

Document downloaded from:

<http://hdl.handle.net/10251/177521>

This paper must be cited as:

Infante-Perea, M.; Navarro Astor, E.; Román-Onsalo, M. (2021). Sex, Age, Work Experience, and Relatives in Building Engineering Career Development. *Journal of Management in Engineering*. 37(5):1-15. [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000935](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000935)



The final publication is available at

[https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000935](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000935)

Copyright American Society of Civil Engineers

Additional Information

1 Sex, age, work experience, and relatives in Building Engineering career

2 development

3 Authors

4 Margarita, Infante-Perea¹

5 Elena, Navarro-Astor²

6 Marisa, Román-Onsalo³

7 Affiliation(s)

8 ¹Ph. D., Lecturer, Department of Graphic Engineering, School of Building Engineering,

9 Universidad de Sevilla, Avda. Reina Mercedes, 4 A, 41012-Sevilla, Spain

10 ²Ph. D., Senior Lecturer, Department of Business Organization, School of Building

11 Engineering, Universitat Politècnica de València, Camino de Vera s/n, 46022 Valencia,

12 Spain

13 ³Ph. D., Senior Lecturer, Department of Business Organization and Marketing, Faculty

14 of Industrial Relations and Human Resource Management, Universidad de Sevilla, Calle

15 Enramadilla, 18, 41018 Sevilla, Spain

16 Corresponding author information

17 Elena, Navarro-Astor²

18 enavarro@omp.upv.es

19 Abstract

20 Women's membership in Spanish Building Engineering professional bodies has

21 increased in the last decade, but with a fifth of women registered, the situation is far from

22 equitable. Furthermore, job allocation is gendered, with work on site very much male

23 dominated. This paper delves deeper into occupational segregation within Building

24 Engineering. By means of a survey to 704 undergraduate university students in their final

25 year of the Schools of Building Engineering in Andalusia (Spain), career barriers mostly

26 perceived for different career categories are determined. Significant differences in
27 perceptions according to gender, age, working experience and relatives in the industry
28 are identified. The results reveal that career barriers' perception differs according to
29 gender. Female students foresee a harder work scenario than males, especially in career
30 paths directly related to work on site. Age, combined with gender, constitutes the
31 sociodemographic variable showing most variations, and becomes the key element of
32 analysis. The career categories considered more accessible and those beyond reach are
33 identified, considering the different variables chosen. This research offers a framework
34 to reflect on the wide range of career barriers perceived by women as a group in the
35 profession and warns of its possible impact on occupational segregation.

36 **KEYWORDS:** Building engineering, career barriers, career development, construction
37 industry, Gender, Gottfredson's theory.

38

39 **Introduction**

40 Women's participation in construction is low internationally and little has changed in
41 recent decades (Perrenoud et al. 2020, Naoum et al. 2020, Struchers and Strachan 2019,
42 French and Strachan 2018). In Spain, the construction industry is also male-dominated
43 and women's presence has been increasing at a slow pace (OFLC 2020a, Infante et al.
44 2012). The latest employment figures show that only 8.9% of the workers are women
45 (107.639), they are mainly concentrated in the 35-54 age range and 66% of them have
46 achieved higher education levels (OFLC 2020a). They are mostly found in administrative,
47 customer service, accounting, and finance occupations in the industry, representing 50%
48 of these posts, but only account for 0.8% of bricklayers (INE 2018). This shows
49 horizontal segregation, which measures the extent to which men and women are
50 employed in different occupations (Blackburn and Jarman 1997). The types of roles and
51 responsibilities that both men and women occupy within the sector are not the same: work
52 on site is very much male-dominated, while off-site positions (i.e., office-based roles) are
53 more likely to comprise a balance of genders. This fact motivates reflections on career
54 barriers that might influence people's distribution in different career paths, and also on
55 their preferences when choosing careers (Infante-Perea et al. 2019).

56 Career barriers are viewed as obstacles preventing advancement (Brown and Barbosa
57 2001), they can be defined as "events or conditions, either within the person or in his/her
58 environment, that make career progress difficult" (Swanson and Woitke 1997, p. 446), or
59 "as obstacles that individuals face in the attainment of their career goals" (Ng and
60 Feldman, 2014, p. 14).

61 A comprehensive international literature review of career barriers encountered by women
62 in the construction industry over 15 years (2000-2015) outlines that there are more
63 commonalities than divergences in gender discrimination across nations (Navarro-Astor

64 et al. 2017). The main career obstacles identified are 1) maternity and multiple-role
65 conflict, 2) gender stereotypes, 3) sexist allocation of posts and activities, 4) limited
66 promotion opportunities, 5) difficult working conditions, 6) masculine culture, 7)
67 harassment and disrespect, 8) informal recruitment and selection processes, 9) lack of
68 recognition, 10) pay discrimination and 11) difficulties with social networks (Navarro-
69 Astor et al. 2017: p. 203). Since then, recent research shows that women all over the
70 world still face the same hindrances both in accessing and in maintaining a career in
71 construction and that little has changed.

72 Perrenoud et al. (2020), for example, finds that managerial level females in the US
73 electrical construction industry have limited promotion opportunities due to their lower
74 level of craft training. Pay discrimination and wage-gaps for female US workers persist
75 (Shrestha et al. 2020, Manesh et al. 2020). UK senior management women still describe
76 the industry as a “man’s world” and a “gruff” one (masculine culture) and experience
77 many career barriers from Navarro et al. (2017): informal selection processes, lack of
78 recognition, disrespect in the form of “building site banter” in the corporate office, few
79 career promotion chances, difficult working conditions and maternity issues (Aboagyie-
80 Nimo et al. 2019). In Australia, Rosa et al. (2017) and Bryce et al. (2019) validate
81 women’s persistent barriers to career advancement related to difficult working conditions
82 (long work hours, lack of part time and flexible work options), family and career
83 commitments, gender stereotypes regarding women’s abilities, recruitment practices, few
84 promotion opportunities and lack of recognition.

85 Interviews with construction workers in Brazil (Regis et al. 2019) also confirm that the
86 list of barriers is still valid. They note the gendered allocation of posts since women are
87 assigned to the finishing phase of construction, the cleaning and the grouting. Few
88 advancement possibilities, the masculinized environment, the lack of respect and verbal

89 sexual harassment and discriminatory hiring practices based on stereotypes are also
90 highlighted. Furthermore, Ling et al. (2020) identify that gender stereotypes exist in
91 Singapore Facility Management and that females doubt their own success and lack
92 confidence. In addition, Song et al. (2020) show that Chinese new-generation female
93 construction professionals face less advancement opportunities and hold noncore
94 positions in project management teams. Lastly, Nigerian women working in architecture,
95 building technology, quantity surveying and engineering verify the list of barriers as well
96 (Afolabi et al. 2020).

97 While obstacles confronted by women already working in the industry (experienced
98 barriers) have been extensively studied as summarized above, perceptions of career
99 barriers held by students of construction related degrees have not (Infante-Perea *et al.*
100 2016). These anticipated barriers might be based on an idea, on what each person
101 imagines might happen based on what others say, but not necessarily on their own
102 experience. Hence, it is important to ascertain if young people who are determining their
103 occupational aspirations perceive these career barriers, since they will guide their first
104 steps in the labour market (Gottfredson 1981, 1996; Lent et al. 2010). Research focused
105 on barriers perceived by those who intend to access the construction sector remains of
106 vital importance. It will help us to understand their subsequent career paths and anticipate
107 potential horizontal segregation.

108 Alves and English (2018) and Moraba and Babatunde (2020) research female students
109 perceptions in two South African Universities and confirm that they anticipate the male-
110 dominated culture, sexual harassment and gender stereotypes that lead them to
111 administrative support positions in the site office or as real estate agents. Quantity
112 Surveying undergraduates also identify the work-family conflict due to inflexible
113 working conditions and glass ceilings (Moraba and Babatunde 2020) while Construction,

114 Economics and Management students add the lack of self-confidence (Alves and English
115 2018). Regarding Spanish Building Engineering students, pilot studies conclude that the
116 gender variable is relevant in perceptions of barriers for career paths linked to on site
117 work (Infante-Perea et al. 2016) and also for nonsite jobs (Infante-Perea et al. 2018).

118 **Research Background**

119 *Gottfredson's Theory of Circumscription and Compromise*

120 Linda S. Gottfredson, in her career development theory (1981, 1986), explains how
121 people determine their occupational aspirations through a process of different phases
122 associated with the elimination of potential jobs considered “inappropriate”. The process
123 of circumscription describes how youth construct occupational aspirations by identifying
124 a “zone of acceptable alternatives” (Gottfredson 2002, p. 91) based on their gender
125 identity, prestige and self-interest (Tsaousides and Jome, 2008).

126 Based on people's self-concept and occupational images (sextype, prestige level, ...),
127 occupational preferences are shaped. Later, a process of compromise takes place where
128 young people - either anticipating barriers or experiencing them (Gottfredson, 2002),
129 begin to accommodate their aspirations to a more reasonable set of goals in response to the
130 labor market and the accessibility of occupations (Hardie, 2015). In Gottfredson's words,
131 accessibility refers to “the obstacles or opportunities in the social or economic
132 environment that affect one's chances of getting into a particular occupation”
133 (Gottfredson 1981, p. 548). The perception of accessibility can be based on job
134 availability within the surrounding geographic area, perceptions of discrimination or
135 favoritism or ease in obtaining training for the job. These and other factors may end up
136 driving people into certain occupations and away from others.

137 Because of its focus on gender identity, Gottfredson's model is acknowledged for
138 studying the career dynamics of minorities in general and women in particular (Moore

139 and Gloeckner 2007, Coogan and Chen 2007, Brown 2002, Cushnie 1999), but it has not
140 been considered yet in the construction industry.

141 The theory of Circumscription and Compromise pays special attention to barriers in
142 career development. Swanson et al. (1996) include a list of barriers that may interfere
143 with career choice and development in their “Career Barriers Inventory-Revised”. Many
144 coincide with those found in previous construction related research cited above. If these
145 barriers are perceived differently by women and men, they could influence their choice
146 and specialization in certain occupations. This research is based on Gottfredson's model
147 of career development with an adaptation of Swanson's barrier inventory (1996).

