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When the first degree isn't enough—rational choice and social inequality in graduate enrollment in Germany

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Abstract

It is a well-established finding that social origin matters in the transition to graduate education and that social inequality in this regard is shaped by previous educational pathways and rational decision-making. This study is situated within the German context, where bachelor's degrees were introduced during the Bologna Process, and extends previous research on the transition from bachelor's to master's programs in three ways: first, I draw on prospectively measured estimations of costs, benefits, and success probabilities to analyze their relevance in explaining social inequality. Second, I differentiate between intentions for immediate enrollment in a master's program and delayed enrollment which might be especially attractive to students from low social origins. Third, I assume that many students consider a master's degree as the only viable option, and therefore ignore high costs or a low probability of success in their decision. The analyses are based on data from 8166 bachelor's students in the third year of their studies in German higher education (National Educational Panel Study, Starting Cohort 5). First, decompositions reveal that preceding educational trajectories and rational calculations explain about three quarters of the social origin gap. Second, multinomial regressions show that the intention for delayed enrollment in a master's program is less socially selective than for immediate enrollment. Third, I estimate how costs and success probabilities interact with expected benefits of a bachelor's degree. If students expect very low returns from a bachelor's degree, estimations of costs and success probabilities have at best minuscule effects on their plans.

Keywords Social origin · Graduate education · Rational choice · Delayed enrollment · Bologna process · Germany

Introduction

Access to graduate education has often been shown to be selective by social origin (Barsegyan & Maas, 2024; Mateos-González & Wakeling, 2022; Ortiz-Gervasi, 2023; Posselt & Grodsky, 2017; Thomsen, 2023). During the Bologna Process, graduate

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enrollment gained importance in many countries of the European Higher Education Area (EHEA), in which traditional long programs (5 years) were replaced with a two-cycle system of bachelor's and master's programs (mostly 3 + 2 years). In this study, I focus on Germany where short programs were not established before the Bologna Process and rates of graduate enrollment are particularly high (about 70%). Specifically, I address the question of *what role rational choice plays in the formation of socially disparate intentions for graduate enrollment* in this context.

A few studies have addressed this topic (Lörz et al., 2015; Neugebauer et al., 2016; Neumeyer & Alesi, 2018). Consistent with the rational choice approach, socially stratified estimations of different parameters (costs, benefits, and success probabilities) contribute to the social origin gap in the decision to enroll in a master's program. Further, the studies highlight the relevance of a life course perspective, as previous choices in students' educational pathways seem to shape further preferences and opportunities for enrollment in a master's program and for labor market entry.

However, previous research is inconsistent when it comes to the observed explanatory value of rational calculations, probably because different operationalizations are employed. So far, no study has utilized prospectively measured estimations of costs, benefits, and success probabilities when analyzing social origin gaps in master's enrollment in the Bologna system. To address this gap, I analyze social inequalities and decision-making among 8166 bachelor's students in the third year of their studies in German higher education (*National Educational Panel Study*, NEPS-SC5). I employ decomposition analyses to test to what extent differences in rational calculations explain the gap in intentions for graduate education.

Further, previous studies are to some degree simplistic in their set of *choice alternatives*. A clear decision between leaving higher education and enrolling in graduate education is assumed. However, after graduating from a bachelor's program, students might also opt for *delayed enrollment*, i.e., to first enter the labor market and then, after a few years, re-enroll in a master's program to upgrade their educational degree. Delayed enrollment is highly relevant from a policy perspective, as the potential of lifelong learning in widening access to higher education was emphasized in the Bologna Process (Leuven/Louvain-la-Neuve Communiqué, 2009). Meanwhile, plans for delayed enrollment are of particular interest because they might stay unrealized (Wells & Lynch, 2012), because delayed enrollment carries an increased risk of non-completion (Roksa & Velez, 2012), and because it can affect success in the labor market (Yu, 2021).

Lastly, it is questionable whether all students consider the bachelor's degree as an alternative at all. Especially in countries, where short higher education programs were less established before the Bologna Process, concerns about the employability with a bachelor's degree persist (e.g., for Denmark: Hovdhaugen & Ulriksen, 2023). Against this background, I assume that some students consider a master's degree as their only option and, in consequence, ignore contrary rational calculations, e.g., that graduate enrollment might put a financial burden on them, or that it might be academically challenging for them. To capture this phenomenon theoretically, I propose a model of a restricted choice set, in which alternatives need to reach a sufficient threshold of associated benefits to be considered at all. I test this model by scrutinizing the interplay between different rational choice parameters.

The introduction of bachelor's and master's degrees in Germany

Before the Bologna Process, higher education programs were mostly structured as long one-cycle programs (*Diplom* and *Magister*) with a regular study duration of mostly 9 semesters and factual study durations of about 12 semesters. Most higher education institutions are differentiated in a two-tiered system of traditional research universities and universities of applied sciences (UAS, also: *Fachhochschulen*), similar to other countries (e.g., the Netherlands, Switzerland, Sweden). Access to higher education is mostly granted by obtaining a (general or restricted) higher education entrance qualification which is highly selective due to early tracking in the German educational system. With negligible tuition costs (public institutions only charge small administrative fees) and financial support for students from low-income families, the system can be characterized as a low-cost system (Garritzmann, 2016).

In this article, I focus on the situation after the Bologna Process, in which traditional long programs were translated into a two-cycle structure (Bologna Declaration, 1999), and short higher education programs were not established before, like in many other countries in the EHEA. The implementation of bachelor's and master's programs took place between 2000 and 2010 and affected most traditional programs (*Diplom*, *Magister*). In consequence, a *new educational transition* between both cycles was implemented. State examination programs are a notable exception. In teaching programs, the implementation of the reform progressed at a slower pace and about a third of programs are still not restructured to bachelor's and master's programs (Federal Statistics Office, 2024). The one-cycle structure was completely retained in medicine and law which are the most socially selective fields in Germany and are strongly linked to prestigious academic professions. Therefore, it has to be acknowledged that social inequalities in students' trajectories in the new system of bachelor's and master's programs do not show the complete picture of inequalities across all fields (Neugebauer et al., 2016).

