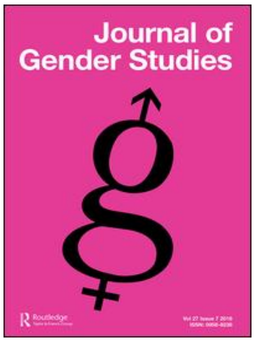

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College gender composition and bachelor's degree completion: the disadvantage of enrolment in a male-dominated institution

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ABSTRACT
Women are now the majority in undergraduate studies in many higher education systems, yet men and women tend to enrol at different rates in different fields of study and institutions. As a result, gender segregation is a prominent feature of contemporary higher education. Most previous studies have focused on gender composition in fields of study. In contrast, we considered college-level study in the Israeli context and asked whether composition is related to on-time undergraduate degree completion. By merging census data with other information, we followed students from high school into higher education and distinguished those who completed their undergraduate degree within the allotted timeframe from those who did not. Our results indicate that for both men and women, studying in an institution with a higher percentage of men is associated with reduced chances of on-time graduation, after controlling for socio-economic background, previous achievement, field of study and college selectivity. This suggests that equalizing gender ratios in male-dominated institutions, which are often technology-oriented, will benefit both women, as they will enter lucrative technological fields of study, and men, who will otherwise suffer the disadvantage of attending institutions with lower chances of on-time graduation and possibly a less positive learning climate and study culture.

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Gender composition; higher education; degree completion; Israel

Introduction

Women are now the majority in undergraduate studies in many higher education systems, yet men and women tend to enrol at different rates in different fields of study and institutions. As a result, gender segregation is a prominent feature of contemporary higher education (Barone & Assirelli, 2020; Buchmann, DiPrete, & McDaniel, 2008; Van De Werfhorst, 2017). While previous research has extensively examined these patterns and offered possible explanations, much less is known about what it means for women and men to study in a female- or male-dominated higher education programme or institution. Cumulative evidence from research on elementary and secondary education indicates that a higher proportion of girls in the classroom or the school is associated with a better learning climate, fewer behavioural problems and higher achievement for both males and females (Lavy, Schlosser, & Francis, 2011; Pahlke, Cooper, & Fabes, 2013; Van Houtte, 2004), but we know relatively little about the effects of gender composition in higher education. For example, ongoing gender segregation in certain fields of study and institutions raises the question of how

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studying in an environment dominated by the opposite gender may influence an individual's academic and social experience (Banchefsky & Park, 2018; Sax, 2008; Severiens & Ten Dam, 2012).

In this paper, we focus on higher education institutions in the Israeli context and ask whether college gender composition is related to on-time undergraduate degree completion. By merging census data with other information, we were able to follow students through high school into higher education and to distinguish those who completed their undergraduate degree within at most one year after the allotted timeframe from those who did not graduate. The unique dataset enabled us to control for socioeconomic background, previous achievement and the student's field of study, and for institutional-level variables such as gender composition, selectivity and the curricular orientation of the college. Our results indicate that for both men and women, studying in an institution with a higher percentage of men is associated with reduced chances of on-time graduation.

Gender composition, learning climate and student outcomes in elementary and secondary education

Recent research suggests from the beginning of elementary education, the gender composition of classes and schools makes a difference, with higher proportions of girls associated with better student behaviours and higher achievement for both genders. Based on the Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS-K) dataset and employing multilevel modelling, Pahlke and associates (2013) examined the effect of gender composition on first-graders. After controlling for background variables, they found students in classrooms with more girls had higher achievement in reading (but not in maths) and enjoyed better socioemotional outcomes at the end of first grade even after initial levels of socioemotional skills were taken into account. The main mechanism mediating classroom gender composition and these outcomes was classroom behaviour; in classrooms with more girls, student behaviours were better, and this enabled better learning and socioemotional development.

Lavy et al. (2011) examined gender composition effects among Israeli students in the fifth and eighth grades and in high school matriculation exams. This large-scale study provides further evidence that a more feminine environment (that is, higher percentages of girls) is associated with better achievement for both boys and girls at different educational stages, and behaviours and interactions among students and teachers mediate this relationship. Higher proportions of girls in a school are related to lower levels of classroom disruption and violence, improved inter-student and student-teacher relationships and less teacher burnout. Utilizing data from a randomized trial in the US, Eren (2017) found a higher share of female peers in the classroom improved girls' maths scores. The findings suggest boys benefit from the presence of more girls but only in less advanced maths courses. Moreover, higher proportions of girls in maths classrooms are related to a decreased probability of chronic absenteeism among male (but not female) students.

Building on research showing boys' attitudes towards school are less favourable than girls' (Francis, 1999; Warrington, Younger, & Williams, 2000), Demanet and associates (2013) examined whether attending a school with a higher proportion of girls is related to more positive attitudes towards school among boys. Using data on Flemish secondary schools in Belgium and applying multilevel analyses, they found both boys and girls expressed more favourable attitudes and were less likely to misbehave when schools had higher proportions of girls. This study connected students' values (or 'culture') and student behaviours in the context of gender composition research. In another recent study in the Flemish school system, Van Houtte and Vantieghem (2020) explored a different normative aspect, concentrating on gender role attitudes. Their multilevel analyses suggest in schools with more girls, boys generally display lower levels of futility and more progressive gender role attitudes.

