in the cohort of doctoral students and
563 university professors, but in these cases the differences are considerably attenuated: for UNIBO the
564 inequality decreases to 14% of the highest value in reference to doctorate and 10% for professors.

565 In addition, academic career possibilities or professional career possibilities in University male-advantage
566 inequalities take place, which assume the form of vertical segregation, considering that several roles and
567 positions reflect recognised hierarchy. Among the university professor category, as anticipated, full
568 professors are 32% for men and only 16% for women; consequently, 68% of male professors and 84% of
569 female professors are associate professors or Researchers (2017). The inequality, which is 39% of the
570 highest feasible gap, is common to the overall national university system and for UNIBO and is decreasing.

571 In the context of technical-administrative staff, the presence of managers and employees in the high
572 profession level of career (EP) is higher for men, but the inequality level is relatively low (in 2017, 8% of the
573 theoretical highest possible one) and even in this case there is a decreasing trend.

574 In the domain 'Research', all the gender inequalities are male-advantage, but these inequalities have a
575 limited extent: 9% of the highest possible inequality for assignment of funded research projects, 3% for the
576 amount of the funds obtained and 5% with reference to the publications of professors.

577 The analysis of the presence of men and women in the University's governance body and other high-level
578 position is particularly interesting. Among students of UNIBO, in governing body in which they are admitted
579 (Student Council, University Senate, Board of Governors), the presence of men is higher than the presence
580 of women (in 2017, 6.3 in 10.000 men enrolled, 3.9 in 1,000 women enrolled); this involves an inequality of
581 21%. Among professors, the gap concerns both university dean positions and directors of department
582 positions (41% of the highest possible) and the body's components (in this case the inequality is lower – 5%
583 - but, as already said, it should be recalled that the total population of potential members of body
584 governance among professors is already strongly dominated by men). Finally, for technical-administrative
585 staff, men-advantage inequality is 19% of the highest possible. To sum up, it may be concluded that,

586 regarding the chance of achieving positions of responsibility in the University, women are still far from
587 reaching gender equality.

588 Strong gender inequalities, male-advantage even in this case, occur in the workplace and they concern,
589 therefore, aspects which, in a university research system, we consider exogenous. For this analysis, we
590 considered the occupational condition of the graduated in master's degree and single cycle degree
591 interviewed in 2017 at 5 years after graduation. Among graduates of UNIBO, men have higher chance to be
592 employed (20% of the highest possible inequality) and, when they work, men tend to earn more than
593 women (with an inequality of 32% of the highest theoretical inequality). Furthermore, among workers,
594 part-time is especially a female choice (it refers to 22% of female workers and only 10% of men workers,
595 with a gap of 39% of the highest possible). None of these trends, common in the rest of the overall national
596 context, has decreased in the last five years.

597 Actually, women are more involved than men in contribution of care and assistance to other people. In
598 analysis of this issue, gender inequality for the University is recognisable through the number of days of
599 absence from work for reasons of commitment in care and assistance by technical-administrative staff. For
600 women, the days per capita are, on average, more than tripled that of men and the level of inequality
601 reaches 51% of the highest possible value. Obviously, this same form of inequality may concern not only
602 technical-administrative staff, but also members of the university community (professors and students) and
603 hinder activities other than work, such as study.

604 As already mentioned, the reference to a normalised measure – in this case the percentage of the highest
605 possible inequality – enables comparing the level of inequality which affects different aspects, and to
606 define, consequently, summary and concise measures (Fig 5). Of the 6 “endogenous” domains, 4
607 (Horizontal Segregation, Academic and Professional career, Research and Governing bodies and top
608 positions) include aspects in which there is always a male-advantage inequality. In each of these domains,
609 the average level of the gap is between 6% and 23% of the highest possible. In the domains “Education”

610 and “International Dimension”, the co-existence of male and female advantage aspects are present; in each
611 of the two domains, therefore, there is one average inequality for men and one for women. All of these
612 aspects leads, in summary, to two indices of overall gender inequality, from which we can conclude that in
613 UNIBO, there is a male-advantage average gender inequality of 13.9% of the highest possible, while the
614 female advantage results only 2.1%.

615 The total gender inequality in the University is therefore 16% of the highest possible value and most of
616 overall female advantage results from only two aspects: access to university and participation in mobility
617 programs abroad.

