



Social Inequality in Dropout from Higher Education in Germany. Towards Combining the Student Integration Model and Rational Choice Theory

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Abstract

Students from a lower socioeconomic background have a higher risk of dropping out of higher education. The underlying mechanisms of this association between socioeconomic background and higher education dropout are not well understood. Previous research in higher education has followed Tinto's model of academic and social integration to explain dropout but has largely neglected social inequality therein. In contrast, social stratification research draws on rational choice theory to explain social inequality in educational attainment but has rarely been applied to explain dropout from higher education. In our paper, we combine these two strands of research. Utilizing data from the National Educational Panel Study (NEPS), we draw on a largescale, representative sample of students in Germany to quantify the relative contribution of each theoretical approach for explaining social inequality in dropout from higher education. Binary logistic regression models reveal that both students' integration and costs-benefit considerations are associated with their dropout risk net of each other. While academic and social integration appears to better predict dropout, rational choice theory accounts for a larger proportion of social inequality therein. We conclude that combining Tinto's model and rational choice theory provides a more comprehensive perspective of dropouts from higher education and social inequality therein.

Keywords Academic integration · Dropout · Higher education · Social integration · Rational choice · Social inequality

In most Western societies, students from a lower socioeconomic background (henceforth: SEB) are less likely to participate in higher education (OECD, 2019). Moreover, even

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among students who enroll in higher education, those with less-educated parents and working-class families are more likely to drop out before obtaining a degree. This finding holds for the US (Chen, 2012; Ishitani, 2006) as well as for European countries (Larsen et al., 2013), such as Italy (Argentin & Triventi, 2011; Contini et al., 2017), the UK (Smith & Naylor, 2001; Vignoles & Powdthavee, 2009), and Germany (Heublein et al., 2017; Müller & Schneider, 2013). While numerous studies describe social inequality in higher education, the underlying mechanisms that drive the association between SEB and higher education dropout are not well understood.

Previous research on dropout from higher education has traditionally followed Tinto's (1975, 1987) seminal work on the so-called *student integration model* (henceforth: SIM). From this perspective, students' *academic* and *social integration* into the higher education system are the pivotal predictors of degree completion; students' SEB is only of marginal interest. Despite having dominated theoretical discussions for decades (Kuh et al., 2006), empirical support for the SIM, while vast in number (for a review, see Braxton et al., 1997), remains mostly limited to the US context. Whether the model proves fruitful for explaining dropout beyond the US higher education system remains an open question. Moreover, only few studies have applied the SIM to explain social inequality (cf. Soria et al., 2013); whether differences in academic and social integration account for social inequality in higher education dropout is not known.

In contrast, social stratification researchers have established *rational choice theory* (henceforth: RCT) as the predominant micro foundation for explaining social inequality in educational attainment (Boudon, 1974; Breen & Goldthorpe, 1997; Erikson & Jonsson, 1996). Differentiating between performance-based (*primary effects*) and decision-based (*secondary effects*) factors, this theory assumes that social inequality in educational attainment arises from the expected *costs*, *benefits*, and *success probability* that vary systematically with students' SEB. While RCT has received considerable empirical support in various countries (Daniel & Watermann, 2018; Gabay-Egozi et al., 2010; Need & De Jong, 2001), it has rarely been applied to explain dropout from higher education.

In our paper, we combine these two predominant theories on higher education dropout and on social stratification. Conceptually, we treat the SIM and RCT as complementary rather than competing theoretical approaches. We argue that combining the SIM and RCT provides an integrating perspective for identifying the mechanisms underlying both dropout from higher education and the social disparities therein.

More specifically, we ask whether the SIM and RCT explain social inequality in dropout from higher education in Germany. We choose Germany as an example case because the association between SEB and educational attainment is comparatively strong (Stocké et al., 2011). At the same time, the German higher education system provides an interesting contrast to those of other countries with high levels of social inequality, such as the UK and especially the US (Allmendinger, 1989; Jackson, 2013). There are striking differences regarding access to and tuition for higher education and differences in everyday campus life that will likely affect social stratification, students' integration, and perceived costs and benefits from higher education. Moreover, unique survey data from Germany suits our research questions particularly well by combining a nationwide representative sample of students with questions specifically designed to measure students' integration (Dahm et al., 2016) and the perceived costs, benefits, and success probability associated with higher education (Stocké et al., 2011).

The contribution of our paper is threefold. First, we add to the limited number of empirical applications of the SIM outside of the US higher education context. Second, we are among the first to assess whether the SIM explains social inequality in higher education

dropout. Third, our paper contributes to the scarce literature that applies RCT to explaining dropout from higher education.

Background

The Student Integration Model

The vast majority of sociological studies on higher education dropout approach the subject from the perspective of Tinto's (1975, 1987) SIM and its core concepts academic and social integration (Braxton et al., 1997). This model distinguishes between an academic and a social domain within higher education institutions and views students' dropout as resulting from failure to integrate into either of these two domains.

Integration into the academic domain comprises structural and normative components (Tinto, 1975, p. 104). In addition to meeting formal performance requirements, such as maintaining a certain GPA and passing exams, students have to adjust to the norms and achievement orientations commonly held by higher education institutions. A perceived mismatch between achievement expectations and actual academic performance leads students to consider alternatives to higher education and drop out. Likewise, students who do not share the achievement orientations held by their institution are less likely to engage in their studies and more likely to drop out (Tinto, 1987, pp. 53–56).

To integrate into the social domain of higher education institutions, students must establish and cultivate contacts with faculty and fellow students (Tinto, 1975, pp. 106–107). Besides providing academic support, interactions with faculty stimulate students' intellectual development and increase institutional commitment. Conversely, students who feel unfairly treated or unaccepted by faculty are less likely to commit to their studies and more likely to drop out (Tinto, 1987, pp. 116–117). Likewise, establishing relationships with fellow students assures friendship support, which leads to collective affiliation and decreases the likelihood of dropping out (Tinto, 1975, p. 107).

While the core predictions of the SIM have been confirmed across different institutional settings inside the US (Bers & Smith, 1991; Pascarella & Chapman, 1983; Terenzini & Pascarella, 1977; Thomas, 2000), international empirical support is surprisingly scarce. Most international studies focus solely on the measurement model of integration (Dahm et al., 2016; Mannan, 2007) or academic progress in general (Rienties et al., 2012; Severiens & Schmidt, 2009), not on dropout. Nevertheless, the few studies that focus on dropout support the SIM's core predictions (Chrysikos et al., 2017; Heublein et al., 2017, pp. 211–216; Klein, 2019).

Regarding social inequality in dropout, the SIM posits that students from a lower SEB face difficulties integrating into the academic and the social domain of higher education (Tinto, 1987, pp. 70–72). On average, these students enter higher education with lower levels of academic performance (Terenzini et al., 1996), which then translate into lower levels of academic integration. Moreover, students from a lower SEB hold norms that are incompatible with those held by their more privileged peers, making it more difficult to establish social relationships (Tinto, 1987, pp. 95–99). According to the SIM, social inequality in dropout from higher education arises from differences in the levels of academic and social integration.

In contrast to the core predictions of the SIM, very few studies have focused on its hypotheses regarding social inequality. While some studies suggest that social and

academic integration mediate the association between SEB and dropout (Pascarella & Chapman, 1983), other studies find that parental education predicts students' dropout risk even at comparable levels of academic integration (Donovan, 1984). Two recent studies find lower levels of academic and social integration among working-class students (Soria et al., 2013) and first-generation students (Soria & Stebleton, 2012). However, neither study empirically tests whether these differences in academic and social integration account for social inequality in dropout.

At its core, the SIM posits students' academic and social integration as the decisive factors influencing their dropout decision. Despite the relevance of students' integration, researchers have criticized this perspective for largely disregarding economic factors, such as financial considerations, for dropping out (Breier, 2010; Cabrera et al., 1992).¹ Several studies find that financial aid reduces dropout rates (Chen & St. John, 2011; Melguizo et al., 2011) most notably for students from a lower SEB (Alon, 2011; Arendt, 2013). Therefore, we argue that a theoretical model that aims not only at explaining higher education dropout but also social inequality therein should include economic factors. More specifically, we suggest complementing the SIM with RCT, which explains dropout as resulting from cost–benefit considerations.

Rational Choice Theory

Boudon (1974) suggests RCT as a general theoretical framework for explaining social inequality in educational attainment. This approach distinguishes between so-called primary and secondary effects. Primary effects refer to, on average, lower academic abilities of students from a lower SEB that stem from differences in cultural resources among social classes (Bourdieu & Passeron, 1990; Erikson & Jonsson, 1996). Secondary effects are class-specific educational choices, conditional on academic ability (Jackson et al., 2007), which result from evaluating the costs, benefits, and success probabilities of educational pathways (Breen & Goldthorpe, 1997). Taking primary effects as given, RCT aims at explaining educational choices and social disparities therein as resulting from cost–benefit considerations (Breen & Goldthorpe, 1997, p. 277).

The costs associated with higher education include direct costs, such as tuition fees; indirect costs, such as books and travel; as well as opportunity costs, such as forgone labor market earnings until degree completion. Because students from working-class families have fewer economic resources than students from a more advantageous SEB, the former tend to perceive objectively equal costs as more subjectively burdensome (Stocké, 2007). Consequentially, compared with students from a more advantageous SEB, working-class students are more sensitive to information about the actual costs of attending university (Barone et al., 2017; Mangan et al., 2010) and perceive higher education as more cost-intensive (Becker & Hecken, 2009; Daniel & Watermann, 2018; Schindler & Lörz, 2012).

The benefits from higher education operate through a mechanism that Breen and Goldthorpe (1997, pp. 283–285) call relative risk aversion. Trying to avoid intergenerational downward mobility, students seek to maintain their parents' socioeconomic status. Students from the service class, therefore, aspire to higher occupational status than their working-class peers, increasing the former's motivation to graduate. Despite ongoing

¹ Indeed, while acknowledging the relevance of financial constraints, Tinto (1987, pp. 80–83) considers them primarily related to the decision to enroll in higher education.

debates about the assumption of equal concern for status maintenance across social classes (Barone et al., 2018; Tutić, 2017), studies have shown that the motive of status maintenance partly explains social inequality in educational choices (Need & De Jong, 2001; Van de Werfhorst et al., 2007).