The overall supply of study places in master's programs is lower compared to bachelor's programs, especially at UAS, which affects opportunities for enrollment. Accordingly, not all students who have the intention or make efforts to enroll into a master's program are able to realize the transition (e.g., Neumeyer & Pietrzyk, 2023). However, only a minor share of bachelor's graduates are deterred from master's enrolment because they have not found a suitable program or because they have not been admitted (Reifenberg, 2021, p. 134).

At the new educational transition from bachelor's to master's programs, students have the possibility to postpone their enrollment. For example, students have the option to first enter the labor market and then, after a few years, re-enroll in higher education.¹

While the master's degree level was comparable to traditional long programs in the German labor market, the new bachelor's degree had no equivalent in the pre-Bologna system and thus deserves further attention. The bachelor's degree seems to pay off as it yields higher objective labor market returns than vocational education and training (Neugebauer & Weiss, 2018). However, labor market entry is quite rare in several fields with most students enrolling in graduate education (e.g., sciences), possibly indicating a weak link to the

¹ Graduates might also combine both options by studying alongside work (*berufsbegleitendes Studium*) or by studying in an integrated work-study program (*berufintegrierendes Studium*). However, as only a small share of master's students are enrolled in these formats (Brünjes et al., 2018), I refrain from a more specific analysis.

bachelor's graduates' labor market. Graduating from a master's degree is associated with an additional increase in wages (Neugebauer & Weiss, 2018), as observed in other post-Bologna systems (Raudenská & Mysíková, 2020; Suleman & Figueiredo, 2019).

Employers generally welcomed the new bachelor's degrees and considered them for many jobs, especially in applied fields. However, they were concerned about the skills and the employability of bachelor's graduates from universities, whom they considered not specialized enough (Hippach-Schneider & Weigel, 2012). Employer's skepticism about academic bachelor's has been observed in multiple countries (Alesi, 2007; Scheerlinck et al., 2019). For some areas, e.g., research and development, master's graduates would continue to be the main candidates from the employer perspective (Alesi, 2007).

With regard to subjective beliefs, it is important to acknowledge that the perception of what is considered a "real" or "complete" higher education program is shaped by the traditional long degrees that serve as a reference point when comparing the new degree levels. While the master's degree level is seen as equivalent, the bachelor's degree doesn't match long degrees in terms of its duration, and it was not considered a complete higher education program. Accordingly, the new degree level was met with skepticism by faculty (e.g., Brändle, 2016). Students also had doubts about the quality of bachelor's programs and the employability of bachelor's graduates, who were partly characterized as second-class graduates (Bargel et al., 2008). Low levels of trust in the bachelor's degree have also been observed among master's beginners and were more prevalent among university students compared to UAS students (Reifenberg, 2021, pp. 224–225). While there are no studies on long-term trends of attitudes towards bachelor's degrees, skepticism about the new degree level seemed to persist (Bargel et al., 2008; Reifenberg, 2021). Therefore, it can be assumed that a substantial number of students consider the master's degree as their *only option*. I will come back later to this characteristic of bachelor's degrees when discussing its ramifications for decision-making.

Theoretical considerations

Rational choice theory

When explaining social inequalities, researchers often refer to rational choice models (Breen & Goldthorpe, 1997; Erikson & Jonsson, 1996), which have also been applied in the context of higher education (Barone et al., 2018; Entrich et al., 2024; Mcdossi, 2023). According to these models, actors evaluate the *benefits, costs, and success probabilities* associated with different educational alternatives, and try to maximize their subjectively expected utility when deciding between options.

Estimations of benefits, costs, and success probabilities vary by social origin and thus lead to socially stratified educational decisions. As students from low social origins can draw on fewer financial resources from their families, they are more likely to expect that continuing higher education would pose a financial burden on them (*direct costs*). Additionally, students from low social origin perceive higher *opportunity costs* of not entering the labor market, as financial independence is more important in their educational decisions compared to students from high social origin (Schindler & Reimer, 2011). Estimations of *benefits* differ for several reasons: First, as most parents with a higher education degree have studied in the traditional degree system and therefore usually have traditional long degrees that are equivalent to a master's degree, students from high social origin expect

that they would not be able to maintain their parents' social status with a bachelor's degree and, therefore, avoid the risk of status demotion by opting for graduate education (e.g., Breen & Goldthorpe, 1997). Second, students from high social origin strive more often for highly prestigious or academic occupations. Students from low social origin expect lower *probabilities of success* in graduate education due to their lower levels of achievement during undergraduate education and because they expect to perform worse in academic tasks, like academic writing (Bergann et al., 2019).

Research on the relevance of rational decision-making at the transition to master's programs in Germany consistently indicates that the probability of success is positively associated with graduate enrollment and mediates part of the social origin differences, while evidence is mixed on the relevance of costs and benefits (Bergann et al., 2019; Lörz et al., 2015; Neugebauer et al., 2016; Neumeyer & Alesi, 2018). These inconsistencies might be driven by suboptimal operationalizations of rational choice parameters. One study is based on subjective estimations for first enrollment in higher education (Lörz et al., 2015), one study draws on objective proxies of costs and success probabilities (Neugebauer et al., 2016), and one study utilizes retrospectively measured estimations (Neumeyer & Alesi, 2018).

Based on rational choice theory, differences in rational calculations *mediate* the relationship between social origin and graduate enrollment. Specifically, I expect that *students from high social origin are more likely to intend graduate enrollment, because they expect lower costs, higher success probabilities, and higher relative benefits from graduate enrollment, compared to students from low social origin* (hypothesis H1).