148 It is part of a wider research intended to find out the occupational aspirations of building
149 engineering students before they access the construction sector. Gottfredson’s theory has
150 been a guide to set the original research objectives, that is the study of job preferences
151 (Infante-Perea et al. 2019) and career barrier perceptions.

152 *Literature Review*

153 Even at a professional level, Spanish female integration in the construction industry is
154 poor. Otto (2018) describes the evolution of their presence in Building Engineering
155 throughout history, and highlights that it was very low in professional bodies’
156 membership, but it has increased by 66% between the years 2000 and 2017. Nevertheless,
157 the current situation remains far from equitable. Indeed, there are currently 49,943
158 professionals registered in the Spanish professional bodies, of which 39,303 are male
159 compared to 10,341 female (20.8%) (CGATE 2019).

160 The Building Engineering professional body in Spain (CGATE) carried out the first
161 Gender Equality Survey of the profession at the end of 2018. A representative sample of
162 1,360 professionals of all ages participated, of which 51.2% were female and 48.8% male.
163 While 60.4% of surveyed professionals believe the profession has evolved favourably in

164 terms of gender equality over the last decade, 59.1% find women have many more
165 difficulties in professional practice, and 61.9% think it is much easier for males to be
166 selected for positions in construction companies. More than half of the women state they
167 would have a better position within the company if they were men. Furthermore 58.4%
168 have felt improperly treated in the workplace by professionals “with the same educational
169 level”. The majority also point out having felt ignored in the workplace and their
170 performance underestimated due to being women.

171 With respect to the long-hours culture and expectation of total availability typical of the
172 construction industry (Bryce et al. 2019, Clarke et al. 2018), 60.9% of the sample
173 categorically agree that working conditions fail to allow a work-life balance, with more
174 than half believing it is easier for men to achieve it (CGATE 2019). Hence, women in
175 this profession and context share the same challenges and confront the same career
176 barriers as the rest.

177 In the face of this scenario, the construction industry presents a major challenge for
178 women’s inclusion and equal opportunities in all its career fields. The call for workforce
179 diversity in construction is often supported by the discourse that diverse work teams are
180 more effective and that such diversity would mitigate the shortage of skills and expand
181 the pool of available talents (Naoum et al. 2020, Aboagyie-Nimo et al. 2019, Dainty 1999,
182 Sang and Powell 2012). An increase in the number of women in construction work teams,
183 on the condition that they are allowed to be women and embrace their differences, can
184 provide added value, inspire innovation, challenge norms, and improve collaboration
185 (Davis 2014).

186 **Research Questions**

187 Since perceived career barriers may impact professional interests and the pursuit of
188 specific career paths (Gottfredson 1981, 1986), the aim of this research was to identify

189 the barriers that Building Engineering students would expect to encounter within
190 particular career categories.

191 Aboagyie-Nimo et al. (2019) suggested the need to go into greater depth in this reality
192 through quantitative surveys that consider variables, such as age, working experience in
193 the construction sector, and relatives working in the industry. Therefore, this research
194 analyses whether there are significant differences in perceptions according to these
195 variables and their size.

196 Age is related to both the accumulation of life experiences and to educational differences
197 between generations. Elejabeitia and López (2003) find younger women have fewer
198 prejudices and Wright (2014) notes that age combined with gender, can condition the
199 experience of barriers to entering the job market. Furthermore age is a “significant factor
200 in women’s desire to continue their careers in the construction industry” (Naoum et al.
201 2020).

202 Motherhood is a key point associated with a limited age group that changes the
203 circumstances of the person, by modifying priorities and developing the sense of
204 responsibility. Gadassi and Gati (2009) relate people’s preferences towards different
205 types of work with the anticipation of work-family conflict, trends that become stronger
206 when considering forming a family (Sax and Bryant 2006 and Astin and Sax 1996, in
207 Gadassi and Gati 2009).

208 Work experience can provide first-rate information on the sector and a predetermined
209 idea from the own experience. In addition, the literature shows family’s influence in
210 making decisions related to a career in engineering and construction (Thevenin and Elliott
211 2015, Lopez del Puerto et al. 2011), as well as the transmission of industry knowledge
212 through relatives (Moore and Gloeckner 2007).

213 Based on the preceding background this study hypothesized that:

214 H₁ = Women have a greater perception of the barriers that may limit their career
215 development than men.

216 H₂ = The variables age, work experience and relatives in the industry will influence
217 women and men's perception of career barriers.

218 **Methodology**

219 This research takes a descriptive-reflexive approach, of exploratory nature, through the
220 application of quantitative methods. The authors wished to collect data from a large
221 sample, that would allow maximum representativeness in order to extrapolate the results
222 to a larger population. Hence the survey was chosen as the most suitable tool for obtaining
223 data.

224 *Description of the sample*

225 The research has been carried out with a representative sample of 704 4th year students of
226 the Building Engineering faculties in Andalusia (Spain). The sample represents 50.87%
227 of the total number of students enrolled for the compulsory subjects of the final year,
228 where 37.93% are women and 62.07% are men. Presumably, this group are about to gain
229 access to the labour market in the construction sector.

230 Their ages range from 20 to 60 years old, with a mean age of 25.92 and a mode of 22.

231 The women in the sample are slightly younger than the men, with an average age of 24.51
232 vs. 26.80. At the time of the survey, the vast majority (93.16%) were not working in the
233 construction sector. Although 36.42% do have previous work experience in the sector,
234 only 10.80% refer to functions directly related to building engineering. In terms of work
235 experience, there is a great disparity according to gender. Thus, while only 18.80% of
236 women in the sample have worked in the construction sector, the percentage of men
237 amounts to 47.14%: a proportion 2.5 times higher.

238 Furthermore, the men have mostly performed jobs that require little or no formal training,

239 such as unskilled labourers, while others have gained experience as site managers,
240 draughtsmen, and project managers. However, the women lack previous experience in
241 construction trades. Their presence begins to be visible in occupations that require
242 specialized studies such as draughtsmanship and topography, site management, studies
243 manager, site director, risk prevention and health and safety, technical project planning
244 and development, or work in consulting and technical audits.

245 40% of the students have a close relative who works or has worked in construction, and
246 it is therefore assumed that they have a close-up view of the sector transmitted through
247 their experience. Relatives included are fathers, uncles, cousins, and brothers, with the
248 anecdotal presence of females with jobs in construction.

249 *Data collection and tools*

250 The data collection was carried out in person through surveys provided during the 2014
251 and early 2015 term times. The questionnaire is structured into three sections of which,
252 for the objectives desired, two sections are analysed. The first part contains a series of
253 open and closed questions of dichotomous answers (e.g., Yes/No, Male/Female) on the
254 following sociodemographic variables: gender, age, work experience, and relatives in the
255 construction industry.

256 - Variable "Gender". It enables differences and similarities between women and men to
257 be ascertained.

258 - Variable "Age". According to Eurostat (2015), the average age of Spanish mothers at
259 the birth of their first child was 30.4 years old in 2013. Therefore, an analysis is carried
260 out on career barriers that women perceive according to whether they are under or over
261 30 years old.

262 - Variables "work experience and employment situation". This data is obtained through
263 the questions: "Have you ever worked in the construction sector?"; "In what type of

264 work?"; and "Are you currently working in the sector?".

265 - Variable "relatives in the industry". The questions posed here include: "Do you have
266 any relatives working in construction? Indicate relatives' kinship and job position ".

267 [Please insert Figure 1 here]

268 The part of the questionnaire focused on the perception of career barriers is divided into
269 six sections, with fifteen items repeated in each section. These sections correspond to
270 each of the six career categories included in the White Book of Building (ANECA, 2004)
271 (Figure 1) and the 15 items are the result of an adaptation of the "Career Barriers
272 Inventory - Revised" (CBI-R) (Figure 2), designed and validated by Swanson et al.
273 (1996). Participants assess, by means of a Likert scale of ratio 1 to 4 (where 1 represents
274 nothing and 4 represents the highest level), the degree to which each barrier can limit
275 their career development in each of the six job opportunities offered by the university
276 degree.

277 [Please insert Figure 2 here]

278 Prior to its distribution, the questionnaire was subjected to several pre-tests and to a cross-
279 validation of five experts with extensive professional and research experience.

280 *Analysis*

281 The study of the results was first carried out taking into account only the gender variable.
282 Subsequently, other variables that can separately modify women's and men's perception
283 of barriers (age, work experience in the sector, and family members working in
284 construction) were included. A basic descriptive study was carried out for the analysis of
285 the sociodemographic data.

286 A three-step process was followed for the analysis of perceived barriers. First, major
287 barriers for each gender and career category were identified by means of a basic
288 descriptive study, according to the frequency distributions in the scores and their

289 dispersion.
290 Second, the Mann-Whitney non-parametric contrast test was applied to ascertain whether
291 there were significant differences between the perceptions of the two groups. Finally, in
292 order to ascertain the size of the effect in the differences found, Cohen's "d" was obtained
293 by calculating combined standard deviations, whereby the differences were classified as
294 small, medium, or large when "d" took values around 0.2, 0.5, or are at least 0.8,
295 respectively (Cohen 1988).

296

297 **Results**

298 *Gender*

299 Frequency distribution scales in Figure 3 show that both female and male future building
300 engineers anticipate the barriers “job market constraints” and “inadequate preparation”
301 for all job categories in the construction industry. Furthermore, it reveals that male
302 students do not foresee any other career barrier from the list of 15. In contrast, the women
303 reflect greater disparity of opinion. Their percentages of positive answers are higher than
304 the men’s in practically all cases, and at least one third of all women perceive 9 or 10 out
305 of the 15 barriers as future obstacles for all job opportunities (Figure 3).

306 The Mann-Whitney U test (Table 1) confirms the existence of significant differences in
307 perceptions between sexes in 9 barriers for the 6 career paths, with average range
308 favouring women. This means it is women who show a more pronounced perception of
309 these obstacles: “biased boss”, “lack of confidence”, “sexual harassment”, “promotion
310 delays”, “lower salaries”, “sex discrimination in hiring” ($p=0.000$); “decision-making
311 difficulties” and “work/family conflict” ($p\leq 0.001$) and “discouragement from choosing
312 nontraditional career” ($0.001\leq p\leq 0.035$).