Finally, the probability of success rests on students' beliefs about their academic abilities (Breen & Goldthorpe, 1997, pp. 285–286). Because of primary effects, students from a lower SEB enter higher education with, on average, fewer academic abilities (Terenzini et al., 1996). Therefore, they will estimate for themselves a lower success probability. Moreover, even at comparable levels of academic abilities, students from less educated parents might lack the tacit knowledge to navigate the higher education system that their more privileged peers possess (Erikson & Jonsson, 1996, p. 22; Schindler & Reimer, 2011, p. 265).

Towards Combining the Student Integration Model and Rational Choice Theory

While the SIM specifically aims at explaining dropout from higher education, RCT aims at an explanation of educational choices in general and social inequality therein. Both theoretical approaches emphasize certain aspects while disregarding others. Emphasizing students' experiences in the academic and social domain of higher education, the SIM tends to disregard external influences in general and cost–benefit considerations in particular (Cabrera et al., 1992). However, such influences might be crucial for explaining social inequality in dropout. RCT, on the other hand, emphasizes cost–benefit considerations but disregards student's sense of belonging to the higher education institution (Tinto, 1986, p. 363), which reduces the risk of dropping out.

We suggest combining the SIM and RCT, arguing that the two theoretical approaches compensate for each other's potential blind spots. While Tinto (1975, p. 98) explicitly frames students' academic and social integration as cost–benefit considerations, he focuses on intrinsic motivation, defining costs in terms of dissatisfaction with academic failure and benefits in terms of satisfying friendships that students experience during their studies. In contrast, RCT views higher education as a means to an end and focuses on extrinsic motivation, such as monetary costs until degree completion and the likelihood of status maintenance, both of which relate to future events. We argue that students are likely to be both intrinsically and extrinsically motivated by immediately perceived rewards from integrating into and the anticipated costs and benefits from completing higher education. Therefore, combining the SIM and RCT provides a more comprehensive theoretical approach.

Others have preceded us in combining the SIM with RCT. Using longitudinal data on a sample of first-year students in the Netherlands, Beekhoven et al. (2002) test the SIM and RCT against a model comprising variables from both theoretical approaches. They find that the combined model best predicts academic progress, measured in terms of completed credits after five years. Unlike Beekhoven et al. (2002), we are less interested in academic progress but more in students' risk of dropping out of higher education and especially in explaining the social inequality therein.

Hypotheses for the German Higher Education Context

The German higher education system differs from the higher education systems of other European countries and even more so from the US. The differences will likely affect the extent of social inequalities and the associations of students' academic performance,

integration, and cost–benefit considerations with the risk of dropping out. Although we cannot empirically test such differences between higher educational systems, they are informative for deriving our hypotheses.

Both the SIM and RCT assume that students from a lower SEB have, on average, lower levels of academic performance. Unlike the US, Germany has a highly stratified school system (Allmendinger, 1989; Neugebauer et al., 2013) that allocates students to different secondary school types according to academic performance very early, typically after fourth grade (Pietsch & Stubbe, 2007).² Only one secondary school type, the “Gymnasium”, then provides direct access to higher education.³ Germany’s early tracking system leads to a comparatively homogeneous student population eligible to entering higher education (Mare, 1980). Still, social disparities in academic performance persist even during the transition into tertiary education (Schindler & Reimer, 2011).⁴ Therefore, despite early selection processes, we expect that students from a lower SEB have, on average, lower levels of academic performance (H1a).

From the perspective of the SIM, academic performance in higher education reflects students’ formal academic integration, while RCT views academic performance as stemming from primary effects that partly determine the success probability. We prefer to think of academic performance as an additional predictor not belonging exclusively to either theoretical approach. In line with previous research in the US (Mayhew et al., 2016, pp. 556–557), Europe (Larsen et al., 2013), and Germany (Neumeyer & Alesi, 2018), we expect a negative association between academic performance and dropout risk (H1b). Following our argument that students from lower SEB enroll with lower levels of academic performance, we further expect differences in academic performance partly explain social inequalities in dropout (H1c).

According to the SIM, students from a lower SEB integrate less well into the academic and social domains of higher education. Unlike in the US or the UK, only very few students live on campus in Germany. Moreover, students from lower SEB are more likely to live with their parents rather than share an apartment with fellow students (Middendorff et al., 2013, p. 415). Thus, students from lower SEB have fewer opportunities of interacting and integrating with fellow students. Also, the student-faculty ratio in Germany is typically worse than in the US (Hüther & Krücken, 2018, p. 61), making interactions with faculty more difficult. Before this background, we expect that students from lower SEB are less integrated, especially with their fellow students (H2a).

Despite likely differences between Germany and other countries in the degree of students’ integration, the association between integration and dropout risk should generally be comparable across countries. Following the SIM, we expect insufficient academic and social integration increases the risk of dropping out (H2b). Combining the lower levels of integration among students from lower SEB and the association of integration with dropout risk, we further expect social disparities in academic and social integration to partly explain social inequalities in dropout (H2c).

According to RCT, students from a lower SEB perceive higher costs, lower benefits, and a lower probability of completing higher education (H3a). Compared with the US and

² Some federal states allocate students to secondary school tracks only after sixth grade.

³ Although it is possible to enter higher education with a vocational qualification (KMK, 2009), only about 3% of the students in Germany have entered higher education via this pathway.

⁴ Unlike in the US, the German higher education system is highly standardized (Allmendinger, 1989) in that there are only minor differences in educational quality and reputation across universities.

many European countries, especially the UK, tuition for higher education is very low in Germany (OECD, 2021). Until 2006, there were no tuition fees and only nominal administrative fees. Moreover, depending on their parents' income, students are eligible for state subsidies. However, between 2006 and 2014 (when our data was collected), some federal states temporarily charged tuition fees of up to 500 Euro (approximately 725 US \$) per semester (Kroth, 2015, pp. 59ff.). Empirical evidence suggests that financial considerations related to tuition fees are more relevant for students from lower SEB (Kroth, 2015). These findings are in line with the assumptions of RCT that students from lower SEB perceive objectively equal costs as subjectively more burdensome. While students from lower SEB perceive higher education as more costly, they expect few additional benefits. Unlike in the US, where high school graduates either enroll in higher education or enter the labor market directly, Germany has a standardized vocational education and training program (VET). Especially for students from lower SEB, the VET provides access to qualified positions in the labor market that will likely maintain their parents' socioeconomic status (Becker & Hecken, 2009). At the same time, unlike in the US, the higher education experience does not seem to generate additional labor market returns for dropouts in Germany (Schnepf, 2017).

Overall, our arguments suggest that the cost–benefit considerations are likely to vary with higher education systems. Nevertheless, following RCT, higher perceived costs, lower benefits, and a lower success probability should generally increase the risk of dropping out (H3b). Furthermore, accounting for differences in cost–benefit considerations should partly explain social inequalities in the risk of dropping out (H3c).

Data, Variables, and Methods

Data

We base our empirical analyses on data from the National Educational Panel Study (NEPS): Starting Cohort First-Year Students (Blossfeld et al., 2011). The initial one-stage stratified clustered sample comprises 17,910 first-year students at German universities and universities of applied sciences (Zinn et al., 2017), covering the most relevant higher education institutions and the vast majority of higher education students.⁵ Students entered higher education in the winter term of 2010/11 and have been followed up each semester. Interviews were conducted alternating between computer-assisted telephone and computer-assisted web interviews. Participation rates varied between 60% and just above 70% over the 14 available panel waves (Zinn et al., 2020).

In two respects, the NEPS dataset suits our research questions particularly well. First, the prospective research design enables us to measure all explanatory variables of interest

⁵ There are two major types of higher education institutions in Germany. Universities traditionally have a more research-oriented academic focus, while universities of applied sciences have a more vocational orientation. Admission to the latter is somewhat less restrictive as it requires one year less of secondary education ("Fachabitur"). Also, universities of applied sciences do not offer all fields of study (e.g., medicine, law) (Hüther & Krücken, 2018). However, traditional differences between higher education institutions have continuously been decreasing (Enders, 2016), and students have always been allowed to change between universities and universities of applied sciences (KMK, 2003). The NEPS sample only excludes administrative colleges, which are run by the federal states and prepare students for working in public administration as civil servants. Less than 1% of the student population in Germany attends such institutions.

before observing students' academic outcomes, reducing potential bias due to retrospective self-reports (Schwarz, 2007). Second, the NEPS questionnaires include a series of items that were specifically designed to measure both students' academic and social integration (Dahm et al., 2016) and the decision parameters of RCT (Stocké et al., 2011).

Variables

Table 1 provides an overview of our variables, which we briefly describe here. Our focal predictor is *students' SEB*, which we measure in terms of parental education and occupation. We collapse the levels 0 to 4 of the ISCED-97 classification (OECD, 1999) into one category representing non-tertiary education and contrast these first-generation students with those whose parents' have attained tertiary education (ISCED-97 levels 5 or 6). We measure occupation using the EGP class scheme (Erikson et al., 1979).⁶ Here, we differentiate between the working class (IIIb, VI, and VII) and the service and mixed classes (I, II, IIIa, IV, and V). We use the higher level of education and occupational class among both parents, respectively.

We measure *academic performance* using both the grade point average (GPA) of students' higher education entrance certificate and the GPA during their studies, typically reported after the first year. Because register data is not available, we rely on students' self-reports. We reverse the coding of the German GPA so that higher values indicate better academic performance.

We measure students' *academic integration* and *social integration* using a total of 13 items (see Dahm et al., 2016). Two subscales constitute our measure of students' academic integration: *Achievement orientation* (Cronbach's $\alpha = .74$) captures students' compliance with higher education performance standards while fulfillment of *achievement expectations* (Cronbach's $\alpha = .78$) measure students' satisfaction with their academic performance. Two different subscales measure students' social integration: *Interactions with faculty* (Cronbach's $\alpha = .79$) capture how students assess their relationship to faculty members while *interactions with fellow students* (Cronbach's $\alpha = .84$) reflect students' assessment of their relations to fellow students. All scales are composed of Likert-type items, which we recode so that higher values reflect a higher degree of integration.