Immediate and delayed enrollment

Rational choice models often focus on specific educational programs as choice alternatives. For the transition from bachelor's to master's programs, students have the additional option of delayed enrollment in a master's program, e.g., after they gathered occupational experiences or if they need time for orientation to decide in which specific institution or program they want to enroll (Hovdhaugen & Ulriksen, 2023). Delayed enrollment might also be a viable option for students who struggle with costs or academic demands at the time of their graduation but think they will be able to compensate for adverse factors in the future, e.g., after saving some money for financing the living expenses of graduate education. Delayed enrollment can therefore be seen as a sort of a hedging strategy that allows students to maintain the prospect of long-term benefits in the face of potential short-term risks, and that acts as a middle ground between continuing and definitively leaving higher education (Gabay-Egozi et al., 2010).

The intended timing of graduate enrollment is probably also associated with the benefits that students expect from bachelor's and master's degrees. If students expect that their possibilities on the labor market are highly restricted without a master's degree, they probably will not appreciate labor market experience with a bachelor's degree and therefore will be less inclined to delay graduate enrollment (Hovdhaugen & Ulriksen, 2023). As costs, success probabilities, and benefits differ by social origin (see last subsection), delayed enrollment poses a viable alternative especially for students from low social origin.

Taken together, I expect that *students from high social origin prefer immediate enrollment over delayed enrollment* more often than students from low social origin (H2). Further, this difference is probably mediated by rational calculations. Specifically, I expect that *students from high social origin are more likely to intend immediate enrollment instead*

of delayed enrollment, because they expect lower costs, higher success probabilities, and higher relative benefits from graduate enrollment, compared to students from low social origin (H3).

Decision-making when the bachelor's degree is not considered an alternative

In the section about the German context, I have shown that a substantial share of students has doubts about the employability with a bachelor's degree and, therefore, rule out career entry with a bachelor's degree as a possible alternative. This restricts the choice set to only one viable option (immediate enrollment in a master's program). In this case, further rational calculations are not necessary for students to make their decision, and students will ignore adverse rational considerations. Put differently, I hypothesize that *costs and success probabilities are only relevant to decision-making if the bachelor's degree is considered as an option (H4).*

This specific mechanism of decision-making might be associated with social inequality in graduate enrollment. However, it might work in different directions. On the one hand, students from high social origin should be less likely to consider the bachelor's degree as an option for different reasons (see subsection *Rational choice theory*). Therefore, one would expect them to ignore costs and success probabilities in their decision more often than students from low social origin. On the other hand, students from high social origin are less likely to experience adverse circumstances that drive expectations of high costs and low success probabilities in the first place. As it is not clear which factor prevails, I refrain from formulating a hypothesis about the contribution to social inequalities.

Methods

Data

To analyze social inequalities and rational decision-making in graduate enrollment, I draw on data from the National Educational Panel Study (NEPS, see Blossfeld & Roßbach, 2019; NEPS Network, 2023).² Starting cohort 5 of the NEPS comprises a representative sample of first-year students at German higher education institutions who are surveyed for up to 11 years. The analyzed cohort first enrolled in higher education in the winter term of 2010/2011, when bachelor's programs were already established in most institutions.

I restrict the analysis sample to persons who were enrolled in a bachelor's program in their third year (wave 5, when plans and decision-making parameters are measured). Accordingly, the decisions of bachelor's students with highly discontinuous study trajectories cannot be analyzed with the present data (e.g., students who first drop out and decide to re-enroll in a bachelor's program after wave 5; students who start in a traditional long program and then change to a bachelor's program after wave 5). This group is probably less important, as switches of a degree program are concentrated in the first 1.5 years of higher education (Haas, 2023).

² The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LifBi, Germany) in cooperation with a nationwide network.

I exclude students who were already enrolled before the first NEPS wave and thus are not part of the target sample, students who graduated from their bachelor's program or enrolled in a master's program before wave 5, as well as students who were older than 40 years when first enrolled in higher education (see Supplement Table S1).

Overall, 42% of administered students participated in the NEPS panel in survey wave 1 (Zinn et al., 2020). To account for oversampling of specific student groups (e.g., teaching students) in the NEPS, as well as selective participation in the first wave, I apply cross-sectional weights for targets participating in the NEPS. Like in other panel data, a substantial amount of panel attrition can be observed in the NEPS data. In survey wave 5 (third year), 23% did not participate. Overall, social origin is not associated with panel attrition (Zinn et al., 2020) and sample exclusions (Supplement Table S1). Panel attrition seems to be driven by dropout from higher education (Müller & Klein, 2023). As the transition to a master's program would not be salient for those who left higher education without a bachelor's degree, I consider this source of attrition as neutral.

Missing values on variables are imputed with iterated chained equations (White et al., 2011) for the specified subsample of bachelor's students in their third year, after the aforementioned exclusions were applied. Cases with imputed values of the outcome are deleted afterwards (von Hippel, 2007).³ Based on the fraction of missing information, I generate 25 imputations. As missing values are mostly present in achievement variables (grades, credits, see Supplement Table S5), I draw on a series of auxiliary variables in the estimation, including additional measurements of intentions, choice parameters, degree completion, and actual graduate enrollment, as well as multiple predictors and alternative measures of achievement.

Measures

Intentions for graduate enrollment were measured in semester 6 (wave 5), differentiating four categories: 1=no intention; 2=delayed enrollment (“not before I have acquired some labor market experience”); 3=unsure about timing (“I am not sure yet at what time”); 4=immediate enrollment (“as directly as possible after bachelor's graduation”). I further construct a contrast indicator for the preferred timing (1 = immediate; 0 = delayed).

Social origin is measured based on parents' highest educational degree (1 = at least one parent with a higher education degree; 0 = no parent) to ensure comparability with most previous studies in the German context.

