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Supplementary Material

The impact of guidance counselling on gender segregation: Major choice and persistence in higher education. An experimental study

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1 Supplementary Figures and Tables

1.1 Supplementary Figures

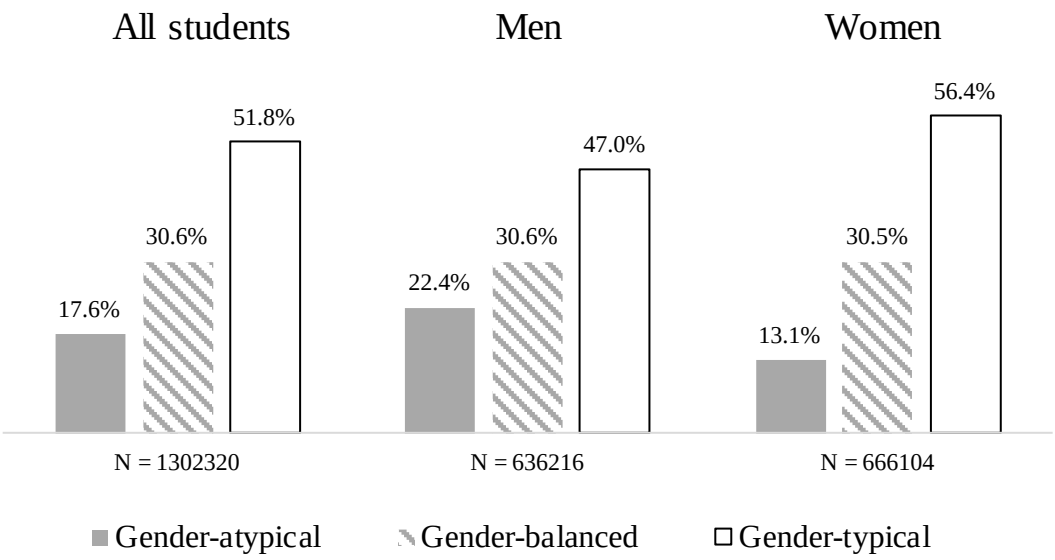

Figure S.1. Gender composition of first semester within major for all students and by gender based on German Federal Statistical Office (Destatis) data, 2017-2019 (Cut-off ≥60). Source: Destatis (2022). Genesis-online Database: Only First-Semester Students 2017-2019

1.2 Supplementary Tables

Table S.1. Distributions of selected characteristics in wave 1 by programme assignment

	Control group	Treatment group	Diff.
Initial academic performance W1	8.89	9.10	-0.21
N	657	653	1310
Initial intention to enroll in higher education	3.62	3.65	-0.03
N	687	675	1362
Parents' education			
HE degree	0.52	0.52	0.00
No HE degree	0.48	0.48	0.00
N	681	679	1360

Table S.2. List of the first 10 majors in higher education with the highest share of men or women first-semester students based on German Federal Statistical Office (Destatis) data, 2017-2019

Men		**Women**	
Subject	%	Subject	%
Automotive Engineering	92.1	Pedagogy of Early Childhood	91.3
Mechatronics	89.4	Linguistic and Cultural Studies	87.8
Mechanical Engineering	87.4	Interior Design	87.2
Aerospace Engineering	84.9	Elementary Education/Primary Education	86.8
Electrical Engineering/Electronics	84.8	Special Needs Education	86.1
Computer Engineering/Technical Informatics	84.5	Nutritional Science	85.3
Manufacturing/Production Engineering	83.7	Learning Area Science/Subject Teaching	84.5
Supply Engineering	83.2	Veterinary Medicine	84.3
Communication and Information Technology	82.4	Library Science	84.0
Wood Technology/Fiber Technology	82.0	Social Pedagogy	83.5

Source: Destatis (2022). Genesis-online Database: Only First-Semester Students 2017-2019; Note: Major with fewer than 150 students were excluded.

Table S.3. Gender-atypical major in the analysis sample

Men		**Women**	
Control group	Treatment group	Control group	Treatment group
Biochemistry	Administrative Science	Electrical Engineering and Information Technology	Civil Engineering/ Engineering
German Studies/German	Applied Science of Linguistics	Business Informatics	Business Administration
Health Sciences/ Health Management	Biology	Civil Engineering/ Engineering	Business Informatics
Japanese Studies	Communication Science/Public Relations	Computer Science	Computer Science
Law	English Studies/English	Industrial Engineering (Engineering focus)	Economics
Media Science	Financial Management	Mechanical Engineering	Electrical Engineering/ Electronics
Medicine (General Medicine)	German Studies/German	Physics	Industrial Engineering (Economics focus)
Non-medical Professions/Therapy	Graphic Design/Communication Design	Police/Constitutional Protection	Industrial Engineering (Engineering focus)
Psychology	Interdisciplinary Studies (Focus on Art, Art science)	Water Management	Mechanical Engineering
Social Work	Interdisciplinary Studies (Focus on Law, Economics, and Social Sciences)		Police/Constitutional Protection
	Islamic Studies		
	Japanese Studies		
	Law		
	Media Economics/Media Management		
	Medicine (General Medicine)		
	Psychology		
	Social Science		
	Social Work		
	Tourism		
n = 16	n = 38	n = 12	n = 18

