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Social Psychological Bulletin

Gender Discrimination and Hegemonic Masculinity in Study Fields: A Multi-Level Analysis Among Female and Male Students in Vocational Education

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Social Psychological Bulletin, 2025, Vol. 20, Article e14229, https://doi.org/10.32872/spb.14229

Received: 2024-03-22 • **Accepted:** 2025-03-13 • **Published (VoR):** 2025-08-19

Handling Editor: Magdalena Formanowicz, SWPS University, Warsaw, Poland

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Supplementary Materials: Code, Data [see Index of Supplementary Materials]

Abstract

A substantial body of research has documented significant variations across fields of study in the prevalence of discrimination experiences among women. In the present research, we investigated the role of normative climates in fields of study by focusing on the shared endorsement of hegemonic masculinity on the experiences and anticipations of gender discrimination among female and male students. We recruited a large sample of students attending upper-secondary vocational schools (N = 1,298), segmented into various fields of study (k = 35). We assessed students' endorsement of hegemonic masculinity (whose effects were estimated at the field level), along with perceived and anticipated gender discrimination (estimated at the individual level). Multi-level structural equation modelling revealed cross-level interactions consistent with our hypotheses. Female students, particularly in fields of study scoring high in hegemonic masculinity, perceived and anticipated more gender discrimination than their male counterparts. These gender differences were either weaker or absent in fields with a climate low in hegemonic masculinity. These findings highlight the importance of addressing the role of normative climates occurring in local educational contexts to adequately determine the experiences of female and male students.

Keywords

fields of study, hegemonic masculinity, gender discrimination, normative climates, vocational education

Highlights

- Prior research has shown that the prevalence of discrimination experiences among women varies significantly across fields of study.
- The present research innovatively investigated the role of the shared endorsement of hegemonic masculinity on gender discrimination among female and male students in vocational education.
- We found that female students perceive and anticipate more gender discrimination than male students in fields of study scoring high in hegemonic masculinity.
- These findings highlight the importance of normative climates in a better understanding of the experiences of discrimination among female students.

Despite growing concerns and efforts to tackle gender inequalities in education over the past few decades, female students still report experiencing more disadvantageous treatments and discriminatory acts (e.g., negative or condescending remarks, paternalistic tone, sexist jokes or comments, lack of support, or exclusion from group activities) than male students (e.g., Brown & Stone, 2016; Leaper & Brown, 2014, 2018). However, prevalence estimates of gender discrimination in school settings vary considerably across fields of study. For example, in comparison to female-dominated (e.g., health, social work) or gender-balanced fields of study (e.g., business, law), women's propensity to experience discrimination is higher in traditionally male-dominated fields of study, such as in STEM (Science, Technology, Engineering, and Mathematics; Leaper & Starr, 2019; Settles et al., 2006, 2013). Robnett (2016) offered a clear illustration of this tendency in a study conducted on a sample of undergraduate women in the US, showing that 70% of those in math-intensive majors reported experiencing gender bias from male peers, while 50% reported so in life science majors. Significant variability has also been observed in typically masculine fields, with remarkably high levels of gender discrimination in computer sciences, engineering, and physics (Barthelemy et al., 2016). Similarly, research has described that women face substantial discrimination even in domains where they are quite well-represented, such as the medical and healthcare domains (Kisiel et al., 2020; Kouta & Kaite, 2011) or the social and behavioral fields (Casad et al., 2022; van Veelen & Derks, 2022).

Experiences of discrimination have significant repercussions for women in general, but this is particularly true for those navigating hostile fields of study. Research has shown that female students in such environments report lower levels of self-esteem (Casad et al., 2019), reduced engagement in their field (Moss-Racusin et al., 2018), diminished sense of belonging (London et al., 2011; Moss-Racusin et al., 2018), and poorer

academic performance (Ahlqvist et al., 2013). In the long run, discrimination can lead to school dropouts, temporary interruptions, or career shifts toward other, more welcoming fields of study (see Ceci et al., 2009; Gianettoni et al., 2021). Therefore, it is of great importance to gain a better sense of why there are such variations in gender discrimination across fields of study. We believe that it is crucial to further develop research that allows a better understanding of the social contexts in which women are likely to be victims of discrimination. Identifying the sources of hurdles that women confront in the course of their school careers, in particular in non-supportive environments, may be important for advancing gender equality. Using data drawn from a large survey conducted over a sample of upper-secondary school students attending vocational education in Switzerland, the present study aimed to investigate how normative climates prevailing across various fields of study are associated with experiences of gender discrimination.

Normative Climates in Fields of Study

Fields of study are not only educational categories structured around disciplines or types of occupation (e.g., health, medicine, engineering). They also correspond to broader socio-cultural environments with unique sets of norms and values. The normative climate refers to the prevailing values and attitudes collectively shared among students (but also among teachers and educators) in a field of study. It reflects the dominant atmosphere pervading a disciplinary domain and establishes specific forms of beliefs as a normal and routine repertoire for guiding social interactions, shaping what is typical to hear, think, and do, and what is not. A wide range of factors can reveal the normative climate in a field of study, such as the way courses are taught, remarks or comments heard in the classroom, direct or indirect experiences, formal and informal practices, procedures, and institutional policies.

Normative climates that occur in local contexts are powerful vectors of social conformity. Accordingly, students' attitudes and behaviors may be deeply affected by the normative climate of their field of study (Ekehammar et al., 1987). Navigating a particular field of study makes it likely to be socialized in a way that students gradually adopt the dominant attitudes after repeated exposure and implicit or explicit pressures. Once particular cultural beliefs become part of the everyday climate in a school context, students are encouraged to conform to those beliefs until they are internalized and applied quite spontaneously.

However, normative climate can be particularly detrimental to those whose personal characteristics or values are at odds with the dominant ones. When deviants go against the grain, they risk paying social penalties, such as discrimination or marginalization (Rudman & Fairchild, 2004). It may also be very harmful to students' school careers and mental health when their social identities come to be directly or indirectly threatened by the prevailing norms and ideologies. For example, LGB (Lesbian, Gay, Bisexual) students often face high levels of prejudice, rejection, and psychological suffering in those schools

where heterosexist norms and traditional gender roles are particularly esteemed and defended (Kosciw et al., 2013). Conversely, climates that are seen as tolerant and supportive of minority groups offer safe spaces for students, which improve their performance and well-being at school.

