

*Educational choice and persistence in male and female dominated fields**

*Arne Mastekaasa, Oslo University College and University of Oslo
Jens-Christian Smeby, Oslo University College*

* Order of authorship is alphabetical to denote our equal contributions. Address communications to: Jens-Christian Smeby, Center for Study of the Professions, Oslo University College, P.O.Box 4, St.Olavs plass, N-0130 Oslo, Norway

*Educational choice and persistence in male and female dominated fields**Abstract*

Even though female students now make up more than half of all higher education students in many countries, the distribution of women across fields of study is still very uneven. This study examines the gendered nature of recruitment and dropout in higher education. Our results show that students who made gender traditional choices more often had an early preference for the study programme they enrolled in. Moreover, female students reported more often than male students that they had been encouraged by their parents and friends. However, unlike what we expected, there are no differences between students in gender traditional and non-traditional programmes with regard to encouragement from parents and students' confidence that they had made the right choice. While gender composition of educational programmes is unrelated to male students' dropout, women drop out of female dominated programmes to a less extent.

Educational choice and persistence in male and female dominated fields

During the past few decades systems of higher education have expanded dramatically in most industrialised countries. In both the UK and in Norway, e.g., the number enrolled in higher education more than doubled from the 1970's to the turn of the century (Brooks 2002; Hansen and Mastekaasa 2003). This expansion is partly due to the increase in the number of female students. Women now make up more than half of all higher education students in many countries in the industrialised world. The distribution of women across fields of study is, however, still very uneven (Jacobs 1996; Bradley 2000; Støren and Arnesen 2003). Cross-national analyses indicate that horizontal inequalities are more resistant than vertical inequalities to gender-egalitarian cultural pressures (Charles and Bradley 2002). Gender segregation in higher education is not just a matter of universalistic ideals. It concerns the uneven distribution of women across occupations, and gender-typical employment has deleterious economical consequences for women (e.g. Jacobs 2003; Høgsnes 1999). A better understanding of the processes behind these horizontal segregation patterns is therefore essential in a gender equality perspective.

Gender segregation in higher education will result if men and women choose to enrol in different programs (differential selection into programmes), or if they drop out of the programmes at different rates (differential selection out). Gender differences in selection into various educational fields and programmes are well documented (Jacobs 1996). Moreover, several studies have established that both parents and peers are important influences in the choice process; the question of how these influences differ by gender has received relatively little attention, however (Brooks 2002).

A number of studies have also examined gender differences in dropout. Some of these report higher dropout rates for female students (e.g. Ishitani 2003), others find men to be more likely to drop out (Johnes and McNabb 2004), while others again find no gender difference (Liljander 1998; Murtaugh et al. 1999). Thus, no clear pattern has been documented. More important in the present context, results on variation in gender differences among educational programmes and fields are also highly inconsistent. Robst, Keil and Russo (1998) found that the proportion female faculty had a positive effect on retention for female students. The opposite effect was reported by Johnes and McNabb (2004): The proportion of male students in a course was positively related to completion for women, but negatively for men. Correspondingly

Rogers and Menaghan (1991) reported that women's persistence likelihood in science and technology increased as the proportion of men increased. Sax (1996) found that the proportion of women was positively related to men's attrition rates, but not to women's, while Smith and Naylor (2001) found no relationship between gender composition and attrition rates for neither men nor women.

In this paper we explore gender segregation using a sample of students from Norwegian university colleges. In Norway as in many other countries, the influx of female students has been even stronger in this part of higher education than in the traditional universities. Nevertheless, there are still large variations between the different educational programmes. Most programmes, like nursing, education and social work, are clearly female-dominated, but there are also strongly male-dominated enclaves like engineering.

While most studies of gender segregation in higher education has focused on either recruitment or dropout, the aim of the present study is to examine both these issues and to explore possible relationships between processes behind these patterns. First, we analyse students' reports on the choice process preceding entry into male and female dominated educational programmes. Do male and female student differ in how early they made their choices and in their assessments of how much parents and peers were involved in the process? The second set of analyses is concerned with gender differences in persistence. Are female students more likely to drop out of male dominated fields, and do male students drop out of female dominated fields? Finally we examine the relationship between the initial choice and later dropout: do those who later drop out report less encouragement and confidence in their choices, and does this explain later gender differences in dropout?