Gender composition effects in higher education

The review in the previous section provides evidence from different educational contexts and levels that, by and large, supports the argument that gender composition is related to achievement and plays a role in structuring the learning climate and norms. To date, however, our knowledge on gender composition effects in higher education is limited. Previous research suggests peers, norms and learning climate are important for behaviour and achievement in postsecondary education (Kremer & Levy, 2008; Oseguera & Rhee, 2009), but less attention has been devoted to the role gender composition may play inside and outside the college classroom in learning climate, achievement, and attitudes. Thus, Sax (2008) who is among the few scholars who have paid attention to the effects of gender composition in higher education argues that 'it is important for future research to probe more deeply into the seemingly positive climate created when campus is composed of greater number of women students and faculty. This question is particularly important given the increase in female students and faculty at [US] colleges nationwide' (p. 183).

Testing Kanter's (1977) principle of tokenism, predicting that individuals will be affected adversely by lower levels of representation of their own gender within an organization, Sax (1996) examined whether variations in gender composition in academic programmes are related to students' cognitive and affective outcomes. Using survey data collected in the late 1980's from 344 four-year colleges and universities in the US, she found no evidence suggesting negative or positive effects of gender composition at the level of the academic programme. More recently Sax (2008) analysed longitudinal data collected between 1994 and 1998 from 17,637 undergraduate students in 204 US colleges and universities. She found that after taking into account a host of individual and institutional characteristics, the percentage of women in the institution is positively correlated with both male and female students' Grade Point Average (GPA). This positive compositional effect, however, was not found regarding many other attitudinal and academic outcomes examined in this study.

In a recent study on group learning, Curşeu and his colleagues (2018) found a positive effect of the proportion of women on discussion quality, partially explained by the ability of women to 'stimulate harmonious interpersonal interactions in groups' (p. 298; see also Takeda & Homberg, 2014). In contrast, Oosterbeek and Van Ewijk (2014) conducted an experimental study with first-year students of economics and business in the Netherlands but did not find substantial support for a positive effect of a high proportion of females in the workgroup. Focusing on gender composition effects on attitudes, Banchefsky and Park (2018) examined whether male-dominated academic environments affect gender ideologies, with negative implications for women. Utilizing survey data collected in the US, they found that 'as academic majors became more numerically dominated by men, the gender ideologies prominent in those environments became more negative and less accepting towards women' (p. 21).

Gender composition effects and undergraduate degree completion

Undergraduate degree non-completion is a widespread problem with complex causes; some are related to individual characteristics, such as gender, academic ability and socioeconomic background, while others are connected to field of study and institutional attributes, such as selectivity and resources. Previous research shows non-completion considerably varies across institutions, even after accounting for individual-level variables. Thus, for example, studies report that drop-out rates are lower in more selective institutions and in institutions that invest more in teaching quality and academic and social services. There are inconsistent findings from different countries regarding the effect of the type of institution (that is, public vs. private, labour market-oriented vs. liberal arts, research university vs. college) on completion rates (Behr, Giese, Teguim Kamdjou, & Theune, 2020; Jones, 1997; Oseguera & Rhee, 2009; Titus, 2004).

Gender segregation in academic programmes and institutions means women and men can find themselves studying in an environment dominated by the opposite gender, with possibly important consequences for on-time degree completion. Several studies have examined some of these possible consequences in the context of undergraduate degree completion. Building on Kanter's (1977) principle of tokenism, Meyer and Strauß (2019) argued individuals in a minority position are often judged according to stereotypes of their group, not according to their own traits. Adding Ridgeway's (2011) theory of gender status beliefs to their argument, they hypothesized women in male-dominated fields of study may be more influenced by stereotypes than men in female-dominated fields. Analysing data from Germany, the researchers found that, in general, women's chances of dropping out of higher education are lower than those of men, and women who enrol in gender-atypical fields of study have higher chances of degree non-completion than those in gender-typical fields. Their hypothesis of a stronger effect on women's enrolment in gender-atypical subjects (compared to men in male-dominated subjects) was only partially supported. Instead, 'the direct effect of gender composition on drop-out risk seems to be explained by the mean (perceived) difficulty of the subject field' (p. 451). In their analysis of data from Norway, Mastekaasa and Smeby (2008) found male students' dropout was unrelated to the gender composition of educational programs, while women tended to drop out less from female-dominated programmes than male-dominated or gender-balanced programmes. These authors thus suggest 'female-dominated programmes are particularly good at fostering a positive environment for female students' (p. 200). Severiens & Ten Dam, 2012) analysed Dutch census data on higher education, as well as a survey of Dutch students, and found men tended to drop out of higher education more than women, and this pattern was even more pronounced in female-dominated programmes. They also found that in male-dominated programmes, women dropped out 'more often because of a lack of motivation and interest than they did in the female-dominated programs' (p. 467).