The role of normative climates in the educational setting has been largely documented (for a review, see Thapa et al., 2013) and substantial literature has brought compelling evidence that educational climates can be particularly hostile for minority students, and especially for women (Leaper & Brown, 2014). In certain fields of study, in particular in those traditionally dominated by men (e.g., STEM), researchers have described that "chilly" or unwelcoming climates to women may often pervade, which in turn greatly affect psychological functioning, day-to-day experiences, and school outcomes (Casad et al., 2019; Kuchynka et al., 2018; Settles et al., 2006). There is a shared agreement in those fields that women are not well-suited for succeeding and that they cannot belong to the student group, and if they do enter the field, they are severely required to comply with masculine norms and accept men's hostility. For example, Fernández et al. (2006) showed that both men and women adhered more to sexism in male-dominated fields of study (i.e., technical domains) than in other fields (i.e., social sciences and humanities, health sciences). Unsurprisingly, such learning environments result in more disengagement of women from school, reduced sense of belonging, self-esteem, and well-being, as well as less satisfaction and interest in the discipline (Casad et al., 2019; Kuchynka et al., 2018; Settles et al., 2013, 2016).

Research has extensively documented the existence of anti-women climates pervading certain fields of study, but the role of such climates in accounting for women's prevalence of discrimination experiences has seldom been examined. Additionally, little research has investigated the field climates in relation to specific gender belief systems. In the present study, we sought to demonstrate that normative climate may be an important factor in explaining the varying levels of discrimination experienced by women across fields of study. More specifically, we examined the role of the shared endorsement of hegemonic masculinity.

Hegemonic Masculinity

Hegemonic masculinity is a belief system that promotes a traditional conception of masculinity and provides an ideological basis for legitimizing men's dominant position in society and the superiority of heteronormativity through the sacralization of an exalted form of heterosexual male identity (Connell, 1995). As a culturally idealized ideology, a large majority of people, both men and women, approve of the precepts of hegemonic masculinity, which are propagated and reproduced in the social space, often implicitly, notably through institutions, political discourses, cultural productions, and the media.

Different normative dimensions structure hegemonic masculinity (Kimmel, 2012; Thompson & Pleck, 1986), such as social dominance (i.e., which prescribes men to display

a willingness to dominate others and achieve high social status), emotional impassivity, (i.e., which requires men to hide their emotions and exhibit rigidity to life's events), or anti-femininity, (i.e., which defines masculinity in opposition to what is typically considered feminine and enjoins men to act in a way that cannot be likened in any way to something feminine). Hegemonic masculinity does not only serve a legitimizing function but also an identity function by providing men with cultural codes signaling how to think and act in order to be categorized as a "real man". This way, research has shown that when seeking to affirm or defend their masculine identity (e.g., after a threat to masculinity), men tend to over-conform to hegemonic masculinity norms by engaging in behaviors that demonstrate power over others or by acting in violent and aggressive ways (Stanaland & Gaither, 2021), especially toward women (Lisco et al., 2015). Therefore, because it is defined by opposition to femininity and underlies a desire for male dominance, hegemonic masculinity constitutes a form of masculinity that has the potential to nurture acts of discrimination against women.

In the school context, which permeates society's beliefs, hegemonic masculinity has been widely identified as a widespread form of gender ideology, especially shared among male students (e.g., Heinrich, 2012; Rogers et al., 2017). Of relevance to the present study, research has found that the endorsement of hegemonic masculinity varies greatly across fields of study. For example, male-dominated fields of study, such as STEM fields, are known to promote a clear masculine culture and add value to typically masculine traits and traditional masculine norms (e.g., competition, dominance, independence; see e.g. Cheryan et al., 2009, 2017; Garr-Schultz et al., 2023). While the dominant atmosphere pervading certain fields of study largely revolves around traditional ideologies of masculinity, other fields tend to prioritize them less. However, to our knowledge, very little research has ever attempted to demonstrate that hegemonic masculinity as an ideological feature of field climate can potentially fuel gender discrimination. Closely related, Blondé et al. (2024) recently showed that hegemonic masculinity is more prevalent in typically male-dominated fields (vs. female-dominated fields), and that concomitantly, female students of these fields reported more gender discrimination than male students. However, this study did not further examine whether the shared endorsement of hegemonic masculinity across fields of study was related to perceived discrimination among women.

In the present research, we predicted that those fields whose normative climate is imbibed with hegemonic masculinity are likely to have a higher prevalence of discriminatory experiences among female students[1]. Where there is a normative climate promoting the maintenance of a traditional conception of masculinity with traits such as dominance and anti-femininity, discrimination against women should be higher, notably

1) Additional analyses were conducted using ambivalent sexism (i.e., hostile and benevolent sexism) as a context-level variable. The results closely mirrored those found with hegemonic masculinity and are detailed in the Supplementary Materials.

because acts of discrimination against women are valued and encouraged as a means to demonstrate one's conformity to the field norms and one's willingness to fit into the field. Additionally, such normative climates provide an ideological justification for students to engage in discriminatory behavior. As a consequence, we can expect that women attending those fields are more prone to experience gender-based discrimination.

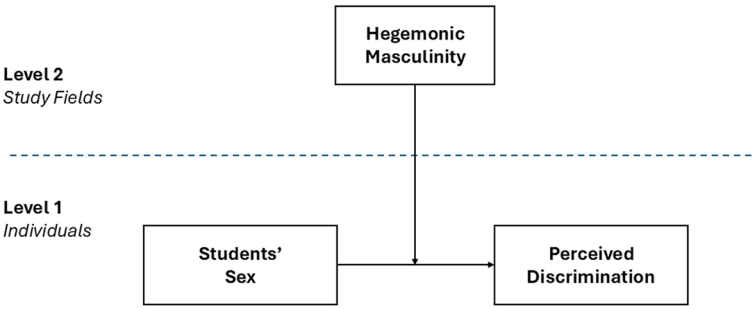
The Current Study

The purpose of the current study was to examine the role of hegemonic masculinity as an aspect of the normative climate across various fields of study on gender discrimination. More specifically, we aimed to investigate whether adherence to hegemonic masculinity, as a contextual factor located at the field level, contributes to women's experiences of discrimination (compared to men). Thus, we sought to examine the interaction between students' sex and hegemonic masculinity (operationalized at the contextual level) in shaping gender discrimination. We hypothesized that female students would experience heightened levels of gender discrimination compared to male students, particularly in fields of study characterized by a strong ideological climate of hegemonic masculinity.

One challenge in addressing normative climates is the need to capture the collectively shared positioning of students within each field of study. Consequently, the level of analysis is not located at the individual level but at the field level, which implies that modeling climate is a higher-order, context-level construct (see Marsh et al., 2012). Insofar as it is rather complex to establish true context-level measures assessing adequately the shared ideologies within the fields of study, we used aggregates of student-level responses to infer field-level variables and evaluate their effects on student-level discrimination perceptions. Therefore, a multi-level approach was necessary. More particularly, we conceptualized and measured normative climate through multi-level structural equation modeling (multi-level SEM), which uniquely allows estimating attitudes at the context level (i.e., at the field level), based on aggregates of individual-level responses, and examining how they affect personal experiences of individuals nested in those contexts. We tested a cross-level interaction estimating whether hegemonic masculinity as a set of field-level beliefs moderates the relationship between students' sex and perceptions of gender discrimination (see Figure 1). To the best of our knowledge, no prior studies have analyzed the relationship between ideological climate and gender discrimination from a multi-level perspective. The current study is then the first to measure hegemonic masculinity as an individual-level belief system estimated at the field level and to investigate how it relates to personal experiences of gender discrimination among female students, in comparison to male students.