Before turning to the empirical results, however, we discuss relevant literature on gender segregation in higher education and provide a description of the research setting and the data.

Theories and research on gender differences in higher education

A common explanation for gender segregation in higher education as well as more generally is that it is due to differences in the early socialization of boys and girls (cf. Eagly 2000). Boys and girls internalize different values and preferences, and this leads them to choose different educations. In particular, the nurturing role of women may encourage girls and women to make educational choices that lead to caretaking occupations (Bradley 2000). A second type of explanation, particularly common among economists, is that gender differences arise because

women tend to choose careers that make it easier to combine employment and family life (e.g. Polachek 1981). According to this theory, men and women have the same basic value or preference (maximization of life time income), but the opportunity situations in which they find themselves lead them to make different choices. A third type of explanation assumes that men and women are exposed to different external factors, including possible gender discrimination. An example of this strand of theory is the “social control perspective” suggested by Jacobs (1989). Jacobs argues that women are exposed to a lifelong system of social control. External social pressures rather than internalized values or calculation of costs and benefits push women in the direction of making traditional choices at all life stages.

There is a huge literature addressing the gendered nature of science and engineering. Consistent with the socialization perspective, a prevalent claim found in the research in this area is that the roots of gender segregation in higher education lie in the earlier stages of the student’s career (Oakes 1990; Ma 1999). Several studies have also shown that there are cultural beliefs that males are more competent than females at mathematics (Hyde et al. 1990; Wagner and Berger 1997; Seymour and Hewitt 1997; Correll 2001), even though the empirical support for actual gender differences in mathematical competence is weak (Baker and Jones 1993; Finn 1980). Furthermore, males tend to overestimate their mathematical competence relative to females and are therefore more likely to pursue activities leading toward a career in science and engineering (Correll 2001).

The family and the peer group have been found to be an important influence on educational choices (Moogan et al. 1999). Parents play an early role in helping students develop postsecondary aspirations (Somers et al. 2002). Girls are found to have a collaborative approach to the choice process towards their parents, especially mothers, while boys tended to be more resistant to parental involvement (David et al. 2003). Girls are also more likely than boys to be influenced by peers and perhaps to consult more with others more generally (Reay 1998). The implication of these differences for students’ choice of field of study has not been examined. It may, however, be hypothesised that these patterns play an important role in the reproduction of gender segregation in higher education. Moreover, irrespective of whether or not men and women differ in the overall level of support or influence from parents and friends, the specific direction or content of this influence may be different. One possibility is that parents in particular influence sons and daughters in the direction of making traditional gender-typical choices, like nursing for females and engineering for males.

A focus on family and peer influences is consistent with both socialization and social control theories, depending on whether these influences are assumed to be internalized or not. Research on student dropout has focussed more clearly on the impact of factors external to the individual. In particular, the emphasis has been on student integration (Austin 1993; Tinto 1987, 1997; Braxton et al. 1997; Read et al. 2003). Tinto draws heavily on Durkheim's work (1897/1951) and focuses on the role of social structure in the persistence process. Students enter higher education with a set of background characteristics, intentions and expectations and the way these variables interact and are modified in a social and academic integration process are decisive for students' decision to persist or depart. In terms of this theory, higher dropout of students in educational fields dominated by the opposite gender could be understood as a result of these students being less integrated. Differences between male and female dominated fields have not been a central topic in this research tradition, however.