313 In addition, the “multiple-role conflict” barrier also shows significant differences between

314 women and men for all career paths except for Risk prevention and health and safety
315 ($0.018 \leq p \leq 0.035$).

316 There are five barriers in the previous list directly related to discrimination based on
317 gender, presenting differences of greater size. The size of the effect of these differences
318 is medium in most cases, but it is large for “sex discrimination in hiring” for the following
319 career categories: Production site management ($d=0.92$), Risk prevention and health and
320 safety ($d=0.81$), Building operation ($d=0.87$) and Technical site management ($d= 0.94$).

321 The greatest differences are found in Production site management and Technical site
322 management, which involve work activities closely linked to the execution of buildings,
323 carried out in situ on construction sites. This may indicate that women think of these
324 career categories as male-dominated areas with difficult access.

325 Moreover, these two career categories are the ones with the greatest number of
326 statistically significant differences in perceptions according to sex. The following should
327 be added to the previous list of 9: “disapproval from significant other”, “socialization and
328 communication difficulties” and “multiple-role conflict” (Table 1).

329 However, risk prevention and health and safety emerges as the career path with the most
330 positive results. It shows the least number of perceived career barriers for both sexes, as
331 well as of significant differences in perceptions between them.

332 Taking into account the results presented, the hypothesis H1 is confirmed: women have
333 a greater perception of the barriers that may limit their career development than men.

334 *Age*

335 According to frequency distribution analysis, the combination of gender with age causes
336 results of a more decisive nature.

337 On the one hand women of 30 or older perceive more barriers for Building Engineering
338 career categories and point out limitations only foreseen by them, such as “sexual

339 harassment”, “multiple-role conflict” and “work-family conflict”, “sex discrimination in
340 hiring”, “promotion delays”, and “career dissatisfaction” (Figure 4). Only these older
341 students forecast experiencing difficulties accessing a job because they are women,
342 pointing to “sex discrimination in hiring” for practically all career paths (Figure 4). This
343 is coupled with the major impact that motherhood has on their careers, which is perceived
344 by the majority as a problem for career development. The lowest percentages of women
345 who anticipate the “work-family conflict” barrier are found in Consulting and in
346 Technical project drafting and development, at 50% (Figure 4).

347 However, in the case of men, the majority only perceive the limitations of a sector in
348 crisis and inadequate preparation, disappearing the last barrier when they reach 30 years
349 of age (Figure 5).

350 On the other hand, the contrast test in Table 2 shows that age influences the perception
351 of both female and male students for certain career barriers. Thus, there are statistically
352 significant differences for those under 30 years of age, in barriers that may reflect
353 insecurity regarding future work responsibilities, such as the feeling of being
354 insufficiently prepared, lack of confidence and socialization difficulties. In the case of
355 men “disapproval from significant other” and “decision-making difficulties” are added.
356 Significant differences favouring students over 30 years of age are mainly identified in
357 the group of women. These older women more closely perceive the barriers of “career
358 dissatisfaction”, “multiple-role conflict”, “promotion delays” and “work/family conflict”.
359 This last barrier is the only one that shows significant differences for men over 30 (Table
360 2).

361 From these results it is concluded that age is a relevant variable in the perception of career
362 barriers, especially for women.

363 *Work experience in construction*

364 Students with no work experience in the sector, just like the younger students from the
365 previous section, reflect greater self-doubt than the more mature and experienced ones
366 (Table 3).

367 Women without construction working experience foresee the possibility of encountering
368 the following barriers with more intensity: “inadequate preparation”, “lack of
369 confidence”, “socialization difficulties”, and “decision-making difficulties” (Table 3).

370 Furthermore, the differences are more obvious and emerge in more career categories for
371 these 4 barriers than those found in the age-centred analysis.

372 With the exception of “socialization difficulties”, something similar happens in the case
373 of men with these same characteristics, for which there are also differences in 5 of the 6
374 career paths for the “disapproval from significant other” barrier.

375 Wherever statistical differences are found significant, students without professional
376 experience show a greater perception. The exception is the more experienced women,
377 who more closely foresee the possibility of suffering conflicts derived from having to
378 reconcile family and work life in Production site management ($p=0.029$) (Table 3).

379 In regards to men, the majority only point out to labour market restrictions as career
380 limitations, adding “inadequate preparation” for those with no work experience (Figure
381 5). For women, Figure 4 shows that those with work experience expect to find a worse
382 situation in work areas closely linked to on-site work (Production and Technical Site
383 Management). They perceive the possibility of having a male chauvinist as their boss and
384 of suffering salary discrimination.

385 Obviously, work experience and age retain a close relationship. The passing of time is
386 necessary to get a solid base of practical knowledge for any profession, which provides
387 assurance and helps overcome the fears of those who have not yet taken up employment.

388 This may be the reason why the results of the analysis of these variables show a certain

389 parallelism.

390 *Relatives in the industry*

391 Table 4 displays results of the contrast test for this variable. The fact of having relatives
392 working in the industry does not influence career barriers' perceptions, since there are not
393 large differences (neither in the number of identified differences, nor in their size).

394 The results in Table 4 and Figures 4 and 5 lead us to conclude that the differences in most
395 perceived barriers take place when the remaining variables are taken into account. Family
396 therefore does not constitute a relevant variable in the perception of career barriers, a
397 starting hypothesis in the study.

398 **Discussion**

399 Women and men appear to be keenly aware of the difficulties of finding a job in a sector
400 that has drastically contracted its activity since the recession that started at the end of
401 2007. This perception might be exacerbated by the fact that the Spanish unemployment
402 rate almost reached its peak when data collection was carried out (25.9% in the first
403 quarter of 2014) (INE 2020).

404 The "inadequate training" barrier is also shared by all students. The explanation may lie
405 in the existence of major educational mismatches between higher education and
406 professional performance (Alves and English 2018, Fuentes-del-Burgo and Navarro-
407 Astor 2015). Along these lines, Solís and Arcudia (2004) also state that graduates of
408 similar studies feel they lack practical engineering knowledge when they access their first
409 job in the sector.

410 In this respect, building engineering schools should analyse the contents of the curricula
411 that is being taught to make sure it includes more practical skills, it is updated and in line
412 with professional requirements. And also take action to instill students' confidence both
413 in the knowledge gained and their ability to become good professionals.

414 Confirming previous pilot studies (Infante-Perea et al. 2016, Infante-Perea et al. 2018), it
415 is verified that women have a greater perception of career barriers than men. Results also
416 agree with Hawks and Spade (1998), who argue that, although female engineering
417 students have overcome many of the gender barriers, they continue to perceive more
418 obstacles in their future career paths than their male peers, an issue also pointed out by
419 Scott and Martin (2014) for similar degrees.

420 Despite recent social and cultural progress, particularly since women's inclusion in the
421 labour market, the distribution of household tasks and family responsibilities in Spain
422 continues to fall more heavily on women (Prieto and Pérez 2013). Of course, this is
423 reflected in the finding of statistically significant differences in perceptions of obstacles
424 according to sex.

425 In relation to the "work-family conflict" barrier, the lowest percentages of women who
426 anticipate it are found in Consulting and in Technical project drafting and development.
427 Perhaps this happens because work carried out in these employment areas normally takes
428 place in architectural offices, with relatively well-defined schedules, greater geographical
429 stability, and greater freedom of self-organization.

430 Infante-Perea et al. (2016) called attention to the fact that certain barriers, such as work-
431 family conflict and multi-tasking go unnoticed by students heading towards the labour
432 market. They wondered whether this was caused by the young age of the participants.
433 This research shows that women over 30 have greater knowledge of the existence of
434 barriers, as shown in the literature, and are therefore more realistic regarding their future
435 working lives. They are the only ones who foresee conflicts derived from juggling family,
436 housework and the profession, they anticipate delays in promotion, pay and hiring
437 discrimination and sexual harassment. This is coherent with Ellison and Cowling (2006)
438 who found women in their 40s leaving surveying in greater numbers, due to inflexible

439 working hours and conditions, need to spend more time with family and limited career
440 advancement.

441 In accordance with Bagilhole (2006), who states that women have a more positive image
442 of this industry at the beginning of their careers, younger female students and those
443 without working experience could be labelled as more idealistic or naive. Students play
444 down the incidence of motherhood in their careers by thinking that this “problem” can be
445 easily solved by migrating to an office job, unaware that this could limit their
446 development or force them to work exclusively in certain fields imposed by
447 circumstances and not their own preferences (Bagilhole 2006). A similar position is taken
448 by English and Le Jeune (2012) and Alves and English (2018), who attribute the low
449 awareness regarding the impact of interruptions for having children on their career to their
450 young age.

451 It should be pointed out that the results of our research differ from those of Infante-Perea
452 et al. (2016). Regarding Risk prevention and health and safety career category, the results
453 showed a much more unfavourable situation for women in terms of the perception of
454 barriers. Here, however, with a much bigger sample, most of the younger women foresee
455 their career development to be relatively free of obstacles, and it therefore constitutes one
456 of the most positive employment areas. This might be related to this career path having
457 developed recently, with less related gender stereotypes and a less masculine image
458 attached to it. In fact, the Health and Safety Coordinator only appeared in the Spanish
459 legislation through the incorporation of the European Directives (Royal Decree 1627/97
460 on the minimum health and safety regulations in construction works in BOE 1997).

461 Finally, in regards to the “relatives in the industry” variable, the explanation for the
462 scarcity of differences may be due to the fact that, being a male-dominated industry, the
463 number of feminine references within families is very low. The consequence is that

464 female working experiences are hardly shared, and information about different career
465 categories and what might happen in them generally comes from men.

466 **Conclusions**

467 Gottfredson's theoretical model of career development (1981, 1996, 2002, 2005) shows
468 that perceptions of career barriers contribute to the shaping of people's professional
469 aspirations and will guide their first steps towards the labour market. Based on this theory,
470 the purpose of this research was to determine the career barriers anticipated by Spanish
471 building engineering students in different career paths considering various
472 sociodemographic variables. The results show two quite different worlds for women and
473 for men. Female students perceive the possibility of confronting career barriers to a
474 greater extent than males, with differences being more pronounced in the case of gender-
475 based barriers. Results strongly suggest that the impact of career barriers faced by women
476 in the construction industry goes beyond the labour market and filters down to students
477 seeking access to this sector.