All rational choice parameters are measured prospectively in semester 6, with one or several ratings on a 5-point scale (see Supplement Table S3). The expected *success probability* in a master's program is measured with one item. Two items about direct costs and opportunity costs are combined to a mean score (Cronbach's $\alpha=0.78$). *Benefits* are separately measured for bachelor's and master's degrees with four items each (chances of getting a well-paid job, prestigious job, interesting job, and avoiding unemployment). The internal consistency is good for the mean score for bachelor's programs ($\alpha=0.84$) and sufficient for master's programs ($\alpha=0.72$). I also assume that the expected benefits of a bachelor's degree indicate whether a student considers the degree as an alternative. A substantial share (21%) report rather low or very low benefits of a bachelor's degree (below

³ Including imputed outcomes yields similar distributions of intentions and social origin differences therein (Supplement Table S2).

the theoretical mean of the scale). For comparison, less than 1% of students expect this level of returns from a master's degree.

As research highlighted the relevance of path dependencies in access to graduate education (e.g., Lörz et al., 2015), I include indicators of *educational trajectories* and choices preceding higher education as alternative explanations: field of study (6 categories), the type of higher education institution (research universities and UAS), and graduation from vocational education and training. The age of students indicates delays and detours in their previous educational career.

I measure *achievement* based on study performance as grade point average, which was *z*-standardized within fields and reversed (higher values correspond to better grades), and based on study progress in *z*-standardized ECTS credit points.⁴ To capture non-linear effects, I include squared terms of both variables.

I control for gender and immigrant background (at least one parent born abroad), which have been shown to be associated with master's enrollment and social origin (Lörz et al., 2015; Neumeyer & Pietrzyk, 2023). Table 1 shows the distributions of all variables by social origin.

Analytical procedures

To quantify the contributions of rational choice parameters to social inequality in intentions for graduate enrollment (hypothesis H1), I employ the *khb*-decomposition (Karlson et al., 2012). In line with traditional mediation approaches for linear outcomes, it estimates indirect effects based on social origin differences in endowment with mediators (e.g., different costs) and on the direct effects of mediators on the outcome variable (e.g., enrollment intention), but applies a correction to compare nested *nonlinear* models. In addition to sociodemographic controls, I include previous educational trajectories and achievement as alternative explanations.

To test differences based on social origin in the preferred timing of graduate enrollment (hypothesis H2), I estimate average marginal effects (AMEs) of social origin based on multinomial regressions.⁵ To test if socially different estimations of rational choice parameters contribute to origin differences in the intended timing of graduate enrollment (hypothesis H3), I conduct decompositions for intention categories (no, delayed, unsure, immediate) as well as the specific contrast (immediate vs. delayed).

To test if expecting low benefits of a bachelor's degree increases the likelihood that students ignore other rational choice parameters (hypothesis H4), I include two interaction terms into the previous models (benefits of a bachelor's degree \times costs; benefits of a bachelor's degree \times success probabilities). I report predictive margins of intentions as well as conditional AMEs of costs and success probabilities to describe the interactions.

⁴ The *European Credit Transfer System* (ECTS) is a common system in the study structure established in the Bologna Process that allows to quantify the workload associated with specific courses or degrees. For details on the construction of achievement variables, see Supplement Table S4.

⁵ Even if a hierarchy is assumed regarding the social selectivity of the outcomes (immediate > delayed > no enrollment), no ordered logit models are employed because the proportional odds assumption is violated for most of the coefficients.

Table 1 Descriptive statistics by social origin

	All students	Low social origin	High social origin
Intention for graduate enrollment: no intention	11.6%	14.3%	8.1%***
Delayed enrollment	10.7%	11.3%	10.0%
Unsure	28.1%	27.7%	28.6%
Immediate enrollment	49.6%	46.7%	53.3%***
Success probabilities (master's program)	3.18 (0.83)	3.10 (0.84)	3.28 *** (0.81)
Costs (master's program)	1.90 (0.88)	2.06 (0.88)	1.69 *** (0.85)
Benefits (bachelor's degree)	2.44 (0.78)	2.51 (0.77)	2.34 *** (0.79)
Benefits (master's degree)	3.33 (0.49)	3.34 (0.49)	3.32 (0.50)
Type of institution: university of applied sciences (Ref.: university)	42.3%	49.7%	32.3%***
Field of study: humanities/arts	9.0%	7.8%	10.7%***
Sciences	16.8%	16.2%	17.6%
Social science/economics	31.1%	31.6%	30.4%
Engineering	24.1%	25.0%	22.8%
Health/education/services	12.8%	13.1%	12.4%
Teaching	6.3%	6.4%	6.1%
Vocational education before studies: yes (Ref.: no)	24.7%	31.2%	16.0%***
Age	24.05 (2.88)	24.39 (3.14)	23.59 *** (2.41)
Credits	−0.00 (1.00)	−0.02 (1.02)	0.03 * (0.97)
Grade point average	0.00 (1.00)	−0.05 (1.01)	0.07 *** (0.98)
Gender: male (Ref.: female)	52.9%	53.2%	52.3%
Immigrant background: yes (Ref.: no)	18.0%	18.8%	16.9%
<i>N</i>	8166	4603	3563

Means (and standard deviations) of continuous variables and shares of categories. Significance of social origin differences based on bivariate regression, computed for each variable or category: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results

Explanation of social origin differences in the intention for graduate enrollment

I assumed that differences in costs, benefits, and success probabilities explain social inequality in the intention for graduate enrollment (hypothesis H1). Students from high social origin expect higher success probabilities and lower costs of graduate enrollment than their peers from low social origin (Table 1). Further, they expect lower benefits from a bachelor's degree. To analyze the explanatory value of these differences for the social origin gap in graduate enrollment, I conducted a decomposition analysis (Table 2).