Moving beyond studies of student persistence to more general theories, several authors have suggested that the numerical strength of a minority group has important consequences for the degree to which it is exposed to discrimination or more generally experience difficulties in various social settings. Particularly influential has been Kanter's (1977a, b) theory of "tokenism". Kanter suggests that small minorities, like women in predominantly male settings, are faced with special problems. The basic issue is that members of small minorities are not perceived and treated as individuals but rather as representatives or "tokens" of their category. As an example she refers to an interview study conducted by Segal (1962) where a male nursing student reported that he thought he would enjoy being the only man in a group of women until he found out that he engendered a great deal of hostility and that he was teased every time he failed to live up to the manly image (Kanter 1977b). A related albeit different idea is that traditionally privileged majorities may feel that their advantaged position is threatened by the minority, and that the minority is therefore subject to various kinds of hostile behaviour (Blalock 1967). Kanter's and Blalock's theories give rise to different hypotheses. According to Kanter, the situation of the minority is more difficult the smaller it is. Blalock, on the other hand, argues that the majority is more likely to tolerate a very small minority group; when the relative size of the minority group increases, it is perceived to be a greater threat, and the majorities' hostility increases.

As noted above, results on the relationship between gender segregation and the dropout of female and male students are highly inconsistent. The reasons for these contradictory results

may be that even though demographic attributes as gender may well be objective categories, their interpretation and meaning are essentially social. Gender differences are social constructions in a particular organisational setting (Chatman and O'Reilly 2004). Moreover, it has been argued that Kanter's theory of relative numbers lacks a gender power perspective (Zimmer 1988; Teigen 1999). Therefore, being a minority may differ between educational programmes as well as between women and men. A study of deviation from occupational gender stereotypes reported for example that deviance appeared more costly in the minds of undergraduate women than men (Yoder and Schleicher 1996).

Reviewing the literature it seems that the gendered patterns in choice of study field is highly resistant to increased female participation as well as egalitarian culture norms. It has been argued that expansion of higher education implies a diversification that affects the gender distribution across programmes and fields of study in the sense that female students in these "mass" systems are more willing to settle for lower status institutions and "gender appropriate" fields of study (Charles and Bradley 2002). It is therefore reasonable to hypothesise to find significant gendered patterns in our examination of students' educational choice process. Considering the literature on "tokenism" and the impact of relative numbers of minorities it is less evident that we will find gender differences in student dropout. It is reasonable to assume that gender stereotypes have been modified during recent decades and that they are less significant among young people in a country with strong egalitarian norms like Norway (Esping-Andersen 1990).

Methods

Data set

As part of a large longitudinal survey programme (called StudData), a questionnaire was administered to all beginner students at Oslo University College and to selected educational programmes in other Norwegian university colleges in September 2000. Oslo University College offers a variety of mostly three year professional programmes in areas like teaching, nursing, social work, public administration, business administration, library science, journalism, physical therapy, etc. Students included from other colleges were on similar programmes.

Overall, 33 different study programmes are included. In Table 1 these are grouped into eleven educational fields. Most of the educational fields are clearly female-dominated. Overall, 74 percent of the students are women. The female domination is particularly strong in early

childhood education and nursing, which are both more than 90 percent female. The only clearly male-dominated field is engineering, while business administration and journalism are quite gender balanced.

Note that there is also considerable variation within many of the categories in table 1. Within the field of engineering, e.g., percent female varies from four in the programme in machine engineering to 72 in chemical engineering.

Table 1 The gender composition of the student body in various educational fields.

	Percent women	N
Nursing	91	380
Physical therapy, etc.	78	185
Various health related	85	188
Social work	87	288
Education (primary school)	73	555
Education (pre-school)	96	209
Library science	86	74
Journalism	61	104
Public administration	80	40
Business administration	55	110
Engineering	22	289
Total	74	2422

The questionnaires were completed in class, and collected by the teacher or an administrative official. In a few classes with low response rates, questionnaires were mailed to students who had been absent when the questionnaires were distributed or who had not returned it for some reason. (Students who did not want to participate could return a blank questionnaire, and would not be contacted again.) The total number of completed questionnaires was 2422, yielding to a response rate of 74.

Data on dropout was taken from the schools' computerised student registers. Such data is available only for students at Oslo University College. The number of respondents in the dropout analyses is therefore 1718.