Figure 1

The Predicted Cross-Level Interaction



To address our predictions, we conducted a study with a large sample of fresh-year students from eight Swiss upper-secondary vocational schools. In Switzerland, students in vocational education pursue a 3- or 4-year apprenticeship and can either attend a dual occupation-focused educational program with half their time spent in school and half their time in a firm (they spend generally three days per week in their training firm and two days per week in their school), or a full-time school apprenticeship. Our study targeted all students attending dual educational programs who began their training in the 2020 academic year over six vocational training centers (out of eight in the Canton of Geneva), with each center specialized in distinct vocational sectors (e.g., health, business, technical sector). Moreover, in two centers with a particularly high representation of men, we extended the study to include all students, both in dual and full-time programs, primarily to increase the sample size of women in those fields.

Method

Participants

We recruited 1,298 first-year students from vocational schools in the canton of Geneva, Switzerland. The participants had a mean age of 18.88 years, with the majority ranging between 15 and 26 years. Of the sample, 446 were female (34.7%) and 838 were male (64.6%). Most participants held Swiss nationality (n = 783; 60.3%), and nearly half reported French as their first language (n = 600; 46.2%). The majority (n = 1,032; 79.5%) were enrolled in a dual apprenticeship program, combining half-time school attendance with half-time training in a firm, while the remainder (n = 262; 20.2%) were engaged in full-time school-based apprenticeships.

The students recruited were grouped into 35 distinct fields of study, which corresponded to the occupational discipline that they were learning at the time we collected the data (e.g., business-related occupations, technical occupations, health and medical occupations, construction-related occupations; see Table 1)[2]. Apart from the educational content of apprenticeship programs, those fields of study differed greatly in terms of male-female ratios (see also Table 1 for male-female ratios within each field of study). As an illustration, in 2017, less than 8% of secondary school students enrolled in the field of construction were women, while only 14% of students who enrolled in the field of social care were men (Office Fédéral de la Statistique, 2019). They also vary in terms of sample sizes with the smallest field being composed of 5 students and the largest one including 245 students. However, multi-level data analyses do not assume equal group sizes and can perfectly deal with unbalanced sample size distributions (Milliren et al., 2018). On a general note, it is important to highlight that a high number of the fields examined in this study included a strong proportion of male students (i.e., 22 out of the 35 fields included were composed of 90% men or more) but comprised of small sample sizes. This reflects how vocational schools are structured in the Geneva Canton where male-dominated fields (e.g., construction, technology, engineering) are sliced into small sub-fields related to particular types of occupations, whereas female-dominated and gender-neutral fields are larger and less centered around specific occupational categories.

2) The classification of fields of study was not an artificial grouping constructed retrospectively but reflected the categories of trades in which the students were being trained.

Table 1

Sample Characteristics of Fields Study

Fields of study	*N*	Age	Estimated male/female ratio[a] (in %)	Observed male/female ratio (in %)	Hegemonic Masculinity (Mean)
Retail field	44	19.9	58/42	51.2/48.8	2.44
Dental, laboratory, medical assistant	53	19.7	21/79	7.5/95.5	1.93
Pharmacy assistant	43	19.7	15/85	19/81	1.90
Customer relations agent	16	19.9	40/60	43.8/56.2	2.46
Business employee	245	19.2	58/42	34.3/65.7	2.17
Business management professions	127	19.3	58/42	66.9/33.1	2.50
Operating agent	17	20.2	93/7	93.8/6.2	3.17
Cleaning agent	13	22.3	93/7	84.6/15.4	3.37
Poly-designer	5	19.0	32/68	20/80	1.21
Socio-educational assistant	83	22.2	38/62	45.8/54.2	1.95
Care and community health assistant	30	21.6	23/77	20/80	1.95
Automation technician	6	15.7	95/5	100/0	1.40
Biology/chemistry laboratory technician	15	18.2	21/79	60/40	2.12
Automotive field	84	18.2	98/2	96.4/3.6	2.75
Tiler	5	18.7	100/0	100/0	3.80
Carpenter/tinsmith	7	25.0	93/7	85.7/14.3	3.14
Heating engineer	8	21.0	99/1	100/0	3.20
Metal worker	17	17.9	99/1	100/0	3.00
Road construction	7	18.8	100/0	100/0	1.42
Heavy vehicle driver	9	20.7	98/2	100/0	2.33
Building drawer, civil engineering, architecture	40	16.7	99/1	90/10	2.87
Electrician	108	18.3	99/1	97.1/2.9	3.06
Electronic field	40	16.1	95/5	97.5/2.5	2.07
Woodworking	8	15.8	93/7	62.5/37.5	1.63
Horology	42	16.9	79/21	78.6/21.4	2.26
Mechanics/micromechanics	12	17.2	79/21	75/25	2.55
Computer science	86	16.3	93/7	92.9/7.1	2.32
Media specialist	17	18.9	39/61	76.5/23.5	1.51

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https://doi.org/10.32872/spb.14229

Fields of study	*N*	Age	Estimated male/female ratio[a] (in %)	Observed male/female ratio (in %)	Hegemonic Masculinity (Mean)
Refrigeration technician	14	18.4	99/1	92.9/7.1	2.32
Masonry	14	18.5	100/0	100/0	3.16
Carpenter	14	19.7	93/7	85.7/14.3	2.25
Mechanical production	15	18.6	95/5	100/0	3.22
Plasterer	5	20.8	93/7	100/0	2.13
Poly-mechanics	20	16.8	95/5	80/20	2.56
House painter	29	19.6	93/7	85.2/14.8	3.36

[a]These estimates correspond to the statistics provided by the Office Fédéral de la Statistique about the male/female ratio in the year of data collection.