Table 2 Logistic regression and khb-decomposition of social origin differences in the intention for graduate enrollment, irrespective of the intended timing

Model	Logistic regressions			Decomposition					
	M1	M2		AME × 100	<i>p</i>	Explained AME × 100	<i>p</i>	Explained share	
	AME × 100	<i>p</i>		AME × 100	<i>p</i>	AME × 100	<i>p</i>	Explained share	
Social origin: high (Ref.: low)	6.71	***	2.00	***	**				
<i>Mediators:</i>									
Success probabilities (master's)			7.42	***		1.25	***	18.6%	
Costs (master's)			-0.39			0.14		2.0%	
Benefits (combined)			7.56	***		1.51	—	22.4%	
Benefits (master's)			-10.40	***		-0.12	***		
Benefits (bachelor's)						1.63			
Achievement (combined)			0.95			0.13	—	1.9%	
Grade point average			-0.13			0.11			
Grade point average, squared			0.77			0.01			
Credits			0.25			0.04			
Credits, squared						-0.02			
Educational trajectories (combined)			-5.66	***		1.70	—	25.3%	
University of applied sciences (Ref.: university)			7.00	***		0.92	***		
Field of study (Ref.: humanities/arts): sciences			3.35	*		0.10			
Social science/economics			6.56	***		-0.04			
Engineering			3.15	***		-0.11			
Health/education/services			-0.98			-0.02			
Teaching			-4.61	***		0.00	***		
Vocational education before studies			-0.24			0.66			
Age						0.18			
Explained difference (all mediators combined)						4.72	***	70.3%	

Table 2 (continued)

Model	Logistic regressions			Decomposition		
	M1	M2		AME × 100	AME × 100	Explained share
	AME × 100	<i>p</i>	<i>p</i>	AME × 100	<i>p</i>	AME × 100
<i>Controls:</i>						
Male (Ref.: female)	2.75	***		3.36	***	
Immigrant background (Ref.: no)	2.06			2.68	*	

Explained shares are computed in relation to the total origin difference (M1). *N* = 8166. Significance levels: * *p* < 0.05; ** *p* < 0.01; *** *p* < 0.001; —not tested

The total social origin gap in the general intention, irrespective of the time preference, amounts to 6.7 percentage points (p.p.; see model M1). This means that the probability of planning graduate enrollment is 6.7 p.p. higher among students from high social origin compared to students from low social origin. After accounting for differences in mediator variables (M2), the origin gap decreases to 2.0 p.p. When put in relation to the total difference as estimated in M1, the mediators explain 70% of the social origin difference.

The decomposition allows us to quantify the relevance of specific mediators. Of the rational choice parameters, benefits (22%) and success probabilities (19%) explain almost half of the social origin gap. While estimations of costs of a master’s program also vary by social origin (Table 1), they have no effect on the general intention and, therefore, are irrelevant for the respective social origin gap. Differences in achievement have practically no explanatory value when success probabilities are included in the model. Differences in educational trajectories explain 25% of the social origin gap.

Social origin differences in the preferred timing for graduate enrollment

In the theory section, I derived the hypothesis that students from high social origin are more likely to prefer immediate enrollment over delayed enrollment (hypothesis H2). Figure 1 shows predicted probabilities and differences in intentions for graduate enrollment by social origin. The probability of intending no graduate enrollment is 6.3 p.p. lower for students from high social origin compared to students from low social origin (Fig. 1b). Instead, students from high social origin intend immediate enrollment more often (+6.6 p.p.). Compared to no enrollment and immediate enrollment, delayed enrollment forms a middle category in terms of social selectivity. Among students who intend graduate enrollment, high social origin students are more likely to prefer immediate enrollment over delayed enrollment (+3.6 p.p.), in line with hypothesis H2. The probability of planning enrollment while being unsure about the timing does not differ by social origin.

Further, I expected that social origin differences in the preferred timing can be explained by differences in rational calculations (hypothesis H3). Figure 2 shows the results of the decompositions. Each bar represents the social origin difference in one of

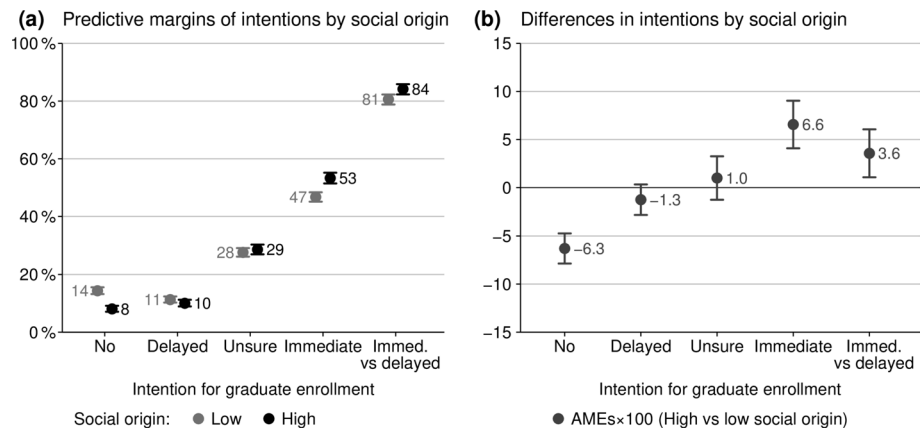


Fig. 1 Social inequalities in intentions for graduate enrollment and the preferred timing of graduate enrollment. Notes: $N=8166$. 95% CI. Based on multinomial regressions (Supplement Table S6–8). Controls: gender, immigrant background