Variables

The variables are presented in Table 2. Nearly half of the sample report that they made their choice of education during childhood or youth years. The amount of encouragement from mother and from friends is at about the same level, whereas somewhat less encouragement is reported for fathers. We may also note that most students report a high degree of confidence

that they have made the right educational decision, with a mean of close to four on a five-point scale.

Table 2 Variable definitions and descriptive statistics

Early decision	Having made the decision during childhood or youth years = 1; made the decision in connection with the application = 0 (Mean = .47)
Encouragement mother	Mother's degree of encouragement for chosen education; not at all = 1, to a very high degree = 5 (Mean = 3.12; SD = 1.43)
Encouragement father	Father's degree of encouragement for chosen education ; not at all = 1, to a very high degree = 5 (Mean = 2.82; SD = 1.45)
Encouragement friends	Friends' degree of encouragement for chosen education; not at all = 1, to a very high degree = 5 (Mean = 3.08; SD = 1.35)
Confidence	Average of two five point items: "I am confident that I have made the right choice" and "I might as well have chosen another education" (reversed); low certainty = 1, high certainty = 5 (Mean = 3.93; SD = 1.00)
Dropout	Registered as having left the educational programme = 1; else = 0 (Mean = .23)
Gender	Woman = 0; Man =1 (Mean = .26)
Proportion men	Proportion men among students in educational program, dummy variables for .25 to .75 (34% of sample) and more than .75 (11%), with less than .25 as reference (55%)

Statistical methods

The data are analyzed by means of linear and logistic regression. The respondents are clustered within classes and cannot be considered as independent observations. If this clustering is neglected, standard errors may be seriously underestimated. This is taken into account by estimating multi-level (random intercept) regression models (Snijders and Bosker 1999).

The central issue in this paper is whether the impact of gender is different in male and female dominated educations, or, equivalently, whether male/female domination has different implications for men and women. We address this issue by estimating regression models in which gender, the gender composition of the programme, and the interaction of gender and gender composition are included. In the analysis of dropout, we also estimate models in which encouragement from friends and peers, timing of the educational decision and the students confidence in the choice are included as explanatory variables.

We also performed analyses controlling for background factors like parents' education and ethnic background. These controls had no impact on the estimated effects of gender or gender composition, and are therefore not included in the analyses presented here.

Results

The educational choice process

Table 3 provides some regression results on how the process of selection into the various educational programmes differs between men and women in female-dominated, balanced and male-dominated programmes. There is a considerable gender difference in the amount of encouragement from fathers and mothers as well as friends. In all cases women report more encouragement. There are few differences between male and female-dominated programmes. Generally speaking, encouragement from mothers and friends are reported equally often in all three categories of programmes. Amount of encouragement from father shows, however, a clear positive association with the proportion male in the programme (see figure 1). There is no interaction with gender, however. This means that the higher degree of encouragement from fathers in male-dominated programmes applies to both men and women.

Table 3 Regression analyses of some aspects of the educational choice on gender and gender composition of the chosen programme

	Encouragement from mother		Encouragement from father		Encouragement from friends		Early decision		Confidence in choice	
Constant	3.194	***	2.773	***	3.145	***	-0.235	**	3.957	***
Gender	-0.669	***	-0.533	***	-0.481	***	-0.633	**	-0.014	
Gender composition (omitted: <25 percent male)				a						
25-75 percent male	0.026		0.314	*	-0.010		-0.019		-0.038	
>75 percent male	-0.233		0.487		-0.429		-0.371		-0.293	
Interaction gender comp. with gender							b			
25-75 percent male * Gender	0.371	*	0.177		0.193		0.448		-0.161	
>75 percent male * Gender	0.136		0.032		0.310		1.115	**	0.241	

^a Hypothesis of zero coefficients for both dummies rejected at .05 level. ^b Hypothesis of zero coefficients for both interaction terms rejected at .05 level. Otherwise, significance probabilities are denoted as follows: *** for $p < .001$, ** for $p < .01$, and * for $p < .05$