In contrast, Johnes and McNabb (2004), who analysed a large British dataset, found men had lower chances of dropping out if they studied in a female-dominated environment, while women had higher chances of dropping out in the same environment. Riegle-Crumb and associates' (2016) findings further complicate the assumption that students who belong to a gender minority tend to drop or opt out more often than others. This study used a nationally representative dataset on US undergraduates and focused on switching majors during the college years. The researchers found men who enrolled in female-dominated majors were significantly more likely to switch majors than their male peers in other majors. However, women in male-dominated fields of study were not more likely to switch fields than their female peers in other majors. Since switching majors during undergraduate studies may cause delayed graduation, at least in the Israeli case (Feniger, Mcdossi, & Ayalon, 2016), Riegle-Crumb and associates' findings are relevant for the question of on-time degree completion.

As this literature review shows, most of the previous research on gender composition effects on degree completion has focused on the level of the academic program or field of study. While this is important to understand the academic experience within the classroom, it does not cover other salient aspects of student life, especially at the undergraduate level, such as social interactions with students from different courses and academic programmes, on and off campus. It is, thus, important to take a more holistic approach to gender composition at the institution level to illuminate the effects of gender composition at college or university.

Hill (2017) focused on gender composition at the institutional level, considering within-college, across-cohort variations in freshman enrolment based on data from the Integrated Postsecondary Education Data System. These data contain information from all US colleges participating in federal student financial aid programmes. The study looked at public four-year colleges and included data from 525 institutions. The gender composition was computed for each cohort in each college between 1996 and 2006. The dependent variable was graduation rate six years after enrolment. An additional analysis at the student level used data from eight Texas four-year colleges. This longitudinal dataset focused on student grade point average (GPA) as the outcome variable, while controlling for information on departments and fields of study. Both data sources supported the hypothesis that higher proportions of females improve graduation rates (at the institutional level) and GPAs (at the individual level) for males but not for females. Hill was unable to find any evidence of gender composition effects when he used a proxy for course gender composition, however, leading him to suggest the gender composition effect works at the institutional level rather than the classroom level. Hill's study, therefore, underscores the need to further explore gender composition effect at the institution level, especially in the context of degree completion.

The present study and the Israeli context

The study probed on-time degree completion, asking whether gender composition at the college level is related to this outcome after taking into account social background, previous achievement, field of study and college selectivity. The Israeli context provides an excellent context for such an examination, as it includes about 50 colleges that widely vary in their gender composition (see Table A1 in the appendix). Until the early 1990s, most Israeli undergraduate students enrolled in six research universities, but since the mid-1990s, enrolment in academic colleges has burgeoned. Today, about 60% of Israeli undergraduate students enrol in over 50 public and private colleges (Feniger, Mcdossi, & Ayalon, 2015).

We examined our research question using a comprehensive dataset we constructed by merging different sources of Israeli administrative data. We limited the analysis to colleges and omitted the six Israeli research universities.[1] Israeli academic colleges are relatively small institutions that focus on undergraduate studies. The smaller colleges enrol a few hundred students and the larger ones a few thousand. At the undergraduate level, their fields of study and level of qualifications are similar to those offered by the universities. Some colleges specialize in specific fields of study, such as teacher education or engineering, while others offer a more diverse combination of programmes, including, for example, social sciences, law, business and computer science. The research universities are much larger institutions, with 20,000–30,000 students at all academic levels. They are divided into faculties and schools, and because there are large differences in the gender composition of different faculties and schools, gender composition at the university level is less meaningful. (It should be noted, however, that our preliminary analysis showed that including the six Israeli research universities in the analysis did not affect our main findings or conclusions.)

Data and methods

Data

The primary source of information was a dataset prepared by the Israeli Central Bureau of Statistics (ICBS) with information from multiple sources: the 1995 census data and administrative files from the Ministry of Education, the National Institute for Testing and Evaluation and the higher education institutions. The 1995 census file includes information on a sample of 20% of all households. Based on these data, we chose all individuals born between 1978 and 1981. Members of this cohort were aged 14–17 years at the time of the 1995 census and were sampled in their parents' household; those who entered higher education enrolled during the first decade of the 2000s. (The median age of enrolment in higher education in Israel is 23, higher than in most developed countries, mainly due to mandatory military service for Jewish men and women). The extended questionnaire of the 1995 census provides data on parents' sociodemographic and socioeconomic characteristics. We merged this census file with matriculation files of the Ministry of Education, which provide information on high-school track and matriculation grades. Students' college entrance psychometric test scores (equivalent to American SAT scores) were taken from the National Institute for Testing and Evaluation. All information on students' applications to a higher education institution, fields of study and year of enrolment was taken from the application files of the higher education institutions. Information on the year of graduation, institution and field of study came from graduation files provided to the ICBS by all higher education institutions.[2]

The dataset included information on all Israeli colleges, but we omitted institutions with a very small number (less than 15) of students and single-sex institutions (small religious colleges specializing in training teachers for religious schools). The final sample included 51 institutions and 8,222 students, of whom 5,591 were females and 2,629 males. Table A1 in the appendix presents the distribution of these colleges according to the percent of male students in each. The high degree of overrepresentation of women in this sample is mainly due to colleges specializing in teacher education where females are the vast majority. In the university sector in Israel, women are about 60% of all undergraduate degree recipients.