All parameters of *RCT* are measured with single Likert-type items (also, see Stocké et al., 2011). The item that measures *direct and indirect costs* of higher education asks students how difficult it is for their family to pay for commuting, books, and tuition fees. A second item measures *opportunity costs* in terms of students' perceived financial pressure resulting from forgone labor market earnings until graduation. In both items, higher values indicate higher costs. To capture the concept of *relative risk aversion*, we follow Barone et al., (2018, p. 557) and measure students' occupational aspirations in terms of ISEI-08 (Ganzeboom & Treiman, 1996) scores. The *success probability* is measured by students' perceived likelihood of obtaining a degree.

Our primary outcome is a binary indicator variable that takes the value of 1 if a student has dropped out of higher education before obtaining a degree and 0 if they have

⁶ The EGP class scheme is widely used in social stratification research. It groups occupations along the specificity of required skills and the difficulty of monitoring, which are typically associated with the type of contract (service vs. working; for a detailed discussion, see Goldthorpe, 2000).

Table 1 Variable description and descriptive statistics

| Variable | Mean/proportion (SD) | Values/range | Description |
|--|----------------------|--------------|--|
| Socioeconomic background | | | |
| ISCED 0–4 (non-tertiary education) | .73 | 0/1 | ISCED-97 levels: 0: Pre-primary education, no formal education; 1: Primary education; 2: Lower secondary education; 3: Upper secondary education; 4: Post-secondary non-tertiary education; 5: Tertiary education (first stage, e.g., Bachelor or Master); 6: Tertiary education (second stage, e.g., Ph.D.) |
| ISCED 5–6 (tertiary education) | .27 | | |
| EGP IIIb, VI, VII (working class) | .10 | 0/1 | EGP class scheme: I, II: professionals, managers; IIIa: routine administrative; IV: self-employed; V: manual supervisors; IIIb: routine sales; VI: skilled manual; VII: semi-/unskilled workers, agricultural |
| EGP I, II, IIIa, IV, V (service/mixed classes) | .90 | | |
| GPA ($X - 1$) | | | 1.0–1.5 “very good” 1.6–2.5 “good” 2.6–3.5 “satisfactory” 3.6–4.0 “sufficient” 5.0 “failed” |
| Entrance certificate | – 2.20 (0.61) | 1–4 | |
| Studies | – 2.28 (0.60) | 1–5 | |
| Student integration model | | | |
| Achievement orientation | 3.59 (0.83) | 1–5 | “I no longer do anything more for my studies than that which is absolutely necessary.”; “When it comes to achievements in my course of study, I set the highest standards for myself.”; “I invest a lot of energy in being successful in my degree course.” |
| Achievement expectation | 2.61 (0.66) | 1–4 | “My academic achievements are better than I had originally expected.”; “My performance expectations and requirements were fully fulfilled during my studies.”; “I am satisfied with my academic performance.” |
| Interaction with faculty | 3.00 (0.45) | 1–4 | “I feel accepted by the instructors.”; “I get along well with the instructors in my degree program.”; “Most of the instructors treat me fairly.”; “The lecturers are interested in what I have to say.” |
| Interaction with peers | 3.11 (0.64) | 1–4 | “I have been successful in building contacts with other students during my studies up to now.”; “I know a lot of classmates with whom I can exchange ideas about questions in my field of study.”; “I have many contacts with students in my class.” |
| Rational choice theory | | | |
| Costs (direct and indirect) | 2.55 (0.96) | 1–5 | “How difficult is it for you and your family to pay for the things you need for your degree course, for instance, travel costs, books or tuition fees?” |
| Costs (opportunity) | 3.01 (0.95) | 1–5 | “Up until the end of your degree course, the possibilities of earning your own money and supporting yourself are limited. Under how much financial pressure will it put you and your family until the degree course is completed?” |

Table 1 (continued)

| Variable | Mean/proportion (SD) | Values/range | Description |
|---|----------------------|--------------|--|
| Status maintenance (aspired occupation ISEI-08) | 75.97 (10.53) | 16.5–89.96 | “Regardless of how your degree course is going, what job would you most like to have at some point?” |
| Success probability | 4.40 (0.65) | 1–5 | “How likely is it for you to successfully complete a course of study?” |
| Entrance certificate | | | |
| General (“Abitur”) | .88 | 0/1 | |
| Univ. of applied sciences | .09 | | |
| Other | .03 | | |
| Type of higher education | | | |
| University | .77 | 0/1 | |
| Univ. of applied sciences | .23 | | |
| Field of studies | | | |
| Linguistics, cultural st | .27 | 0/1 | |
| Law, econ., social sc | .24 | | |
| Mathematics, natural sc | .23 | | |
| Medicine and health sc | .05 | | |
| Engineering | .15 | | |
| Other | .06 | | |
| Pursued degree | | | |
| Bachelor | .58 | 0/1 | |
| Bachelor (teaching) | .14 | | |
| State Exam. (teaching) | .20 | | |
| Other | .08 | | |

Table 1 (continued)

| Variable | Mean/proportion (SD) | Values/range | Description |
|---------------------------|----------------------|--------------|--|
| Ethnic origin | | | Migration background: migrated or at least one parent born abroad Native: born in Germany or both parents born in Germany |
| Migration background | .14 | 0/1 | |
| Native German | .86 | | |
| Gender | | | |
| Female | .62 | 0/1 | |
| Male | .38 | | |
| Age at enrollment (years) | 21.08 (2.33) | 17.25–35 | |
| Educational attainment | | | Full sample (including cases with missing outcome): N = 16,962; Dropout = 24% |
| Dropout | .08 | 0/1 | |
| Graduation | .92 | | |

Descriptive statistics of the analyses sample are based on $M=100$ imputed datasets. $N=11,057$. SD: Standard deviation (pooled over imputed datasets). 0/1: indicator variables taking values 0 or 1

graduated.⁷ Because the median time for obtaining a degree is 7 to 8 semesters (Autorengruppe Bildungsberichterstattung, 2020, p. 195), we exclude all students (about 2%) who have not obtained a degree and are still studying by the time of the last interview.

In all analyses, we control for the type of entrance certificate, the type of higher education institution, the field of studies, and the pursued degree. We also control for students' migration background, gender, and age at enrollment.

Methods

Analytic Sample and Multiple Imputation of Missing Values

From the initial sample of 17,910 students, we exclude 581 (3.2%) students, who were already enrolled in higher education before the winter-term of 2010/11, a further 284 (1.6%) students who were already 35 years or older when they first enrolled in higher education, and 83 students (<1%) with missing values on basic variables such as their field of studies. These exclusions leave us with 16,962 students, half of which have missing values in less than 3 out of the 22 variables that we use in the analyses (see Fig. 2 and Table 5, appendix). The proportion of missing values across variables ranges from less than 5% for parental education, GPA of the entrance certificate, and most measures of RCT, to slightly over 50% for GPA during studies (see Table 6, appendix). There are no missing values in the basic control variables.

Assuming that variables are missing at random, we address missing values by multiple imputations via chained equations (Rubin, 1987; Van Buuren, 2012). In the imputation models, we include all variables of the substantive analyses and, if available, repeated measures. In order to improve the imputations of missing values on the outcome, we additionally include a measure of students' intentions of dropping out of higher education. Considering missing values due to non-participation, we further include the total number of completed interviews by each student. Finally, we account for the sampling design by including weights for strata and probability weights for participation in the first panel wave (Rubin, 1996). We use Stata 16 (StataCorp., 2019) to create a total of 100 complete datasets, ensuring that the number of imputations is larger than the fraction of missing information (White et al., 2011). Following Von Hippel (2007), we restrict our analyses to 11,057 cases that do not have missing values on the outcome.⁸

Analytic Approach

In a first step, we assess social inequality in GPA, academic and social integration, and the costs, benefits, and success probability (H1a, H2a, and H3a). We standardize all variables to zero mean and unit variance. In a second step, we use binary logistic regression models

⁷ Because neither changing subjects nor transferring to another higher education institution prevents students from completing a degree, we do not consider such events dropouts.

⁸ The imputed values of the outcome result in an estimated overall dropout rate of 24% (as opposed to about 8% observed), which reasonably resembles official reports for Germany (e.g., Heublein et al., 2020). We take this as evidence of the validity of our imputation model. Robustness checks (Tables 7, 8, 9, appendix) suggest that including cases with missing values in the outcome result in somewhat larger standard errors but do not substantively alter our main conclusions. We further discuss missing values due to panel attrition as a key limitation to our study.

Table 2 Social disparities in students' GPA

| | GPA | | | |
|---|----------------------|-----------|---------|----------|
| | Entrance certificate | | Studies | |
| ISCED parents (Reference: 5–6) | | | | |
| 0–4 (non-tertiary education) | – 0.20 | (0.02)*** | – 0.08 | (0.02)** |
| EGP parents (Reference: I, II, IIIa, IV, V) | | | | |
| IIIb, VI, VII (working class) | – 0.11 | (0.04)** | – 0.10 | (0.04)* |
| R^2 | .19 | | .11 | |
| N | 11,057 | | | |

Results from linear regression models. Linear regression coefficients from $M=100$ imputed datasets. Robust standard errors in parentheses. GPA standardized to zero mean and unit variance. Models include controls for type of entrance certificate, type of higher education institution, field of studies, pursued degree, migration background, gender, and age

* $p < .05$, ** $p < .01$, *** $p < .001$

to predict students' dropout risk from their SEB, GPA, and the predictors of the SIM and RCT (H1b, H2b, and H3b).⁹ Last, we assess the extent to which the theoretical approaches mediate the association between SEB and the dropout risk (H1c, H2c, H3c) using the non-linear decomposition method suggested by Karlson et al. (2012).

Results

Social Disparities in the Theoretical Predictors

To test whether our predictors vary with students' SEB, we estimate a series of linear regression models predicting students' GPA, their academic and social integration, and the perceived costs, benefits (status maintenance), and success probability from parents' educational level and class position. We choose tertiary education (ISCED levels 5 and 6) and the composite of the service and mixed classes (EGP I, II, IIIa, IV, and V) as the reference categories, which we compare to non-tertiary educated (ISCED level 0 to 4) and working class (EGP IIIb, VI, and VII) students.