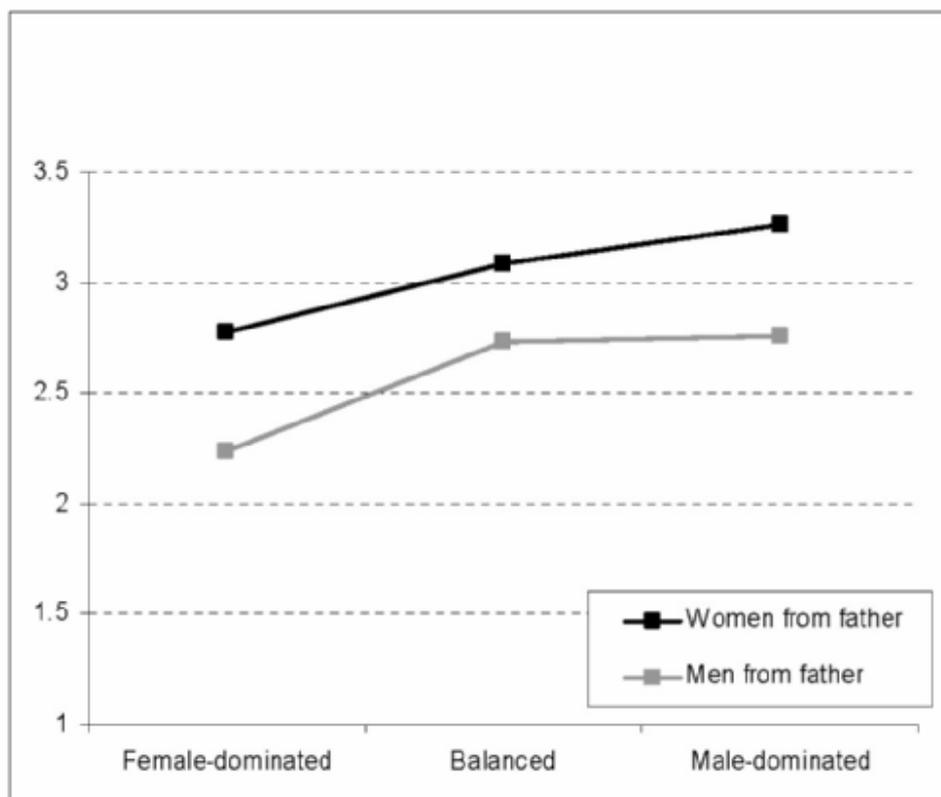


Figure 1 Sons' and daughters' encouragement from fathers in the choice of female- and male-dominated programmes (means).

Table 3 also contains results with regard to the timing of the educational decision, analysed by means of logistic regression. There is a very strong interaction effect of gender and the gender composition of the programme. This is shown in figure 2. For men the probability of having made the decision early increases from .30 in female-dominated programmes to .47 in male-dominated ones. For women, there is an opposite pattern, a decline from .44 in female-dominated to .35 in male-dominated programmes. In other words, for both men and women traditional, gender typical choices have been made at an earlier age than non-traditional choices.

Although women report more encouragement from parents and friends, the final analysis in Table 3 shows that men and women are equally confident that they have made the right choice of educational programme. Also, although gender typical choices are made earlier, those who have made untraditional choices are equally confident that their decisions have been right.