618 Conclusion

619 Nowadays graphic and iconographic elements are much more effective than long reports, in such a context
620 we aimed to propose an instrument to easily understand a situation or that can express a benchmark
621 situation in a few pages. This would both promote analysis of gender equality by analysts and unburden the
622 work of whom are involved in drafting gender equality annual report.

623 The construction of an effective tool for gender inequality analysis at universities is a complex operation,
624 also considering the interests of the overall university community in these aspects and for anyone who, in
625 any capacity, is involved in education, social phenomena and equal opportunity. For this reason, in
626 definition of the UGII, we aimed to balance technical-statistical rigor with usability and interpretability the
627 immediate visual effect of the instrument.

628 This paper proposes a new index formulated to measure and rank gender inequality at universities: the
629 UGII. This index results from the determination of 9 domains and 25 aspects, considering academic staff,
630 technical-administrative staff and students. Using index numbers, UGII measures the distance between the
631 situation of gender inequality performed by the university and the maximum level of inequality that can be
632 recorded with regard to each domain. This gives the “real” situation of domains with male or female
633 advantage, thus, indicating directions in which to intervene to the university’s governing bodies. Finally,

634 synthesising index numbers calculated with reference to each domains, UGII gives a final score of the
635 overall situation of gender inequality at the university, allowing comparisons among different time horizons
636 and with other universities.

637 We then tested the methodology for the calculation of UGII at UNIBO. As mentioned, in the more concise
638 formulation, the gender inequality manifested in UNIBO is 18.4% of the highest possible inequality; 16.1
639 points are male-advantage, 2.3 are female-advantage. Is this an acceptable inequality? It's hard to say, in
640 the absence of standard of comparison. However, if this tool will be adopted by EIGE, other similar agencies
641 in the world and, mostly, experimented by other universities, it will be possible to make comparisons to
642 verify if the current level of inequality is decreasing and to disseminate the results. Consequently, the
643 gender gap will become more easily measurable, such as the effect of policies implemented to reach equal
644 opportunities.

645 The next objective for UNIBO, very ambitious but to which we hope to arrive, is to measure UGII "in real
646 time".

647 Acknowledgements

648 The research reported in this paper was funded by the PLOTINA project ("Promoting gender balance and
649 inclusion in research, innovation and training"), which has received funding from the European Union's
650 Horizon 2020 research and innovation programme, under Grant Agreement No 666008
651 (www.plotina.eu<http://www.plotina.eu>). The views and opinions expressed in this publication are the sole
652 responsibility of the author(s) and do not necessarily reflect the views of the European Commission.

653

654 References

655 [1] UN. Convention on the Elimination of All Forms of Discrimination against Women. General
656 Assembly resolution 34/180 of 18 December 1979.