Table S.4. Conditional average treatment effects by gender based on model 1b

	Men			**Women**			**Gender diff.**
Dependent variable	Mean CG	Mean TG	ATE (p-value)	Mean CG	Mean TG	ATE (p-value)	ATE (p-value)
atypical choice	0.128	0.292	0.164*** (0.001)	0.066	0.099	0.033 (0.269)	-0.131** (0.029)
N							625

Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; all models with school-fixed effects

Table S.5. Results of the linear regression model on share of women in majors

	Share of women in majors	
	Model 1a	*Model 1b*
Programme (assigned = 1)	0.034** (0.016)	0.064** (0.025)
Gender (women = 1)		0.204*** (0.020)
Interaction (assigned*women)		-0.048 (0.030)
Parents' education (HE degree = 1)	-0.013 (0.016)	-0.003 (0.015)
Wave (4th wave = 1)	0.114*** (0.017)	0.078*** (0.015)
Constant	0.523*** (0.055)	0.372*** (0.047)
N	625	625
Adj. R2	0.073	0.258

Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; all models with school fixed effects

Table S.6. Conditional average treatment effects by gender typicality of major in higher education based on model 2b – 5b

	Not gender-atypical			**Gender-atypical**			**Typicality diff.**
Dependent variable	Mean CG	Mean TG	ATE (p-value)	Mean CG	Mean TG	ATE (p-value)	ATE (p-value)
Person–major fit (perceived)	5.68	5.56	-0.116 (0.298)	4.99	5.72	0.724* (0.054)	0.840** (0.033)
Satisfaction	3.48	3.42	-0.063 (0.515)	3.16	3.66	0.496* (0.091)	0.559* (0.072)
Intention to switch majors	2.01	2.03	0.023 (0.827)	2.49	2.16	-0.330 (0.329)	-0.352 (0.320)
Intention to drop out	1.72	1.70	-0.019 (0.833)	1.86	1.49	-0.370 (0.126)	-0.351 (0.176)
N							625

Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; all models with school fixed effects

Table S.7. Differences between treatment and control groups by exclusion

				Excluded due to …		
Characteristics in W1	**Total**	**Included**	**Excluded**	*Item non-response*	*Unit non-response*	*Not in HE*
N (Total)	1344	625	719	147	199	373
Treatment (TG)	0.50	0.50	0.50	0.47	0.53	0.49
N	1344	625	719	147	199	373
Parents' education (HE degree)	0.47	0.49	0.44	0.56	0.47	0.38
N	1318	625	693	142	182	369
Gender (women)	0.57	0.59	0.55	0.65	0.48	0.54
N	1343	625	718	147	198	373
Initial academic performance	8.97	9.67	8.33	8.87	8.63	7.98
N	1259	599	660	132	176	352

Notes: The original intended experimental sample included 1,404 students. Due to the withdrawal of one school (n = 60) immediately before the implementation of the programme, our total pre-treatment sample was reduced to 1,344 students. Because of the randomisation at the individual level within the schools, we do not assume any selection bias resulting from the drop out of this school.

Table S.8. Differences between control and treatment groups by panel attrition

	No participation in W3 and/or W4			**Participation in W3 and/or W4**		
Characteristics	*CG*	*TG*	*Diff.*	*CG*	*TG*	*Diff.*
Initial academic performance W1	8.35	8.86	-0.51	8.95	9.10	-0.15
N (Total = 1259)	82	94		552	531	
Initial intention to enroll in higher education W1	3.54	3.46	0.08	3.62	3.67	-0.05
N (Total = 1304)	87	101		571	545	
Gender (women)	0.53	0.45	0.08	0.58	0.58	0.00
N (Total = 1343)	93	105		579	566	
Parents' education (HE degree)	0.48	0.47	0.01	0.47	0.47	0.00
N (Total = 1318)	84	98		575	561	
Total (N = 1344)	93	106		579	566	

Notes: CG: Control group; TG: Treatment group; Diff.: CG-TG; Total number of cases with valid values for each variable in parentheses.

Table S.9. Differences between treatment and control groups by sample selection

	Excluded (n = 147)			**Included** (n = 625)		
	CG	*TG*	*Diff.*	*CG*	*TG*	*Diff.*
Gender-atypical major	0.20	0.00	0.20	0.09	0.18	-0.09
N (Total = 634)	5	4		310	315	
Person–major fit (perceived)	5.47	4.85	0.62	5.61	5.59	0.02
N (Total = 686)	34	27		310	315	
Satisfaction	3.16	3.11	0.05	3.46	3.45	0.01
N (Total = 684)	32	27		310	315	
Intention to switch majors	2.36	2.19	0.18	2.05	2.05	-0.01
N (Total = 685)	33	27		310	315	
Intention to drop out of HE	2.06	2.22	-0.16	1.73	1.66	0.07
N (Total = 685)	33	27		310	315	
Gender (women)	0.67	0.62	0.04	0.59	0.59	0.00
N (Total = 772)	78	69		310	315	
Parents' education (HE degree)	0.57	0.54	0.03	0.52	0.46	0.06
N (Total = 767)	77	65		310	315	
Initial academic performance W1	8.83	8.92	-0.09	9.60	9.74	-0.13
N (Total = 731)	71	61		301	298	
Total (N = 772)	78	69		310	315	

Notes: CG: Control group; TG: Treatment group; Diff.: CG-TG; Total number of cases with valid values for each variable in parentheses.