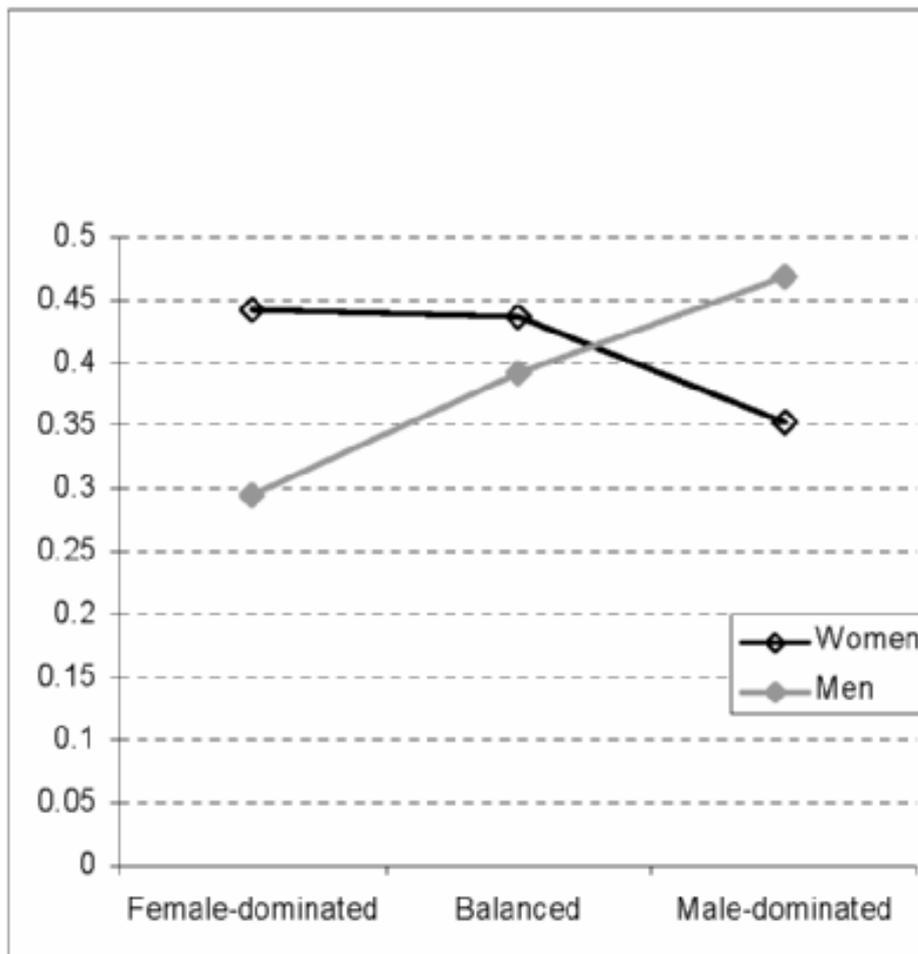


Figure 2 Estimated probability of having made an early decision by gender and gender composition of the educational programme.

Persistence in educational programmes

Analyses of how students' background characteristics relate to the probability of dropping out of the educational programme are presented in Table 4. Model 1 includes only gender, percentage male and the interaction of these variables, giving gross gender differences in dropout in female-dominated, male-dominated and balanced programmes. In model 2 we control for encouragement from parents and friends, whether the student reports that the decision was made early, and the degree of confidence in having made the right decision. Drop-out probabilities based on the estimated coefficients are presented in Figure 3.

Figure 3 shows that for men the dropout probability is about the same irrespective of the gender composition of the programme. For female students, however, the dropout is much

lower in female dominated programmes than in balanced or male dominated ones. In balanced and male dominated programmes the probability of dropping out is also very similar for men and women, whereas in female dominated programmes only half as many women as men drop out.

These patterns are virtually unaffected by inclusion of the control variables in Model 2.¹ Thus, the very low dropout of women in female dominated programmes is not due to these women reporting more encouragement or greater confidence in their choices at the time of enrolment.

Table 4 Logistic regression analyses of student dropout on gender, the gender composition of the chosen programme, and variables related to the educational choice.

	Model 1	Model 2
Constant	-1.801 ***	-0.810 *
Gender	0.852 **	0.828 **
Gender composition (omitted: <25 percent male)	a	a
25-75 percent male	0.898 ***	1.015 **
>75 percent male	1.170 **	0.920
Interaction gender comp. with gender	b	b
25-75 percent male * Gender	-0.655 *	-0.853 *
>75 percent male * Gender	-1.094 *	-0.745
Encouragement from mother		-0.145 *
Encouragement from father		0.050
Encouragement from friends		0.070
Confidence in choice		-0.228 **
Early decision		-0.224
Number of observations	1718	1435