Social Disparities in Academic Performance

Table 2 shows the social disparities in GPA of both students' entrance certificate and during their studies. The results for the GPA of the entrance certificate confirm our expectations (H1a): First-generation students enter tertiary education with, on average, one fifth

⁹ Others have suggested to model similar data within the framework of event history analysis (Willett & Singer, 1991). This method centers on the question *when* an event occurs and models the time to that event. We are, however, neither interested in the duration of studies nor in the timing of dropout (or graduation) but in the final academic outcome. Therefore, we follow previous research on social stratification in higher education (e.g., Barone et al., 2018; Daniel & Watermann, 2018; Schindler & Lörz, 2012) in applying (binary) logistic regression models.

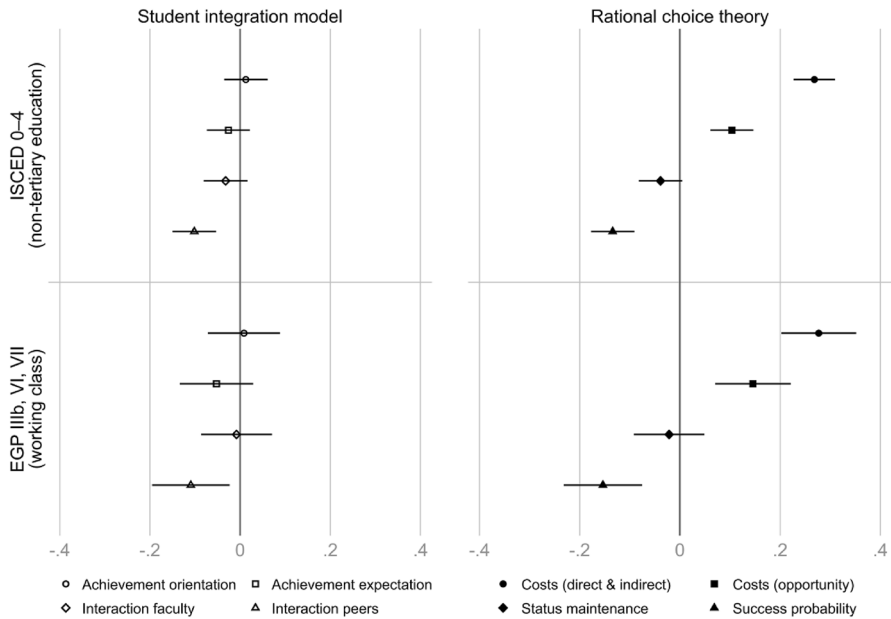


Fig. 1 Social disparities in theoretical predictors. *Notes:* Linear regression coefficients and 95% confidence intervals from $M=100$ imputed datasets. Coefficients represent standard deviations. Confidence intervals are based on robust standard errors. Models include controls for type of entrance certificate, type of higher education institution, field of studies, pursued degree, migration background, gender, and age

standard deviation lower grades ($b = -0.20$; $p < .001$). These disadvantages are less pronounced with respect to parents' social class ($b = -0.11$; $p < .01$). Turning to the first GPA during studies, we find that the differences according to parents' education are much lower ($b = -0.08$; $p < .01$) whereas the differences according to social class are similar to those of the entrance certificate ($b = -0.10$; $p < .05$).

Social Disparities in Academic and Social Integration

The left panel of Fig. 1 depicts linear regression coefficients along with their 95% confidence intervals that indicate differences in students' academic and social integration according to their parents' educational level and class position (H2a).¹⁰ The overall picture suggests relatively small differences in students' integration according to their SEB. Regarding academic integration, there is no evidence for social disparities in students' achievement orientations with respect to their parents' education or class position ($b = 0.01$; $p > .05$). We find slightly lower levels of achievement expectations among first-generation students ($b = -0.03$; $p > .05$) and working-class students ($b = -0.05$; $p > .05$) but neither difference is statistically significant (at the conventional 5% level), and we deem these differences substantively negligible.

¹⁰ We produce all plots using the community-contributed software COEFPLOT (Jann, 2014) for Stata. We provide tabular results in Table 10 in the appendix.

Turning to social integration, the picture for interactions with faculty basically resembles our findings for academic integration: There is no evidence for social disparities according to parents' education ($b = -0.03$; $p > .05$) or class position ($b = -0.01$; $p > .05$). We do, however, find that first-generation students ($b = -0.10$; $p < .001$) and working-class students ($b = -0.11$; $p < .05$) appear to struggle to establish friendships during higher education. Overall, except for interaction with peers, these results do not confirm our hypotheses regarding social disparities in the predictors of the SIM.

Social Disparities in Costs, Benefits, and Success Probability

The right panel of Fig. 1 depicts social disparities in the perceived costs, benefits, and success probability (H2b). Compared to the results for the SIM (left panel), the overall picture suggests comparatively large differences according to students' SEB. Both first-generation students ($b = 0.27$; $p < .001$) and working-class students ($b = 0.28$; $p < .001$) perceive higher education as financially more burdensome than the respective reference groups. The pattern is similar for opportunity costs, although the respective differences according to parents education ($b = 0.10$; $p < .001$) and social class position ($b = 0.15$; $p < .001$) are only about half the size.

Regarding status maintenance, there is no strong evidence for differences in occupational aspirations according to parents' educational level ($b = 0.04$; $p > .05$) or social class ($b = 0.02$; $p > .05$). Considering that we are looking at a highly selective sample, we might expect that all higher education students aspire to similar occupations that typically require a higher education certificate.

Turning to the success probability, we find that first-generation students ($b = -0.13$; $p < .001$) and working-class students ($b = -0.15$; $p < .001$) perceive a lower likelihood of completing a degree. Overall, these results confirm our hypotheses regarding social disparities in the parameters of RCT.

Social Inequality in Dropout Risks

Next, we turn to our main research questions and test whether social inequality in the risk of dropping out can be attributed to differences in students' academic performance, their academic and social integration, as well as the expected costs, benefits, and success probability. We present results from binary logistic regression models choosing dropout as the reference outcome.¹¹

Table 3 shows the social inequality in dropout risk. In the baseline model (Table 3, Model 1), first-generation students (OR 1.53; $p < .001$) and working-class students (OR 1.74; $p < .001$) have a higher risk of dropping out, net of each other, than the respective reference groups.

Model 2 confirms that students' GPA in their entrance certificate (OR 0.48; $p < .001$) and their studies (OR 0.55; $p < .001$) is negatively associated with the risk of dropping out (H1b). Furthermore, accounting for differences in students' GPA reduces inequality with

¹¹ We present results as odds ratios. We provide results as average marginal effects as robustness checks in Tables 11 and 12 in the appendix. We use the community-contributed software MIMRGENS (Klein, 2014) to estimate average marginal effects.

Table 3 Social inequality in dropout

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---------------------------------------|----------------|----------------|----------------|----------------|----------------|
| ISCED parents (Ref. 5–6) | | | | | |
| 0–4 (non-tertiary education) | 1.53 (0.16)*** | 1.26 (0.11)* | 1.46 (0.16)*** | 1.34 (0.14)** | 1.17 (0.12) |
| EGP parents (Ref. I, II, IIIa, IV, V) | | | | | |
| IIIb, VI, VII (working class) | 1.74 (0.23)*** | 1.51 (0.20)** | 1.63 (0.22)** | 1.52 (0.21)** | 1.39 (0.19)* |
| GPA | | | | | |
| Entrance certificate | | 0.48 (0.03)*** | | | 0.50 (0.03)*** |
| Studies | | 0.55 (0.06)*** | | | 0.80 (0.11) |
| Student integration model | | | | | |
| Achievement orientation | | | 0.64 (0.04)*** | | 0.74 (0.04)*** |
| Achievement expectation | | | 0.60 (0.04)*** | | 0.72 (0.07)*** |
| Interaction with faculty | | | 0.84 (0.05)*** | | 0.89 (0.06) |
| Interaction with peers | | | 0.72 (0.05)*** | | 0.73 (0.05)*** |
| Rational choice theory | | | | | |
| Costs (direct and indirect) | | | | 1.24 (0.06)*** | 1.14 (0.06)** |
| Costs (opportunity) | | | | 0.91 (0.04)* | 0.95 (0.05) |
| Status maintenance | | | | 0.84 (0.04)*** | 0.91 (0.04)* |
| Success probability | | | | 0.57 (0.02)*** | 0.74 (0.03)*** |
| McFadden's Pseudo- R^2 | .06 | .17 | .15 | .10 | .23 |
| N | 11,057 | | | | |

Results from binary logistic regression models (Odds ratios). Odds ratios (exponentiated coefficients) from $M=100$ imputed datasets. Raw coefficients corrected according to Karlson et al. (2012). Robust standard errors in parentheses. Ref.: reference category. GPA, SIM (student integration model), and RCT (rational choice theory) variables are standardized to zero mean and unit variance. Models include controls for type of entrance certificate, type of higher education institution, field of studies, pursued degree, migration background, gender, and age

* $p < .05$, ** $p < .01$, *** $p < .001$

respect to parental education (OR 1.26; $p < .05$) and social class (OR 1.51; $p < .01$), respectively (H1c).

In Model 3, we include measures of students' academic and social integration. As expected (H2b), we find that, net of each other, all four dimensions are negatively associated with the risk of dropping out. The association is strongest for achievement expectations (OR 0.60; $p < .001$). We also find that the inequality with respect to parents' education (OR 1.46; $p < .001$) and social class (OR 1.63; $p < .01$) slightly decrease when compared to Model 1, weakly supporting hypothesis H2c.

Model 4 includes students' perceived costs, benefits, and success probability, each of which is associated with dropout risks (H3b). Except for the success probability (OR

Table 4 Percentages of mediated social inequality in dropout

| | GPA | SIM | RCT | Total |
|--|-------|------|-------|-------|
| ISCED parents (Reference: 5–6) | | | | |
| 0–4 (non-tertiary education) | 36.70 | 9.47 | 17.63 | 63.80 |
| EGP parents (Reference I, II, IIIa, IV, V) | | | | |
| IIIb, VI, VII (working class) | 17.45 | 9.11 | 14.17 | 40.73 |
| Average | 27.08 | 9.29 | 15.90 | 52.27 |

Results from nonlinear decomposition. Percentages represent reduction of coefficients from binary logistic regression models. GPA combines both GPA of entrance certificate and GPA during studies

0.57; $p < .001$), the respective associations are somewhat weaker than those for academic and social integration. Moreover contrary to our expectations, higher opportunity costs are associated with a slightly lower dropout risk (OR 0.91; $p < .05$). One possible ad-hoc explanation is that students might feel obliged to persist in order to justify high opportunity costs. Accounting for differences in the perceived costs, benefits, and success probability reduces the association of both parents' education (OR 1.34; $p < .01$) and class position (OR 1.52; $p < .01$) with the risk of dropping out (H3c). The respective reductions are comparable to those observed when accounting for students' GPA (Model 2).