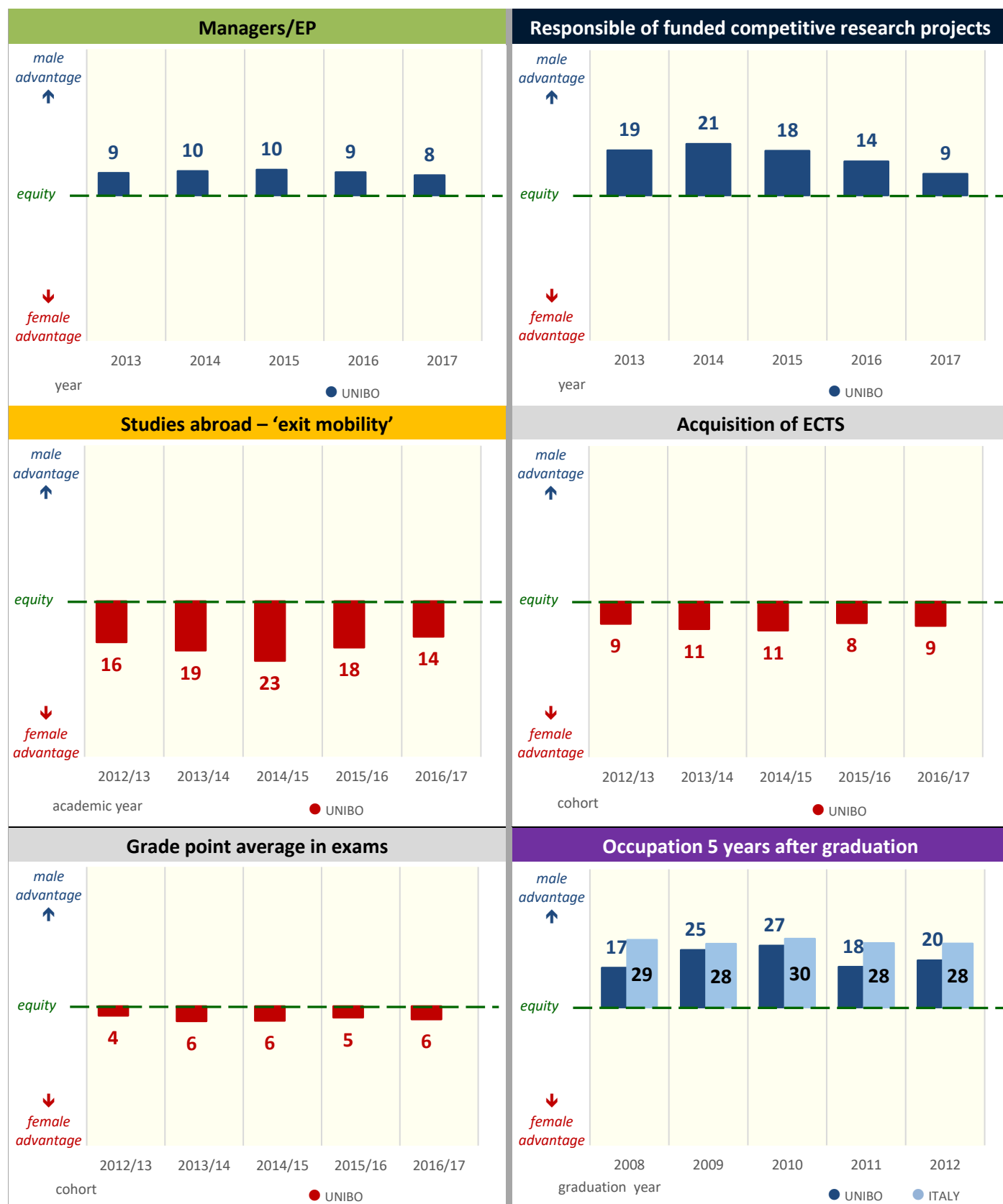
- 657 [2] EU. European Convention on Human Rights”, European Court of Human Rights, Council of Europe,
658 F-67075 Strasbourg cedex; 1950.
- 659 [3] Uthman OA, Lawoko S, Moradi T. The role of individual, community and societal gender inequality
660 in forming women's attitudes toward intimate-partner violence against women : a multilevel analysis.
661 World health & population. 2010; 12(2): 5-17.
- 662 [4] Hausmann RD, Tyson L, Zahidi S. The Global Gender Gap Report 2007. World Economic Forum,
663 Davos; 2007.
- 664 [5] Baslevant C, Kirmanoglu H. Gender Inequality in Europe and the Life Satisfaction of Working and
665 Non-working Women. *J Happiness Stud.* 2017; 18: 107–124.
- 666 [6] OECD. Society at a Glance 2016: OECD Social Indicators. OECD Publishing. Paris; 2016.
667 <http://dx.doi.org/10.1787/9789264261488-en>.
- 668 [7] OECD. Gender wage gap (indicator). 2018. doi: 10.1787/7cee77aa-en (Accessed on 08 May 2018).
- 669 [8] Jalalzai F. Women political leaders: Past and present. *Women & Politics.* 2004; 26 (3/4): 85–108.
- 670 [9] UN. *The World’s Women 2015: Trends and Statistics.* Department of Economic and Social Affairs
671 United Nation; New York; 2015.
- 672 [10] Unesco. Women in Science – the gender gap in science. *UIS Fact Sheet.* 2017; 43: 1-4.
- 673 [11] EU. She figures 2015, gender in research and innovation. *Statistics And Indicators,* European
674 Commission; 2015.
- 675 [12] Hymowitz C, Schelhardt TD. The Glass-Ceiling: Why Women Can’t Seem to Break the Invisible
676 Barrier that Blocks Them from Top Jobs. *The Wall Street Journal.* 1986; 57, D1, D4-D5.
- 677 [13] EU. Communication from the Commission to the European Parliament, the Council, the European
678 economic and social committee and the Committee of the regions. *A Reinforced European Research*
679 *Area Partnership for Excellence and Growth,* European Commission; 2012.
- 680 [14] Galizzi G, Siboni B. Positive action plans in Italian universities: does gender really matter?. *Meditari*
681 *Accountancy Research.* 2016; 24(2): 246-268.