Variables

Dependent variable: The dependent variable was on-time undergraduate degree completion, calculated based on the standard time allotted for graduating from a specific field of study. The fields differ by the number of years required to complete the fulltime course load, and the standard time varies from three years in most liberal arts fields (such as, humanities, social sciences, natural sciences) to four years in most professional fields (such as, law, paramedical studies, teaching, engineering) and five years in architecture. We added one year to the standard number of years for timely graduation, as the institutions report on students' graduation one year after graduation. The dependent variable included two categories, coded 1 for on-time graduation and 0 for students who did not graduate on time (either dropping out before graduation or still studying at the time of expected graduation). We removed from the analysis students who transferred to another institution (less than 4% of all students) because they were exposed to two institutional environments.

Independent variables: Our main independent variable was the percentage of undergraduate male students out of all undergraduate students in the institution (mean = 37%, SD = .26; see Table A1 in the appendix for the distribution of this variable). At the institutional level, we controlled for two additional variables. The first was STEM (Science, Technology, Engineering and Mathematics) orientation, measured by the percentage of undergraduate STEM students at the institution (mean = 17%, SD = .27). The second was institution selectivity, measured as the high-school average matriculation score of the undergraduate students at the institution (mean = 87.89, SD = 3.98) (a matriculation diploma is a prerequisite for admission to higher education in Israel). In our preliminary analysis, we also included other types of specialization and private vs. public colleges as controls, but as these controls had very little effect and were not statistically significant, we decided not to include them in the analysis presented here, because of the limited number of institutions (51).

At the individual level, our independent variables included five sociodemographic characteristics: (1) gender, coded 1 for males; (2) ethno-religious group, coded 1 for the Arab minority and 0 for the Jewish majority, a dichotomous coding based on previous findings suggesting net of other sociodemographic characteristics, there are only minor differences in on-time graduation within each group (Feniger et al., 2016); (3) parental education, coded 1 for at least one parent with an academic degree and 0 for those whose both parents did not attain an academic degree; (4) economic circumstances measured by the number of electric appliances found in the student's home by the 1995 census (for example, washing machine, dryer, dish washer), a common socioeconomic measure in Israeli studies based on ICBS data; (5) number of siblings, an important predictor of educational achievement and attainment in the sociology of education literature, was measured according to the number of live births of the mother.

Our measures of previous ability included three variables: (1) weighted average of high-school matriculation score; (2) high-school track measured according to the advanced subjects taken by the student during high school and coded into four categories (no advanced subject, humanities and social sciences, natural sciences, vocational/technological track); (3) psychometric entrance score (equivalent to the American SAT) coded into four groups (did not take the test, low score, medium score, high score). This test is required by some but not all institutions. We also controlled for the student's field of study in higher education (engineering, natural sciences, social sciences and

Table 1. Descriptive statistics of variables.

Variable	Mean/Pct.	S.D.	P5	P95
Institutional level				
% of male students	0.385	0.198	0.084	0.702
Average matriculation score	87.532	3.246	83.216	92.966
% of students in STEM fields	0.185	0.148	0.434	0.958
Individual level				
Gender (Male = 1)	32%			
Ethnicity (Arab = 1)	14%			
Parental education (Academic = 1)	28%			
Economic Circumstances	6.25	1.91	3	9
Number of siblings	3.64	1.64	2	7
Average matriculation score	86.71	9.24	71.11	100.97
High school advanced placement				
Without advanced placement	5%			
Humanities and social sciences	48%			
Sciences	36%			
Technology	11%			
Psychometric score				
Did not tested	20%			
Low	33%			
Medium	35%			
High	12%			
Field of Study in higher education				
Humanities	3%			
Teacher education	24%			
Arts	3%			
Social sciences	37%			
Law	10%			
Paramedical	1%			
Natural sciences	7%			
Engineering	14%			

N = 8,220

business, humanities, law, arts, teacher education, paramedical degrees). Descriptive statistics for these variables are presented in Table 1.

Analytical strategy

We estimated multilevel logistic mixed models to disentangle contextual effects, especially the effect of the gender composition of the institution, from individual effects. More specifically, we used a random intercept logit model in which the dependent variable was on-time graduation versus no on-time graduation. The independent variables included the gender composition of the institution, institutional selectivity and STEM orientation, all measured at the institutional level. Our preliminary analysis indicated that the type of college and college size (measured by either the number of students or the number of programmes) had no effect, and we therefore decided not to include these variables in the models. The individual-level variables included gender, socioeconomic status during high school, parental education, number of siblings, previous achievement and advanced high-school courses and field of study in higher education.

The random intercept model with individual- and institutional-level predictors takes the form of:

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 x_{1ij} + \beta_2 x_{2j} + u_j$$

$$u_j \sim N\left(0,\ \sigma_u^2\right)$$

In this model, β_0 is the (log) odds of on-time graduation when all other predictors in the model and the error term are fixed to zero. β_1 is the individual (level-1) effect that can be interpreted as the change in the (log) odds of on-time graduation with a one unit increase in$x_{1ij}$for all students at the same institution. β_2 is the contextual (level-2) effect of x_{2j} for all students at the same institution. u_j is the random part of the model, the residual at the institutional level, interpreted as the effect of being in institution *j* on the (log) odds of graduation. We estimated the random intercept logit models for each gender group separately. To facilitate comprehension of the results, we combined the results of the marginal effects and created a graph based on predictive margins.