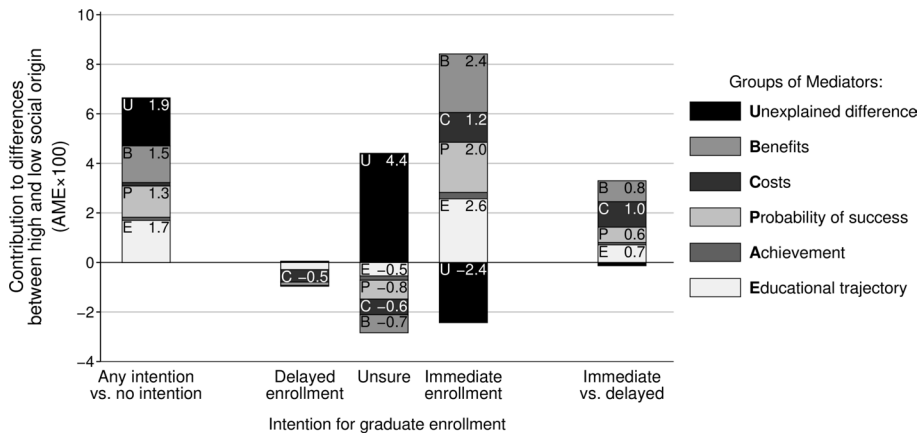


Fig. 2 Explanation of social origin differences in intentions for graduate enrollment (kfb-decompositions). Notes: $N_{(\text{left four bars})} = 8166$. $N_{(\text{immediate vs. delayed})} = 5254$. Statistically significant unexplained differences ($p < 0.05$) and groups of mediators with a total contribution of at least ± 0.5 are labeled. For detailed results, see Supplement Table S9

five specifications of plans for graduate enrollment (same categories as in Fig. 1, except *No intention* is reverted to *Any intention*) and is composed of six segments that represent groups of mediator variables and the unexplained residual difference.

The first bar represents the difference in the general intention based on multinomial regressions (which yield practically the same results as the logistic models reported in Table 2). The second bar represents origin differences in the probability of delayed enrollment, based on the same model. The decomposition indicates that mostly lower cost estimations explain why students from high social origin are slightly less likely to plan delayed enrollment (instead of one of the other three options) than students from low social origins. For intentions without a clear time preference (“Unsure”), opposing tendencies can be observed regarding the origin gap. On the one hand, students with a high social origin would be comparatively less likely to be unsure about the timing based on their rational considerations; on the other hand, after controlling for mediators, there is a statistically significant tendency towards this option. The fourth bar shows the composition of differences in the probability of plans for immediate enrollment. Again, educational trajectories, success probabilities, and benefits play a major role. In contrast to the general intention (first bar), social inequality in planning immediate enrollment is also associated with higher effects of cost considerations. After the inclusion of mediators, the model yields a negative unexplained effect of social origin, which partly reflects the unexplained tendency towards being unsure about the timing of enrollment.

The fifth bar focuses on the contrast between intentions for immediate enrollment vs. delayed enrollment. The total difference can be explained completely by the mediation model. Cost considerations, benefits, and success probabilities substantially contribute to social origin difference in the preferred timing, in line with hypothesis H3.

Differences in the general intention and in the preferred timing, as well as the relevance of rational choice parameters therein, are largely robust against alternative specifications (Supplement Fig. S1–4, S6–7). When actual enrollment behavior is analyzed instead of the intention, the explanatory value of previous educational trajectories is higher and the explanatory value of rational calculations is slightly lower (Fig. S4).