478 As in a previous pilot study (Infante-Perea et al. 2016), it is confirmed that women foresee
479 job opportunities on site as being less accessible to them than to their male peers.
480 However, in contrast to Infante-Perea et al. (2016), by conducting the research with a
481 representative sample, it is revealed that "Risk prevention and health and safety" is
482 positioned as the most positive employment area in terms of perceived barriers.

483 This suggests that the occupational segregation observed in the construction sector could
484 be building up from earlier stages of people's access to this industry. According to
485 Gottfredson's idea of compromise, women will determine their occupational aspirations
486 based on occupations where they perceive fewer barriers and are likely to target them
487 when they enter the labour market (Gottfredson 1981), feeding the current segregation.

488 For the remaining demographic variables, age constitutes a key element of the analysis,

489 since it marks major differences between people, especially for women. Having relatives
490 in the industry is the least determinant variable of the research.

491 This research offers a framework for reflection on the breadth of career barriers perceived
492 by women and on their possible influence on gender distribution in the various career
493 choices in the sector. It warns us of their possible impact on the problem of occupational
494 segregation.

495 The findings contribute to the body of knowledge on career barriers and career
496 development in the construction industry. In addition, information is provided on the
497 extent to which career barrier perceptions change when considering different socio-
498 demographic variables, thereby responding to researchers' suggestions.

499 Business owners, human resource managers, governing bodies of higher education
500 institutions and professional bodies such as the Spanish CGATE, aware of this situation,
501 are responsible for taking immediate practical action. On the business side, strict
502 compliance with existing gender equality regulations and a commitment to awareness
503 raising through compulsory training to all employees on unconscious biases are called
504 for. These actions could contribute to the elimination of barriers. Regarding universities,
505 training programs in the form of skill development workshops are needed to empower
506 women to be able to deal with any discriminatory situation and to build up their self-
507 confidence. Mentoring programs aimed at female students led by female role models is
508 another proposal that is not widespread yet among Spanish building engineering schools.
509 Their management teams should also make big efforts to increase women's visibility by
510 inviting professionals from the construction industry to give lectures, ensuring that all
511 conferences have female speakers.

512 Finally, professional bodies also have an important role to play in the employment
513 prospects and career development of their members because they represent their affiliates

514 in professional practice. Hence, it is expected that these organizations play a major role
515 in promoting gender equality, by following good practices to improve the situation and
516 by making female professionals more visible. For example, they could try to increase the
517 percentage of female members in their governing boards and they could take greater care
518 of the images they publish both in their web pages and journals. They should select more
519 female photographs, showing them in managerial roles and located in construction
520 working spaces.

521 Infante-Perea et al. (2019) found that both male and female building engineering students
522 consider two occupations within Technical Site Management among the most desired
523 career options. If we relate this information with findings from our study, we can conclude
524 that the preferred career paths are not always those for which fewer barriers are perceived.
525 For women over 30, Technical Site Management is precisely the career category where
526 the greatest number of barriers are anticipated. Therefore, for a more direct relationship
527 of results, an analysis of career preferences according to the sociodemographic variables
528 analyzed here would be valuable.

529 Certain limitations must be highlighted. This study focuses on building engineering 4th
530 year students of faculties in Andalusia, a Spanish autonomous region, which limits the
531 generalizability of the findings. Future research can extend to the other Spanish regions
532 to reveal a more comprehensive picture across the country.

533 The correlation between age and work experience in students' perceptions has not been
534 studied. Therefore, the influence that one variable may exert on the other has not been
535 ruled out. Delving into this question would be interesting to obtain more decisive results
536 and sounder conclusions.

537 With respect to work experience, other control variables such as years of experience and
538 type of work carried out were not considered. The focus was on providing an overview.

539 Further research using qualitative methods for data gathering such as focus groups with
540 students is needed to provide a more complete picture of the reasons why they perceive
541 differentiated realities. It would be helpful to know the discourses that support the data
542 and to make a deeper analysis of reality.

543 Moreover, to better understand the complexity of perceived career barriers and explore
544 variations over time, it would be interesting to carry out a longitudinal study with the
545 same students once they graduate and are employed in the labour market. This would
546 allow to compare students' career perceptions and real job opportunities found.

547 **Data Availability Statement**

548 Some or all data, models, or code that support the findings of this study are available from
549 the corresponding author upon reasonable request.

550 **References**

551 Aboagye-Nimo, E., Wood, H. and Collison, J. 2019. "Complexity of women's modern-
552 day challenges in construction." *Engineering, Construction and Architectural*
553 *Management*, 26 (11), 2550-2565.

554 Afolabi, A., Oyeyipo, O., Ojelabi, R. and Patience, T.O. 2019. "Balancing the female
555 identity in the construction industry". *Journal of Construction in Developing Countries*,
556 24(2): 83–104. <https://doi.org/10.21315/jcdc2019.24.2.4>.

557 Alves, S. and English, J. 2018. "Female students' preparedness for a male-dominated
558 workplace." *Journal of Engineering, Design and Technology*, 16(4), 581-595.

559 ANECA 2004. *Libro blanco: Título de grado de ingeniería de edificación*. Madrid, Spain:
560 Agencia Nacional de Evaluación de la Calidad y Acreditación.

561 Bagilhole, B. 2006. "The UK engineering professions. Women student's perspectives."
562 *International Journal of Diversity in Organisations, Communities and Nations*, 5(1),
563 109–116.

564 Blackburn, R. M., and J. Jarman. 1997. "Occupational gender segregation." Accessed
565 December 12, 2019. <http://sru.soc.surrey.ac.uk/SRU16/SRU16.html>

566 Brown, S. G., and Barbosa, G. 2001. "Nothing is going to stop me now: Obstacles
567 perceived by low-income women as they become self-sufficient". *Public Health Nurs*,
568 18(5), 364–372.

569 Brown, D. 2002. *Career Choice and Development*. Jossey-Bass, Ed. (4th ed.).

570 Bryce, T., Far, H. and Gardner, A. 2019. "Barriers to career advancement for female
571 engineers in Australia's civil construction industry and recommended solutions",
572 *Australian Journal of Civil Engineering*, 17:1, 1-10, DOI:
573 10.1080/14488353.2019.1578055

574 CGATE 2019. "Encuesta sobre igualdad de género todavía existen diferencias." *Cercha:*
575 *revista de los aparejadores y arquitectos técnicos*, 139, 40-42. Consejo General de la
576 Arquitectura Técnica.

577 Clarke, L., Michielsens, E. and Snijders, S. 2018. Misplaced gender diversity policies and
578 practices in the British construction industry, in: F. Emuze and J. Smallwood (eds.):
579 *Valuing People in Construction*, 130-150. Routledge.

580 Cohen, J. 1988. *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ:
581 Erlbaum E.d. 2nd ed.

582 Coogan, P. A., and Chen, C. P. 2007. "Career development and counselling for women:
583 Connecting theories to practice". *Counselling Psychology Quarterly*, 20 (2), 191–204.

584 Cushnie, M. E. 1999. *African-american women first-line supervisors: a qualitative study*
585 *of their career development process* (Doctoral thesis). Ohio State University.

586 Dainty, A. R. J., Neale, R. H., and Bagilhole, B. M. 1999. "Women's careers in large
587 construction companies: expectations unfulfilled?." *Career Development International*,
588 4(7), 353-358.

589 Dainty, A. R. J., Bagihole, B. M., Ansari, K. H., and Jackson, J. 2004. "Creating equality
590 in the construction industry: An agenda for change for women and ethnic minorities."
591 *Construction Research*, 5(1), 75–86.

592 Davis, S. 2014. "Professional women in construction." In The Smith Institute (Ed.),
593 *Building the future: women in construction*, 45-54.

594 Elejabeitia Tavera, C., and López Sáez, M. 2003. *Trayectorias personales y profesionales*
595 *de mujeres con estudios tradicionalmente masculinos*. Instituto de la Mujer. Ministerio
596 de Trabajo y Asuntos Sociales.

597 Ellison, L., and Cowlin, E. 2006. *Raising the ration research: What motivates women to*
598 *leave the profession*. Thames, UK: Kingston Univ.

599 English, J., and Hay, P. 2015. "Black South African women in construction: cues for
600 success." *Journal of Engineering, Design and Technology*, 13(1), 144–164.

601 English, J., and Le Jeune, K. 2012. "Do professional women and tradeswomen in the
602 South African construction industry share common employment barriers despite
603 progressive government legislation?" *J. Prof. Issues Eng. Educ. Pract.*, 138(2), 145-152.

604 Eurostat 2015. *Women in the EU gave birth to their first child at almost 29 years of age*
605 *on average*. Accessed Jul 23, 2020.
606 [http://ec.europa.eu/eurostat/documents/2995521/6829228/3-13052015-CP-](http://ec.europa.eu/eurostat/documents/2995521/6829228/3-13052015-CP-EN.pdf/7e9007fb-3ca9-445f-96eb-fd75d6792965)
607 [EN.pdf/7e9007fb-3ca9-445f-96eb-fd75d6792965](http://ec.europa.eu/eurostat/documents/2995521/6829228/3-13052015-CP-EN.pdf/7e9007fb-3ca9-445f-96eb-fd75d6792965)

608 French, E. and Strachan, G. 2018. Women in the construction industry. In: Emuze, F. and
609 Smallwood, J. Eds: *Valuing People in Construction*. Routledge. 151-171.

610 Fuentes-del-Burgo, J. and Navarro-Astor, E. (2015) "Propuestas para reducir los
611 desajustes educativos percibidos: Visión de arquitectos técnicos e ingenieros de
612 edificación que trabajan como jefe de obra". *Revista de Formación e Innovación*
613 *Educativa Universitaria*. Vol. 8 (3), 114-134.

614 Gadassi, R. and Gati, I. 2009. "The effect of gender stereotypes on explicit and implicit
615 career preferences". *The Counseling Psychologist*, 37(6), 902–922.

616 Gottfredson, L. S. 1981. "Circumscription and Compromise: A developmental theory of
617 occupational aspirations." *Journal of Counseling Psychology Monograph*, 28(6), 545–579.