Note: See note to table 3

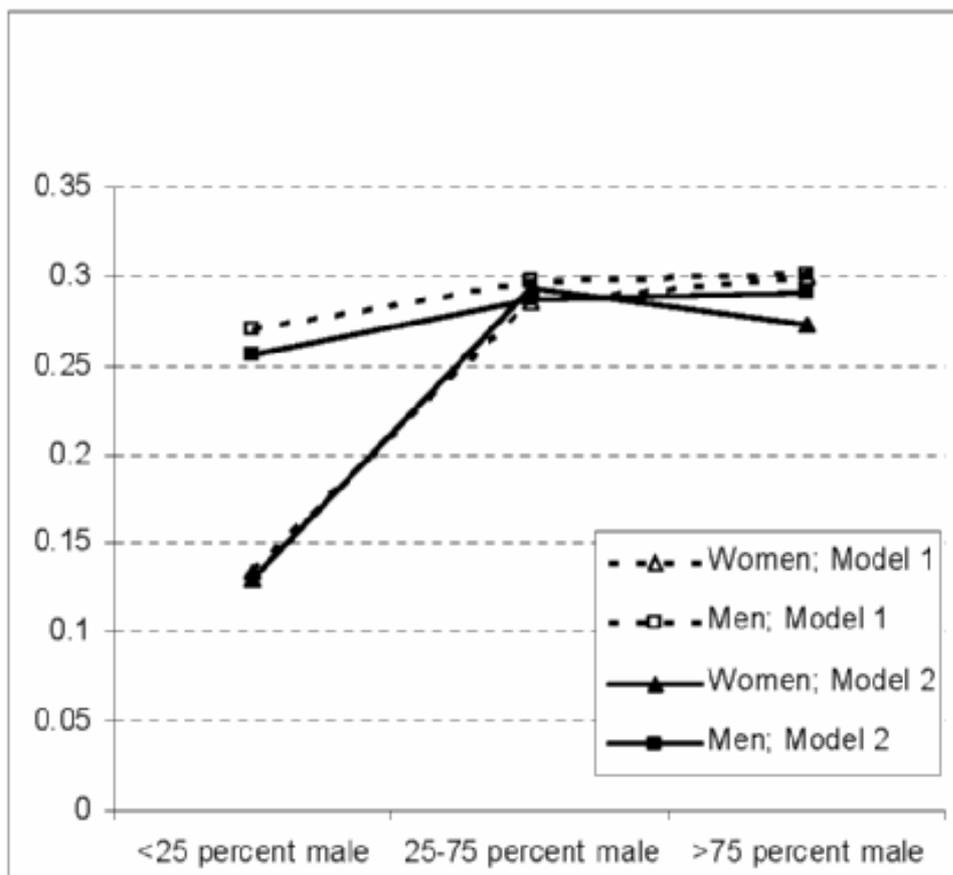


Figure 3 Estimated probability of dropout by gender and gender composition of the educational programme.

Discussion and conclusion

The present study confirms the gendered nature of student recruitment as well as dropout in higher education at least to some extent. However, contrary to our expectations, we did not find any relationships between the processes behind these patterns. Our results show that students who made traditional choices more often had an early preference for the study programme they enrolled in. Those who made untraditional choices had made their decision later; they were, however, equally certain that they had made the right choice. Female students reported more often than male students that they had been encouraged by their parents, especially mother, to choose the particular programme they actually ended up in. This is consistent with the research literature (Somers et al. 2002; David et al. 2003). However, unlike what we expected there are no differences with regard to encouragement from parents between students on gender traditional and non-traditional programmes.

These results do not necessarily indicate that parents do not play an important role in the reproduction of gender stereotypical educational choices. The vast majority of students have in fact made traditional choices, and report having been supported by their parents in this. Nevertheless, it would seem reasonable to expect strong pressure against non traditional choices to be evident in lower support for many of those who made such choices, but there are no indications of this in our data. One possible explanation is that the reproduction mechanisms may be more complex and subtle. General gender roles and gendered stimulation of pupils' self confidence in different subjects during primary and secondary school may be more important than direct encouragement (e.g. Correll 2001). While the literature to a great extent has focused on stereotypical educational choice among women (e.g. Correll 2001; Bradley 2000; Ma 1999), some of the same mechanisms seems however to be at work among men. Parents may act as role models and play important role in these processes even if they encourage their children to make their own choices and are very reluctant to give advices based on their own preferences. This may be one of the reasons why gender segregation in choice of study field is so resistant to equality norms in society (Charles and Bradley 2002).