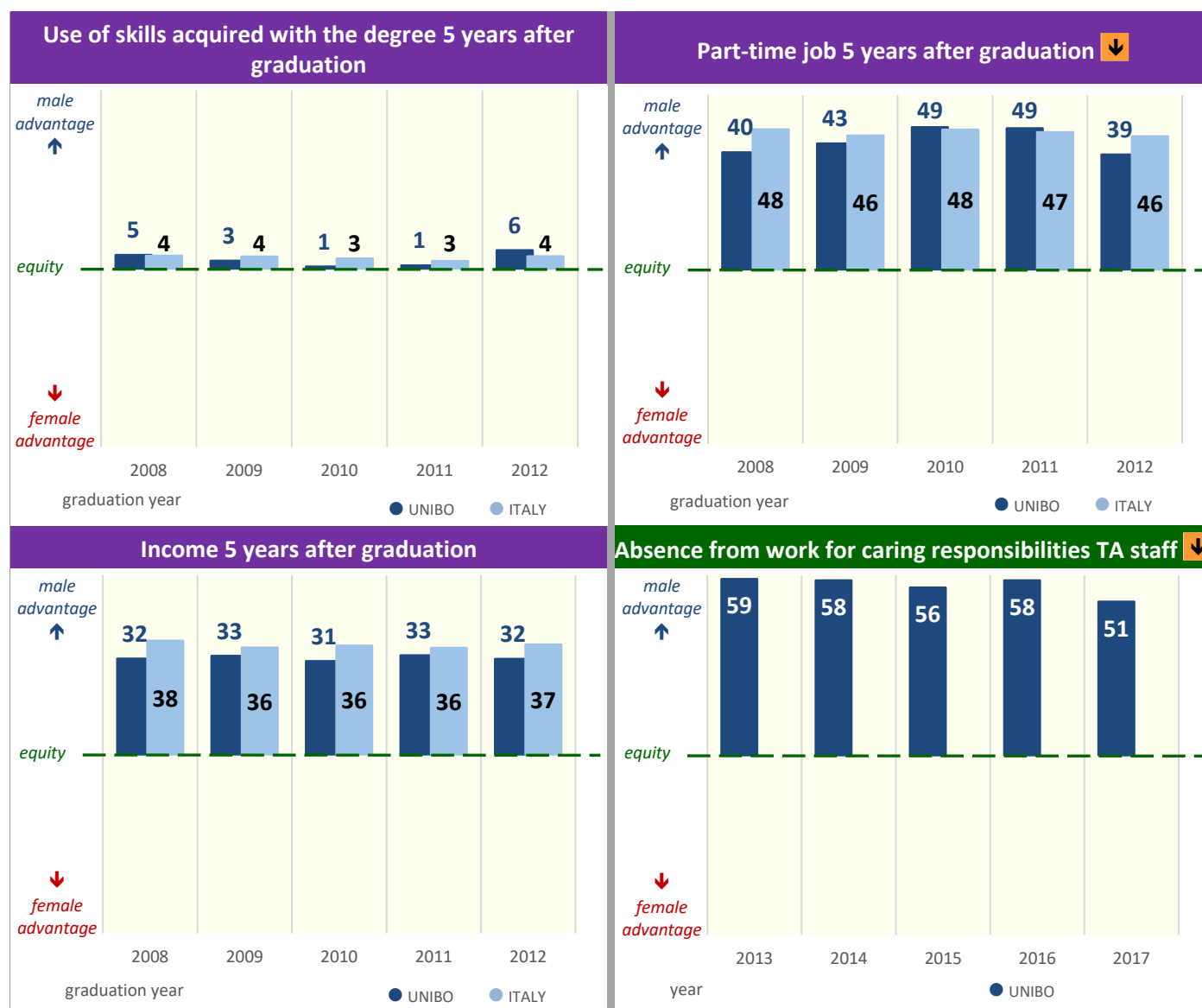
- [15] Artazcoz L, Artieda L, Borrell C, Cortes I, Benach J, Garcia V. Combining job and family demands and being healthy: what are the differences between men and women?. *European Journal of Public Health*. 2004; 14: 43-48.
- [16] Purcell K, Tzanakou C. Life after higher education: the diversity of opportunities and obstacles in a changing graduate labour market. *Routledge Handbook of the Sociology of Higher Education*; 2016.
- [17] Tzanakou C. Dual career couples in academia, international mobility and dual career services in Europe. *European Educational Research Journal*. 2017; 16(2-3): 298-312.
- [18] Aidis R, Weeks J. Mapping the gendered ecosystem: The evolution of measurement tools for comparative high-impact female entrepreneur development. *International Journal of Gender and Entrepreneurship*. 2016; 8(4): 330-352.
- [19] Chiao JY, Bowman NE, Gill H. The Political Gender Gap: Gender Bias in Facial Inferences that Predict Voting Behavior, *PLoS ONE*, Vol. 3, No. 10.
- [20] Thanacoody PR, Bartram T, Barker M, Jacobs K. Career progression among female academics: A comparative study of Australia and Mauritius. *Women in Management Review*. 2006; 21(7): 536-553.
- [21] Frattini R, Rossi P. Report sulle donne nell'università italiane, Meno di zero III 2012; (8-9).
- [22] Santos GG. Career barriers influencing career success: A focus on academics' perceptions and experiences. *Career Development International*. 2016; 21(1): 60-84.
- [23] Symonds MRE, Gemmell NJ, Braisher TL, Gorringer KL, Elgar MA. Gender Differences in Publication Output: Towards an Unbiased Metric of Research Performance. *PLoS ONE*. 2006; 1(1): e127. doi:10.1371/journal.pone.0000127.
- [24] Ghiasi G, Larivière V, Sugimoto CR. On the Compliance of Women Engineers with a Gendered Scientific System. *PLoS ONE*. 2015; 10(12): e0145931. doi:10.1371/journal.pone.0145931.
- [25] Dalal K. Does economic empowerment protect women from intimate partner violence?. *Journal of Injury and Violence Research*. 2011; 3(1): 35-44.
- [26] Bozzano M. Assessing Gender Inequality among Italian Regions: The Italian Gender Gap Index. *Working Paper*; 2012.