618 Gottfredson, L. S. 1996. *Gottfredson's theory of circumscription and compromise*. In:
619 Career choice and Development (3rd ed.) 179–232.

620 Gottfredson, L.S. 2002. *Gottfredson's Theory of circumscription, compromise, and self-*
621 *creation*, in Brown (Ed.): Career Choice and Development. 85-148.

622 Gottfredson, L. S. 2005. *Applying Gottfredson's Theory of circumscription and*
623 *compromise in career guidance and counseling*, in S. D. Brown and R.W. Lent: Career
624 Development and Counseling. Putting Theory and Research Work. 71-100. Hardie, J.
625 H. 2015. "Women's work? Predictors of young men's aspirations for entering
626 traditionally female-dominated occupations". *Sex Roles*, 72, 349-362.

627 Hawks, B. K. and Spade, J. Z. 1998. "Women and men engineering students: anticipation
628 of family and work roles." *Journal of Engineering Education*, 87(3), 249–256.

629 INE 2018. *Encuesta de Población Activa EPA. Cuarto Trimestre de 2018*. Instituto
630 Nacional de Estadística.

631 INE 2020. *Encuesta de Población Activa EPA. Serie histórica*. Instituto Nacional de
632 Estadística.

633 Infante Perea, M., Román Onsaló, M. and Traverso Cortés, J. 2012. "The Spanish
634 construction sector under gender perspective. Analysis of working conditions". *Revista*
635 *de la Construcción*, 11(1), 32–43.

636 Infante-Perea, M., Román-Onsaló, M., and Navarro-Astor, E. 2016. "Perceived Career
637 Barriers for Future Female and Male Spanish Building Engineers: Case of Occupations
638 Related to Work on Site." *J. Prof. Issues Eng. Educ. Pract.*, 142(4), 1-10.

639 Infante-Perea, M., M. Román-Onsalo, and E. Navarro-Astor. 2018. “Expected career
640 barriers in building engineering: Does gender matter?” *Journal of Women and Minorities*
641 *in Science and Engineering*, 24 (1): 43–59. [https://doi](https://doi.org/10.1615/JWomenMinorScienEng.2017018301)
642 [.org/10.1615/JWomenMinorScienEng.2017018301](https://doi.org/10.1615/JWomenMinorScienEng.2017018301).

643 Infante-Perea, M., Román-Onsalo, M., and Navarro-Astor, E. 2019. “Relationship
644 between Gender Segregation and Students' Occupational Preferences in Building
645 Engineering.” *J. Prof. Issues Eng. Educ. Pract.*, 145 (4): 04019014.
646 DOI: 10.1061/(ASCE)EI.1943-5541.0000422

647 Lent, R. W., Paixão, M. P., Silva, J. T. and Leitão, L. M. 2010. Predicting occupational
648 interests and choice aspirations in Portuguese high school students: a test of social
649 cognitive career theory. *Journal of Vocational Behavior*, 76(2), 244–251.

650 Ling, F.Y.Y., Zhang, Z. and Tay, S.Y.L. 2020. “Imposter Syndrome and Gender
651 Stereotypes: Female Facility Managers’ Work Outcome”. *J. Manage. Eng.*, 36 (5).

652 Lopez del Puerto, C., Guggemos, A., and Shane, J. 2011. Exploration of Strategies for
653 Attracting and Retaining Female Construction Management Students. *In: 47th ASC*
654 *Annual International Conference Proceedings*, 187-194. Omaha, NE.

655 Manesh, S.N., Choi, J.O, Shrestha, B.K., Lim, J. and Shrestha, P.P. 2020. “Spatial
656 Analysis of the Gender Wage Gap in Architecture, Civil Engineering, and Construction
657 Occupations in the United States. *J. Manage. Eng.*, 36 (4): 04020023

658 Moore, J. D., and Gloeckner, G. W. 2007. “A Theory of Women’s Career Choice in
659 Construction Management: Recommendations for Academia.” *International Journal of*
660 *Construction Education and Research*, 3(2), 123–139.

661 Moraba, M.Y. and Babatunde, O. 2020. “Graduating female students’ long-term career
662 decisions and underrepresentations of women in South Africa’s construction industry”.
663 *In: C. Aigbavboa and W.Thwala (Eds.): CIDB 2019, The Construction Industry in the*

664 *Fourth Industrial Revolution*, 158-167.

665 Morello, M., R. Issa, and Franz, B. 2018. "Exploratory study of recruitment and retention
666 of women in the construction industry", *J. Prof. Issues Eng. Educ. Pract.* 144(2)

667 Naoum, S.G., Harris, J., Rizzuto, J., and Egbu, C. 2020. "Gender in the Construction
668 Industry: Literature Review and Comparative Survey of Men's and Women's Perceptions
669 in UK Construction Consultancies", *J. Manage. Eng.* 36(2).

670 Navarro-Astor, E.; Román-Onsalo, M. and Infante-Perea, M. 2017. "Women's career
671 development in the construction industry across 15 years: main barriers", *Journal of*
672 *Engineering, Design and Technology*, 15 (2), 199-221.

673 Ng, T.W. and Feldman, D.C. 2014. "Subjective career success: a meta-analytic review",
674 *Journal of Vocational Behavior*, 85, 169-179.

675 OFLC. 2020a. *Mujeres en el sector de la construcción. Microdatos EPA 4T-2019*.
676 Observatorio Fundación Laboral de la Construcción.

677 Otto, C. 2018. "Mujeres y Arquitectura Técnica: cambio de mentalidad". *Revista Cercha*,
678 138, octubre, 12-16.

679 Perrenoud, A.J., Bigelow, B.F. and Perkins, E.M. 2020. "Advancing Women in
680 Construction: Gender Differences in Attraction and Retention". *J. Manage. Eng.*, 36 (5).

681 Prieto, C., and Pérez de Guzmán, S. (2013). "Gender Labour Inequalities, Temporal
682 Availability and Social Regulation". *Revista Española de Investigaciones Sociológicas*,
683 141, 113–132.

684 Regis, M.F., Alberte, E.P.V., dos Santos Lima, D. and Freitas, R.L.S. 2019. "Women in
685 construction: shortcomings, difficulties, and good practices." *Engineering, Construction*
686 *and Architectural Management*. 26(11), 2535-2549. DOI 10.1108/ECAM-09-2018-0425

687 Rosa, J.E., Hon, C.K.H., Xia, B. and Lamari, F. 2017. "Challenges, success factors and
688 strategies for women's career development in the Australian construction industry".

689 *Construction Economics and Building*, 17(3), 27-46. [http://dx.doi.](http://dx.doi.org/10.5130/AJCEB.v17i3.5520)
690 [org/10.5130/AJCEB.v17i3.5520](http://dx.doi.org/10.5130/AJCEB.v17i3.5520)

691 BOE. 1997. Real Decreto 1627/1997, de 24 de octubre, por el que se establecen
692 disposiciones mínimas de seguridad y de salud en las obras de construcción.
693 <https://www.boe.es/eli/es/rd/1997/10/24/1627/con>

694 Sang, K., and Powell, A. 2012. Gender inequality in the construction industry : Lessons
695 from Pierre Bourdieu. Smith, S.D (Ed) *Procs 28th Annual ARCOM Conference*,
696 September 3-5, 2012, Edinburgh, UK, Association of Researchers in Construction
697 Management, 237-247.

698 Scott, A., and Martin, A. 2014. "Perceived barriers to higher education in science,
699 technology, engineering, and mathematics." *Journal of Women and Minorities in Science*
700 *and Engineering*, 20(3), 235–256.

701 Shrestha, B.K., Choi, J.O., Shrestha, P. P., Lim, J. and Manesh, S.N. 2020. "Employment
702 and Wage Distribution Investigation in the Construction Industry" *J. Manage. Eng.*, 36
703 (4):06020001-1

704 Solís, R., and Arcudia, C. 2004. "Estudio de caso en México: Los alumnos de ingeniería
705 civil opinan sobre las debilidades de egreso." *Revista Ingeniería e Investigación*, 24(2),
706 27-34.

707 Song, Z., , Yang, F., Boezeman, E.J. and Li, X. 2020. "Do new-generation construction
708 professionals be provided what they desire at work? A study on work values and supplies–
709 values fit", *Engineering, Construction and Architectural Management*, Vol. ahead-of-
710 print No. ahead-of-print. <https://doi.org/10.1108/ECAM-11-2019-0619>

711 Sospeter, N. G., Rwelamila, P. D., Nchimbi, M. and Masoud, M. 2014. "Review of theory
712 and practice literature on women entrepreneurship in the tanzanian construction industry:
713 Establishing the missing link". *Journal of Construction in Developing Countries*, 19(2),

714 75–85.

715 Struthers, K., Strachan, G. 2019. “Attracting women into male-dominated trades: Views
716 of young women in Australia”, *International Journal for Research in Vocational*
717 *Education and Training* 6 (1), 1-19.

718 Swanson, J. L., and Woitke, R. 1997. “Theory into practice in career assessment for
719 women: Assessment and interventions regarding perceived career barriers.” *Journal of*
720 *Career Assessment*, 5(4), 443–462.

721 Swanson, J. L., Daniels, K. K., and Tokar, D. M. 1996. “Assessing perceptions of career
722 related barriers: The career barriers inventory.” *Journal of Career Assessment*, 4(2), 219–
723 244.

724 Thevenin, M. K., and Elliott, J. W. 2015. “Construction Management Students’ Mentors
725 and Role Models: Developing a Demographic Profile”. In *51st ASC Annual International*
726 *Conference Proceedings*.

727 Tsaousides, T., and Jome, L. 2008. “Perceived career compromise, affect and work-
728 related satisfaction in college students”. *Journal of Vocational Behavior*, 73(2), 185–194.
729 <https://doi.org/10.1016/j.jvb.2008.04.003>

730 Wright, T. 2014. *The Women into Construction Project: an assessment of a model for*
731 *increasing women’s participation in construction*. Queen Mary, University of London,
732 UK.

733

734

735 [Please insert Figures 3-4-5 here]

736

737

738

739

740 [Please insert Tables 1-2-3-4 here]

Table 1: Significant differences and effect size in career barrier perceptions according to sex.