Table S.10. Series of linear regressions models: inclusion status on treatment, one covariate and their interaction

Interaction variable	Coefficient	P-value
Person–major fit (perceived)	0.026	0.139
Satisfaction	0.002	0.938
Intention to switch majors	0.011	0.533
Intention to drop out	-0.014	0.563
Initial academic performance W1	-0.001	0.922

Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; Coefficients and p-values refer to the interaction term;

Table S.11. Results of the linear probability models on gender-atypical major with additional control for initial academic performance

	Gender-atypical major	
	Model 1a	*Model 1b*
Programme (assigned = 1)	0.083***	0.148***
	(0.029)	(0.053)
Gender (women = 1)		-0.061
		(0.038)
Interaction (assigned*women)		-0.111*
		(0.062)
Parents' education (HE degree = 1)	0.031	0.022
	(0.031)	(0.030)
Initial academic performance W1	-0.009	-0.006
	(0.007)	(0.007)
Wave (4^{th} wave = 1)	-0.072**	-0.046
	(0.029)	(0.030)
Constant	0.154	0.163
	(0.116)	(0.130)
N	599	599
Adj. R^2	-0.003	0.027

Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; both models with school-fixed effects

Table S.12. Results of linear regression models with variables of students' persistence with additional control for initial academic performance

	Person–major fit (perceived)		Satisfaction		Intention to switch majors		Intention to drop out	
	Model 2a	*Model 2b*	*Model 3a*	*Model 3b*	*Model 4a*	*Model 4b*	*Model 5a*	*Model 5b*
Programme (assigned = 1)	-0.023 (0.107)	-0.150 (0.115)	0.015 (0.093)	-0.079 (0.099)	0.000 (0.102)	0.039 (0.107)	-0.034 (0.082)	0.027 (0.090)
Gender typicality (atypical = 1)		-0.662** (0.325)		-0.289 (0.257)		0.469 (0.288)		0.105 (0.215)
Interaction (assigned*atypical)		1.027*** (0.374)		0.666** (0.309)		-0.436 (0.353)		-0.393 (0.248)
Gender (women = 1)	-0.053 (0.115)	-0.046 (0.121)	-0.029 (0.099)	-0.008 (0.100)	0.071 (0.109)	0.090 (0.111)	-0.054 (0.085)	-0.074 (0.087)
Parents' education (HE degree = 1)	0.202* (0.114)	0.185 (0.113)	0.101 (0.095)	0.086 (0.095)	-0.124 (0.111)	-0.121 (0.110)	0.026 (0.088)	0.036 (0.089)
Initial academic performance W1	0.101*** (0.028)	0.101*** (0.027)	0.061** (0.024)	0.062** (0.024)	-0.073*** (0.025)	-0.072*** (0.025)	-0.132*** (0.021)	-0.133*** (0.021)
Wave (4^{th} wave = 1)	0.131 (0.115)	0.131 (0.114)	-0.030 (0.106)	-0.024 (0.106)	0.032 (0.114)	0.042 (0.114)	0.089 (0.090)	0.082 (0.091)
Constant	4.060*** (0.559)	4.077*** (0.565)	2.285*** (0.349)	2.267*** (0.356)	2.803*** (0.497)	2.756*** (0.503)	2.806*** (0.345)	2.831*** (0.342)
N	599	599	599	599	599	599	599	599
Adj. R^2	0.028	0.041	0.028	0.035	0.014	0.017	0.118	0.120

Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; all models with school-fixed effects

Table S.13. Results of the linear probability models on gender-atypical field of vocational training programme

	Gender-atypical field of vocational training programme	
	Model 1a	*Model 1b*
Programme (assigned = 1	0.014 (0.059)	0.012 (0.085)
Gender (women = 1)		-0.037 (0.085)
Interaction (assigned*women)		0.001 (0.112)
Parents' education (HE degree = 1)	0.111** (0.055)	0.105* (0.057)
Wave (4th wave = 1)	-0.039 (0.056)	-0.034 (0.058)
Constant	0.129 (0.202)	0.139 (0.207)
N	183	183
Adj. R2	0.029	0.019

Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; both models with school-fixed effects, Source: Destatis (2018, 2019a, 2019b, 2019c, 2020, 2021)

Table S.14. Results IV-analysis with linear probability model on gender-atypical major choice

	Gender-atypical major
	Model 1b (IV-analysis)
Programme (participated/assigned = 1)	0.127*** (0.039)
Parents' education (HE degree = 1)	0.038 (0.030)
Wave (4^{th} wave = 1)	-0.064** (0.028)
Constant	0.004 (0.077)
N	625
Adj. R^2	-0.021

Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1; model with school-fixed effects