Findings

The multivariate analysis is presented for three samples: both genders, female-only and male-only. For each sample, we present three models. The first includes the percentage of males in the institution and controls for socioeconomic background, previous achievement, specialization during high school and psychometric entrance test score (in categories, as explained above). This model examines whether the proportion of men in the institution is related to on-time degree completion after socioeconomic background and previous achievement are taken into account. The second model adds a control for student field of study in higher education. As we show below, accounting for this variable helps uncover the gender composition effect among women. The third model adds institutional-level controls for selectivity (mean matriculation score) and curricular orientation (percentage enrolled in STEM fields of study). This model tests alternative explanations whereby gender composition effects are confounded with other characteristics of the institution.

The findings presented in Table 2 (Table A2 in the appendix presents the full results of the analysis and odds ratios) show that for the combined sample, the proportion of males in the institution has a statistically significant effect only after the field of study is taken into account. After fields of study are controlled for, the percentage of males in the institution has a negative effect on the odds of on-time graduation. Controlling for institutional selectivity and curricular orientation does not change this finding. The female sample features a similar pattern. In the male sample, the coefficient of the proportion of males is negative and statistically significant in Model 1. This may suggest the gender composition effect is stronger for men than women. However, when an interaction effect is added to the combined sample (gender X percent male), the effect is not statistically significant. What our study finds, then, is that for both genders, a higher proportion of men in the institution is associated with lower odds of on-time undergraduate degree completion.

The finding that for women the gender composition effect is evident only after fields of study are controlled for is interesting and deserves elaboration. We propose that this suppressor effect occurs because women are overrepresented in fields of study at both the higher and lower ends of the graduation rate spectrum. Controlling for fields of study enables us to look at the institutional gender composition effect above and beyond the confounding effect of the gender composition of the field of study. For men, the picture is less complex, because they tend to be concentrated in STEM-oriented fields. Hence, among men, the confounding effect of the gender composition of the field of

Table 2. Coefficients from multilevel logit models predicting on-time graduation.

Population	All students			Females			Males		
Model #	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Male	−0.193**	−0.186**	−0.177**						
	(0.0665)	(0.0678)	(0.0680)						
Ratio of male students	−0.583+	−1.429***	−1.781***	−0.0650	−1.323**	−1.684**	−1.418**	−1.664***	−2.136***
	(0.350)	(0.331)	(0.370)	(0.425)	(0.506)	(0.581)	(0.442)	(0.434)	(0.511)
Ratio of STEM students			0.638*			0.480			0.673+
			(0.309)			(0.413)			(0.400)
Institutional average ability score			0.007			0.0106			0.0182
			(0.018)			(0.021)			(0.027)
Adjustment factors:									
Personal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Field of study in higher education		Yes	Yes		Yes	Yes		Yes	Yes
N	8,220	8,220	8,220	5,591	5,591	5,591	2,629	2,629	2,629

+ p < .10, *p < .5, **p < .01, ***p < .001

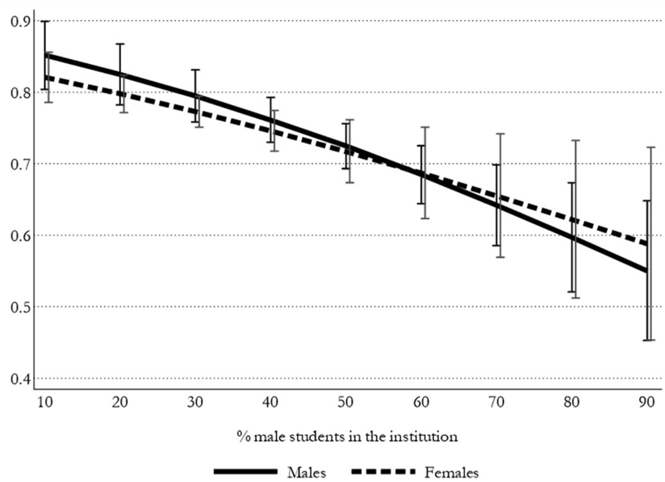

Figure 1. Predicted probabilities for on-time graduation by gender and the percent of male students in the institution.

study is less prominent, and the negative effect of institutional gender composition is evident even in the first model.

Figure 1 presents the average predicted probabilities of on-time graduation (based on the 'margins' procedure in Stata) for men and women according to the percentage of males in the institution (based on Table 1, models 6 and 9, for women and men respectively). The graph clearly shows the gender composition effect is not trivial for either gender. For men, the average predicted probability of on-time graduation drops from about .80 when the percentage of men in the institution is set to 30% to .65 when men compose 70% of the institution's student population. For women, the average predicted probability of on-time graduation drops from about .78 to about .67 for the same range of percentages of men in the institution.