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https://doi.org/10.32872/spb.14229

Context-Level Measure

Hegemonic Masculinity

We measured hegemonic masculinity using the Male Role Norms Inventory-Short Form (MRNI-SF; Levant et al., 2013). This abbreviated scale assesses adherence to the traditional norms of masculinity and comprises 21 items, spread across seven dimensions: (1) restrictive emotionality (e.g., "*Men should be detached in emotionally charged situations*"); (2) self-reliance through mechanical skills (e.g., "*Men should be able to fix most things around the house*"); (3) negativity toward sexual minorities (e.g., "*Homosexuals should never kiss in public*"); (4) avoidance of femininity (e.g., "*Boys should play with trucks rather than dolls*"); (5) importance of sex (e.g., "*A man should always be ready for sex*"); (6) Dominance (e.g., "*A man should always be the boss*"); and (7) toughness (e.g., "*I think a young man should try to be physically tough, even if he's not big*"). Each item was translated into French (we used a back-translation procedure with the help of French and English native speakers) and pre-tested on a sample of 250 Swiss undergraduate students for internal validity, which was revealed to be satisfactory (details can be found in the Supplementary Materials, see Blondé, 2024). Responses were given using 6-point Likert-type scales (1 = strongly disagree, 6 = strongly agree). We explored the factor structure of this instrument at the student and field levels using multi-level confirmatory factorial analyses. Following the MRNI-SF modeling, we tested a second-order factor model with a seven-factor solution, as first-order factors (and three observed indicators for each of the seven sub-dimensions), and a single-factor solution embedding those seven first-order factors, as a second-order factor. Analyses showed a good fit to the data, $\chi 2\ (364) = 1183.62$, $p < .001$; RMSEA = .044; $SRMR_{student\text{-}level} = .04$; $SRMR_{field\text{-}level} = .09$; CFI = .97[3], giving support that hegemonic masculinity represents an overarching construct consisting of seven distinct dimensions, as evidenced by Levant et al. (2013). Moreover, additional analyses showed that this factorial structure is equally satisfactory across both gender groups (see in the Supplementary Materials). Accordingly, the subsequent multi-level analyses examined the effects of hegemonic masculinity with such a second-order factorial structure.

Individual-Level Measures

As further mentioned below, we also controlled for and included students' endorsement of hegemonic masculinity as an individual-level variable.

3) Model fit was assessed following Hu and Bentler (1999)'s cutoff criteria. An excellent fit was indicated by CFI > 0.95, RMSEA < 0.06, and sRMR < 0.08.

Gender Discrimination

Because most of our participants were completing their apprenticeships at school, as well as in a training firm, we used two measures of perceived discrimination: perceived discrimination in school (which covered all students; n = 1,298) and in the firm (which covered only those students attending a dual apprenticeship; n = 1,032). In addition, we included a measure of anticipated discrimination assessing the extent to which students expected that they might encounter discrimination in their future professional career. Those variables were assessed with three items each and were developed by adapting items used by Schmitt et al. (2002). Perceived discrimination at school comprised the following items: "*since the beginning of your current apprenticeship, have you ever been personally…a victim of discrimination at school because of your sex?/ …deprived of professional opportunities at school because of your sex/ …a victim of harassment at school because of your sex (mockery, insults, comments)?*" (α = .93); perceived discrimination in the firm included the following items: "*since the beginning of your current apprenticeship, have you ever been personally…a victim of discrimination in your firm because of your sex?/ …deprived of professional opportunities in your firm because of your sex?/ …a victim of harassment in your firm because of your sex (mockery, insults, comments)?*" (α = .93); anticipated discrimination was measured with the following items: "*if you persist with your current apprenticeship, do you think that you might be at risk of… being a victim of discrimination because of your sex in your future professional career?/ …being deprived of professional opportunities because of your sex in your future professional career?/ … being a victim of harassment because of your sex in your future professional career (mockery, insults, comments)?*" (α = .93). Participants had to give their responses on 6-point scales ranging from 1 (= No, not at all) to 6 (= Yes, absolutely). A confirmatory factor analysis was performed with both dimensions of perceived discrimination and anticipated discrimination considered as three distinct latent constructs, which showed a good fit to the data, $\chi 2$ (23) = 202.182, p < .001; RMSEA = .078, 90% CI [.068, .088]; SRMR = .02; CFI = .98. Means (and standards deviations) of each discrimination variable, as well as hegemonic masculinity dimensions, as a whole and by gender group can be found in the Supplementary Materials.

Demographics

We asked participants to self-report their sex as indicated on their ID (i.e., male or female), along with their age, nationality, and first language. Only sex was used in the above multi-level analyses and was coded as such: 0 = male students, 1 = female students.

Procedure

We conducted the study in students' classrooms during the course of a normal school day. They were all provided with a Qualtrics questionnaire and were asked to complete it individually on a computer. Total completion of the study took approximately 30

minutes and was supervised by the students' regular teacher who was trained to ensure instructions were correctly understood and answer questions. All responses were fully anonymized, and participants were told so prior to starting the study. We obtained their consent before completing the study, as well as the parents' consent of those under 18. We received ethical approval from an independent committee of the education research service of Geneva Canton, which was afterward validated by the education department of Geneva Canton. Note that this study was part of a larger longitudinal project designed to gather information and investigate determinants of gender-based and sexual orientation-based discrimination from students attending vocational schools in Geneva (Switzerland; for more details about the project, see Gianettoni et al., 2023). We certify that the analyses presented in this paper are entirely original, addressing aspects that do not overlap with any ongoing works related to this larger research project. Neither the study nor the current analyses were pre-registered.

Results

Analytic Strategy

As students (individual-level) were nested in fields of study (context-level), we performed a series of multi-level analyses and tested cross-level interactions between students' sex and hegemonic masculinity across fields of study (i.e., estimated at the field level) on perceived and anticipated discrimination. To avoid generating context-level information by computing mean scores for each unit of the context (which does not correct for sampling and measurement errors and thus may lead to biased estimates; Croon & van Veldhoven, 2007), we used multi-level SEM and formed context-level constructs based on latent aggregations from multiple individual-level observed indicators (Marsh et al., 2009)[4]. Accordingly, hegemonic masculinity and discrimination variables were analyzed as latent variables, whereas sex was a manifest binary variable. An outlier detection analysis, using the Interquartile Range (IQR) method, was conducted and revealed that there were no outliers among the variables used in the multi-level analyses, indicating that no extreme values could skew the results.

First, we estimated empty models (intercept-only) and calculated the Intra Class Coefficients (ICC) and Design EFFects (DEFFs) to ensure that a substantial proportion of variance in perceived and anticipated discrimination can be attributed to the clustering across fields of study (k = 35). Second, we estimated baseline models by adding the main effects of sex and hegemonic masculinity (estimated at the context-level) on perceived and anticipated discrimination. Note that any positive effect of sex should be interpreted

4) For information, we provided the individual-level mean scores of hegemonic masculinity by fields of study in Table 1.

as a higher effect for female students on the outcome variable being tested (and vice versa for male students). Third, we expanded baseline models by adding cross-level interaction terms between sex and hegemonic masculinity (estimated at the context-level). Given that omitting random slope may inflate a Type 1 error when estimating cross-level interactions (Bell et al., 2019), we modeled a random coefficient model with the intercepts and the slope coefficients varying across fields of study. In the event of significant cross-level interactions, we performed decomposition analyses testing the effect of sex at 1 standard deviation above and below the cluster mean of hegemonic masculinity. We grand-mean centered hegemonic masculinity before being entered into the analyses and we used full-information maximum likelihood as an estimator. Because hegemonic masculinity as a context-level predictor is based on a latent aggregation of individual-level observed indicators whose referent is the individual and not the context (i.e., the field of study), we estimated, in both the baseline and cross-level interaction models, its effects at the field level after controlling for the students' differences at the individual level (i.e., individual ratings of hegemonic masculinity; Marsh et al., 2012; Morin et al., 2014)[5]. Missing data were handled using full information maximum likelihood. We ran all analyses using the Mplus software Version 8.8. Table 2 shows means, standard deviations, and correlations of all variables at the individual level, and Table 4 presents the main effects of students' sex and hegemonic masculinity, the cross-level interactions, as well as the decompositions. The data that support our findings (along with a codebook and a Mplus syntax) are available (see Blondé, 2024).