In Model 5, we include all theoretical predictors simultaneously. The overall picture still supports most of our hypotheses regarding the predictors' associations with dropout risk (H1b, H2b, and H3b). However, compared to the separate models, the odds ratios, especially those of the variables that capture students' academic performance in higher education such as GPA (OR 0.80; $p > .05$), achievement expectations (OR 0.72; $p < .001$), and success probability (OR 0.74; $p < .001$), are somewhat closer to 1. In contrast, the odds ratio of the GPA of the entrance certificate remains rather stable (OR 0.50; $p < .001$), suggesting that a substantial part of students' performance in higher education is driven by their academic performance at the end of secondary education.

In the full model (Model 5, Table 3), social inequality in dropout risk substantially decreases with respect to parents' education (OR 1.17; $p > .05$), which is no longer statistically significant different from 1, and social class position (OR 1.39; $p < .05$).

In a last step, we apply the nonlinear decomposition method suggested by Karlson et al. (2012) to the results of Model 5.¹² Table 4 disentangles the relative contribution of each theoretical approach for explaining social inequality in dropout risk. We find that social disparities in GPA account, on average, for about 27% of the social inequality in dropout. The SIM accounts for just above 9% while RCT accounts for roughly 16% of social inequality in dropout from higher education. Overall, controlling for social disparities in the theoretical predictors reduces about half of the social inequality in dropout risk.

Discussion

In our paper, we sought to move from describing social inequalities in higher education dropout to an explanatory model thereof. In this endeavor, we suggested combining the two predominant theories from higher education dropout and social stratification: Tinto's

¹² The full model, showing coefficients for all covariates, is presented in Table 13 (appendix).

(1975, 1987) SIM and RCT (Boudon, 1974; Breen & Goldthorpe, 1997). Drawing on a nationwide, representative sample of higher education students in Germany, we tested these theories' predictions regarding dropout risks and each theory's contribution to explaining social inequality in dropout from higher education.

Our results confirm the SIM's hypotheses that students' academic and social integration are associated with their dropout risk. These findings are in line with various studies from the US (Braxton et al., 1997) and add to the still limited number of empirical applications of the SIM outside of the US context (Chrysikos et al., 2017; Klein, 2019). Contrary to our expectations, we hardly find any social disparities regarding students' academic and social integration. One notable exception is that students from lower SEB struggle to establish friendships with their fellow students. Our results differ from those of others, who report social disparities in both academic and social integration (Soria & Stebleton, 2012; Soria et al., 2013). The diverging results might be due to differences in the educational systems between the US and Germany. The latter is highly selective regarding the transition into secondary education (Müller et al., 2017), which leads to a homogeneous student population in tertiary education in terms of achievement orientations and academic integration in general. Further research should investigate the effects of selectivity of educational systems on students' integration and higher education dropout.

Regarding RCT, our results confirm that the perceived costs, benefits, and success probability are associated with the dropout risk. These findings strengthen the argument that financial considerations affect students' dropout decisions (Cabrera et al., 1992) and provide an empirical underpinning of micro-level assumptions that underlie studies on the effects of financial aid on dropout (Chen & St. John, 2011; Melguizo et al., 2011). As expected, the parameters of RCT vary with students' SEB in that first-generation students and students from working-class families perceive higher costs, lower benefits, and a lower success probability.

Overall, our results suggest that both the SIM and RCT offer empirically valid explanations for students' dropout from higher education in Germany. The theoretical predictors are associated with the dropout net of each other, suggesting that the SIM and RCT are complementary. While the SIM appears to predict dropout better, RCT accounts for a higher proportion of social inequality. However, even our combined model cannot fully account for the disadvantages of working-class students, and we leave it to future research to further explore additional factors that explain the remaining social inequality in dropout.

While our paper extends previous research by offering a more comprehensive theoretical approach to explaining dropout from higher education and social inequality therein, we acknowledge certain limitations. First, our dataset suffers from panel attrition, due to which we do not observe the educational outcome of a substantial proportion of students (about 30%). While the respective complete case analyses will underestimate the overall dropout rate, the extent to which our results regarding social inequality in dropout are affected is less clear. Obviously, we cannot completely rule out bias due to unobserved confounders. However, drawing on a rich set of covariates, our imputation model recovers the officially reported dropout rate for Germany (Heublein et al., 2020) quite well. Moreover, observing several focal variables and strong predictors of degree completion, such as parental education and entrance certificate GPA for the vast majority (more than 95%) of the students, we have some confidence in our results.

Another limitation follows from our analytic approach. Focusing on the final academic outcome and disregarding the timing of dropout, we do not capture potential variations in the associations between social inequalities, students' integration, and cost-benefit considerations over the time spent in higher education. For example, one might speculate that students from

lower SEB integrate more slowly into the higher education system, increasing their dropout risk primarily in earlier semesters. Given that the literature appears to be missing studies on students' integration in later semesters (Nora & Crisp, 2012, p. 243), we suggest them for future research, possibly within the framework of event history analysis (Willett & Singer, 1991).

On a similar note, while our theoretical perspective demonstrates how the SIM and RCT compensate for each other's blind spots, we have not addressed possible interrelations between the variables of both theories. For instance, Beekhoven et al. (2002) have suggested that students' integration might increase their perceived probability of success and vice-versa. Future research should investigate such interrelations and whether they account for the remaining social inequality in dropout from higher education.

With these limitations in mind, what can we learn from our results? First and foremost, combining the SIM and RCT leads to a more comprehensive understanding of both higher education dropout and social inequality therein. Students appear to be equally concerned with the intrinsic rewards from integrating into higher education communities and the expected costs and benefits from completing higher education. However, we also learn that social disparities in these factors do not fully account for the social inequality in dropout.

Finally, our results should be interpreted with the peculiarities of the German higher education context in mind. Although the SIM does not seem well suited for explaining social inequality in dropout from higher education in Germany, results might differ for higher education systems in other countries. For instance, in Germany, only a minority of the students live on campus (Middendorff et al., 2013). Because social integration appears to be more relevant for residential students (Pascarella & Chapman, 1983), the SIM might better explain social inequality in dropout in countries where more students are living on campus, such as the US. Likewise, compared to Germany, other European countries, such as the UK, the Netherlands, and Italy, charge higher tuition fees (OECD, 2021). If higher tuition fees increased social stratification during the transition into higher education (Kroth, 2015), we would expect financial considerations to be less relevant for the subsequent decision to drop out. Ultimately, the extent to which students' academic and social integration and the perceived costs, benefits, and success probability account for social inequality in dropout in different higher education systems remains an empirical question.

Appendix

See Tables 5, 6, 7, 8, 9, 10, 11, 12, 13.

See Fig. 2.

Table 5 Distribution of missing values in variables by cases

| Number of variables with missing values (out of 22 variables) | Number of cases | Proportion | Cumulative |
|---|-----------------|------------|------------|
| 0 | 2,778 | .16 | |
| 1 | 4,116 | .24 | .40 |
| 2 | 2,720 | .16 | .56 |
| 3–5 | 2,753 | .17 | .73 |
| 6–8 | 4,404 | .26 | .99 |
| 9–12 | 191 | .01 | 1.00 |
| Total | 16,962 | 1.00 | |

Table 6 Proportion of missing values in variable groups

| Variable group | Proportion of missing values |
|--|------------------------------|
| Socioeconomic background | |
| ISCED parents | .03 |
| EGP parents ^a | .41 |
| GPA | |
| Entrance certificate | .02 |
| Studies | .52 |
| Student integration model ^b | |
| Achievement orientations | .35 |
| Achievement expectations | .36 |
| Interactions with faculty | .36 |
| Interaction with peers | .36 |
| Rational choice theory | |
| Costs (direct and indirect) | < .01 |
| Costs (opportunity) | < .01 |
| Status maintenance | .22 |
| Success probability | < .01 |
| Covariates | < .01 |
| Dropout | .32 |

N = 16,962

^aEGP is reported for at least one parent in 93% of all cases

^bStudents' integration was assessed in online-interviews, which had lower response rates than telephone interviews

Table 7 Robustness check: Social disparities in theoretical predictors

| | Parents' | | | |
|-----------------------------|--|-----------|--|-----------|
| | ISECD 0–4 (non-tertiary education) (Reference: 5–6) | | EGP IIIb, VI, VII (working class) (Reference: I, II, IIIa, IV, V) | |
| GPA | | | | |
| Entrance certificate | – 0.24 | (0.02)*** | – 0.11 | (0.03)*** |
| Studies | – 0.11 | (0.02)*** | – 0.10 | (0.03)** |
| SIM | | | | |
| Achievement orientation | 0.01 | (0.02) | 0.00 | (0.03) |
| Achievement expectation | – 0.03 | (0.02) | – 0.05 | (0.03) |
| Interaction with faculty | – 0.03 | (0.02) | – 0.03 | (0.04) |
| Interaction with peers | – 0.09 | (0.02)*** | – 0.10 | (0.04)** |
| RCT | | | | |
| Costs (direct and indirect) | 0.24 | (0.02)*** | 0.29 | (0.03)*** |
| Costs (opportunity) | 0.09 | (0.02)*** | 0.13 | (0.03)*** |
| Status maintenance | – 0.02 | (0.02) | – 0.01 | (0.03) |
| Success probability | – 0.14 | (0.02)*** | – 0.15 | (0.03)*** |
| <i>N (minimum)</i> | 16,260 | | | |