To examine the robustness of our findings to different model specifications, we conducted a series of additional analyses (not presented here) that showed that taking into account the socioeconomic composition of the institution (measured as the percentage of students with academic parents) or the percentage of students who specialized in science during high school did not change the pattern. These analyses also showed that using a more detailed categorization of fields of study (59 different programmes) did not alter our main finding.

Discussion

Previous research on gender composition effects on undergraduate degree completion has mainly focused on academic programmes and fields of study and yields inconsistent outcomes across educational contexts and methodological approaches (Johnes & McNabb, 2004; Mastekaasa & Smeby, 2008; Meyer & Strauß, 2019; Sax, 2008; Severiens & Ten Dam, 2012). Unlike most previous researchers, we focused on the institutional level using a comprehensive dataset of all Israeli colleges. For both men and women, institutional gender composition seems to be an important factor in on-time graduation in Israel, after socioeconomic background, previous achievement, field of study and institutional selectivity and curricular orientation are controlled for. These findings partially corroborate Hill's (2017) recent findings on the institution gender composition effect in the US. Hill found higher female representation in a college improves men's (but not women's) chances of on-time graduation. Our study, like Hill's study, however, cannot provide information on the mediation mechanisms linking gender composition and on-time degree completion. As noted, research on elementary and secondary education suggests gender composition affects educational outcomes mainly through social norms and student behaviours, with higher proportions of girls related to improved learning climate, better interactions among students and between students and teachers and less disruptive behaviours. Pro-school social norms and student behaviours are also important for success in higher education, and gender composition can be related to such norms and behaviours. Research on negative academic behaviours, such as cheating, indicates higher prevalence among male students than female students (Gibson, Khey, & Schreck, 2008; Whitley, Nelson, & Jones, 1999).

Research on hegemonic masculinities provides important insights into how a male-dominated environment may hamper academic success. Jackson and Dempster (2009), for example, found the masculine 'uncool to work' discourse is more prevalent in secondary education, but they also found evidence of its existence in higher education. Jackson, Dempster, and Pollard (2015) studied 'laddish' culture in a sports science undergraduate programme in England and reported that 'laddish behaviours in teaching-learning contexts included: talking and generally being loud (which disrupted classes); being a joker; throwing stuff; arriving late; and being rude and disrespectful to lecturers. Mature students … were particularly critical of these behaviours, and resented the ways they negatively impacted on their learning' (p. 311). Jeffries (2020) also studied laddish culture in a university in England. Although they found much more favourable attitudes to learning and academic achievement, their interviewees still reported anti-academic laddish behaviours: 'They bought into that sort of culture, don't do much work. You've given up, that's not good, that's not funny anymore' (p. 919). Our findings, thus, emphasize the need to continue to explore the consequences of hegemonic masculinity attitudes and behaviours on academic success in higher education, especially in male-dominated fields of study and institutions.

Conclusion and policy implications

This paper provides an empirical examination of the theoretical question whether gender composition in higher education has similar effects to those found in elementary and secondary education. Studies on elementary and secondary education suggest that higher proportions of girls improve the learning climate, enable better interactions among students and between students and teachers, and reduce violent and risky behaviours (Demanet et al., 2013; Lavy et al., 2011). The present study, which is based on a comprehensive dataset of all Israeli colleges, indicates that institutional gender composition is an important factor regarding on-time graduation, after socioeconomic background, previous achievement, field of study in higher education and institutional-level characteristics are taken into account. From a policy perspective, our study suggests that equalizing gender ratios in male-dominated institutions, which are, in most cases, technology-oriented, will benefit both women, who may enter lucrative technological fields of study, and men, who otherwise suffer the disadvantage of attending an institution with lower chances of on-time graduation and possibly a less positive learning climate and study culture. This, of course, is a difficult task, as decades of research on gender segregation in higher education have proved (Barone & Assirelli, 2020; Buchmann et al., 2008; Van De Werfhorst, 2017). While this body of literature is beyond the scope of this paper, we hope that our findings will encourage policy makers to consider the female underrepresentation in some higher education institutions not just a problem of women but as a problem that may affect all students as well as the learning climate and academic achievement in the institution. We also hope that this study, together with other recent studies that explored gender composition effects in higher education (Hill, 2017; Sax, 2008) will encourage both policy makers and scholars from diverse academic disciplines (such as economics, sociology, psychology, and anthropology) to develop research agendas that can help uncover the mechanism behind the effect we found.

Limitations

The study has three main limitations. First, despite our detailed information on student background, the administrative nature of the data did not allow us to examine possible mediating mechanisms. Research on elementary and secondary education suggests several theoretical explanations for gender composition effects through normative channels, learning climate and student behaviours, or a combination of both. Our findings highlight the importance of further research that will focus on these aspects in higher education and examine whether they are associated with gender composition at different levels of analysis. The second limitation was that in the present study we were able to study institutional gender composition effects but not programme or classroom ones. The latter effects are important, and we hope future research will shed more light on their role in the context of higher education. Third, although we utilized a rich longitudinal dataset and applied sophisticated hierarchical modelling techniques, our findings cannot be interpreted as revealing a causal relationship. Future research on gender effects in higher education should use both idiosyncratic sources of variation to enable causal claims (Hill, 2017) and correlational data, like ours, to generate a more comprehensive view. It is acknowledged here that non-binary individuals do not form part of Israeli data collection strategies.