Table 2

Means, Standard Deviations, and Correlations

Variable	*M*	*SD*	1	2	3
1. Perceived discrimination (school)	1.32	0.77	—		
2. Perceived discrimination (firm)	1.29	0.72	.79***	—	
3. Anticipated discrimination	1.70	1.10	.62***	.57***	—
4. Hegemonic masculinity (individual-level)	2.40	1.27	.04	.08*	-.12***

*$p < .05$. ***$p < .001$.

5) In line with Morin et al. (2014), who recommend not interpreting the effects of the individual-level ratings (notably because they may be confounded with the context-level effects), we did not report and interpret the effects of student-level endorsement of hegemonic masculinity on perceived and anticipated discrimination.

Multi-Level Analyses

ICCs and DEFFs

To ensure multi-level modeling applies to the current data, we first examined whether there is enough between-level variance for each indicator of perceived and anticipated discrimination. To do so, we built an empty model (i.e., without predictors) and calculated the ICCs and DEFFs for each item of discrimination. Owing to well-known issues with ICCs, we considered DEFFs greater than 1.5 as a cut-off criterion for deciding whether there is a hierarchical structure in the data (see Sommet & Morselli, 2021). Results showed that all discrimination items were above the expected threshold (see Table 3). Thus, we decided to retain them all for subsequent analyses.

Table 3

ICCs and DEFFs

Item of discrimination	*ICC*	*DEFF*
Perceived discrimination (school) – Item 1	0.022	1.78
Perceived discrimination (school) – Item 2	0.024	1.85
Perceived discrimination (school) – Item 3	0.017	1.60
Perceived discrimination (firm) – Item 1	0.037	2.31
Perceived discrimination (firm) – Item 2	0.022	1.78
Perceived discrimination (firm) – Item 3	0.057	3.03
Anticipated discrimination – Item 1	0.058	3.06
Anticipated discrimination – Item 2	0.063	3.24
Anticipated discrimination – Item 3	0.052	2.85

Table 4

Effects of Sex, Hegemonic Masculinity, and Cross-Level Interactions

	Perceived discrimination (school) (n = 1,298)				Perceived discrimination (firm) (n = 1,032)				Anticipated discrimination (n = 1,298)			
Variable	***b***	***SE***	***p***	**95% CI**	***b***	***SE***	***p***	**95% CI**	***b***	***SE***	***p***	**95% CI**
Sex (ILV)	0.28	.07	< .001	[0.174, 0.390]	0.37	.09	< .001	[0.220, 0.513]	0.86	.06	< .001	[0.760, 0.953]
HM (CLV)	0.21	.46	.654	[-0.546, 0.956]	0.94	.16	< .001	[0.684, 1.203]	0.22	.37	.562	[-0.394, 0.823]
Sex * HM (CLI)	1.10	.04	< .001	[0.578, 0.689]	0.81	.07	< .001	[0.698, 0.928]	1.29	.06	< .001	[1.199, 1.387]
Low HM (-1SD)	0.04	.10	.696	[-0.121, 0.197]	0.08	.09	.329	[-0.057, 0.222]	0.82	.16	< .001	[0.558, 1.091]
High HM (+1SD)	0.81	.11	< .001	[0.627, 0.990]	0.68	.09	< .001	[0.537, 0.832]	1.76	.18	< .001	[1.473, 2.048]
Analyses controlling for the male-female ratio												
Sex (ILV)	0.16	.05	< .001	[0.069, 0.254]	0.20	.06	< .001	[0.083, 0.310]	0.88	.08	< .001	[0.733, 1.031]
HM (CLV)	0.25	.18	.176	[-0.110, 0.599]	0.51	.18	.003	[0.168, 0.853]	0.11	.24	.651	[-0.368, 0.589]
Male-Female ratio (CLV)	-0.01	.01	.398	[-0.010, 0.004]	-0.01	.01	.325	[-0.008, 0.003]	0.01	.01	.936	[-0.006, 0.005]

	Perceived discrimination (school) (n = 1,298)				Perceived discrimination (firm) (n = 1,032)				Anticipated discrimination (n = 1,298)			
Variable	***b***	***SE***	***p***	**95% CI**	***b***	***SE***	***p***	**95% CI**	***b***	***SE***	***p***	**95% CI**
Sex * HM (CLI)	1.47	.29	< .001	[0.903, 2.032]	1.05	.09	< .001	[0.872, 1.228]	1.56	.13	< .001	[1.309, 1.802]
Low HM (-1SD)	0.07	.13	.593	[-0.179, 0.314]	0.11	.12	.382	[-0.134, 0.350]	0.89	.21	< .001	[0.489, 1.296]
High HM (+1SD)	1.09	.28	< .001	[0.551, 1.633]	0.89	.16	< .001	[0.573, 1.147]	2.02	.27	< .001	[1.495, 2.537]

Note. ILV = Individual-Level Variable; CLV = Context-Level Variable; CLI = Cross-Level Interaction; HM = Hegemonic Masculinity

All estimates are unstandardized; Analyses including CLV and CLI controlled for individual-level ratings of hegemonic masculinity, but these effects are neither reported nor interpreted (see Morin et al., 2014)

Baseline Models

Results showed that students' sex was significantly related to all discrimination-related outcomes, such that anticipated and perceived discrimination were higher among female students than male students. In addition, we found that hegemonic masculinity at the field level was positively associated with perceived discrimination in the firm, but not with perceived discrimination in school, or with anticipated discrimination.