Results from linear regression models (including cases with missing outcome). Linear regression coefficients from $M=100$ imputed datasets. Robust standard errors in parentheses. The number of excluded students with imputed outcome ‘still studying’ varies slightly over imputed datasets; *N (minimum)* is the minimum number of observations. GPA, SIM (student integration model), and RCT (rational choice theory) variables are standardized to zero mean and unit variance. Models include controls for type of entrance certificate, type of higher education institution, field of studies, pursued degree, migration background, gender, and age

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 8 Robustness check: Social inequality in dropout

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---------------------------------------|----------------|----------------|----------------|----------------|----------------|
| ISCED parents (Ref. 5–6) | | | | | |
| 0–4 (non-tertiary education) | 1.29 (0.07)*** | 1.13 (0.06)* | 1.27 (0.07)*** | 1.21 (0.07)*** | 1.09 (0.06) |
| EGP parents (Ref. I, II, IIIa, IV, V) | | | | | |
| IIIb, VI, VII (working class) | 1.48 (0.12)*** | 1.36 (0.11)*** | 1.45 (0.11)*** | 1.39 (0.11)*** | 1.31 (0.10)*** |
| GPA | | | | | |
| Entrance certificate | | 0.66 (0.04)*** | | | 0.69 (0.05)*** |
| Studies | | 0.69 (0.13)* | | | 0.72 (0.18) |
| Student integration model | | | | | |
| Achievement orientation | | | 0.83 (0.10) | | 0.91 (0.11) |
| Achievement expectation | | | 0.89 (0.11) | | 1.08 (0.19) |
| Interaction with faculty | | | 0.83 (0.09) | | 0.87 (0.09) |
| Interaction with peers | | | 0.87 (0.10) | | 0.88 (0.09) |
| Rational choice theory | | | | | |
| Costs (direct and indirect) | | | | 1.13 (0.03)*** | 1.08 (0.03)** |
| Costs (opportunity) | | | | 0.94 (0.02)* | 0.97 (0.03) |
| Status maintenance | | | | 0.91 (0.03)** | 0.96 (0.03) |
| Success probability | | | | 0.76 (0.02)*** | 0.88 (0.03)*** |
| McFadden’s Pseudo- R^2 | .03 | .09 | .06 | .05 | .11 |
| N (<i>minimum</i>) | 16,260 | | | | |

Results from binary logistic regression models (including cases with missing outcome). Odds ratios (exponentiated coefficients) from $M=100$ imputed datasets. Raw coefficients corrected according to Karlson et al. (2012). Robust standard errors in parentheses. The number of excluded students with imputed outcome ‘still studying’ varies slightly over imputed datasets; N (*minimum*) is the minimum number of observations

Ref.: reference category. GPA, SIM (student integration model), and RCT (rational choice theory) variables are standardized to zero mean and unit variance. Models include controls for type of entrance certificate, type of higher education institution, field of studies, pursued degree, migration background, gender, and age
 * $p < .05$, ** $p < .01$, *** $p < .001$

Table 9 Robustness check: Percentage of mediated social inequality in dropout

| | GPA | SIM | RCT | Total |
|--|-------|------|-------|-------|
| ISCED parents (Reference: 5–6) | | | | |
| 0–4 (non-tertiary education) | 46.41 | 5.78 | 13.46 | 65.66 |
| EGP parents (Reference I, II, IIIa, IV, V) | | | | |
| IIIb, VI, VII (working class) | 18.70 | 3.48 | 9.61 | 31.79 |
| Average | 32.56 | 4.63 | 11.54 | 48.73 |

Results from non-linear decomposition analyses (including cases with missing outcome). Percentages represent reduction of average marginal effects from binary logistic regression models. Deviations in sums are due to rounding errors. GPA combines both GPA of entrance certificate and GPA during studies

Table 10 Social disparities in theoretical predictors

| | Parents' | | | |
|-----------------------------|---|-----------|---|-----------|
| | ISCED 0–4 (non-tertiary education) (Reference: 5–6) | | EGP IIIb, VI, VII (working class) (Reference: I, II, IIIa, IV, V) | |
| GPA | | | | |
| Entrance certificate | – 0.20 | (0.02)*** | – 0.11 | (0.04)** |
| Studies | – 0.08 | (0.02)** | – 0.10 | (0.04)* |
| SIM | | | | |
| Achievement orientation | 0.01 | (0.02) | 0.01 | (0.04) |
| Achievement expectation | – 0.03 | (0.02) | – 0.05 | (0.04) |
| Interaction with faculty | – 0.03 | (0.02) | – 0.01 | (0.04) |
| Interaction with peers | – 0.10 | (0.02)*** | – 0.11 | (0.04)* |
| RCT | | | | |
| Costs (direct and indirect) | 0.27 | (0.02)*** | 0.28 | (0.04)*** |
| Costs (opportunity) | 0.10 | (0.02)*** | 0.15 | (0.02)*** |
| Status maintenance | – 0.04 | (0.02) | – 0.02 | (0.04) |
| Success probability | – 0.13 | (0.02)*** | – 0.15 | (0.04)*** |
| <i>N</i> | 11,057 | | | |

Results from linear regression models. Linear regression coefficients from $M=100$ imputed datasets. Robust standard errors in parentheses. GPA, SIM (student integration model), and RCT (rational choice theory) variables are standardized to zero mean and unit variance. Models include controls for type of entrance certificate, type of higher education institution, field of studies, pursued degree, migration background, gender, and age

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 11 Robustness check: Social inequality in dropout

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---------------------------------------|------------------|--------------------|--------------------|--------------------|--------------------|
| ISCED parents (Ref. 5–6) | | | | | |
| 0–4 (non-tertiary education) | 0.023 (0.005)*** | 0.013 (0.006)* | 0.021 (0.006)*** | 0.017 (0.006)** | 0.009 (0.006) |
| EGP parents (Ref. I, II, IIIa, IV, V) | | | | | |
| IIIb, VI, VII (working class) | 0.038 (0.010)*** | 0.027 (0.010)** | 0.033 (0.010)** | 0.027 (0.010)** | 0.021 (0.009)* |
| GPA | | | | | |
| Entrance certificate | | – 0.044 (0.004)*** | | | – 0.041 (0.004)*** |
| Studies | | – 0.036 (0.006)*** | | | – 0.013 (0.008) |
| Student integration model | | | | | |
| Achievement orientation | | | – 0.026 (0.003)*** | | – 0.018 (0.003)*** |
| Achievement expectation | | | – 0.030 (0.004)*** | | – 0.020 (0.006)*** |
| Interaction with faculty | | | – 0.011 (0.004)*** | | – 0.007 (0.004) |
| Interaction with peers | | | – 0.020 (0.004)*** | | – 0.019 (0.004)*** |
| Rational choice theory | | | | | |
| Costs (direct and indirect) | | | | 0.013 (0.003)*** | 0.008 (0.003)** |
| Costs (opportunity) | | | | – 0.006 (0.003)** | – 0.003 (0.003) |
| Status maintenance | | | | – 0.010 (0.003)*** | – 0.005 (0.003)* |
| Success probability | | | | – 0.033 (0.002)*** | – 0.018 (0.002)*** |
| McFadden's Pseudo-R ² | .06 | .17 | .15 | | .23 |
| N | 11,057 | | | | |

Results from binary logistic regression models (Average marginal effects). Average marginal effects from $M = 100$ imputed datasets. Coefficients corrected according to Karlsson et al. (2012). Robust standard errors in parentheses. Ref.: reference category. GPA, SIM (student integration model), and RCT (rational choice theory) variables are standardized to zero mean and unit variance. Models include controls for type of entrance certificate, type of higher education institution, field of studies, pursued degree, migration background, gender, and age

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 12 Robustness check: Percentage of mediated social inequality in dropout

| | GPA | SIM | RCT | Total |
|---|-------|-------|-------|-------|
| ISCED parents (Reference: 5–6) | | | | |
| 0–4 (non-tertiary education) | 35.13 | 8.91 | 16.68 | 62.19 |
| EGP parents (Reference: I, II, IIIa, IV, V) | | | | |
| IIIb, VI, VII (working class) | 19.34 | 10.21 | 15.78 | 43.83 |
| Average | 27.24 | 9.56 | 16.23 | 53.01 |

Results from nonlinear decomposition analyses (Based on average marginal effects). Percentages represent reduction of average marginal effects from binary logistic regression models. Deviations are due to rounding errors. GPA combines both GPA of entrance certificate and GPA during studies

Table 13 Social inequality in dropout. Results from binary logistic regression model (full model)

| | Model 5 | |
|---|---------|-----------|
| ISCED parents (Ref. 5–6) | | |
| 0–4 (non-tertiary education) | 1.17 | (0.12) |
| EGP parents (Ref. I, II, IIIa, IV, V) | | |
| IIIb, VI, VII (working class) | 1.39 | (0.19)* |
| GPA | | |
| Entrance certificate | 0.50 | (0.03)*** |
| Studies | 0.80 | (0.11) |
| SIM | | |
| Achievement orientation | 0.74 | (0.04)*** |
| Achievement expectation | 0.72 | (0.07)*** |
| Interaction with faculty | 0.89 | (0.06) |
| Interaction with peers | 0.73 | (0.05)*** |
| RCT | | |
| Costs (direct and indirect) | 1.14 | (0.06)** |
| Costs (opportunity) | 0.95 | (0.05) |
| Status maintenance | 0.91 | (0.04)* |
| Success probability | 0.74 | (0.03)*** |
| Entrance certificate (Ref. General) | | |
| University. of applied sciences | 1.64 | (0.23)** |
| Other | 2.35 | (0.46)*** |
| University (Ref. University of applied sciences) | 1.04 | (0.13) |
| Field of studies (Ref. Linguistic and cultural studies) | | |
| Law, economics, and social sciences | 0.61 | (0.08)*** |
| Mathematics. natural sciences | 1.06 | (0.13) |
| Medicine and health sciences | 0.52 | (0.17)* |
| Engineering | 0.84 | (0.14) |
| Other | 0.50 | (0.10)*** |
| Pursued degree (Ref. Bachelor) | | |
| Bachelor (teaching) | 0.82 | (0.12) |
| State Examination (teaching) | 1.02 | (0.13) |
| Other | 1.32 | (0.31) |