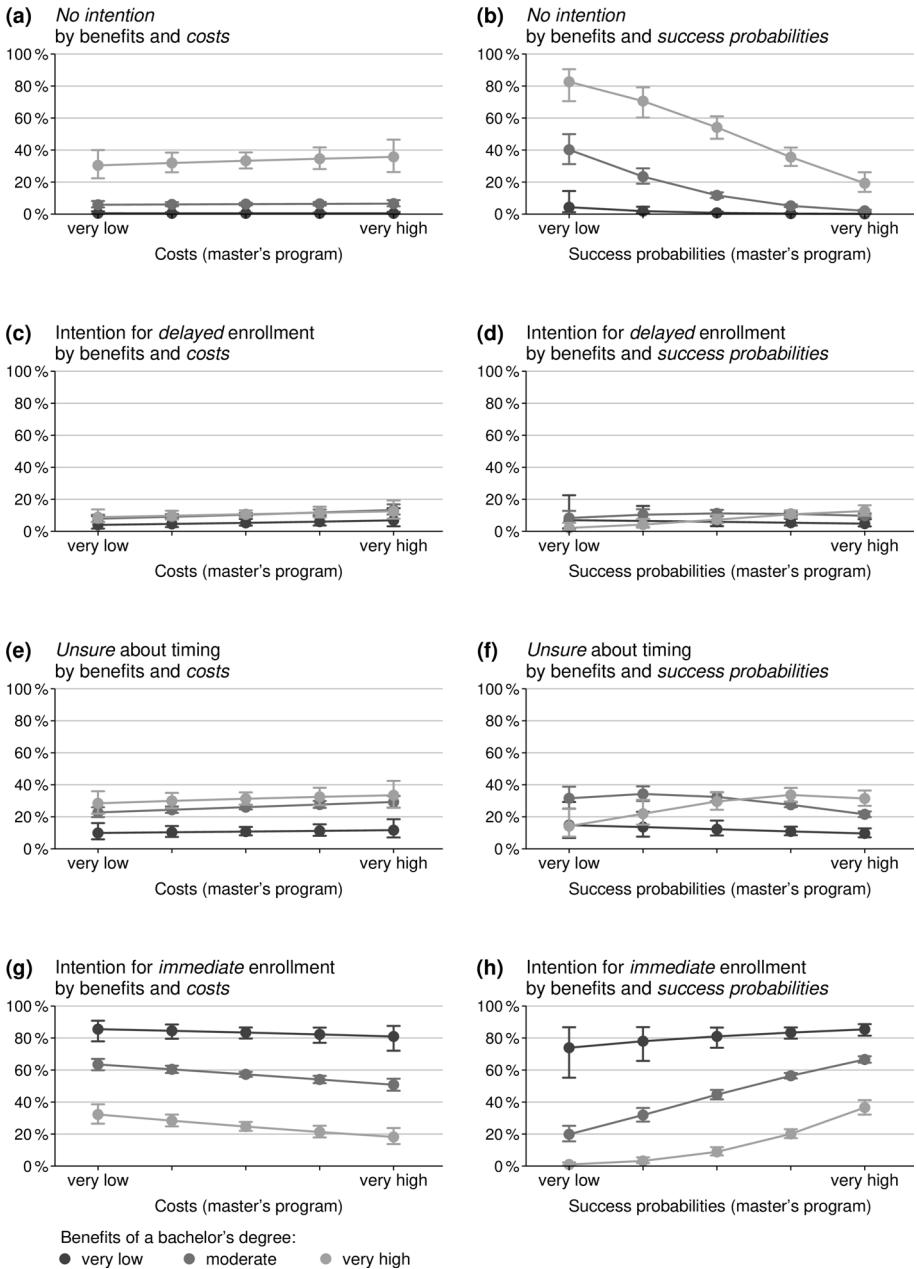


Fig. 3 Predicted probabilities of intentions for graduate enrollment by combinations of success probabilities, costs, and benefits. Notes: $N=8166$. 95% confidence intervals. Based on multinomial regressions (Supplement Table S6–7, M3)

Decision-making when the bachelor’s degree is not considered as an alternative

I assumed that when students don’t consider the bachelor’s degree as an alternative (indicated by low benefits), their choice set will be restricted to immediate graduate enrollment, and they will ignore potentially adverse conditions in their decision (e.g., high costs or low success probabilities). To test this assumption, I add two interaction terms to the previously estimated multinomial model. Figure 3 shows predictive margins of each outcome based on these interactions.

Among students who expect very low returns from a bachelor’s degree, the vast majority aim for immediate enrollment (74% to 86%, Fig. 3g, h: black dots), with only slight variations by costs and success probabilities. In contrast, small negative effects of costs and large positive effects of success probabilities can be observed when benefits of a bachelor’s degree are expected to be moderate (dark gray) or very high (light gray).

I further estimated AMEs of expected costs and success probabilities at different levels of benefits (Fig. 4). With very low expected benefits of a bachelor’s degree, the AME of costs on the intention for immediate enrollment is minuscule and not statistically significant (−1.1 p.p. per scale point, Fig. 4a). It reaches statistical significance with moderate benefits (−3.1 p.p.). Similarly, if students expect low benefits of a bachelor’s degree, the positive effect of success probabilities is very small (+2.2 p.p., Fig. 4b). It increases markedly if the bachelor becomes a viable option (to up to 14 p.p.). Overall, the interaction effects are in line with hypothesis H4. Figure 4 further shows that costs differentiate mostly between intentions for immediate enrollment and other alternatives, while success probabilities also differentiate between no enrollment and delayed enrollment.

However, model fit statistics indicate that the additional predictive value of interactions is negligible (Pseudo- $R^2=0.1591$, see Supplement Table S6, M3), compared to the additive model (Pseudo- $R^2=0.1586$, M2). Further, the interactions are irrelevant when it comes to social inequalities and their explanations, as the AMEs of social origin don’t change between models (Table S6–7, M2 and M3). Though students from high social origin attribute lower benefits to the bachelor’s degree, adverse conditions that shape low success probabilities and high estimations of costs are less prevalent in this group (Table 1).

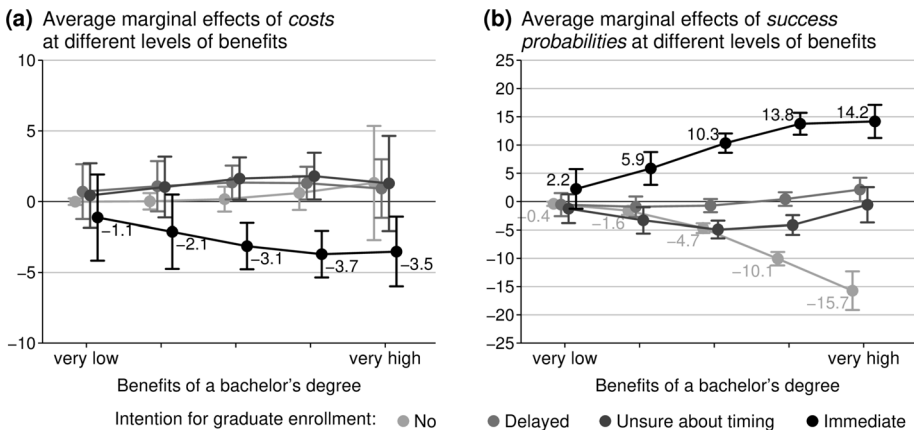


Fig. 4 Effects of costs and success probabilities on intentions for graduate enrollment, conditional on benefits of a bachelor’s degree. Notes: See Fig. 3

Therefore, the *additive* model of choice parameters seems to cover the relevance of rational calculations for social inequalities in graduate enrollment. The pattern of conditional effects is robust against alternative specifications (e.g., analyzing actual enrolment, Supplement Fig. S5, S8 – 10).

Conclusions

Consistent with previous research, this study has shown marked social origin differences in access to master's programs. Based on the NEPS data, I was able to confirm the validity of the rational choice approach for educational inequalities. Regarding the question of which *specific* estimations play a decisive role, I arrive at different results compared to previous analyses (Lörz et al., 2015; Neugebauer et al., 2016). First, benefit considerations, especially related to the bachelor's degree, play a more decisive role than previously assumed (Bergann et al., 2019; Lörz et al., 2015). Second, in line with Bergann et al. (2019), costs have no influence on the general intention but they affect the preferred timing as well as actual enrolment. Third, the specifically measured rational choice parameters explain a larger share of origin differences than indirect measures (Lörz et al., 2015; Neugebauer et al., 2016). In line with international research, the relevance of previous educational pathways, in particular the choice of university type that shapes opportunities for graduate enrollment, was confirmed (Mateos-González & Wakeling, 2022), whereas horizontal differentiation into fields of study as well as achievement differences have proven to be largely negligible (Ortiz-Gervasi, 2023). The mediating role of previous vocational training might be particular to contexts with similar, highly established systems of vocational education.