The fact that students who choose non gender-traditional educational programmes are encouraged by parents as well as friends in their educational choice to the same extent as students who choose more traditional programmes with respect to the composition of gender, indicate nevertheless that the norms with regard to what educational fields are appropriate for men and women are not very strong. This suggests that the proportion of men and women in the respective fields should not have significantly different impact on dropout among male and female students. Such a hypothesis would also be supported by our finding that those who made non-traditional choices were no less confident than others that they had made the right choice.

These expectations are, however, not supported; women have a much higher dropout probability in gender neutral and male dominated programmes than in female dominated ones. Although a relationship between gender composition and dropout is found, the findings do not provide any strong support for theories assuming that women in traditionally male contexts face special problems or are exposed to special pressures, as suggested by Jacobs' (1989) social control perspective or Kanter's (1977a) theory of tokenism. But women in male dominated programmes do not differ from women in gender balanced programmes. We may also add that although the gender neutral category is defined as 25 to 75 percent men (or women), none of the programmes in this category does in fact have more than 50 percent men. Thus, it seems fair to

say that it is not so much a case of women being pushed out of male dominated programs as one of women persisting to a particularly high degree in female dominated programmes.

With regard to Kanter's theory, the findings are also negative in another respect. Kanter expects minority status to be stressful for any group; that is, not only for women, but also for men. Our results indicate, however, that men's dropout is entirely unrelated to their being in either a minority or a majority situation. We note that Kanter's theory has also received little support in previous studies of student dropout (e.g. Johnes and McNabb 2004; Sax 1996; Rogers and Menaghan 1991).

The present findings indicate that instead of asking why female students are pushed out of male dominated programmes one should rather ask why they are so strongly attracted to the female dominated ones. In terms of Tinto's student integration theory one might suggest that the female dominated programmes are particularly good at fostering a positive environment for female students. In this connection it is interesting to note that there are some indications that male and female students tend to cite different reasons for withdrawal. Yorke (1999) found that men were more likely to report having made a wrong choice of programme, while women were more likely to have been unhappy with aspects of the social environment. If this is the case, it could explain why men's dropout seem to be unaffected by the gender composition whereas female students display such a high persistence in strongly female dominated fields.

Studies indicate that the effect of some of the variables predicting student departure varies by time since enrolment (DesJardins et al. 1999; Ishitani 2003; Montmarquette et al. 2001). The data analysed here does not make it possible to differentiate between dropout at different stages of the college career, however. An interesting question for further research is whether the impact of gender composition on male and female students' probability of dropping out increases or decreases over time and whether it also continues beyond graduation, leading to differential rates of leaving the occupation or the profession.

Another limitation of the present study is that we are not able to differentiate between those who drop out of higher education altogether and those who merely give up a particular programme. Information on whether students who drop out of gender atypical programmes tend more often than other dropouts to continue in other programmes would shed further light on the segregation mechanisms in higher education.

It has been a political objective in Norway as well as in many other countries to raise the proportion of women in male dominated study fields, but also the proportion of men in female

dominated fields as education. It has been argued that developing learning communities among students is a successful way to increase student persistence (Tinto 1997, 1998). Even though dropout among male students is unrelated to gender composition in the fields, dropout among male students in female dominated fields is nevertheless higher than among women. Strategies in the development of learning communities should therefore also include a gender perspective.

Notes

¹ Due to missing data on the attitudinal variables, the number of observations included is lower for Model 2 than for Model 1. The results for Model 1 are, however, almost identical if the analysis is restricted to observations with complete data on all variables in Model 2.

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