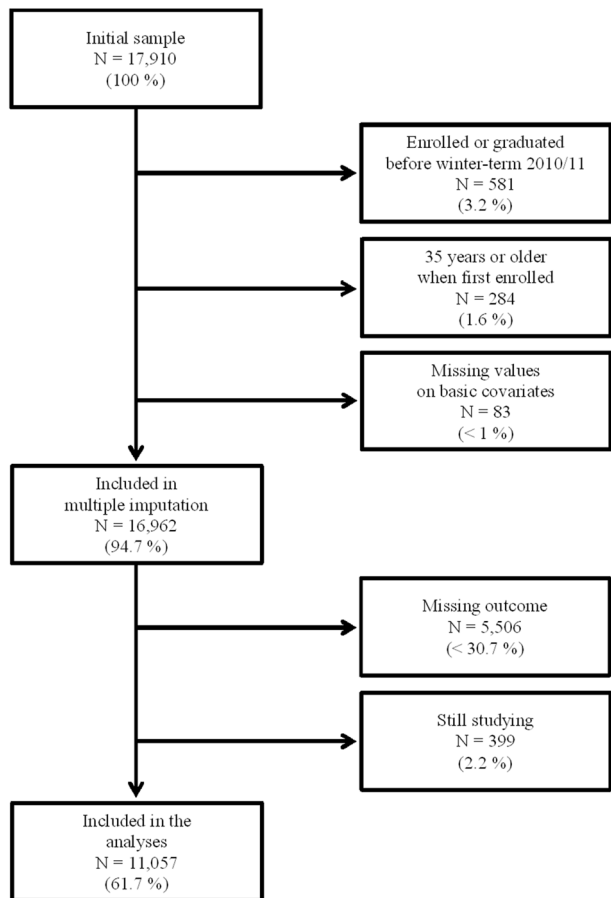
Table 13 (continued)

| | Model 5 | |
|---|---------|-----------|
| Migration background (Ref. native German) | 0.99 | (0.11) |
| Female (Ref. male) | 0.98 | (0.09) |
| Age at enrollment in years | 1.06 | (0.03)* |
| Age at enrollment in years (squared) | 1.00 | (0.00) |
| Baseline (constant) | 0.04 | (0.01)*** |
| McFadden's Pseudo- R^2 | .23 | |
| N | 11,057 | |

Odds ratios (exponentiated coefficients) from $M=100$ imputed datasets. Robust standard errors in parentheses. Ref.: reference category. GPA, SIM (student integration model), and RCT (rational choice theory) variables are standardized to zero mean and unit variance

* $p < .05$, ** $p < .01$, *** $p < .001$

Fig. 2 Sample reduction steps from initial sample to analytic sample. *Notes:* All percentages in reference to the initial sample. Basic covariates: type of higher education institution, field of studies, and pursued degree



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Code Availability Syntax files (Stata) used for data preparation and analyses are available from the authors upon request.

Declarations

Conflict of interest The authors declare that they have no competing interests.

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent for Publication Not applicable.

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References

- Allmendinger, J. (1989). Educational systems and labor market outcomes. *European Sociological Review*, 5(3), 231–250.
- Alon, S. (2011). Who benefits most from financial aid? The heterogeneous effect of need-based grants on students' college persistence. *Social Science Quarterly*, 92(3), 807–829.
- Arendt, J. N. (2013). The effect of public financial aid on dropout from and completion of university education: Evidence from a student grant reform. *Empirical Economics*, 44(3), 1545–1562.
- Argentin, G., & Triventi, M. (2011). Social inequality in higher education and labour market in a period of institutional reforms: Italy, 1992–2007. *Higher Education*, 61(3), 309–323.
- Autorengruppe Bildungsberichterstattung. (2020). *Bildung in Deutschland 2020. Ein indikatorengestützter Bericht mit einer Analyse zu Bildung in einer digitalisierten Welt*. wbv.
- Barone, C., Schizzerotto, A., Abbiati, G., & Argentin, G. (2017). Information barriers, social inequality, and plans for higher education: Evidence from a field experiment. *European Sociological Review*, 33(1), 84–96.

- Barone, C., Triventi, M., & Assirelli, G. (2018). Explaining social inequalities in access to university: A test of rational choice mechanisms in Italy. *European Sociological Review*, *34*(5), 554–596.
- Becker, R., & Hecken, A. E. (2009). Why are working-class children diverted from universities? An empirical assessment of the diversion thesis. *European Sociological Review*, *25*(2), 233–250.
- Beekhoven, S., Jong, U. D., & van Hout, H. (2002). Explaining academic progress via combining concepts of integration theory and rational choice theory. *Research in Higher Education*, *43*(5), 577–600.
- Bers, T. H., & Smith, K. E. (1991). Persistence of community college students: The influence of student intent and academic and social integration. *Research in Higher Education*, *32*(5), 539–556.
- Blossfeld, H. -P., Roßbach, H. -G., & von Maurice, J. (2011). *Education as a lifelong process—The German National Educational Panel Study (NEPS)*. (Zeitschrift für Erziehungswissenschaft: Sonderheft 14). Wiesbaden: Springer VS.
- Boudon, R. (1974). *Education, opportunity, and social inequality: Changing prospects in western society*. Wiley.
- Bourdieu, P., & Passeron, J.-C. (1990). *Reproduction in education, society and culture (Reprinted.)*. SAGE Publications.
- Braxton, J. M., Sullivan, A. V. S., & Johnson, R. M. (1997). Appraising Tinto's theory of college student departure. In J. C. Smart (Ed.), *Higher education. Handbook of theory and research* (pp. 107–164). Agathon Press.
- Breen, R., & Goldthorpe, J. H. (1997). Explaining educational differentials: Towards a formal rational action theory. *Rationality and Society*, *9*(3), 275–305.
- Breier, M. (2010). From 'financial considerations' to 'poverty': Towards a reconceptualisation of the role of finances in higher education student drop out. *Higher Education*, *60*(6), 657–670.
- Cabrera, A. F., Nora, A., & Castaneda, M. B. (1992). The role of finances in the persistence process: A structural model. *Research in Higher Education*, *33*(5), 571–593.
- Chen, R. (2012). Institutional characteristics and college student dropout risks: A multilevel event history analysis. *Research in Higher Education*, *53*(5), 487–505.
- Chen, R., & St. John, E. P. (2011). State financial policies and college student persistence: A national study. *The Journal of Higher Education*, *82*(5), 629–660.
- Chryssikos, A., Ahmed, E., & Ward, R. (2017). Analysis of Tinto's student integration theory in first-year undergraduate computing students of a UK higher education institution. *International Journal of Comparative Education and Development*, *19*(2/3), 97–121.
- Contini, D., Cugnata, F., & Scagni, A. (2017). Social selection in higher education. Enrolment, dropout and timely degree attainment in Italy. *Higher Education*, *75*(5), 785–808.
- Dahm, G., Lauterbach, O., & Hahn, S. (2016). Measuring students' social and academic integration—Assessment of the operationalization in the National Educational Panel Study. In H.-P. Blossfeld, J. von Maurice, M. Bayer, & J. Skopek (Eds.), *Methodological issues of longitudinal surveys: The example of the National Education Panel Study* (Vol. 12, pp. 313–329). Springer.
- Daniel, A., & Watermann, R. (2018). The role of perceived benefits, costs, and probability of success in students' plans for higher education. A quasi-experimental test of rational choice theory. *European Sociological Review*, *34*(5), 539–553.
- de Werfhorst, V., Herman, G., & Hofstede, S. (2007). Cultural capital or relative risk aversion? Two mechanisms for educational inequality compared. *The British Journal of Sociology*, *58*(3), 391–415.
- Donovan, R. (1984). Path analysis of a theoretical model of persistence in higher education among low-income black youth. *Research in Higher Education*, *21*(3), 243–259.
- Enders, J. (2016). Differenzierung im deutschen Hochschulsystem. In D. Simon, A. Knie, S. Hornbostel, & K. Zimmermann (Eds.), *Handbuch Wissenschaftspolitik* (pp. 503–516). Springer VS.
- Erikson, R., Goldthorpe, J. H., & Portocarero, L. (1979). Intergenerational class mobility in three western European societies: England, France and Sweden. *The British Journal of Sociology*, *30*(4), 415–441.
- Erikson, R., & Jonsson, J. O. (1996). Explaining class inequality in education: The Swedish test case. In R. Erikson (Ed.), *Can education be equalized?: The Swedish case in comparative perspective* (pp. 1–63). Westview Press.
- Gabay-Egozi, L., Shavit, Y., & Yaish, M. (2010). Curricular choice: A test of a rational choice model of education. *European Sociological Review*, *26*(4), 447–463.
- Ganzeboom, H. B. G., & Treiman, D. J. (1996). Internationally comparable measures of occupational status for the 1988 International Standard Classification of Occupations. *Social Science Research*, *25*, 201–239.
- Goldthorpe, J. H. (2000). *On sociology*. Oxford University Press.
- Heublein, U., Ebert, J., Hutzsch, C., Isleib, S., König, R., Richter, J., & Woisch, A. (2017). *Zwischen Studierwartungen und Studienwirklichkeit: Ursachen des Studienabbruchs, beruflicher Verbleib der*