Notes

1. Bar Ilan university, Ben-Gurion University of the Negev, Haifa University, Hebrew University of Jerusalem, Technion – Israel Institute of Technology, and Tel Aviv University.
2. These files were merged by the ICBS using national identification numbers, that were removed before the dataset was made available to the researchers. The analysis was carried out according to the strict regulations of the ICBS that were designed to prevent the identification of any person included in the dataset.

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No potential conflict of interest was reported by the author(s).

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References

Banchefsky, S., & Park, B. (2018). Negative gender ideologies and gender-science stereotypes are more pervasive in male-dominated academic disciplines. *Social Sciences*, *7*(2), 27.

Barone, C., & Assirelli, G. (2020). Gender segregation in higher education: An empirical test of seven explanations. *Higher Education*, *79*(1), 55–78.

Behr, A., Giese, M., Teguim Kamdjou, H. D., & Theune, K. (2020). Dropping out of university: A literature review. *Review of Education*, *8*(2), 614–652.

Buchmann, C., DiPrete, T. A., & McDaniel, A. (2008). Gender inequalities in education. *Annual Review of Sociology*, *34*(1), 319–337.

Curşeu, P. L., Chappin, M. M., & Jansen, R. J. (2018). Gender diversity and motivation in collaborative learning groups: The mediating role of group discussion quality. *Social Psychology of Education*, *21*(2), 289–302.

Demanet, J., Vanderwegen, P., Vermeersch, H., & Van Houtte, M. (2013). Unravelling gender composition effects on rule-breaking at school: A focus on study attitudes. *Gender and Education*, *25*(4), 466–485.

Eren, O. (2017). Differential peer effects, student achievement, and student absenteeism: Evidence from a large-scale randomized experiment, *Demography*, *54*(2), 745–773.

Feniger, Y., Mcdossi, O., & Ayalon, H. (2015). Ethno-religious differences in Israeli higher education: Vertical and horizontal dimensions. *European Sociological Review*, *31*(4), 383–396.

Feniger, Y., Mcdossi, O., & Ayalon, H. (2016). Inequality in bachelor's degree completion: Social background, previous achievement and institutional characteristics. *Israeli Sociology*, *18*(1), 82–104.(In Hebrew)

Francis, B. (1999). Lads, lasses and (new) labour: 14–16-year-old students' responses to the 'laddish behaviour and boys' underachievement' debate. *British Journal of Sociology of Education*, *20*(3), 355–371.

Gibson, C. L., Khey, D., & Schreck, C. J. (2008). Gender, internal controls, and academic dishonesty: Investigating mediating and differential effects. *Journal of Criminal Justice Education*, *19*(1), 2–18.

Hill, A. J. (2017). The positive influence of female college students on their male peers. *Labour Economics*, *44*, 151–160.

Jackson, C., & Dempster, S. (2009). 'I sat back on my computer . . . with a bottle of whisky next to me': Constructing 'cool' masculinity through 'effortless' achievement in secondary and higher education. *Journal of Gender Studies*, *18*(4), 341–356.

Jackson, C., Dempster, S., & Pollard, L. (2015). 'They just don't seem to really care, they just think it's cool to sit there and talk': Laddism in university teaching-learning contexts. *Educational Review*, *67*(3), 300–314.

Jeffries, M. (2020). 'Is it okay to go out on the pull without it being nasty?': Lads' performance of lad culture. *Gender and Education*, *32*(7), 908–925.

Johnes, G., & McNabb, R. (2004). Never give up on the good times: Student attrition in the UK. *Oxford Bulletin of Economics and Statistics*, *66*(1), 23–47.

Jones, J. (1997). Inter-university variations in undergraduate non-completion rates: A statistical analysis by subject of study. *Journal of Applied Statistics*, *24*(3), 343–362.

Kanter, R. M. (1977). *Men and women of the corporation*. New York, NY: Basic Books.

Kremer, M., & Levy, D. (2008). Peer effects and alcohol use among college students. *Journal of Economic Perspectives*, *22*(3), 189–206.

Lavy, V., Schlosser, A., & Francis, B.. (2011). Mechanisms and impacts of gender peer effects at school. *American Economic Journal. Applied Economics*, *3*(2), 1–33.

Mastekaasa, A., & Smeby, J. C. (2008). Educational choice and persistence in male-and female-dominated fields. *Higher Education*, *55*(2), 189–202.

Meyer, J., & Strauß, S. (2019). The influence of gender composition in a field of study on students' drop-out of higher education. *European Journal of Education*, *54*(3), 443–456.

Oosterbeek, H., & Van Ewijk, R. (2014). Gender peer effects in university: Evidence from a randomized experiment. *Economics of Education Review*, *38*, 51–63.

Oseguera, L., & Rhee, B. S. (2009). The influence of institutional retention climates on student persistence to degree completion: A multilevel approach. *Research in Higher Education*, *50*(6), 546–569.