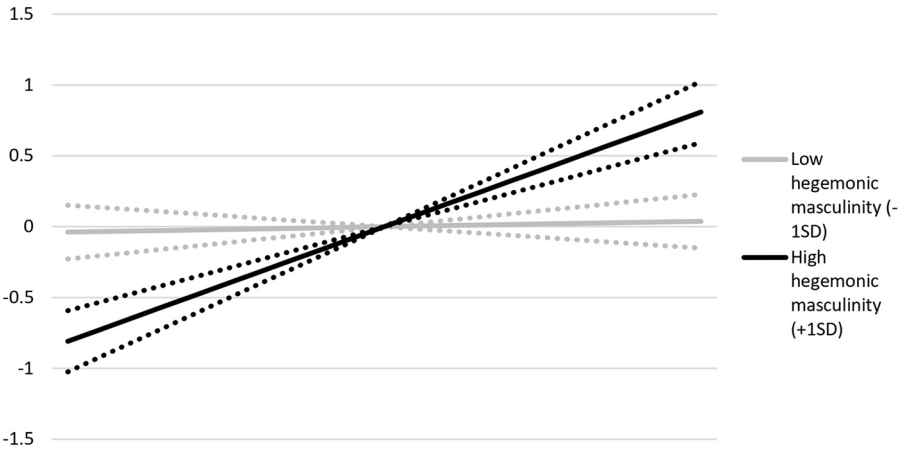
Cross-Level Interactions

We found significant cross-level interactions between students' sex and hegemonic masculinity on perceived discrimination in school (Figure 2)[6], perceived discrimination in the firm (Figure 3), and anticipated discrimination (Figure 4). In the study fields high in hegemonic masculinity, decomposition analyses showed that female students (vs. male students) reported more discrimination in school, reported more discrimination in the firm, and anticipated more discrimination. In the study fields low in hegemonic masculinity, the difference between female and male students was less pronounced on anticipated discrimination, and disappeared on perceived discrimination in school, and perceived discrimination in the firm.

6) The figures illustrate the slopes of the relationship between students' sex and discrimination at both high and low levels of hegemonic masculinity. A positive slope indicates a positive relationship between sex and discrimination, suggesting that female students report more discrimination than male students. The steeper the slopes, the more pronounced this relationship becomes. The vertical axis represents the unstandardized *b*-values of the sex-discrimination relationship. Furthermore, the dotted lines, representing confidence intervals, indicate the significance of the sex-discrimination slope. If the upper and lower bounds of the confidence intervals do not include zero, this indicates that the sex-discrimination slope is significant.

Figure 2

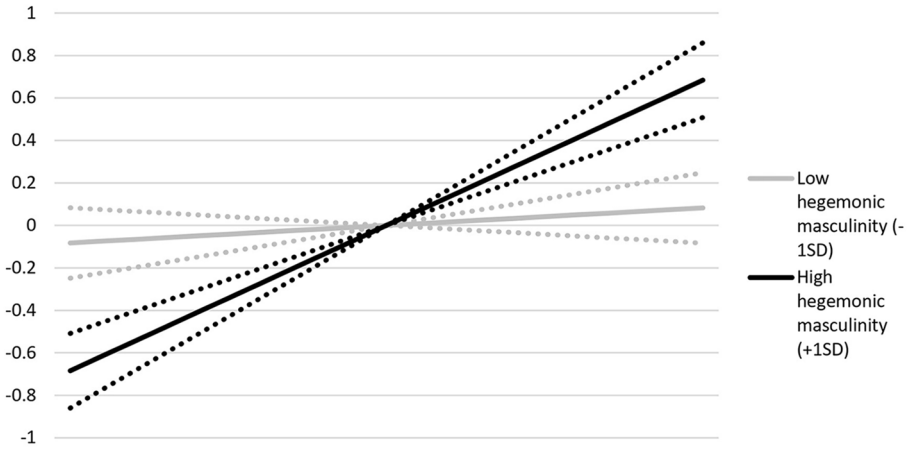
Graph Depicting the Slopes of the Relationship Between Students' Sex (Coded: 0 = Male Students, 1 = Female Students) and Perceived Discrimination in School Across Study Fields With Different Levels of Hegemonic Masculinity (Context-Level Variable)



Note. The solid straight lines correspond to the sex-discrimination slopes, whereas the dotted lines are the 95% confidence intervals.

Figure 3

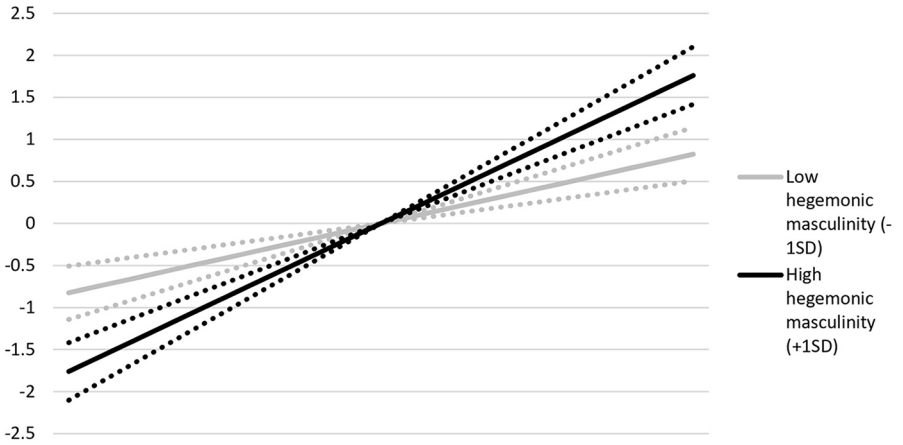
Graph Depicting the Slopes of the Relationship Between Students' Sex (Coded: 0 = Male Students, 1 = Female Students) and Perceived Discrimination in the Firm Across Study Fields With Different Levels of Hegemonic Masculinity (Context-Level Variable)



Note. The solid straight lines correspond to the sex-discrimination slopes, whereas the dotted lines are the 95% confidence intervals.

Figure 4

Graph Depicting the Slopes of the Relationship Between Students' Sex (Coded: 0 = Male Students, 1 = Female Students) and Anticipated Discrimination Across Study Fields With Different Levels of Hegemonic Masculinity (Context-Level Variable)



Note. The solid straight lines correspond to the sex-discrimination slopes, whereas the dotted lines are the 95% confidence intervals.

Moreover, we re-ran the previous analyses controlling for the male-female ratio at the field level (see Table 4). The results showed significant cross-level interactions for discrimination at school, discrimination in the firm, and anticipated discrimination. In fields characterized by high levels of hegemonic masculinity, women reported higher levels of discrimination at school, discrimination in the firm, and higher levels of anticipated discrimination. Conversely, in fields with lower levels of hegemonic masculinity, we found no significant association between gender and discrimination at school, or between gender and workplace discrimination. Although this effect is less pronounced in fields with lower levels of hegemonic masculinity, we still found that women anticipated more discrimination. Consequently, the findings across all discrimination variables remained unchanged even after adjusting for the male-female ratio, suggesting that the normative climate of hegemonic masculinity affected perceptions of gender discrimination above and beyond the gender composition within the fields of study.