- Studienabbrecherinnen und Studienabbrecher und Entwicklung der Studienabbruchquote an deutschen Hochschulen.* DZHW.
- Heublein, U., Richter, J., & Schmelzer, R. (2020). *Die Entwicklung der Studienabbruchquoten in Deutschland.* DZHW.
- Holm, A., & Breen, R. (2016). Behavioral and statistical models of educational inequality. *Rationality and Society*, 28(3), 270–298.
- Hüther, O., & Krücken, G. (2018). *Higher education in Germany—Recent developments in an international perspective.* Springer International Publishing.
- Ishitani, T. T. (2006). Studying attrition and degree completion behavior among first-generation college students in the United States. *The Journal of Higher Education*, 77(5), 861–885.
- Jackson, M. (2013). *Determined to succeed? Performance versus choice in educational attainment.* Stanford University Press.
- Jackson, M., Erikson, R., Goldthorpe, J. H., & Yaish, M. (2007). Primary and secondary effects in class differentials in educational attainment. *Acta Sociologica*, 50(3), 211–229.
- Jann, B. (2014). Plotting regression coefficients and other estimates. *The Stata Journal*, 14(4), 708–737.
- Karlson, K. B., Holm, A., & Breen, R. (2012). Comparing regression coefficients between same-sample nested models using logit and probit. *Sociological Methodology*, 42(1), 286–313.
- Klein, D. (2014). MIMRGNS: Stata module to run margins after mi estimate. Boston College Department of Economics: Statistical Software Components. Retrieved April 1, 2021, from <https://ideas.repec.org/c/boc/bocode/S457795.html>
- Klein, D. (2019). Das Zusammenspiel zwischen akademischer und sozialer Integration bei der Erklärung von Studienabbruchintentionen. Eine empirische Anwendung von Tintos Integrationsmodell im deutschen Kontext. *Zeitschrift für Erziehungswissenschaft*, 22(2), 301–323.
- KMK: Kultusministerkonferenz. (2003). *10 Thesen zur Bachelor- und Masterstruktur in Deutschland. Beschluss vom 12.06.2003.* Bonn: Kultusministerkonferenz.
- KMK: Kultusministerkonferenz. (2009). *Hochschulzugang für beruflich qualifizierte Bewerber ohne schulische Hochschulzugangsberechtigung. Beschluss der Kultusministerkonferenz vom 06.03.2009.* Bonn: Kultusministerkonferenz. [beschuesse/2009/2009_03_06-Hochschulzugang-erful-qualifizierte-Bewerber.pdf](#)
- Kroth, A. J. (2015). *The effects of the introduction of tuition on college enrollment in Germany: Results from a natural experiment with special reference to students from low parental education backgrounds.* University of Michigan.
- Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2006). *What matters to student success: A review of the literature: Commissioned Report for the National Symposium on Postsecondary Student Success: Spearheading a dialog on student success.* NEPC.
- Larsen, M. S., Kornbeck, K. P., Kristensen, R. M., Larsen, M. R., & Sommersel, H. B. (2013). *Dropout phenomena at universities: What is dropout? Why does dropout occur? What can be done by the universities to prevent or reduce it?: A systematic review.* Danish Clearinghouse for Educational Research.
- Mangan, J., Hughes, A., & Slack, K. (2010). Student finance, information and decision making. *Higher Education*, 60(5), 459–472.
- Mannan, M. A. (2007). Student attrition and academic and social integration: Application of Tinto's model at the University of Papua New Guinea. *Higher Education*, 53(2), 147–165.
- Mare, R. D. (1980). Social background and school continuation decisions. *Journal of the American Statistical Association*, 75(370), 295–305.
- Mayhew, M. J., Rockenbach, A. N., Bowman, N. A., Seifert, T. A. D., & Wolniak, G. C. (2016). *How college affects students: 21st century evidence that higher education works.* Jossey-Bass.
- Melguizo, T., Torres, F. S., & Jaime, H. (2011). The association between financial aid availability and the college dropout rates in Colombia. *Higher Education*, 62(2), 231–247.
- Middendorff, E., Apolinarski, B., Poskowsky, J., Kandulla, M., & Netz, N. (2013). *Die wirtschaftliche und soziale Lage der Studierenden in Deutschland 2012: 20. Sozialerhebung des Deutschen Studentenwerks durchgeführt durch das HIS-Institut für Hochschulforschung.* DZHW.
- Müller, S., & Schneider, T. (2013). Educational pathways and dropout from higher education in Germany. *Longitudinal and Life Course Studies*, 4(3), 218–241.
- Müller, W., Pollak, R., Reimer, D., & Schindler, S. (2017). Hochschulbildung und soziale Ungleichheit. In R. Becker (Ed.), *Lehrbuch der Bildungssoziologie* (pp. 309–358). Springer Fachmedien.
- Need, A., & Jong, U. D. (2001). Educational differentials in The Netherlands: Testing rational action theory. *Rationality and Society*, 13(1), 71–98.
- Neugebauer, M., Reimer, D., Schindler, S., & Stocké, V. (2013). Inequality in transitions to secondary school and tertiary education in Germany. In M. Jackson (Ed.), *Determined to succeed? Performance versus choice in educational attainment* (pp. 56–88). Stanford University Press.

- Neumeyer, S., & Alesi, B. (2018). *Soziale Ungleichheiten nach Studienabschluss?: Wie sich die Bildungsherkunft auf weitere Bildungsübergänge und den erfolgreichen Berufseinstieg von Hochschulabsolventen auswirkt*. INCHER-Kassel.
- Nora, A., & Crisp, G. (2012). Student persistence and degree attainment beyond the first year in college: Existing knowledge and directions for future research. In A. Seidman (Ed.), *College student retention: Formula for student success* (pp. 229–250). Rowman & Littlefield Publishers Inc.
- OECD. (1999). *Classifying educational programmes: Manual for ISCED- 97 implementation in OECD countries*. OECD Publishing.
- OECD. (2013). *Education at a glance 2013: OECD indicators*. OECD Publishing.
- OECD. (2019). *How does socio-economic status influence entry into tertiary education? Education indicators in focus. April 2019. #69*. OECD Publishing.
- OECD. (2021). *Education at a glance 2021: OECD indicators*. OECD Publishing.
- Pascarella, E. T., & Chapman, D. W. (1983). A multiinstitutional, path analytic validation of Tinto's model of college withdrawal. *American Educational Research Journal*, 20(1), 87–102.
- Pietsch, M., & Stubbe, T. C. (2007). Inequality in the transition from primary to secondary school: School choices and educational disparities in Germany. *European Educational Research Journal*, 6(4), 424–445.
- Rienties, B., Beusaert, S., Grohnert, T., Niemantsverdriet, S., & Kommers, P. (2012). Understanding academic performance of international students: The role of ethnicity, academic and social integration. *Higher Education*, 63(6), 685–700.
- Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. Wiley.
- Rubin, D. B. (1996). Multiple imputation after 18+ years. *Journal of the American Statistical Association*, 91(434), 473–489.
- Schindler, S., & Lörz, M. (2012). Mechanisms of social inequality development: Primary and secondary effects in the transition to tertiary education between 1976 and 2005. *European Sociological Review*, 28(5), 647–660.
- Schindler, S., & Reimer, D. (2011). Differentiation and social selectivity in German higher education. *Higher Education*, 61(3), 261–275.
- Schnepf, S. V. (2017). How do tertiary dropouts fare in the labour market? A comparison between EU countries. *Higher Education Quarterly*, 71(1), 75–96.
- Schwarz, N. (2007). Retrospective and concurrent self-reports: The rationale for real-time data capture. In A. Stone, S. Shiffman, A. A. Atienza, & L. Nebeling (Eds.), *The science of real-time data capture: Self-reports in health research* (pp. 11–26). Oxford University Press.
- Severiens, S. E., & Schmidt, H. G. (2009). Academic and social integration and study progress in problem based learning. *Higher Education*, 58(1), 59–69.
- Smith, J. P., & Naylor, R. A. (2001). Dropping out of university: A statistical analysis of the probability of withdrawal for UK university students. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 164(2), 389–405.
- Soria, K. M., & Stebleton, M. J. (2012). First-generation students' academic engagement and retention. *Teaching in Higher Education*, 17(6), 673–685.
- Soria, K. M., Stebleton, M. J., & Huesman, R. L. (2013). Class counts: Exploring differences in academic and social integration between working-class and middle/upper-class students at large, public research universities. *Journal of College Student Retention: Research, Theory & Practice*, 15(2), 215–242.
- StataCorp. (2019). *Stata statistical software: Release 16*. StataCorp LP.
- Stocké, V. (2007). Explaining educational decision and effects of families' social class position: An empirical test of the Breen-Goldthorpe model of educational attainment. *European Sociological Review*, 23(4), 505–519.
- Stocké, V., Blossfeld, H.-P., Hoinig, K., & Sixt, M. (2011). Social inequality and educational decisions in the life course. *Zeitschrift Für Erziehungswissenschaft*, 14(S2), 103–119.
- Terenzini, P. T., & Pascarella, E. T. (1977). Voluntary freshman attrition and patterns of social and academic integration in a university: A test of a conceptual model. *Research in Higher Education*, 6(1), 25–43.
- Terenzini, P. T., Springer, L., Yaeger, P. M., Pascarella, E. T., & Nora, A. (1996). First-generation college students: Characteristics, experiences, and cognitive development. *Research in Higher Education*, 37(1), 1–22.
- Thomas, S. L. (2000). Ties that bind: A social network approach to understanding student integration and persistence. *The Journal of Higher Education*, 71(5), 591–615.

- Tieben, N. (2019). Non-completion, transfer, and dropout of traditional and non-traditional students in Germany. *Research in Higher Education*, 5(3), 231.
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 45(1), 89–125.
- Tinto, V. (1986). Theories of student departure revisited. In J. Smart (Ed.), *Higher education: A handbook of theory and research* (Vol. 2, pp. 359–384). Agathon.
- Tinto, V. (1987). *Leaving college: Rethinking the causes and cures for student attrition*. University of Chicago Press.
- Tutić, A. (2017). Revisiting the Breen-Goldthorpe model of educational stratification. *Rationality and Society*, 29(4), 389–407.
- Van Buuren, S. (2012). *Flexible imputation of missing data*. CRC Press.
- Vignoles, A. F., & Powdthavee, N. (2009). The socioeconomic gap in university dropouts. *The B.E. Journal of Economic Analysis & Policy*, 9(1), 1–36.
- Von Hippel, P. T. (2007). Regression with missing Ys: An improved strategy for analyzing multiply imputed data. *Sociological Methodology*, 37(1), 83–117.
- White, I. R., Royston, P., & Wood, A. M. (2011). Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine*, 30(4), 377–399.
- Willett, J. B., & Singer, J. D. (1991). From whether to when: New methods for studying student dropout and teacher attrition. *Review of Educational Research*, 61(4), 407–450.
- Zinn, S., Steinhauer, H. W., & Aßmann, C. (2017). *Samples, weights, and nonresponse: The student sample of the National Educational Panel Study (Wave 1 to 8)*. LIfBi.
- Zinn, S., Würbach, A., Steinhauer, H. W., & Hammon, A. (2020). Attrition and selectivity of the NEPS starting cohorts: An overview of the past 8 years. *AStA Wirtschafts- und Sozialstatistisches Archiv*, 14(2), 163–206.

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