Pahlke, E., Cooper, C. E., & Fabes, R. A. (2013). Classroom sex composition and first-grade school outcomes: The role of classroom behavior. *Social Science Research*, *42*(6), 1650–1658.
Ridgeway, C. L. (2011). *Framed by gender: How gender inequality persists in the modern world*. New York, NY: Oxford University Press.
Riegle-Crumb, C., King, B., & Moore, C. (2016). Do they stay or do they go? The switching decisions of individuals who enter gender atypical college majors. *Sex Roles*, *74*(9–10), 436–449.
Sax, L. J. (1996). The dynamics of "tokenism": How college students are affected by the proportion of women in their major. *Research in Higher Education*, *37*(4), 389–425.
Sax, L. J. (2008). *The gender gap in college: Maximizing the developmental potential of women and men*. San Francisco, CA: Jossey-Bass.
Severiens, S., & Ten Dam, G. (2012). Leaving college: A gender comparison in male and female-dominated programs. *Research in Higher Education*, *53*(4), 453–470.
Takeda, S., & Homberg, F. (2014). The effects of gender on group work process and achievement: An analysis through self-and peer-assessment. *British Educational Research Journal*, *40*(2), 373–396.
Titus, M. A. (2004). An examination of the influence of institutional context on student persistence at 4-year colleges and universities: A multilevel approach. *Research in Higher Education*, *45*(7), 673–699.
Van De Werfhorst, H. G. (2017). Gender segregation across fields of study in post-secondary education: Trends and social differentials. *European Sociological Review*, *33*(3), 449–464.
Van Houtte, M. (2004). Gender context of the school and study culture, or how the presence of girls affects the achievement of boys. *Educational Studies*, *30*(4), 409–423.
Van Houtte, M., & Vantieghem, W. (2020). Do girls make boys study? Gender composition, gender role culture, and sense of futility in Flemish secondary schools. *Youth & Society*, *52*(2), 229–250.
Warrington, M., Younger, M., & Williams, J. (2000). Student attitudes, image and the gender gap. *British Educational Research Journal*, *26*(3), 393–407.
Whitley, B. E., Nelson, A. B., & Jones, C. J. (1999). Gender differences in cheating attitudes and classroom cheating behavior: A meta-analysis. *Sex Roles*, *41*(9–10), 657–680.

Appendix

Table A1. Number of colleges according to the percentage of males in the institution.

% Male	No. of colleges
0–9	8
10–19	8
20–29	4
30–39	10
40–49	6
50–59	6
60–69	2
70–79	2
80–89	3
90–100	2
Total	51

Table A2. Odds ratios from multilevel logit models predicting on-time undergraduate degree completion.

	All		Women		Men	
	OR	(SE)	OR	(SE)	OR	(SE)
Male	0.838**	(0.0570)				
% male students	0.169***	(0.0623)	0.186**	(0.108)	0.118***	(0.0603)
% STEM students	1.892*	(0.585)	1.615	(0.667)	1.960+	(0.784)
Institutionalaverage matriculation score	1.007	(0.0179)	1.011	(0.0209)	1.018	(0.0273)
Arab	0.489***	(0.0538)	0.560***	(0.0763)	0.361***	(0.0694)
Parental academic education	0.981	(0.0646)	1.022	(0.0869)	0.920	(0.0974)
Economic circumstances	1.046**	(0.0168)	1.057**	(0.0211)	1.029	(0.0284)
Number of siblings	1.030	(0.0197)	1.010	(0.0232)	1.079*	(0.0377)
Average matriculation score	1.043***		1.045***	(0.00490)		(0.00636)
No advanced subjects	0.991	(0.127)	1.072	(0.179)	0.957	(0.194)
Sciences	1.103	(0.0767)	1.039	(0.0916)	1.343*	(0.158)
Technology	1.012	(0.0918)	0.858	(0.0990)	1.333+	(0.199)
Psychometric score (ref: Low score)						
Did not take the test	0.856*	(0.0675)	0.841+	(0.0786)	0.890	(0.136)
Medium score	0.939	(0.0762)	0.921	(0.0920)	1.002	(0.148)
High score	0.786*	(0.0941)	0.840	(0.147)	0.796	(0.145)
Field of study in higher education (ref: Humanities)						
Teacher education	0.765	(0.159)	0.869	(0.211)	0.511+	(0.207)
Arts	0.640+	(0.160)	0.801	(0.229)	0.349*	(0.182)
Social sciences & business	2.070***	(0.329)	2.383***	(0.424)	1.071	(0.391)
Law	3.402***	(0.709)	4.137***	(1.088)	1.677	(0.672)
Paramedical	2.001+	(0.758)	2.118+	(0.883)	1.465	(1.307)
Natural sciences	1.247	(0.242)	1.510+	(0.377)	0.645	(0.252)
Engineering	1.218	(0.259)	1.352	(0.367)	0.667	(0.275)
Constant	0.0520*	(0.0784)	0.0274*	(0.0485)	0.0490	(0.112)
N	8220		5591		2629	
Exponentiated coefficients; Standard errors in parentheses						
+ *p*<.10, * *p*<.05, ** *p*<.01, *** *p*<.001						