Discussion

The aim of the current study was to apply a multi-level framework to examine whether the field climate in relation to the norms of hegemonic masculinity can be associated with perceived gender discrimination. We hypothesized that women's experiences of

discrimination would be more predominant in the fields of study where there is a common endorsement of hegemonic masculinity. Conversely, in the fields of study where low levels of shared adherence to hegemonic masculinity prevail, we predicted that the differentials in gender discrimination would be less pronounced between female and male students. We conducted a study with a large sample of students across various vocational education fields of study, who completed measures of hegemonic masculinity and reported whether they had experienced discrimination and whether they anticipated experiencing some in their professional future. To gain accuracy and avoid evaluating the normative climates based on mean scores of hegemonic masculinity within each field of study, we used multi-level SEM and aggregated multiple observed indicators at the individual level to construct a contextual-level latent variable.

Our results provided clear empirical support for our hypotheses. First, consistent with many previous findings in the literature (e.g., Brown & Stone, 2016; Leaper & Brown, 2014, 2018), we found that female students reported more perceived and anticipated discrimination than male students, regardless of fields of study. Interestingly, this result appeared even more clearly for anticipated discrimination than perceived discrimination. Beyond gender differences, we also observed a significant relationship between hegemonic masculinity and perceived discrimination in the training firm. The fields of study whose climate saturates with hegemonic masculinity are associated with increased levels of perceived discrimination within the firm where students work, regardless of their sex. This finding suggests that the negative impact of the field climate extends beyond school settings to the workplace, thereby shaping a broader culture promoting a traditional masculine identity (see Berdahl et al., 2018).

In accordance with our central hypotheses, we found cross-level interactions between students' sex and hegemonic masculinity on all outcome variables (perceived discrimination in school and in the firm, and anticipated discrimination). Field climate is strongly related to the extent to which female students experience and anticipate gender discrimination. In the fields where students share traditional views of masculinity, women consistently reported and anticipated more experiences of discrimination than men. In those fields that comprised students who displayed lower levels of shared agreements about hegemonic masculinity, female and male students did not differ. However, we found that they expected to experience more discrimination in their future career, but to a lesser extent than in the fields of study with a strong climate of hegemonic masculinity. It is interesting to note that anticipated discrimination functioned differently from perceived discrimination, since gender differences remained consistently present, even at low levels of hegemonic masculinity. Regardless of whether climates are high or low in traditional masculinity, female students invariably expected to face discriminatory situations or treatments at some point in their careers. Perhaps this reveals a deep-seated belief in the inevitability of gender-based discrimination in the workplace, which may itself reflect a powerful internalization of the structural disadvantages faced by women in society.

Nevertheless, despite these variations in anticipated discrimination, it is noticeable that the patterns of results found through the cross-level interactions were consistent across all outcomes included in the study, which strengthens the confidence in the conclusions that we can draw from our findings. Furthermore, it is important to note that we controlled for student-level attitudes within our models, allowing us to demonstrate that our contextual-level climate variable is uniquely associated with discrimination experiences over and above students' individual differences.

On a similar note, additional analyses controlling for the proportion of men and women in each field of study confirmed that the trends observed in the cross-level interactions remained unchanged. Notably, this suggests that it is not merely the numerical dominance (or under-representation) of men within a field that accounts for discrimination against women. Rather, it is the normative climates that prevail in some of them —fostering a traditional vision of masculinity—that are more critical, regardless of the actual number of men. While a large male presence in a field may be associated with the emergence and reinforcement of a strong normative climate of hegemonic masculinity, the influence of this climate on experiences of discrimination can operate independently of the gender ratio.

Theoretical Contributions

The present results raised several theoretical contributions. First, we demonstrated that female students' discrimination experiences in certain fields of study may, in part, be related to the surrounding climate that students (but also teachers and any of those involved in the fields of study) put in place and reproduce through the type of ideologies they collectively adhere to within their field. In this way, we have added further evidence to the research showing that some educational domains are able to install and enforce particularly unfriendly learning environments for women, which tends, in turn, to have deplorable repercussions for their well-being, school satisfaction, and engagement (e.g., Casad et al., 2019; Settles et al., 2006). Our work specifically contributes to this body of research by demonstrating that an unfavorable field climate is associated with more gender discrimination. In essence, this suggests that experiences of discrimination do not emerge in a social vacuum but are crucially shaped by broader cultural contexts (Major et al., 2002), in which complex forms of ideologies are shared that create a fertile ground for the emergence of discriminatory acts, which afterward foster women's perception of being discriminated against. Thus, discrimination does not primarily arise from hostile acts towards women, or from individual sexist attitudes, but from a socio-cultural environment in which members (both men and women) collectively share and spread a position that sanctifies the superiority of the male identity and justifies the use of disadvantageous treatment towards women. Gender-based discrimination practices develop more in socio-cultural spheres where ideologies promoting and justifying their application are collectively concentrated and disseminated (Brown & Bigler, 2004).

A key contribution of the current findings is to provide evidence that normative climate is associated with a greater incidence of discrimination experiences for women. In fact, our findings lead us to speculate on two routes through which normative climates may result in perceived discrimination. On the one hand, as we suggested above, one might argue that a normative climate of hostility toward women directly increases discriminatory behaviors toward women (especially because this ideological milieu offers an adequate basis for justifying such behaviors), which would inevitably increase perceptions of gender discrimination. Male students would feel authorized, and even encouraged, to treat female students unfairly and make stigmatizing comments, which progressively reinforce an unfriendly and high-pressure atmosphere over them. In turn, women may reasonably come to perceive that they are discriminated against and rejected. This fits in quite well with Kelly's theorizing about the concept of a continuum of violence (Kelly, 1988), which argues that the forms of violence most suffered by women are also the most trivialized ones, that is, those that are defined as normal and ordinary in everyday interactions. It is the trivialization of masculine domination through the ordinary ideological climate, as something to be taken for granted, that makes sexist violence possible.

On the other hand, one may also conceive that a hostile normative climate could modulate how women apprehend social reality by shaping patterns of expectations. If a field normative climate leads to the expectation that women are disadvantaged and that men's dominant status is protected, female students can be more readily vigilant and inclined to detect discrimination (Major et al., 2002; Pinel, 1999, 2004). For example, Kaiser et al. (2006) showed that chronic or situational expectations of gender discrimination tend to direct women's attention toward subtle cues of threats to their social identity. In addition, gender expectations may shape the interpretation of personally negative events or treatments as acts of gender discrimination. Indeed, research has informed that those who can discern the presence of hostile views toward women are also more inclined to be sensitive to discriminatory treatment and interpret personally negative events or situations as an enactment of gender discrimination. Indeed, women differ in the extent to which they are cognizant of the stigma about women in society and those high in stigma consciousness report gender discrimination to a greater extent (Pinel, 1999), and make more attributions to discrimination (Pinel, 2004). For example, in a sample of women majoring in STEM fields, Casad et al. (2019) found that stigma consciousness increases sensitivity to gender-based rejection, thereby indicating that women's propensity to perceive sexism in the surrounding climate is tightly related to greater odds of being sensitive to discrimination cues and perceiving oneself as a victim of discrimination. Thus, being aware of studying in a field whose ideological atmosphere is unfriendly to women or promotes traditional views on gender roles may lead to further interpreting negative treatment as a manifestation of gender discrimination (while they could see it as more harmless in other contexts), thereby leading to a higher likeliness of reporting it.