Career Barriers	Production site management		Consultancy and technical auditing		Risk prevention and health and safety		Building operation		Technical project drafting and develop.		Technical site management	
	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>
Inadequate training	0.367	0.07	0.718	0.03	0.730	0.03	0.341	0.08	0.045* F	0.16	0.067	0.14
Job market constraints	0.675	0.03	0.262	0.06	0.808	0.03	0.611	0.01	0.223	0.06	0.991	0.02
Boss biased against an individual's gender	0.000** F	0.75	0.000** F	0.56	0.000** F	0.64	0.000** F	0.61	0.000** F	0.62	0.000** F	0.70
Lack of confidence	0.000** F	0.36	0.000** F	0.43	0.000** F	0.29	0.000** F	0.32	0.000** F	0.33	0.000** F	0.40
Disapproval from significant other	0.006** F	0.25	0.157	0.16	0.081	0.13	0.120	0.12	0.055	0.16	0.031* F	0.16
Sexual harassment	0.000** F	0.67	0.000** F	0.65	0.000** F	0.74	0.000** F	0.68	0.000** F	0.69	0.000** F	0.75
Socialization and communication difficulties	0.009** F	0.19	0.005** F	0.23	0.153	0.12	0.379	0.05	0.182	0.11	0.040* F	0.15
Multiple-role conflict	0.023* F	0.17	0.035* F	0.15	0.139	0.10	0.024* F	0.16	0.018* F	0.15	0.035* F	0.14
Decision-making difficulties	0.000** F	0.31	0.000** F	0.28	0.000** F	0.30	0.001** F	0.26	0.000** F	0.26	0.000** F	0.32
Work/family conflict	0.000** F	0.31	0.000** F	0.31	0.000** F	0.28	0.001** F	0.29	0.000** F	0.33	0.000** F	0.43
Promotion delays with respect to the opposite gender	0.000** F	0.45	0.000** F	0.42	0.000** F	0.40	0.000** F	0.36	0.000** F	0.45	0.000** F	0.50
Career dissatisfaction	0.667	0.02	0.866	0.01	0.706	0.01	0.113	0.13	0.083	0.15	0.066	0.15
Lower salaries than colleagues of the opposite gender	0.000** F	0.77	0.000** F	0.68	0.000** F	0.71	0.000** F	0.67	0.000** F	0.73	0.000** F	0.73
Discouragement from choosing nontraditional career	0.035* F	0.18	0.023* F	0.21	0.001** F	0.29	0.015* F	0.21	0.009** F	0.23	0.001** F	0.30
Sex discrimination in hiring	0.000** F	0.92	0.000** F	0.77	0.000** F	0.81	0.000** F	0.87	0.000** F	0.74	0.000** F	0.94

* $p < 0.05$ and ** $p < 0.01$ significant differences exist with a 95% and 99% of confidence level, respectively; F: average range favouring female students; M: average range favouring male students; $d \approx 0.2$ minor differences; $d \approx 0.5$ moderate differences; and $d \geq 0.8$ major differences.

Table 2: Significant differences and effect size in career barrier perceptions according to age group.

Career Barriers		Production site management		Consultancy and technical auditing		Risk prevention and health and safety		Building operation		Technical project drafting and develop.		Technical site management	
		<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>
Inadequate training	F	0.056	0.45	0.038**<	0.46	0.338	0.22	0.032**<	0.47	0.368	0.21	0.151	0.32
	M	0.009**<	0.35	0.002**<	0.41	0.003**<	0.37	0.031**<	0.28	0.091	0.19	0.000**<	0.43
Job market constraints	F	0.693	0.15	0.716	0.07	0.020**>	0.53	0.369	0.22	0.222	0.26	0.380	0.20
	M	0.483	0.17	0.578	0.04	0.593	0.11	0.754	0.11	0.29	0.17	0.265	0.21
Boss biased against an individual's gender	F	0.986	0.00	0.958	0.02	0.859	0.04	0.839	0.05	0.832	0.05	0.978	0.01
	M	0.166	0.17	0.501	0.07	0.651	0.06	0.151	0.17	0.441	0.10	0.650	0.08
Lack of confidence	F	0.100	0.38	0.051	0.44	0.035**<	0.44	0.035**<	0.49	0.007**<	0.62	0.009**<	0.61
	M	0.002**<	0.35	0.001**<	0.39	0.001**<	0.39	0.002**<	0.36	0.000**<	0.41	0.002**<	0.37
Disapproval from significant other	F	0.412	0.13	0.151	0.27	0.243	0.20	0.465	0.08	0.508	0.04	0.309	0.13
	M	0.491	0.04	0.014**<	0.27	0.047**<	0.19	0.021**<	0.26	0.014**<	0.26	0.045**<	0.25
Sexual harassment	F	0.785	0.06	0.615	0.10	0.471	0.17	0.390	0.21	0.331	0.22	0.464	0.17
	M	0.341	0.13	0.244	0.16	0.089	0.21	0.132	0.22	0.460	0.14	0.091	0.23
Socialization and communication difficulties	F	0.038**<	0.46	0.224	0.27	0.282	0.25	0.874	0.08	0.982	0.01	0.242	0.28
	M	0.072	0.21	0.093	0.21	0.005**<	0.32	0.008**<	0.31	0.014**<	0.28	0.007**<	0.33
Multiple-role conflict	F	0.007**>	0.61	0.065	0.41	0.042**>	0.44	0.081	0.36	0.174	0.28	0.050**>	0.41
	M	0.322	0.15	0.758	0.07	0.345	0.10	0.389	0.11	0.510	0.08	0.526	0.09
Decision-making difficulties	F	0.134	0.35	0.097	0.38	0.325	0.22	0.164	0.32	0.226	0.26	0.303	0.21
	M	0.011**<	0.30	0.072	0.20	0.016**<	0.30	0.005**<	0.33	0.012**<	0.29	0.013**<	0.31
Work/family conflict	F	0.003**>	0.78	0.008**>	0.71	0.019**>	0.61	0.016**>	0.62	0.052	0.47	0.105	0.42
	M	0.035**>	0.32	0.081	0.19	0.087	0.21	0.330	0.13	0.023**>	0.22	0.070	0.21
Promotion delays with respect to the opposite gender	F	0.012**>	0.59	0.090	0.33	0.336	0.14	0.020**>	0.50	0.167	0.26	0.078	0.41
	M	0.850	0.04	0.512	0.10	0.559	0.12	0.495	0.14	0.962	0.01	0.288	0.17
Career dissatisfaction	F	0.065	0.43	0.121	0.31	0.030**>	0.47	0.060	0.42	0.037**>	0.45	0.028**>	0.49
	M	0.747	0.02	0.505	0.05	0.298	0.17	0.851	0.01	0.962	0.03	0.609	0.08
Lower salaries than colleagues of the opposite gender	F	0.389	0.18	0.377	0.19	0.280	0.22	0.256	0.22	0.211	0.25	0.223	0.25
	M	0.910	0.02	0.653	0.06	0.747	0.03	0.554	0.08	0.871	0.03	0.340	0.11
Discouragement from choosing nontraditional career	F	0.260	0.24	0.177	0.33	0.619	0.10	0.219	0.30	0.490	0.16	0.641	0.08
	M	0.475	0.07	0.590	0.07	0.417	0.10	0.199	0.16	0.687	0.04	0.589	0.08
Sex discrimination in hiring	F	0.487	0.15	0.296	0.24	0.225	0.26	0.269	0.23	0.324	0.21	0.965	0.01
	M	0.714	0.03	0.905	0.03	0.914	0.00	0.684	0.01	0.878	0.03	0.516	0.00

F: Female students according to age M: Male students according to age

p* < 0.05; *p* < 0.01 significant differences exist with a 95% and 99% of confidence level, respectively; >: average range favouring students older than or 30; <: average range favouring students younger than 30; *d* ≈ 0.2 minor differences; *d* ≈ 0.5 moderate differences; and *d* ≥ 0.8 major differences.

Table 3: Significant differences and effect size in career barrier perceptions according to work experience.