While most of the social origin gap in intending master's enrollment can be explained, a statistically significant unexplained difference remains. Other possible explanatory factors that could not be taken into account in this study include the *social* and *psychological costs* of further enrollment (Boneva et al., 2022; Lörz et al., 2015), and *intrinsic benefits*, e.g., for personal development. Furthermore, normative expectations and support by significant others, like parents, might also play a role in socially unequal educational decisions within the higher education system, and should be accounted for in further research.

I found that the decision to delay enrollment is less socially selective than the decision to enroll immediately, and thus has the potential to reduce social inequalities as intended in the agenda of the Bologna Process. Further, the differences in time preference can be largely explained by a combined model of rational considerations and prior educational pathways. However, after accounting for differences in rational calculations, the model unveiled a slight tendency towards intentions without a clear time preference among high social origin students. It could be that higher classes feel less pressure to plan further transitions in advance which allows them to postpone the decision or keep various options open. In this study, I shed light on social inequalities in the preferred timing of enrolment. Further research should investigate how social origin and rational calculations affect other specific decisions, e.g., to change field of study or (type of) institution (Lörz & Neugebauer, 2019; Thomsen, 2023).

Finally, the interplay between different rational choice parameters suggests that the bachelor's degree is not considered an option by some students who seem to ignore the costs and success probabilities they expect from master's enrollment. I posit that the specific decision-making situation is characterized by the context in which the bachelor's degree is not matched by an academic job market in many fields, and in which the new,

shorter study format was belittled as an incomplete degree. Further research should employ more direct measures of the choice set and investigate how it is affected by objective conditions (e.g., subject-specific labor market returns) and normative conditions (e.g., negative attitudes towards the bachelor's degree).

From a theoretical perspective, the conditional effects of rational choice parameters might also be associated with different modes of decision-making; e.g., in the model of frame selection, normative pressure and self-commitment to goals can suppress rational calculations (Kroneberg, 2014). Regardless of the theoretical specification, the results challenge assumptions about the interplay of rational choice parameters. In its original specification, additional benefits are especially important if they align with a high success probability, assuming a positive multiplicative effect (Erikson & Jonsson, 1996). In contrast, at the transition to master's studies, additional benefits of a master's program—as they are implied by low benefits of a bachelor's degree—seem to be a sufficient condition to stay in higher education, irrespective of potential risks of failure associated with low success probabilities or high costs (indicated by negative interactions).

The presented model is of particular interest in other countries of the EHEA in which bachelor's degrees had no historical equivalent and were newly implemented during the Bologna Process (e.g., Belgium, Denmark, the Netherlands), and, more generally, contexts in which degrees are restructured following a two-cycle system, and thus, a new lower-tier degree level is introduced.

In this paper, I examined the decision-making process and its effects on social inequalities based on educational intentions. However, it is questionable whether prospectively measured intentions can fully capture the social inequalities in *access* to graduate education. Probably, some students will never take up further studies, either because they change their plans or because they do not achieve the necessary steps on the way to enrollment (e.g., finding a suitable program, applying for it, being admitted). Additional analyses yielded similar explanations, but a larger social origin gap if the actual enrollment is examined instead of the intention (see Supplement Fig. S3–4). However, in this context, it has not yet been systematically examined to what extent different intentions are realized (Wells & Lynch, 2012), and ultimately lead to the desired degree (Roksa & Velez, 2012). The results point to two groups for whom there is a risk that their intentions will remain unfulfilled.

First, I suspect that intentions for *delayed enrollment* remain unfulfilled for several reasons. Graduates who enter the workforce may be diverted from their original plans by a variety of mechanisms: as they enter the workforce, the opportunity costs of further education increase. This might be mitigated if the labor market provides opportunities for employees for further educational development without changing the employer (e.g., supporting part-time studies or guaranteeing re-entry after the master's program). Possible negative perceptions about the employability with a bachelor's degree could be corrected, making graduate education unnecessary. In addition, the additional life-time earnings that graduates can expect from graduate education decrease over time, while the probability increases that educational plans collide with family formation (Roksa & Velez, 2012). Furthermore, longer delays could prove detrimental to the success in graduate studies, as students lose momentum when leaving the academic learning environment (Attewell et al., 2012) which could be related to socially selective dropout from master's programs (Thomson, 2022). As students from low social origin show a stronger preference for delayed enrollment, the extent to which these plans are realized is also relevant for social inequalities. Second, the interactions suggest that some students choose to enroll in graduate education despite expecting comparatively low probabilities of success or high costs. These

students may face particularly high risks of encountering academic or financial difficulties in graduate education that might lead to dropout.

Previous research showed that the Bologna Process had no effect on the representation of students from low social origin in German higher education (Neugebauer, 2015) and that attainment of long degrees (traditional or master's) became more selective with the implementation of a two-cycle study structure (Neugebauer et al., 2016). This study points to possible areas that policies can target to counteract this development. Social origin differences in economic resources that precede expected costs can be addressed by providing financial support to a larger share of students in need (Herbaut & Geven, 2020). Social gaps in success chances might be reduced by addressing initial achievement gaps (in school and higher education) and performance self-assessments (Bergann et al., 2019). Class differences that are associated with a misperception of the benefits of a bachelor's degree can be reduced by providing information (Berkes et al., 2022). In Germany, guidance counseling has also proven to be an effective approach to reducing social inequality in access to higher education (e.g., Pietrzyk et al., 2023).

In conclusion, this study highlights the relevance of rational decision-making in access to graduate education. Class-specific differences in rational considerations shape social inequalities in access to graduate enrollment to a substantial degree. The study contributes to our understanding of the interplay of different rational considerations in the formation of educational goals in a context with a newly implemented degree level.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10734-025-01426-y>.

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Declarations

Competing interests The author declares no competing interests.

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