One of the strengths of our findings is the emphasis on the critical importance of field climate in relation, specifically, to hegemonic masculinity. Unlike other gender ideologies such as sexism, hegemonic masculinity provides an innovative and comprehensive framework for understanding gender power dynamics by focusing on masculine identity. Indeed, hegemonic masculinity, by prioritizing traditionally masculine traits and behaviors often at the expense of feminine ones, provides a broader perspective on the gender system, which encompasses a negative view of women as a subordinated category and, conversely, a positive view of masculinity as a dominant category. Moreover, it provides a unique lens for explaining the discrimination faced by both men and women. For instance, men who deviate from traditional masculine norms, such as those who are emotionally expressive or do not prioritize power, may experience social pressure to conform to these norms. By identifying the unique influence of hegemonic masculinity, we are better positioned to capture how gender norms serve to maintain gender hierarchies and how they are detrimental to both women and men.

Practical Implications

From a practical viewpoint, our research has important implications. By pointing to the importance of normative climate in the emergence of experiences of discrimination, our findings encourage any instructors or advisors who wish to promote gender equality and discrimination reduction in the realm of education to engage in deep work on transforming the normative climate in the fields of study where hegemonic masculinity is the strongest. Insofar as we conceptualize normative climate as a system of beliefs shared in a broader, second-order context, it logically follows that any attempts aimed at its modification not only should focus on individual attitudes but on collectively shared representations of students and all actors involved in the field. We, therefore, suggest that collective interventions be implemented in schools (as well as in training firms in the case of dual apprenticeships) to deconstruct the norms of traditional masculinity, sometimes deeply rooted in the collective identity of some fields of study. It is fundamental that the beliefs or stereotypes that are part of the routine field environment can be revoked so that they are no longer embedded in the core socialization practices for newcomers or they no longer attract those who initially adhere to them and who target these learning environments in the hope of finding a familiar ideological ground.

Limitations and Future Directions

There are several limitations of our research that are worth mentioning. First, our participants were students attending upper-secondary vocational schools. Given the particularities of vocational education (where schools are composed primarily of apprentices who wish to work quickly and who spend much of their time in training firms) and vocational education-related fields of study (which largely revolve around occupation types and

not around disciplinary domains), it is important to remain cautious in generalizing our results to students of any type of education. Further studies could be conducted on samples of students from general education backgrounds (where gender discrimination is also highly prevalent across fields of study), at levels below or above upper-secondary schools.

Second, we operationalized normative climate using aggregations of individual-level attitudes from students nested in fields of study. Although this method remains common in establishing climate measures in education research (Marsh et al., 2012), alternative approaches may prove useful for future research. It might be interesting to create climate measures through objective indicators that pertain strictly to the field level and not to the student level, such as the number of recorded complaints for gender-related misbehaviors or possibly the number of interventions implemented in schools to prevent gender-based discrimination. In addition, the field climate is not only fed by the attitudes of students, but also by those of teachers, educators, and instructors. Therefore, future studies could consider refining climate measures by addressing the attitudes of all actors in the domain.

Third, we acknowledge that the number of fields of study included in our study (k = 35) was rather modest to meet the statistical requirements for adequately conducting multi-level analyses (which require a minimum of 50 to 100 context units; see Hox & Maas, 2001), which puts our analyses at risk of generating biased estimates. However, it is important to note that we could not reach more fields as the ones included cover all the existing types of fields in vocational education (which is divided into even more fields than general education) in the Canton of Geneva. To address this issue, we could focus on other levels of analysis, such as the class level. Nevertheless, we did not consider the class level because most students in vocational schools in the canton of Geneva do not spend more than two or three days in school and often attend courses that irregularly mix students from several classes.

Fourth, our study relies on correlational data that does not allow us to draw conclusions about causality and is based on a cross-sectional design that does not allow us to detect how changes in ideological climate over time might affect women's experiences of discrimination and whether, in turn, those experiences of discrimination might alter the shared ideological climate among students in the fields of study. A useful next step in addressing these concerns might thus be to resort to longitudinal designs.

Conclusion

In summary, our findings demonstrated that normative climate in fields of study is associated with students' discrimination experiences. The prevalence of discrimination among female students (compared to male students) appeared to be higher in the fields of study where forms of ideology are shared that support a culturally idealized view of masculine identity and the maintenance of a disadvantaged social status for women. From a

broader viewpoint, these findings underscore the importance of considering the role of shared beliefs within local educational contexts to better understand students' individual experiences, as well as their academic trajectories. Experiences of discrimination can be powerful psychological barriers to academic success and can put students at greater risk of leaving school. Our work suggests that the reproduction of gender disparities within fields of study, and more broadly within professional fields, derives, in part, from the persistence of shared traditional beliefs about gender roles and identities, which we urge all types of initiatives directed at promoting gender equality in education to primarily focus on.

Funding: This study was funded by the Swiss National Science Foundation (n° 185460).

Acknowledgments: The authors have no additional (i.e., non-financial) support to report.

Competing Interests: The authors have declared that no competing interests exist.

Author Contributions: *Jérôme Blondé*—Conceptualization | Methodology | Formal analysis | Writing – original draft. *Lavinia Gianettoni*—Conceptualization | Methodology | Investigation | Writing – review & editing | Project administration. *Edith Guilley*—Methodology | Investigation | Writing – review & editing | Project administration. *Dinah Gross*—Methodology | Investigation | Writing – review & editing. *Taïs Foretay*—Methodology | Investigation | Writing – review & editing. *Morgane Dejussel*—Methodology | Investigation | Writing – review & editing.

Ethics Statement: This research received ethical approval from an independent committee of the education research service of Geneva Canton, which was afterward validated by the education department of Geneva Canton. We obtained consent of the participants before completing the study, as well as the parents' consent of those under 18.

Data Availability: The data that support our findings are available (see Blondé, 2024).

Supplementary Materials

For this article, the data is freely available (see Blondé, 2024).

Index of Supplementary Materials

Blondé, J. (2024). *Gender discrimination and hegemonic masculinity* [Data, syntax]. OSF. https://osf.io/tgzhw

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