Career Barriers		Production site management		Consultancy and technical auditing		Risk prevention and health and safety		Building operation		Technical project drafting and develop.		Technical site management	
		<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>
Inadequate training	F	0.017**^N	0.41	0.007*^N	0.45	0.015**^N	0.40	0.010*^N	0.39	0.037**^N	0.34	0.027**^N	0.35
	M	0.001**^N	0.34	0.004**^N	0.29	0.024*^N	0.21	0.006**^N	0.26	0.056	0.17	0.033*^N	0.21
Job market constraints	F	0.734	0.10	0.889	0.01	0.863	0.04	0.531	0.08	0.462	0.09	0.550	0.07
	M	0.830	0.08	0.829	0.01	0.144	0.12	0.703	0.02	0.719	0.01	0.855	0.08
Boss biased against an individual's gender	F	0.694	0.06	0.366	0.13	0.614	0.08	0.708	0.06	0.788	0.04	0.590	0.08
	M	0.711	0.02	0.530	0.06	0.261	0.08	0.975	0.01	0.957	0.01	0.622	0.04
Lack of confidence	F	0.013**^N	0.40	0.024**^N	0.36	0.012**^N	0.39	0.015**^N	0.39	0.001*^N	0.54	0.002*^N	0.49
	M	0.075	0.16	0.035*^N	0.19	0.087	0.14	0.322	0.07	0.004**^N	0.28	0.011*^N	0.21
Disapproval from significant other	F	0.676	0.09	0.314	0.20	0.643	0.10	0.754	0.09	0.818	0.08	0.492	0.12
	M	0.020*^N	0.18	0.000**^N	0.32	0.007**^N	0.23	0.027*^N	0.20	0.056	0.14	0.045*^N	0.15
Sexual harassment	F	0.077	0.28	0.499	0.09	0.702	0.04	0.539	0.08	0.729	0.04	0.712	0.05
	M	0.508	0.06	0.839	0.04	0.594	0.04	0.532	0.07	0.581	0.03	0.889	0.00
Socialization and communication difficulties	F	0.001*^N	0.50	0.021**^N	0.35	0.001*^N	0.52	0.126	0.24	0.039**^N	0.32	0.008*^N	0.45
	M	0.545	0.05	0.447	0.09	0.338	0.09	0.084	0.17	0.416	0.07	0.110	0.17
Multiple-role conflict	F	0.821	0.02	0.409	0.11	0.694	0.05	0.919	0.03	0.874	0.01	0.832	0.03
	M	0.389	0.10	0.391	0.09	0.559	0.03	0.404	0.09	0.936	0.03	0.353	0.09
Decision-making difficulties	F	0.019**^N	0.36	0.103	0.25	0.004*^N	0.46	0.002*^N	0.51	0.007*^N	0.43	0.036**^N	0.34
	M	0.000**^N	0.38	0.105	0.13	0.017*^N	0.17	0.018*^N	0.18	0.007**^N	0.22	0.001**^N	0.25
Work/family conflict	F	0.029**^Y	0.37	0.073	0.33	0.248	0.21	0.100	0.26	0.302	0.17	0.439	0.13
	M	0.760	0.10	0.281	0.12	0.605	0.06	0.798	0.05	0.374	0.11	0.246	0.14
Promotion delays with respect to the opposite gender	F	0.781	0.09	0.673	0.05	0.756	0.03	0.581	0.13	0.697	0.06	0.930	0.03
	M	0.331	0.05	0.833	0.05	0.838	0.03	0.996	0.00	0.543	0.00	0.575	0.09
Career dissatisfaction	F	0.866	0.05	0.829	0.03	0.475	0.11	0.883	0.06	0.828	0.04	0.636	0.07
	M	0.540	0.07	0.526	0.07	0.603	0.08	0.404	0.06	0.517	0.04	0.739	0.01
Lower salaries than colleagues of the opposite gender	F	0.121	0.24	0.407	0.15	0.475	0.12	0.477	0.12	0.453	0.13	0.386	0.14
	M	0.770	0.01	0.955	0.02	0.983	0.05	0.751	0.03	0.846	0.02	0.496	0.03
Discouragement from choosing nontraditional career	F	0.871	0.05	0.653	0.12	0.357	0.12	0.851	0.01	0.881	0.01	0.532	0.08
	M	0.230	0.06	0.185	0.08	0.024	0.18	0.040*^N	0.16	0.078	0.13	0.010**^N	0.22
Sex discrimination in hiring	F	0.538	0.10	0.424	0.13	0.613	0.08	0.637	0.07	0.911	0.01	0.488	0.11
	M	0.743	0.00	0.934	0.06	0.507	0.03	0.030*^N	0.16	0.352	0.07	0.123	0.10

F: Female students with and without work experience M: Male students with and without work experience

*p<0.05 and **p<0.01 significant differences exist with a 95% and 99% of confidence level, respectively; N: average range favouring students without work experience; Y: average range favouring students with work experience; d ≈ 0.2 minor differences; d ≈ 0.5 moderate differences; and d ≥ 0.8 major differences.

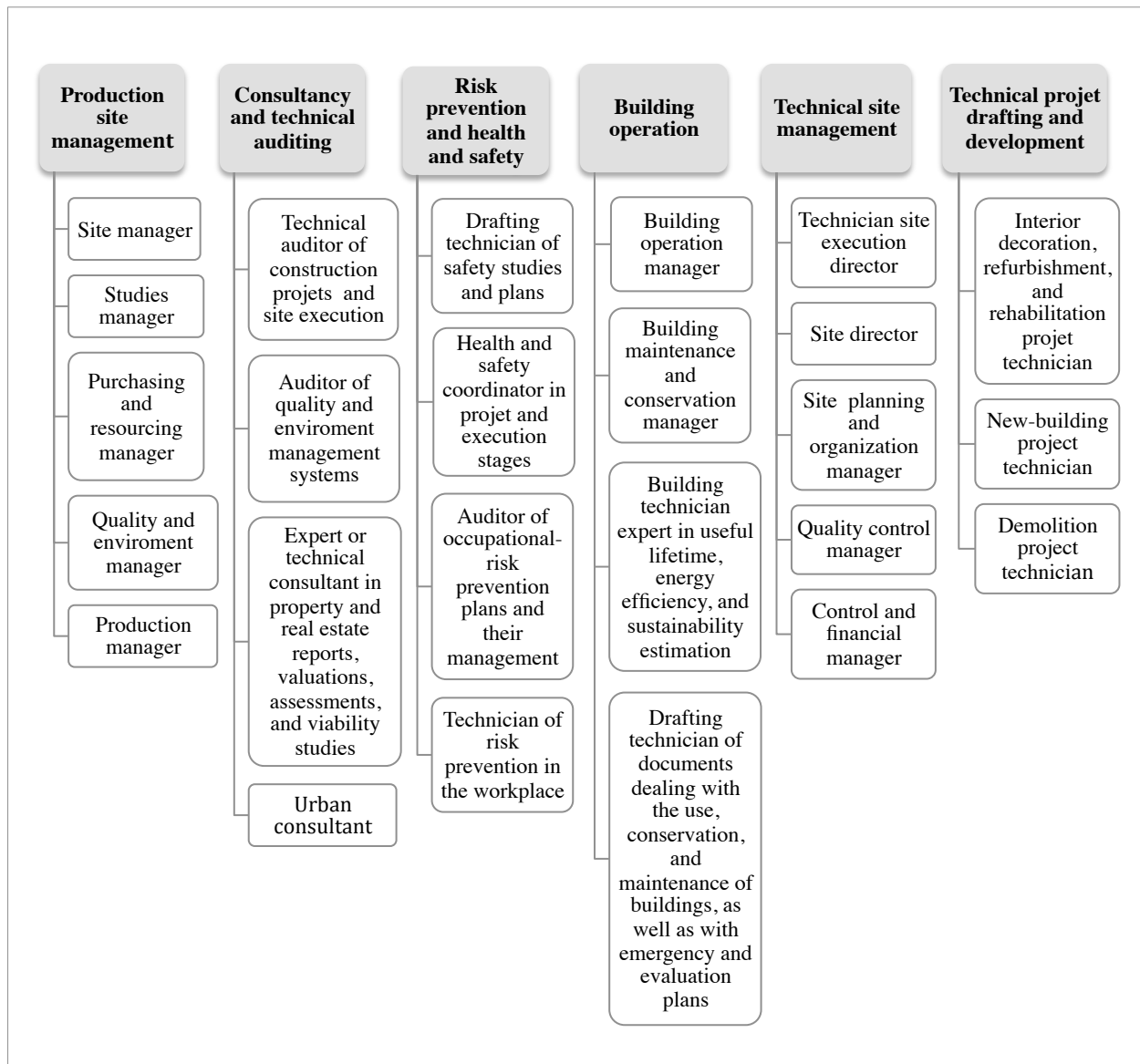
Table 4: Significant differences and effect size in career barrier perceptions according to relatives in the industry.

Career Barriers		Production site management		Consultancy and technical auditing		Risk prevention and health and safety		Building operation		Technical project drafting and develop.		Technical site management	
		<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>
Inadequate training	F	0.370	0.13	0.700	0.04	0.456	0.10	0.481	0.09	0.997	0.00	0.323	0.12
	M	0.338	0.08	0.036**^Y	0.20	0.268	0.11	0.956	0.01	0.437	0.08	0.172	0.13
Job market constraints	F	0.805	0.01	0.582	0.06	0.566	0.11	0.558	0.03	0.779	0.00	0.912	0.06
	M	0.603	0.02	0.939	0.01	0.96	0.01	0.985	0.02	0.989	0.01	0.714	0.03
Boss biased against an individual's gender	F	0.441	0.09	0.445	0.10	0.676	0.05	0.535	0.07	0.796	0.04	0.772	0.04
	M	0.179	0.13	0.159	0.14	0.806	0.01	0.687	0.01	0.522	0.06	0.47	0.05
Lack of confidence	F	0.472	0.08	0.538	0.08	0.345	0.12	0.635	0.08	0.306	0.13	0.278	0.14
	M	0.538	0.07	0.733	0.02	0.439	0.09	0.953	0.01	0.396	0.07	0.888	0.02
Disapproval from significant other	F	0.241	0.16	0.159	0.15	0.657	0.03	0.595	0.05	0.973	0.03	0.721	0.03
	M	0.858	0.02	0.384	0.08	0.929	0.04	0.785	0.03	0.961	0.02	0.981	0.00
Sexual harassment	F	0.259	0.14	0.186	0.17	0.837	0.04	0.328	0.13	0.160	0.18	0.189	0.16
	M	0.705	0.01	0.159	0.11	0.427	0.03	0.518	0.07	0.076	0.13	0.573	0.01
Socialization and communication difficulties	F	0.317	0.13	0.032**^N	0.26	0.264	0.13	0.206	0.16	0.406	0.09	0.344	0.11
	M	0.215	0.10	0.297	0.10	0.305	0.09	0.528	0.04	0.993	0.01	0.317	0.08
Multiple-role conflict	F	0.301	0.09	0.036**^N	0.26	0.260	0.11	0.322	0.12	0.051	0.23	0.092	0.19
	M	0.944	0.03	0.402	0.09	0.878	0.03	0.319	0.12	0.924	0.01	0.952	0.03
Decision-making difficulties	F	0.323	0.12	0.905	0.02	0.700	0.06	0.151	0.20	0.752	0.04	0.530	0.08
	M	0.111	0.14	0.96	0.02	0.884	0.01	0.922	0.01	0.528	0.03	0.448	0.04
Work/family conflict	F	0.632	0.05	0.262	0.11	0.372	0.13	0.179	0.20	0.692	0.05	0.468	0.11
	M	0.118	0.15	0.723	0.03	0.315	0.09	0.191	0.16	0.989	0.00	0.184	0.13
Promotion delays with respect to the opposite gender	F	0.627	0.03	0.212	0.12	0.826	0.01	0.702	0.03	0.532	0.05	0.159	0.17
	M	0.721	0.03	0.685	0.06	0.062	0.17	0.300	0.10	0.048**^N	0.21	0.015**^N	0.20
Career dissatisfaction	F	0.912	0.03	0.437	0.07	0.973	0.02	0.558	0.07	0.778	0.07	0.657	0.03
	M	0.393	0.07	0.399	0.06	0.392	0.06	0.691	0.01	0.268	0.08	0.111	0.14
Lower salaries than colleagues of the opposite gender	F	0.278	0.15	0.160	0.17	0.930	0.00	0.672	0.06	0.189	0.15	0.322	0.12
	M	0.021**^N	0.18	0.103	0.10	0.38	0.07	0.189	0.11	0.173	0.09	0.984	0.01
Discouragement from choosing nontraditional career	F	0.563	0.09	0.341	0.13	0.443	0.13	0.316	0.16	0.277	0.18	0.409	0.12
	M	0.557	0.07	0.549	0.05	0.773	0.05	0.606	0.06	0.53	0.05	0.837	0.01
Sex discrimination in hiring	F	0.506	0.08	0.487	0.09	0.672	0.04	0.670	0.04	0.719	0.03	0.341	0.11
	M	0.857	0.00	0.602	0.06	0.104	0.10	0.571	0.00	0.51	0.03	0.471	0.00

F: Female students with and without relatives working in the industry M: Male students with and without relatives working in the industry

* $p < 0.05$ and ** $p < 0.01$ significant differences exist with a 95% and 99% of confidence level, respectively; N: average range favouring students without relatives in the industry; Y: average range favouring students with relatives in the industry; $d \approx 0.2$ minor differences; $d \approx 0.5$ moderate differences; and $d \geq 0.8$ major differences.