- [27] Castellano R, Rocca A. Gender gap and labour market participation: a composite indicator for the ranking of European countries. *International Journal of Manpower*. 2014; 35(3): 345-367.
- [28] Castellano R, Rocca A. Assessing the gender gap in labour market index: volatility of results and reliability. *International Journal of Social Economics*. 2015; 42(8): 749-772.
- [29] Sörlin A, Ohman A, Blomstedt Y, Stenlund H, Lindholm L. Measuring the gender gap in organizations. *Gender in Management: An International Journal*. 2011; 26(4): 275-288.
- [30] Badaloni S, Perini L. A model for building a Gender Equality Index for academic institution. Padova University Press, Padova; 2016.
- [31] WEF. The Global Gender Gap Report 2017. World Economic Forum; 2017.
- [32] UNDP. Human Development Report 2016. Human Development for Everyone. United Nations Development Program; 2016.
- [33] Economist Intelligence Unit. Women's economic opportunity. A new pilot index and global ranking from the Economist Intelligence Unit - Findings and methodology. *The Economist*; 2010.
- [34] GEDI. The Gender Global Entrepreneurship and Development Index (GEDI). A 30-country pilot analysis of the conditions that foster high-potential female entrepreneurship. Global Entrepreneurship and Development Institute; 2014.
- [35] Branisa B, Klasen S, Ziegler M. The construction of the social institutions and gender index (SIGI). Discussion papers, *Ibero America Institute for Economic Research*, 2009; 184, Ibero-Amerika-Inst. für Wirtschaftsforschung, Göttingen.
- [36] Plantenga J, Remery C, Figueiredo H, Smith M. Towards a European Union Gender Equality Index. *Journal of European Social Policy*. 2009; 19(1): 19-33.
- [37] EIGE. Gender Equality Index 2017. Methodological Report. *European Institute for Gender Equality*; 2017.

734 S1 Appendix. Percentage of the highest possible inequality: time series and comparison UNIBO/Italy* for
735 selected aspect
736







737 ↓ Categories indicative of a potential disadvantaged situation

738 *Data from Unibo has been extracted from the Data Ware House of UNIBO; data from Italy have been
 739 extracted from the data base in open access of the national Ministry of Education, University and Research
 740 (MIUR):

741 [http://dati.ustat.miur.it/organization/ace58834-5a0b-40f6-9b0e-](http://dati.ustat.miur.it/organization/ace58834-5a0b-40f6-9b0e-ed6c34ea8de0?tags=Universit%C3%A0&tags=Studenti)
 742 [ed6c34ea8de0?tags=Universit%C3%A0&tags=Studenti](http://dati.ustat.miur.it/organization/ace58834-5a0b-40f6-9b0e-ed6c34ea8de0?tags=Universit%C3%A0&tags=Studenti)

743

744