Figure 1: Career paths outlined in the White Book of the Building Engineering Degree. Career categories and occupations. (ANECA, 2004):



Source: Own elaboration based on ANECA (2004)

Figure 2: Inventory of Career Barriers.

Career Barriers	
1.	Inadequate training (sense of failed preparation)
2.	Job market constraints (tight economy with few opportunities)
3.	Boss biased against an individual's gender
4.	Lack of confidence (self-esteem issues, not feeling confident in job ability)
5.	Disapproval from significant other
6.	Sexual harassment
7.	Socialization and communication difficulties (no role models available)
8.	Multiple-role conflict (balancing work and non-work responsibilities)
9.	Decision-making difficulties
10.	Work-family conflict (inadequate child-care resources, inflexible training schedules, meetings scheduled outside regular hours)
11.	Promotion delays with respect to the opposite gender
12.	Career dissatisfaction
13.	Lower salaries than colleagues of the opposite gender
14.	Discouragement from choosing non-traditional career
15.	Sex discrimination in hiring

Figure 3: Female and male students' perceived career barriers. Percentages of positive answers (scores 3 and 4).

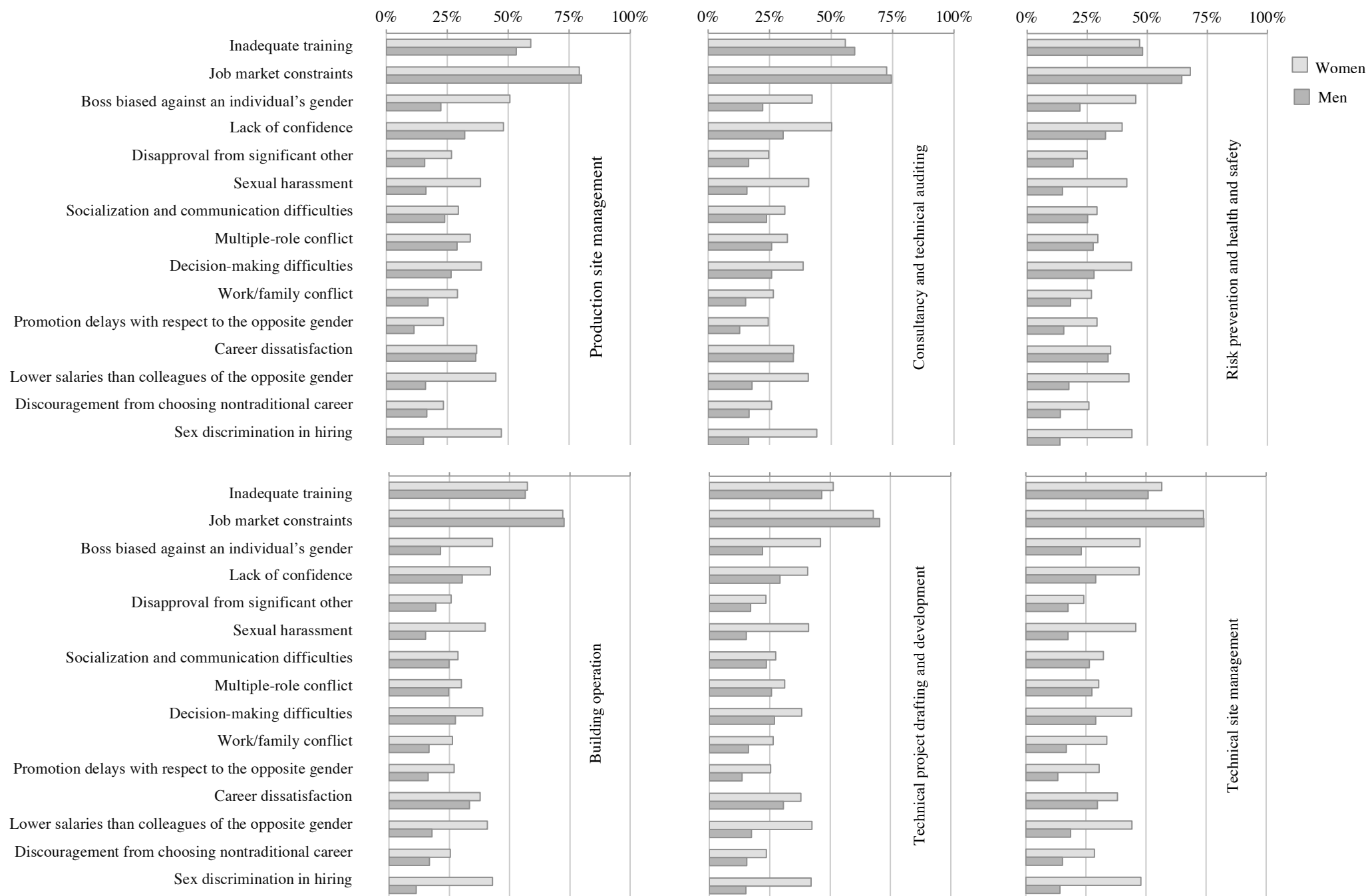


Figure 4: Career barriers perceived by more than 50% of female students, according to sociodemographic variables.

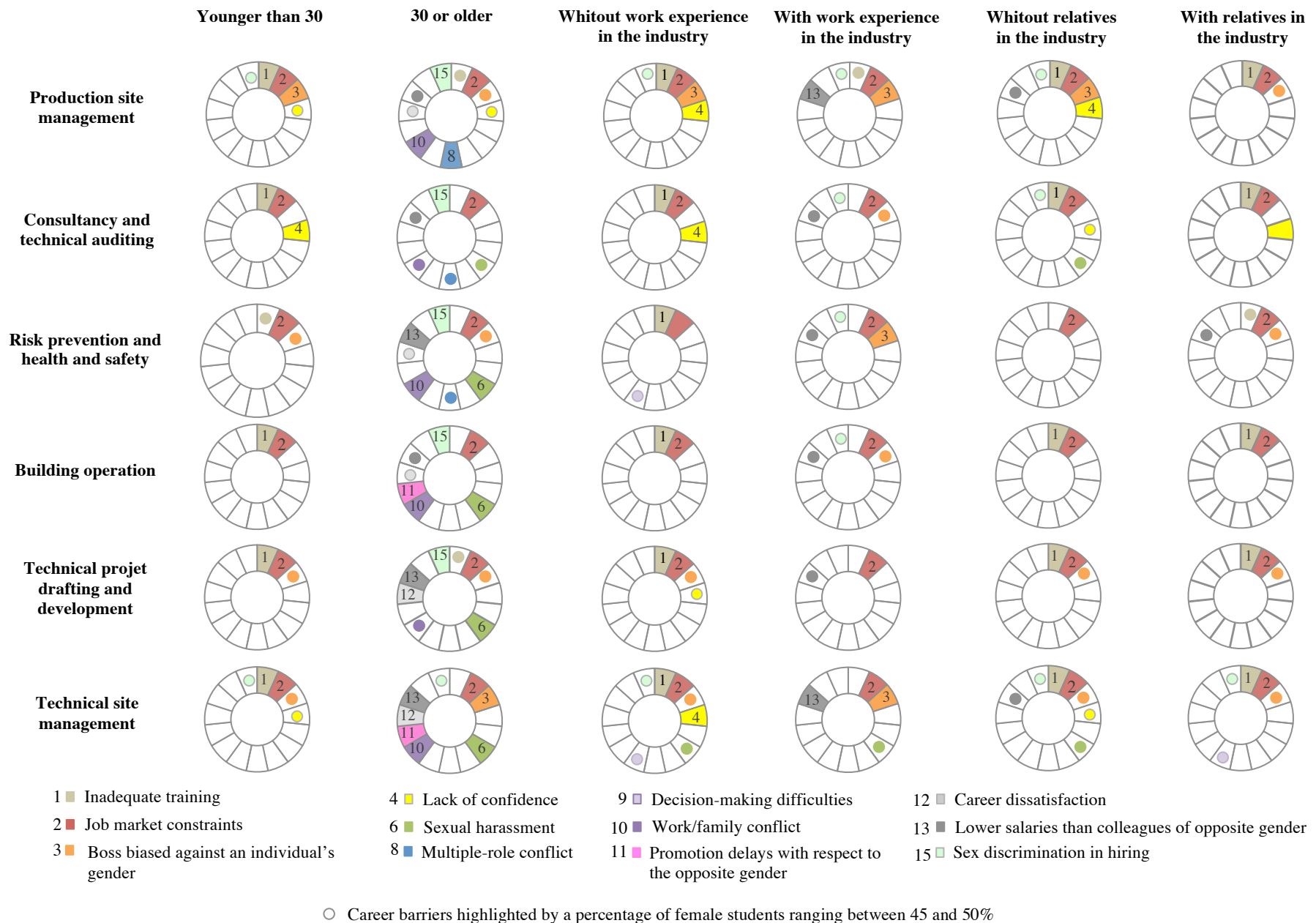


Figure 5: Career barriers perceived by more than 50% of male students, according to sociodemographic variables.

